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Mites of the Family Tetranychidae*

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INTRODUCTION

The mites treated in the present publication have been known under the popular names red spiders, spinning mites, and spider mites, these designations being derived from the ability of many species to spin webbing. They are included in the family Tetranychidae, Order Acarina, Class Arachnida. Many of the spider mites are of great economic importance due to the serious damage caused by their feeding on crop, ornamental, and forest plants.

The metamorphosis of tetranychid mites is of the incomplete type, since the progressive stages from the newly hatched individual to the adult do not include a truly pupal or transformation phase, and the development changes involve chiefly an enchancement in size. The only radical morphological

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departure in the course of ontogeny consists of the addition of the fourth pair of legs following the ecdysis of the first larval stage.

The life histories of the species which have been observed conform closely to one pattern. The eggs are deposited singly on the surface of the food plant, and hatch, during active seasons, in a few days, giving rise to the six-legged larvae which at once begin to feed. The female larva, upon molting, is succeeded by the protonymph which again molts to become the deutonymph. The third ecdysis in the female gives rise to the adult. These stages differ little except in size and in the possession of eight legs by the three later stages, in contrast with the six legs of the larva, as previously explained. The development of the male differs from that of the female in that there is only one nymphal stage. For many species, under optimum conditions, from 10 to 12 days are required for the completion of a generation. In the case of all mites studied, females may deposit eggs without fertilization, but these have invariably produced only male individuals.

Where the winters are mild, as in California and southern United States, spider mites may remain active and undergo development throughout the year, but in other localities hibernation occurs. The European red mite, for example, survives the winter in the egg stage on the food plant, while most species of *Tetranychus* and certain other tetranychids overwinter exclusively as adult females which seek shelter in the soil or in crevices on the supporting host. There may be as many as 16 generations of spider mites per year.

BIOLOGICAL FEATURES

Feeding.—Certain species of spider mites are omnivorous and appear to show little preference among the food plants. Other species discriminate between plants, especially those species occurring on the native flora such as grasses, conifers, and certain indigenous shrubs. This discrimination applies to a lesser extent to such mites as *Tetranychus sexmaculatus* and *Paratetranychus citri,* which are primarily pests of citrus. *P. pilosus* exhibits a preference for woody members of the Rosaceae.

All active stages of spider mites feed upon the leaves, stems or fruits of the food plants. The feeding operation is accomplished by the mandibular stylets which puncture the tissues, and by the oral aperture which is situated near the tip of the rostrum. The extraction of chlorophyll and other pigments in feeding leads to characteristic blotching or stippling of the plant parts, which may be rather typical for a given species of mite. Feeding may result in the discoloration, desiccation, or abscission of the leaves, or in discoloration or stunting of the fruits. Severely attacked plants and trees may become completely defoliated and devitalized.

Webbing.—As mentioned previously, many of the spider mites spin webbing on the food plants; this is most pronounced in the species of *Tetranychus.* Where heavy populations occur, it may result in the enshrouding of the foliage in dense webbing which is visible from a distance. It is probable that the function of the webbing is for protection against enemies and adverse con-

ditions. Acaridologists have speculated variously regarding the locations of the spinning organs of mites. Blauvelt (1) shows the silk glands located over coxae I and II, and the ducts extending along the front of the body where they unite into a common duct which runs anterior-ventrad to a point under the tip of the rostrum. The writer has never actually observed the excretion of webbing fluid, and his limited histological studies do not permit of questioning Blauvelt's conclusions as to the location of the spinning system.

Seasonal occurrence.—In the case of most spider mites that have been observed, the populations are high during late spring and summer, and the severest infestations normally occur during July and August. Relatively high temperatures and periods of drought are optimum conditions for the majority of tetranychid mites. As an example of an exception to this rule, the citrus mite (*Paratetranychus citri* (McG.)) occurs in greatest numbers in California in the spring and fall, while periods of hot summer weather result in sudden deciminations. With the exception of the San Bernardino Valley, the citrus mite is not known to occur in the hotter portions of California, and it is unreported from Arizona. (In May 1948, since writing this manuscript, the citrus red mite has been found in Tulare County, Calif.)

Biological control.—In studies of a spider mite on cotton in the southeastern United States by McGregor and McDonough (2), from 1911 to 1914, 31 species of arthropod enemies were recorded, of which 5 were mites. Several of these natural enemies possessed active predatory potentials; the more important were *Scolothrips sexmaculatus* (Perg.), *Seiulus* sp., itonidid midges, *Geocoris punctipes* Say, *Triphleps insidiosus* Say, several small coccinellids, and *Chrysopa* spp. In the Pacific coastal states *Scolothrips sexmaculatus* Perg. and *Seiulus* sp. appear to be the more effective enemies of tetranychid mites in general, and the six-spotted thrips has been observed almost to eradicate heavy populations of *Tetranychus pacificus* McG. during the late summer. It appears to be true that, collectively, biological control is a substantial factor in reducing populations of many species of spider mites.

Dispersion.—Observations over a period of many years have been made of the ways by which spider mites become dispersed. Such travel includes crawling on the soil surface; from plant to plant by means of the interlacing branches, conveyance in surface water following rains, and by air movement. An example of the last mentioned method is a collection by airplane at a great altitude over Texas of specimens of a mite known to occur only in the high Sierra Nevada Mountains of California.

Coloration.—Many species of spider mites exhibit marked variations in color. In the past this has led to much confusion in the taxonomy of these mites. Variations in coloration among individuals of a given species may be due to the different food plants upon which they feed, to the color phases of the several instars, or to the season of year. A few species are more constant in their coloration than others, but this is a feature which should not be seriously relied upon in the taxonomy of the spider mites. Ewing (3) has

discussed variations in the color of a common spider mite, and the various factors involved.

COLLECTION AND PREPARATION

The critical study of spider mites is made difficult by their minuteness. The records of body length range from 0.25 to 0.68 mm. For the proper study of the structural characters of taxonomic importance, the use of the oil-immersion lens is obligatory. Since the females of different species within a genus often cannot be distinguished by characters at present known, it becomes necessary in most cases to have males at hand for study. In collecting mites for identification many persons have selected the larger individuals, which invariably are females. In most cases this makes specific identification impossible.

The species of spider mites vary somewhat in life history, habits, and in their susceptibility to control chemicals. It is evident, therefore, that the entomologist should become informed of the particular species with which he is concerned.

In collecting tetranychid mites for study, investigators have usually followed one of two methods: The mites have been picked off the host plant with a fine-pointed brush or needle and placed alive in a preservative fluid, or portions of infested foliage have been placed in the fluid. An expeditious method of collecting spider mites, devised by the author, is as follows: A piece of window screen is attached to a small, wooden frame; a large sheet of paper (black for pale mites, white for dark mites) is placed flat; the screen frame is placed on the paper; twigs of infested foliage are whipped sharply onto the screen; the dislodged mites pass through the screen and then may be gathered from the surface of the paper. Many more mites may be collected in a given time in this way than by any other known method. Due to the shrivelling effect of alcohol upon the weakly chitinized spider mites, the writer prefers to use Berlese fluid as the collecting medium.

In preparing spider mites for study, some workers bleach them in heated concentrated lactic acid, or soak for a longer period in this material without heating. Thereupon the mites are transferred directly into a Berlese fluid medium on the glass slide. Since this medium possesses a distinct clearing property, the writer has made a practice of placing mites directly into it alive or from the collecting fluids.

In transferring mites for a permanent mount, a generous drop of Berlese fluid is applied on the slide, into which are placed as many individuals as is practicable. If only a very few mites are available, all should be oriented so as to be viewed in profile. If the supply is more numerous, some may be mounted laterally and others with the dorsum or venter upward; males should be placed so as to be studied in profile. Patience is required in arranging the mites in the desired positions until the medium has "set" sufficiently to maintain them in the desired positions; frequent manipulation of the mites with a needle or extremely fine brush is necessary; this will require from 20 to 30 minutes. After proper mounting has been accomplished, the slide should

be allowed to "age" for from two to five days before capping with a cover-glass; otherwise this operation may disarrange the specimens. In applying the cover-glass, a liberal drop of the medium is placed at its middle, and the cover-glass is then inverted onto the slide, care being taken to have the specimens centered within the periphery of the cover. If too much medium is used, or if the mites are embedded too deeply in the fluid, a proper focus with the oil-immersion lens will not be possible. The preparation should be given 24 hours to "set" before employing the oil-immersion objective. Some acaridologists "ring" the cover-glass with certain sealing materials; the writer has never followed this practice, and the majority of his mounts remain in satisfactory condition, even after 20 years.

CHARACTERS OF THE TETRANYCHIDAE

Mites of the family Tetranychidae have the following disinguishing characteristics: Soft-bodied mites, oval to elliptical in outline in the female; the collective complex of the mouth organs not movable forward and backward, and forming a short cone which is partly sheltered by an overlying fold of the dorsal body tissue; the chitinized portion of the mandibles (stylets) consisting of a pair of fine, bristle-like elements, recurved sharply behind, the short dorsal arm inbedded in the mandibular plate, the longer ventral arm protruding anteriorly from under the spina or digiti fixi; the terminal, thumb-like segment of the palpus articulated to the preceding segment so as often to appear to be deflexed from it; a dorso-terminal claw (usually strong) borne on the penultimate segment of the palpus, overlying the terminal segment; the eyes usually very noticeable as red spots; the genital and anal openings situated near caudal end of venter, the anus subterminal. Inhabiting foliage. Most species producing webbing.

MORPHOLOGY

The body of a spider mite is divisible into the cephalothorax or proterosoma and the abdomen or hysterosoma. The former bears the two anterior pairs of legs and the rostrum; the latter bears the two hind pairs of legs. The dividing suture is not always clearly visible.

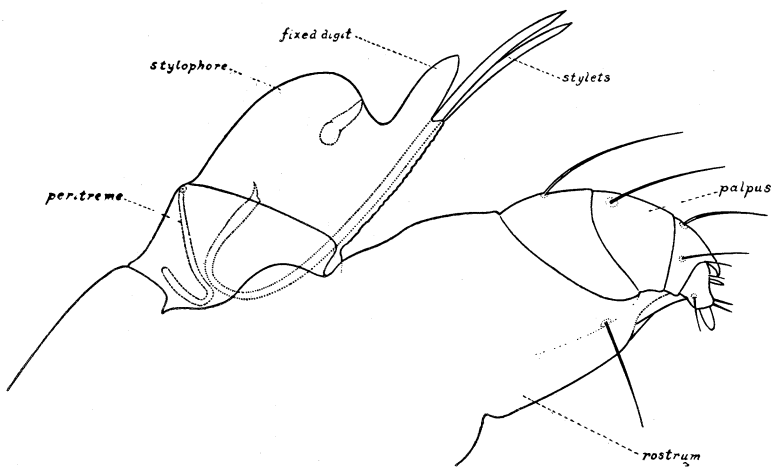
The dorsum of the body bears varying numbers of setae. For the known species, these range in number from 22 to 56, and are usually arranged roughly in transverse and longitudinal rows.

In outline the dorsal setae may be peglike, linear to lanceolate hairs, or ovate to leaflike plates. The dorsal setae arise in some species from countersunk discs, in other species from flush rings, or prominent tubercles. The legs, as a rule, are well supplied with hairs which, within the family, vary as much in structure as do the dorsal body setae.

One or two eye cornea occur on each side, usually between the subfrontal and humeral setae of the cephalothorax.

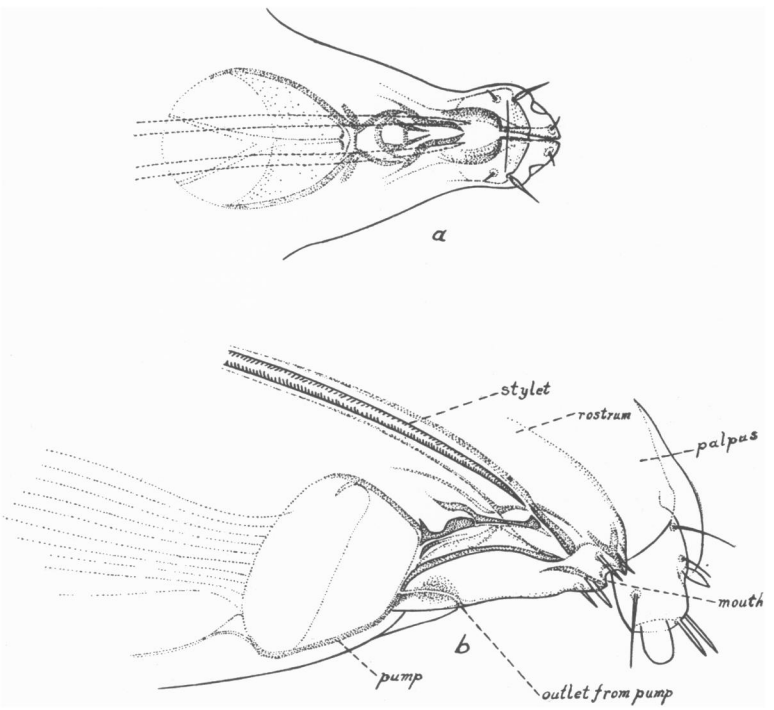
The dorsal body integument of the female exhibits various types of striations or wrinkles. On the proterosoma these mostly run longitudinally,

while on the hysterosoma they are transverse for the most part. Oudemans (4) proposed the genus *Eotetranychus* for mites (otherwise *Tetranychus*) whose dorsal abdominal striations are entirely transverse except for a few small marginal areas. He retained in *Tetranychus* those mites in which most of the dorsal striations behind the third pair of subaxial setae are longitudinal. In certain genera, e. g., *Tetranychus*, *"Eotetranychus,"* *Paratetranychus* and *Schizotetranychus*, there is a U-shaped area with parallel longitudinal striae overlying the normal position of the mandibular plate, called the pseudoshield. The striae on the venter are all transverse. In the males of most species, the striations are transverse on both dorsum and venter. In *Bryobia* the dorsal integument has a very irregular pattern of striations which bend and run in many directions.



Text fig. 1. *Tetranychus bimaculatus*.—Rostrum and associated structures.

In the Tetranychidae the mouthparts consist of the mandibles, palpi, and spina. Basally the mandibles are coalesced to form the manibular plate ("stylophore" of Snodgrass), and distally they project anteriorly as the needle-like stylets and tip of rostrum or spina. The stylets and mandibular plate are movable forward and backward; the former, from their basal origin, extend first backward and then bend sharply forward to emerge under the tip of the rostrum. The stylets are solid, and are used for piercing plant tissue in order to liberate the plant juices used for food. The rostrum evidently is a conical extension from the ventral portion of the cephalothorax, lying between the palpi; it is slightly truncate in front, and bears several minute setae near its tip. The oral orifice opens near the tip of the rostrum. The palpi may be considered to be auxiliary members of the mouthparts. They arise between coxae I, under the manibular plate, and straddle the rostrum. Typically, they are 5-segmented, the last segment forming a "thumb" to the preceding joint which, dorso-terminally, bears a strong claw. The "thumb"



Text fig. 2. *Tetranychus* species.—Rostrum and tip of palpus, showing oral orifice, pharynx, esophageal pump, duct previously thought to be the silk duct, and stylet: "a," ventral view; "b," lateral view.

bears from 5 to 8 appendages, more often 7; typically, there is a terminal bullet-shaped structure called the terminal sensilla, or "finger," and a similar but smaller organ dorsally called the dorsal sensilla, both assumed to be sense organs; in addition, there are, typically, 5 short hairs on the "thumb," the apical-most pair being naillike and probably used for piercing the food plants.

In *Bryobia* and *Tuckerella,* and to a lesser extent in *Monoceronychus, Pseudobryobia,* and *Allochaetophora,* the front margin of the cephalothorax projects forward as a free plate. In *Tuckerella* this plate is dome-shaped and without appendages; in *Allochaetophora* it is an inconspicuous fold; in *Pseudobryobia* it is a semihyaline plate with 5 ill-defined lobes; in *Monoceronychus* the weakly defined plate bears a median fleshy "finger" and laterally a pair of weak lobes, the latter bearing each a leaflike seta. In *Bryobia* the free plate has four lobes, each bearing a leaflike seta.

A pair of tracheae border the mandibular plate and lead inward as variously shaped tubes, usually termed the collar tracheae or peritremes; these have

taxonomic significance. In *Bryobia, Petrobia,* and *Tuckerella* the tracheae protrude externally as udder or tube-shaped structures.

The legs in most tetranychid females are shorter than the body; *Bryobia, Petrobia, and Tetranychina* are exceptional in having some or all of the legs longer than the body. The legs of the male in most cases are proportionately longer than in the female. The legs of spider mites are 6-segmented, consisting of coxa, trochanter, femur, patella, tibia, and tarsus. The relative lengths of the leg segments are of taxonomic value. There is great variation in the structure of the terminal tarsal appendages, and these characters are very useful in distinguishing between both genera and species. Unfortunately, the generic name *Tetranychus* and the family name Tetranychidae originally were based on the belief that *Tetranychus* possesses a tarsal claw that is split into four parts. Subsequently study revealed that in this genus the claw has six subequal divisions. Harvey (5) seems to have been the first to make this observation. In *Eutetranychus* there is no tarsal claw, but four capitate tenent hairs arise from the terminal pad or onychium; the tenent hairs persist, in some form, in all tetranychid mites. *Hystrichonychus* is devoid of a claw, but has 6 tenent hairs arranged in pairs. *Simplinychus* has a single, simple, uncleft claw and 4 tenent hairs arising from the onychium. *Neotetranychus* has the claw obscurely split terminally into 6 very short divisions or teeth. *Petrobia* and *Tetranychina* have a single claw which bears laterally pectinate series of minute tenent hairs; and 4 tenent hairs arise from the onychium. *Allochaetophora* has no true claws, but in their stead are 2 blade-shaped plates each bearing pectinate series of minute tenent hairs; a median pulvillus also bears minute tenent hairs. The tarsus of *Monocerony-chus* resembles that of the latter genus, but has 4 longer tenent hairs arising from the onychium. *Tuckerella* has 2 tarsal claws, each with a duplicated, basal series of numerous tenent hairs, a pulvillus bearing 2 pectinate series of tenent hairs arises from the onychium between the claws. *Bryobia* and *Pseudobryobia* have 2 tarsal claws, each bearing 2 long tenent hairs, with a median pulvillus also bearing two similar tenent hairs. *Schizotetranychus* has 2 to 6 claw divisions, fused at base, widely divergent right and left, with onychium bearing 4 long tenent hairs, a pair each side of claw base (in a few species rudiments of a dorsal and a ventral division of each claw occurs). *Septanychus* resembles *Tetranychus* in that the main claw is cleft into 6 divisions; in addition, a shorter spurlike claw is borne dorsally on the main claw at its point of greatest bending. In *Paratetranychus* there is a strong, uncleft main claw, arising ventrally from which are 6 to 10 needlelike spines; these appendiculate spines arise virtually from a common base, whose position varies from a point near the base of the main claw, to its middle; these spines may be longer or shorter than the main claw. Berlese (6) proposed the genus *Oligonychus* for a mite represented as having the main claw furnished near base with 2 deflexed appendages, each setose on its inner edge with short barbs. This tarsal structure never has been observed in any mites studied by the writer. Ewing (7) has described two mites in this genus, but specimens of *O. americanus* Ewing, identified by Ewing, have he deflexed appendages and spines of the

claw with a common basal origin, thus belonging properly in *Paratetranychus*.

In many species of tetranychid mites the details of the tarsal claw of the male differ from those of the female. This is true especially in tarsus I, and to a lesser degree in tarsus II of the male. This modification may include a reduction in the number of claw divisions, and the shape and length of the component parts. In addition, the claws of legs I of the female rarely may differ slightly from those of the other legs. The foregoing discussion of the tarsal claws of the genera applies chiefly to those of legs I of the female.

The mandibular plate is a somewhat chitinized structure which varies between species in proportions and outline, and is of taxonomic utility.

In the past, the copulatory organ of male tetranychids has been called the penis. As predicted by Pierce (8) in 1919, this strongly chitinized organ almost certainly corresponds to the aedeagus of insects, and in several instances a delicate, filamentous tube has been observed entering and extruding from it. The latter is, with little doubt, the true penis. In the spider mites the aedeagus varies greatly in structure between species, and is of utmost importance for their identification. In certain mite complexes, as in the genus *Tetranychus* for example, the recognition of species in many cases would be all but impossible were it not for the uniqueness of their aedeagi. Due to the strongly chitinized nature of this organ, it is not amenable to change in size or outline in the individual, and the variation within a species is insignificant. This character is of less utility for the identity of genera since in certain cases there are marked resemblances between the aedeagi of species in different genera. This is definitely contrary to the view held by Geijskes (9) who stated that the aedeagus is of more value in the separation of genera than of species.

A phenomenon of interest is the fact that occasional males are inordinately large, even approaching the size of the female. In these cases of gigantism the aedeagi may be correspondingly large, but their proportions and shape conform to those of the typical males.

CLASSIFICATION

Among the mites properly grouped in the Tetranychidae, most of the structural characters used in classification exhibit rather marked variations within the family. This is true of the tarsal appendages, the palpus, the collar tracheae, the mandibular plate, the legs, the body proportions, the dorsal body setae, the dorsal cuticular integument, and the aedeagus. When an attempt is made to segregate species into genera, based on one structural character, such groupings do not necessarily remain logical for other characters. Consequently, it becomes necessary in the taxonomy of the tetranychid mites to select one character for particular use in the separation of the genera. For this purpose, the structure of the tarsal claw (see Plate I) and its associated appendages seems to be best suited, and in the past it has been used rather consistently. The value of the terminal tarsal structures in the conception of genera is due not only to variations in their number, shape, and size, but to the presence or absence of certain fundamental parts. A key to the genera follows.

KEY TO THE GENERA OF THE TETRANYCHIDAE

(Descriptions of tarsal appendages refer to leg I of the female.)

1. Tarsi devoid of true, hooked claws 2
   Tarsi with one or two hooked claws 5

2. Terminal tarsal appendages consisting only of tenent hairs 3
   Terminal tarsal appendages consisting of two bladelike structures and a median pulvillus, all bearing tenent hairs 4

3. Tip of tarsus bearing six tenent hairs; dorsal body armature consisting of many long, strong spines arising from elevated tubercles ..... *Hystrichonychus* n. g.

   Tip of tarsus bearing four tenent hairs; dorsal body armature not as above ..... *Eutetranychus* Banks

4. Outer bladelike structures of onychium each bearing only two tenent hairs; front of cephalothorax bearing a fingerlike projection and two conspicuous leaflike setae; dorsal body setae leaflike ..... *Monoceronychus* McGregor

   Outer bladelike structures of onychium each bearing a comblike series of tenent hairs; front of cephalothorax without fingerlike projection or leaflike setae; dorsal body setae hairlike ..... *Allochaetophora* n. g.

5. The true-claw-complex originating from onychium as a single member; pulvillus lacking 6

   The true-claw-complex originating from onychium as two distinct members; a median pulvillus also present 11

6. Claw simple, uncleft, without appendages ..... *Simplinychus* n. g.
   Claw either cleft or with appendages 7

7. Claw cleft, without other appendages 9

   Claw uncleft, but with 6 to 10 ventral spines arising more or less from a common point on lower portion of claw, these roughly at right angles to the claw ..... *Paratetranychus* Zacher

   Claw uncleft, but with pectinate series of short tenent hairs borne along its sides 8

8. Tarsi somewhat swollen, much shorter than tibiae, not bearing long tactile hairs near tip; frontal tracheae not protruding ..... *Tetranychina* Banks

   Tarsi not distinctly swollen, not greatly shorter than tibiae, bearing two tactile hairs fully half as long as segment; frontal tracheae protruding externally teatlike ..... *Petrobia* Murray

9. Claw obscurely cleft or dentate near tip (probably into 6 parts) ..... *Neotetranychus* Tragardh

   Claw cleft to middle or beyond 10

10. Claw cleft into 7 divisions (a single short, dorsal, straightish spur tangent to 6 other longer spines) ..... *Septanychus* McGregor

    Claw split into 6 subequal, appressed divisions ..... *Tetranychus* Dufour

    Claw split into 2 to 6 divisions, the pairs strongly divergent left and right; where more than two divisions are present, one pair of divisions is much stouter than others ..... *Schizotetranychus* Tragardh

11. Frontal tracheae not protruding externally; dorsal body setae not spatulate or leaflike; palpi borne subapically on rostrum ..... *Pseudobryobia* n. g.

    Frontal tracheae protruding externally, dorsal body setae spatulate or leaflike; palpi not borne subapically on rostrum 12

12. Each onychial claw supplied only with a pair of long tenent hairs; a median pulvillus between claws bearing two similar hairs; anterior margin of body produced into 4 lobes, each bearing a foliaceous seta; dorsal body setae spatulate; leg setae lanceolate ..... *Bryobia* Koch

Each onychial claw with a comblike series of tenent hairs borne on inside and outside of its basal half; pulvillus between claws bearing two comblike series of tenent hairs; body and legs with foliaceous setae; caudal margin of body with 12 long, whiplike hairs; anterior margin of body with a single domelike projection ..... *Tuckerella* Womersley

Genus EUTETRANYCHUS Banks

Eutetranychus Banks, 1917, Ent. News 28(5): 197. *Anychus* McGregor, 1919, Proc. U. S. Nat. Mus. 56: 644.

In 1914 the present author (10) described *Tetranychus banksi* from castor bean, Orlando, Fla. In 1919, the genus *Anychus* was proposed (8) to contain the above mite and a second congeneric species. When *Anychus* was published, the author overlooked the fact that Banks (11) in 1917 had erected the genus *Eutetranychus* to include *A. banksi* (McGregor) and *A. latus* (Canestrini & Fanzago). It appears evident that no type of Banks' genus has been designated, and since *latus* probably belongs in another genus, with which Banks evidently was unfamiliar, *banksi* is herewith designated as the type of the genus *Eutetranychus*.

Spider mites usually with oval, somewhat flattened bodies in the female, with 18 to 26 lanceolate to clavate dorsal body setae. Tarsi with onychium devoid of claws, bearing only 4 knobbed tenent hairs. Palpus, in those species studied, with terminal segment ("thumb") rather long, its terminal sensilla elongate, "thumb" bearing a dorsal sensilla and 4 or 5 additional setae. Aedeagus (known for only one species) with a dorsal basilar lobe, the shaft narrowing abruptly backward, and bent strongly upward, terminating in an acute, unbarbed tip.

KEY TO SPECIES OF EUTETRANYCHUS

(Based on the females)

1. Dorsal body setae 24 in number, mostly lanceolate, very conspicuous, longer than interval to base of seta next behind ..... *spinosa* (Banks)

Dorsal body setae 26 in number, rodlike, clavate, or spatulate, mostly shorter than interval to base of seta next behind 2

2. Palpi when extended reaching nearly to middle of femora I; inner humerales setae arising behind a line even with anterior face of coxae III ..... *mexicanus*, new species

Palpi not nearly reaching to middle of femora I; inner humerales setae arising cephalad of a line even with anterior face of coxae III 3

3. None of dorsal body setae strongly clavate or spatulate, mostly rodlike; tip of terminal segment of palpi bearing 3 sensillae or enlarged setae ..... *rusti* (McG.)

A number of the dorsal body setae are strongly clavate or spatulate; tip of terminal segment of palpi bearing a single sensilla 4

4. Of the dorsal body setae, only the inner scapulares, the 4 humerales, inner dorsales, and inner lumbales are clavate, all others rodlike; sub-basal seta on outer face of

palpal "thumb" spindle-shaped and hispidulous ..... *clarki* (McG.)
Most of the dorsal body setae strongly clavate to spatulate; sub-basal seta on outer face of palpal "thumb" hairlike ..... *banksi* (McG.)

Eutetranychus spinosa (Banks), new combination

Tetranychopsis spinosa Banks, 1909, Ent. Soc. Wash. Proc. 11: 134.

Female.—Body widely oval, widest at main suture which is very indistinct; silightly concave on front margin. Dorsal armature consisting of 24 setae, as follows: A frontal seta each side of mandibular plate, about equaling the palpi; a strong, lanceolate seta arising over coxa I; 3 similar submarginal setae along each side, one of which is on cephalothorax, 2 of which are on abdomen; 4 rod-like setae on caudal margin; 3 pairs of submedian conspicuous, lanceolate spines, one of these pairs at middle of cephalothorax, and 2 pairs on abdomen; a short, marginal, clavate seta behind legs II; and a similar seta over coxae III; all setae arsising from tubercles. Legs I and IV about equaling length of body to front of cephalothorax; legs II and III a little shorter. Mandibular plate oval, notched in front. Rostrum and palpi relatively short. Collar tracheae consisting of a rather straight tube, slightly bent, and ending inwardly in a very slightly enlarged elliptical chamber. A single eye cornea each side near body margin at base of first pair of stout bristles. Legs sparsely supplied with short, lanceolate, setose setae; tarsi I evidently with only a single set of duplex hairs; 5 setae borne on segment proximad of these; onychium without a claw, but bearing 4 capitate tenent hairs.

Type material.—Museum of Comparative Zoology, Cambridge, Mass.

Type locality.—Guelph, Ontario, Canada.

Distribution.—Maryland, Ontario, Canada.

Food plants.—Basswood (*Tilia* sp.); a grass.

An examination and drawings made by E. W. Baker of the type specimens of *Tetranychopsis spinosa* Banks, revealed that this species is identical with the above mite collected recently by Baker from a grass in Maryland. Banks did not describe the palpus, and Baker's lone specimen from Maryland was so mounted that the palpi could not properly be seen.

EUTETRANYCHUS BANKSI (McGregor)

Tetranychus banksi McGregor, 1914, Ent. Soc. Amer. Ann. 7(4): 357, 358, pl. 44. *Eutetranychus banksi* (McGregor), Banks, 1917, Ent. News 28(5): 197. *Anychus banksi* (McGregor), 1919, U. S. Nat. Mus. Proc. 56(2303): 644, 645.

Female.—Body from above subovate, widest across cephalothorax, barely concave in front. Color rusty-red excepting a median abdominal area and a clear area overlying the mandibular plate. Striations on dorsal integument mostly longitudinal on cephalothorax, mostly transverse on abdomen; the striae surrounding inner lumbales setae longitudinal or diagonal. Twenty six serrate dorsal body setae, mostly clavate to spatulate, distributed as follows:

A pair at front margin over palpi, one mediad of each eye, one over and behind each coxa II, 3 along each side of abdomen, 6 forming a fringe on caudal margin, 4 pairs of very small setae straddling the median line, the first pair just in front of the main suture, the other 3 pairs on hysterosoma; setae mostly much shorter than interval to seta next behind. Mandibular plate about half again as long as wide, emarginate in front. Eyes over coxae II. Legs I about equaling body to front of cephalothorax, other legs somewhat shorter; relative lengths of segments of leg I as follows: Coxa, 9; trochanter, 4; femur, 14; patella, 9; tibia, 11; tarsus, 8. Tip of tarsus devoid of a claw; onychium bearing 4 tenent hairs, and produced distally as a subacute protuberance. Tarsi I dorsally bearing a single set of duplex setae, with 7 setae proximad of these. Palpus with penultimate segment dorsally bearing a shortish claw; last segment subconical, bearing terminally a single sensilla which is over four times as long as thick, dorsal sensilla arising near base of segment; "thumb" bearing 5 additional setae.

Male.—Body from above sagittate. Legs proportionately much longer than in female, all distinctly longer than body. Aedeagus somewhat resembling that of *E. clarki* (McG.)

Type material.—U. S. National Museum No. 19089.

Type locality.—Orlando, Fla.

Distribution.—Known only from type locality.

Food plants.—Castor bean, velvet bean.

Eutetranychus rusti (McGregor), new combination

Tetranychus rusti McGregor, 1917, U. S. Nat. Mus. Proc. 51(2167): 582-584, pl. 102. *Anychus rusti* (McGregor), 1919, U. S. Nat. Mus. Proc. 56(2303): 645, 646.

Female.—Body ovate from above, barely truncate in front. Color yellowish, greenish, to red. Twenty-six dorsal body setae, rodlike, sparsely serrate, blunt-tipped, much shorter than interval to seta next behind, distributed as follows: One either side of mandibular plate anteriorly, one in front of and one behind each eye, one at each humeral angle of abdomen, a series of 4 behind the main suture, a series of 4 just behind coxa III, a transverse series of 4 even with the genital region, 6 setae along the caudal margin. Eyes directly over coxae II. Mandibular plate slightly less than twice as long as wide, rounded in front. Forelegs about equaling body to front of cephalothorax, other legs somewhat shorter; relative lengths of segments of leg I as follows: Coxa, 6; trochanter, 4; femur, 15; patella, 10; tibia, 13; tarsus, 9. Tip of tarsus devoid of a claw; onychium produced distally as a small gibba, and bearing 2 pairs of tenent hairs. Tarsi I bearing only 1 pair of duplex setae; 6 setae on segment proximad of these. Palpus with penultimate segment produced dorsally as a claw; last segment subcylindrical, with 3 naillike setae near tip, a small sensilla dorsally, and 2 additional short setae.

Male.—Body from above narrowly sagittate, smaller than female. Legs

proportionately longer than in female, all longer than body. Aedeagus not known.

Type material.—U. S. National Museum No. 20170.

Type locality.—Mira Flores Station, Departmento de Piura, Hacienda "San Jacinto," Peru.

Distribution.—Known only from type locality.

Food plant.—Papaya (*Carica papaya*).

Eutetranychus clarki (McGregor), new combination

Anychus clarki McGregor, 1935, Ent. Soc. Wash. Proc. 37(8): 161-165, pl. 18.

Female.—Color, in nicely preserved specimens, lemon amber; the deeper coloration, due to confluent blotches, a deep chocolate brown, occurs around the margin of the body, but is lacking anteriorly and medially. One perfect eye cornea each side. The dorsal epidermal appendages are 26 in number distributed as follows: One overlying outer margin of palpus anteriorly, one laterad of each eye, one on each lateral margin of cephalothorax just ahead of main body suture, two marginally on each side of abdomen, four along hind margin of abdomen, and a submarginal pair associated with the latter (these all rodlike); one mediad of each eye, one three-fourths distance from eye to main suture, a median pair at hind margin of cephalothorax, a submedian pair a short distance behind the latter, and a median pair even with trochanter IV (these all very short, spatulate). All dorsal setae are clothed with minute hairs. Body of female ovate, widest across hind portion of cephalothorax, mature individuals distinctly obese; cephalothorax anteriorly with a slightly concave margin overlying palpi. Measurements of a series of individuals of this sex from citrus, Weslaco, Texas, averaged as follows: Length, 0.376 mm.; width, 0.300 mm. Mandibular plate notched anteriorly, but emargination obscured by a protuberance which overlies it. "Thumb" of palpus subconical in profile, being much thicker at base than at tip, which bears a long, narrow sensilla fully three times as long as thick; on dorsal surface of "thumb," distad of its mid-point, arise two naillike appendages, in length equaling or exceeding that of terminal sensilla; on dorsal surface of the "thumb," one-fourth of its length from the base, arises a blunt dorsal sensilla; between the latter and base of "thumb" arise another naillike appendage and a slender bristle; near the center of the outer surface of the "thumb" arises a strong, spindle-shaped, hispidulous appendage. Collar trachea extending inward as a long, narrow tube, ending in an elliptical chamber. Length of foreleg of female equaling that of body to tip of mandibular plate. Relative length of segments of legs I as follows: Coxa, 24; trochanter, 13; femur, 36; patella, 20; tibia, 21; tarsus, 26. Onychium of tarsus devoid of claws or central vestigial protuberance, its distal extremity merely produced into a rounded gibba; the usual four capitate tenent hairs arising in pairs from the onychium. Tarsi I bearing only one pair of duplex setae; six setae proximal of these. Egg somewhat flattened, without an apical stalk.

Male.—Color pale, fully one-fourth again as long as wide. Length, 0.254 mm.; width, 0.205 mm. Compared with the female, the pyriform body is much smaller, and the legs much longer. The tubercled spur on the dorsal surface of the palpus, so characteristic of "red spider" males, is lacking in this species. The inner portion of the aedeagus is difficult to observe, but the inner lobe appears to be slender and rodlike, and seems to expand abruptly to form the rather acute basilar lobe; the shaft is rather thick proximally, but distally is abruptly narrowed and bent upward and forward to terminate in an acuminate unbarbed point; the terminal arm, or hook, forms an angle of about 130° with the main axis of shaft.

Type material.—U. S. Nat. Museum No. 1143.

Type locality.—Westlaco, Texas.

Distribution.—Costa Rica, Mexico, Texas.

Food plants.—*Citrus, Croton,* orange.

A species of *Eutetranychus* from Eritrea, on papaya, collected by G. Jannone, is close to *E. clarki* (McGregor), but is distinct. It is probably the mite identified by some workers as *Anychus latus* (Canestrini & Fanzago).

Eutetranychus mexicanus, new species

Female.—Body from above, ovate, widest across hind portion of cephalothorax, frontal margin somewhat truncate; humeral region over coxae I and II rounded. Legs I and IV the longest, about equaling body to front of cephalothorax. Rostrum rather stout. Palpi stout, reaching nearly to middle of femora I. Striations on dorsal integument rather irregular; those on cephalothorax mostly longitudinal, those on abdomen largely transverse, except that striae between second and third submedian seate are deflected longitudinally. Anus and vulva subcaudal ventrally; the anus lies behind the vulva. Thirteen pairs of dorsal body setae, arranged as follows: A pair of stout, lanceolate, setose setae near frontal margin over mandibular plate; three pairs of subclavate, submedian setae on abdomen, these about one-half as long as interval to seta next behind; nine submarginal, rodlike setae each side, as follows: One over coxa I, one over coxa II, one over inner end of coxa III, one just laterad of the latter, one over coxa IV, a semitransverse series of four behind last submedian setae, four along the caudal margin, all of these hardly tapering except at tip; all dorsal seate are serrate-setose and arise from inconspicuous tubercles. Legs bearing short, lanceolate, setose hairs which are mostly much shorter than the supporting segment. Dorsally a single perfect, submarginal eye cornea each side behind coxa I. Mandibular plate ample, rounded in front. Relative lengths of segments of leg I as follows: Coxa, 12, trochanter, 7; femur, 26; patella, 14; tibia, 16; tarsus, 21. Collar tracheae could not be properly studied in the single mature specimen. Tips of tarsi devoid of claws; onychium bearing centrally four knobbed tenent hairs. Tarsi I bearing only one pair of duplex setae; 5 setae proximad of these. Palpi not in position for critical

study; they appear to be somewhat similar in structure to those of *E. clarki* (McG.). Male not seen.

Type material.—One female and 2 nymphs. U. S. Nat. Museum No. 1810.

Type locality.—Guadalajara, Mexico. (intercepted at Nogales, Ariz.)

Distribution.—Known only from type locality.

Food plant.—Sapota leaves.

The present species probably is allied most closely with *E. clarki* (McG.), from which it appears to differ as follows:

E. clarki (McG.): Humeral margin of cephalothorax somewhat truncate over coxae I and II; inner scapulares, outer humerales, and the six submedian setae very short-clavate, all much shorter than one-half the distance to nearest seta.

E. mexicanus, new species: Humeral margin of cephalothorax convex over coxae I and II; inner scapulares, outer humerales, and the six submedian setae distinctly longer, less clavate, all one-half or more as long as distance to nearest seta.

Banks (12) described *Tetranychus gracilipes* from specimens collected on *Sphaeralcea* sp., at Phoenix, Ariz. A specimen removed from the type slide and sent to the writer for study, proved to be identical with a mite collected by the writer from the above plant genus at Gila Bend, Ariz., Desert Center, El Centro, Corona, and Whittier, Calif., and from *Sida hederacea* at Los Alamitos, Calif. Since this mite is radically distinct from *Tetranychus,* and cannot be referred to any existing genus, the writer proposes for it the new genus *Hystrichonychus,* the description of which follows:

Hystrichonychus, new genus

Greenish spider mites with claws lacking on all tarsi. Onychium terminally bearing three distinct pairs of capitate tenent hairs, each pair borne on a short, enlarged pedicel; the inner hair of the outer pairs surpassing the others. Dorsal cuticular armature consisting of very conspicuous lanceolate spines, arising from very prominent, elevated tubercles; each spine with minute secondary hairs. Legs slender, in the female about equaling the length of body to front of cephalothorax. Rostrum rather prominent, somewhat deflexed. Penultimate segment of palpus with a strong claw overhanging and at least equaling the last segment; the latter, the "thumb," is subcylindrical, slightly deflexed from preceding segment, and bearing seven appendages. The aedeagus of male with protrusile portion claw-shaped.

Genotype.—*Hystrichonychus gracilipes* (Banks).

Hystrichonychus gracilipes (Banks), new combination

Tetranychus gracilipes Banks, 1900, U. S. D. A. Div. Ent. Tech. Ser. 8, p. 72.

Female.—Body color greenish. Forelegs slightly longer than body to front

of cephalothorax, other legs shorter than body. Dorsal body setae 32, very conspicuous, lanceolate, with secondary spicules, the complete armature resembling that of a porcupine. Tarsus I with two pairs of subterminal, duplex setae dorsally, the pairs proximate; the onychium devoid of claws, but with three pairs of knobbed tenent hairs, each pair arising from a short, enlarged pedicel; the inner hair of outer pairs surpassing the others; about 9 setae borne on tarsus I proximad of proximal pair of duplex setae. Rostrum unusually long, somewhat deflexed. Palpus with penultimate segment produced dorsally into a strong claw which overhangs and at least equals the terminal segment, "thumb" subcylindrical, somewhat deflexed from preceding segment, bearing apically a long, nail-shaped sensilla, and 6 additional setae, 1 being spindle-shaped; penultimate segment bearing dorsally two strong setae.

Male.—Body pale, smaller than female, legs proportionately longer, exceeding the body. Tubercles of dorsal bristles not conspicuous. Second segment of palpus devoid of horn-shaped structure. Aedeagus with inner lobe rodlike, acute basilar lobe dorsally, shaft thick basally, tapering abruptly backward, curving upward, and terminating in a sharp unbarbed tip; the shaft appears to be encased within a cone-shaped sheath.

Type material.—U. S. National Museum No. 1750.

Type locality.—Phoenix, Ariz.

Distribution.—Arizona, southern California.

Food plants.—*Sida hederacea, Sphaeralcea* spp.

In 1931, Oudemans (4) created the genus *Eurytetranychus* for the species *Tetranychus latus* Canestrini and Fanzago. Oudemans' description of 13 words translates as follows: "Body bristles very sparse, leg hairs very short. Female somewhat longer than broad; male as usual."

Geijskes (9) adopted Oudeman's genus and added to the above description the phrase: "Legs as long as body or only slightly shorter." Geijskes stated that *Eurytetranychus latus* (C. & F.) occurs on *Buxus sempervirens* in Europe.

Garman (13) studied a mite on *Buxus* sp. in Michigan and described it as *Neotetranychus buxi,* new species. He called attention to the marked differences in the tarsal claw and other characters between the American species and *Tetranychus latus* C. & F.

The present writer has studied a mite on *Buxus* spp. from California, Georgia, and Oregon, which seems to conform closely to Garman's species, as described and figured. This species certainly differs materially from *E. latus* (C. & F.), as keyed by Oudemans (14), since the key states that the empodial appendages are similar to those of *Paratetranychus pilosus* (C. & F.) in having a claw with 6 ventrally directed spines, these being absent in the American form on *Buxus.*

According to Geijskes, the last segment of the palpus in *Eurytetranychus* is reduced, and he so shows it in his figure. He figures the tarsi longer than

the tibiae, and the leg setae extremely short, with one to 5 setae per segment.

Finally, the Michigan mite described by Garman cannot properly be in the genus *Neotetranychus,* as the latter has the tarsal claw dentate or split at its tip.

Since the American mite of *Buxus* evidently differs from the European form in the structure of the tarsal claw, the structure of the palp-tarsus, and in the size and number of the leg setae, and considering the worthlessness of Oudemans' description, it would seem justifiable to exclude the American *Buxus* mite from *Eurytetranychus.* Since, furthermore, the American *Buxus* mite was improperly included in *Neotetranychus* by Garman, and as it possesses an onychial claw unlike that of any recognized genus, the present writer prefers to create for it a new genus, the description of which follows:

Simplinychus, new genus

Body of female ovate from above, about one-third again as long as wide. Dorsal integument with striae mostly longitudinal on cephalothorax, mostly transverse on abdomen, but with others tortuous. One perfect and one imperfect eye cornea each side. Dorsum with 13 pairs of linear-lanceolate setae, shorter than interval to seta next behind, not arising from tubercles. Forelegs somewhat longer than body. Legs with numerous hairs of moderate length. Tarsus I barely shorter than tibia I. Tarsal claw simple, uncleft; 4 tenent hairs borne on onychium. Penultimate segment of palpus with a strong claw; last segment subconical, strongly developed, bearing a long, slender apical sensilla, a weak dorsal sensilla, and 5 additional setae. Mandibular plate wide, notched in front. Collar tracheae narrow, unswollen inwardly. Male small and slender, legs longer than in female, palpal horn lacking, aedeagus with the shaft tapering backward, bent upward about 90° to form the tine-shaped hook which is unbarbed and subacute at tip.

Genotype.—Neotetranychus buxi Garman.

Simplinychus buxi Garman, new combination

Neotetranychus buxi Garman, in Ries, 1935, Jr. Econ. Ent. 28(1): 55:62.

Female.—Color, green to yelowish brown. Body from above, ovate, about one-third again as long as wide. Dorsal integument with striae mostly longitudinal on cephalothorax, mostly transverse on abdomen, but with others whorled or tortuous. One perfect and one imperfect eye cornea each side. Dorsum bearing 13 pairs of linear-lanceolate, setose bristles, shorter than interval to bristle next behind, not arising from tubercles. Legs with numerous, setose hairs of moderate length. Forelegs somewhat longer than body to front of cephalothorax, other legs about equaling body. Tarsus I barely shorter than tibia I, bearing dorso-terminally only one set of duplex setae; 8 setae borne proximad of proximal pair of duplex setae, including a short, curved seta. Tip of tarsus with a simple, uncleft, hooked claw, and with a pair of tenent hairs borne on onychium each side of claw base. Penultimate segment of palpus with a strong claw; last segment ("thumb") subconical, strongly

developed, as long as or longer than claw, bearing a long, slender sensilla apically, dorsally a weak sensilla, dorso-terminally two nailshaped setae, subbasally above with two weak setae, and laterally with a stronger hair. Mandibular plate wide, sub-rectangular, obscurely notched in front. Collar tracheae consisting of a narrow, straightish tube, unswollen at inner end. Egg (according to Garman) lemon yellow, flattened apically, striated longitudinally.

Male.—Smaller and more attenuate than in female. Legs proportionately longer, onychial appendages rather similar to those of female. The hornlike structure is lacking on the second segment of palpi. Aedeagus with inner lobe rodlike and expanding rather abruptly into the shaft; basilar lobe obscure, dorsal; shaft tapering backward, bent upward about 90° to form the tine-shaped hook which is about one-half as long as shaft, and terminates in an unbarbed, sub-acute tip.

Type material.—Conn. Agr. Expt. Sta. No. 5.

Type locality.—Ganbrook, Bloomfield Hills, Michigan.

Distribution.—California, Connecticut, Georgia, Michigan, Oregon, Virginia.

Food plant.—*Buxus* spp.

Genus Neotetranychus Trägårdh

Neotetranychus Trägårdh, 1915, Medd. N; r. 109, f. Centralanst., f. forsoksv. p. jordbruksomr., Ent. avdeln., n:r. 20, pp. 20, 55, 56.

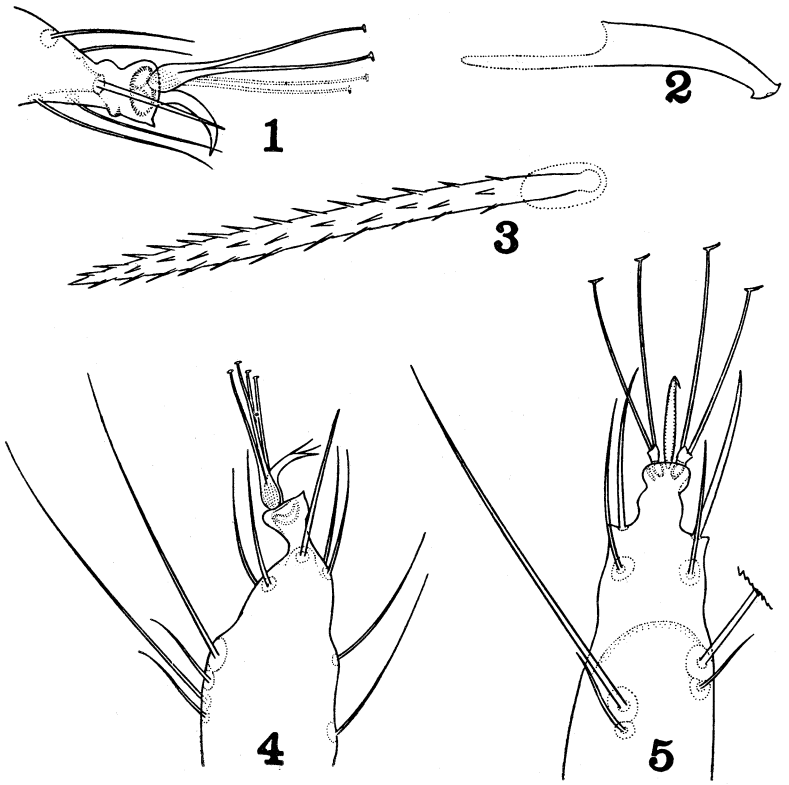
Tip of tarsus bearing a claw without ventral appendages, and uncleft in the female except for closely appressed teeth or short spines at the extreme tip. Collar tracheae U-shaped, with posterior limb much thicker than anterior limb (according to Trägårdh). Dorsal body setae thick and coarsely setose (according to Geijskes (9)).

Genotype.—*Neotetranychus rubi* Trägårdh.

This genus appears to be intermediate between *Simplinychus* and *Tetranychus*.

Neotetranychus virginiensis, new species

Female.—Body from above, oval. Dorsum with striations mostly longitudinal on cephalothorax, mostly transverse on abdomen, but all rather tortuous. Thirteen pairs of dorsal body setae, mostly shorter than interval to seta next behind, thickly lanceolate and setose, not arising from tubercles, distributed as follows: Three pairs on cephalothorax, one transverse series of six behind main suture, a transverse series of four even with coxae IV, a series of four before the genital area, and six over and around the genital area; the six sub-median setae very short, almost peglike. Main suture placed unusually far forward. A perfect and an imperfect eye cornea each side. Mandibular plate wide, rounded in front. Legs relatively short, legs I the longest, none as long



Text fig. 3. *Neotetranychus virginiensis.*—1, tip of tarsus I of male, lateral view; 2, aedeagus, lateral view; 3, dorsal body seta; 4, tip of tarsus of female, lateral view; 5, tip of tarsus I of male, dorsal view.

as body; relative lengths of segments of leg I as follows: Coxa, 9; trochanter, 9; femur, 29; patella, 13; tibia, 17; tarsus, 27. The palpi could not be viewed laterally, but the last segment appears to be short. Collar tracheae not well seen. Tip of tarsus with a weakly curved claw, uncleft for fully two-thirds its length, then split in the sagittal plane into three short, fine, closely appressed spines (a right and left splitting could not be seen); four knobbed tenent hairs on onychium, a pair at each side of claw base. Tarsus I dorso-terminally with two pairs of duplex setae, rather close together; 4 setae proximad of proximal set of duplex setae.

Male.—Body smaller and narrower than female. All legs longer than body; legs I about twice as long as body. Tarsi I and II each with a simple claw, slightly curving, ending in a sharp, entirely uncleft tip. None of the males lie so as to be viewed in exact profile, but the aedeagus is about as figured, namely : Inner lobe rodlike, expanding abruptly into the shaft; basilar

lobe occurring as an acute angle at front of shaft; the latter tapers backward slightly, and evidently bends downward slightly to form a weak hook; distally the aedeagus ends in a disclike barb whose upper and lower angles are rather inconspicuous and sub-equal.

Type material.—U. S. Nat. Museum No. 1715. Collected August 12, 1937 by Evinger and Grant.

Type locality.—Arlington Farm, Virginia.

Distribution.—Known only from the type locality.

Food plant.—Black locust.

Genus Tetranychus Dufour

Tetranychus Dufour, 1832, Ann. Sci. Nat. 25, 276. *Eotetranychus* Oudemans, 1931, Ent. Ber. Dl. 8 (178), 224. *Apotetranychus* Oudemans, 1931, loc. cit. pp. 234, 235.

Tetranychid mites with the tarsal claw originating from the onychium as a single member; pulvillus lacking; claw cleft to about its middle or more into six subequal, divisions, in two right and left appressed series of three spines each; claw without ventral appendages. Four tenent hairs arising from the onychium, a pair at each side of claw base. Collar tracheae consisting of a tube which loops back internally to form a U-shaped or tobacco-pipe-shaped structure (a few exceptions).

Genotype.—*Tetranychus lintearius* Dufour.

Oudemans (4) proposed the genus *Eotetranychus* to include those mites, otherwise *Tetranychus,* having the dorsal cuticular striations on the abdomen entirely transverse, except for a few small, marginal areas. The same author (4) also proposed *Apotetranychus* for mites with short, spindle-shaped dorsal body setae arising from spherical pits. Since other structural characters within the *Tetranychus-Eotetranychus-Apotetranychus* complex are uncorrelated with the differences in the dorsal cuticular integument and armature, the present writer believes that, at most, *Eotetranychus* and *Apotetranychus* are deserving of subgeneric rank.

Key to Species of Tetranychus

1. Dorsum of abdomen of female in region of lumbales and sacrales setae with cuticular striations transverse (Eotetranychus) 2
   Dorsum of abdomen of female in region of lumbales and sacrales setae with submedian cuticular striations mostly longitudinal, or irregular (Tetranychus) 21
2. Aedeagus distally with a barb 13
   Aedeagus distally without a barb 3
3. Shaft of aedeagus narrowly linear-lanceolate 4
   Shaft of aedeagus not narrowly linear-lanceolate 9
4. Collar tracheae with inner portion anastomosing into two branches which form a closed loop ..... *populi* Koch
   Collar tracheae not anastomosing 5
5. Collar tracheae with inner portion bent back on main arm to form a tobacco-pipe-shaped or U-shaped whole 6

Collar tracheae not bent back on main arm; inner end with an enlarged chamber 8

6. Last segment of palpus with terminal "finger" twice as long as thick ..... *telarius* Linnaeus
Last segment of palpus with terminal "finger" about as thick as long 7

7. Distal portion of aedeagus bent upward; egg with a short, dorsal axial stalk ..... *yumensis* McGregor
Dorsal portion of aedeagus deflexed slightly; egg spherical, without a stalk ..... *californicus* McGregor

8. Last segment of palpus (female) with terminal "finger" fully 3 times as long as thick; shaft of aedeagus with profile undulate ..... *flavus* Ewing
Last segment of palpus (female) with terminal "finger" only twice as long as thick; shaft of aedeagus with profile not undulate ..... *monticolus* McGregor

9. Dorsal body setae shorter than intervals between their bases 10
Dorsal body setae longer than intervals between their bases 11

10. Dorsal body setae minute, peglike; aedeagus with distal half of shaft fingerlike, distal tip rounded; last segment of palpus with terminal "finger" reduced, orbicular; tarsal claw very short ..... *thujae* new species
Dorsal body setae short-lanceolate; aedeagus with distal half of shaft subrectangular, distal tip concave-truncate; last segment of palpus with terminal "finger" very long, conelike; tarsal claw long ..... *libocedri* McGregor

11. Shaft of aedeagus bent caudally; terminal "finger" of palpus (female) nearly twice as long as thick 12
Shaft of aedeagus not bent; terminal "finger" of palpus (female) about as thick as long ..... *malvastris* new species

12. Distal tip of aedeagus curving downward ..... *sexmaculatus* Riley
Distal tip of aedeagus curving upward ..... *lewisi* McGregor

13. Hook portion of aedeagus bent upward 14
Hook portion of aedeagus bent downward 15

14. Anterior end of barb of aedeagus with a slight angular projection ..... *pacificus* McGregor
Barb of aedeagus blending into hook portion without an anterior angle ..... *mcdanieli* McGregor

15. Dorsal body setae rodlike to clavate, blunt-tipped 16
Dorsal body setae lanceolate to linear-lanceolate, sharp-tipped 17

16. Dorsal body setae clavate, failing by much to reach base of seta next behind; last segment of palpus (female) with terminal "finger" about twice as long as thick ..... *caribbeanae* new species
Dorsal body setae rodlike, noticeably or barely failing to reach base of seta next behind; last segment of palpus (female) with terminal sensilla as thick as long ..... *planki* new species

17. Dorsal body setae shorter than interval to seta next behind; collar trachea with inner portion branched or lobed ..... *ellipticus* Garman
Dorasl body setae longer than interval to seta next behind; collar trachea with inner portion not branched or lobed 18

18. Aedeagus with hook portion very slighlty deflexed; barb acutely pointed at each end of its axis ..... *perplexus* new species
Aedaegus with hook portion strongly deflexed; barb acutely pointed only at caudal tip of its axis 19

19. Collar trachea not U-shaped or hooked at its inner end, consisting of a straightish tube ending internally in a slightly enlarged chamber ..... *deflexus* new species
Collar trachea either U-shaped or hooked at inner end 20

20. Aedeagus with shaft abruptly constricted in profile at caudal end; dorsal body setae rather short, slightly surpassing base of seta next behind; collar trachea with a short, enlarged hook at inner end ..... *pallidus* Garman

Aedeagus with shaft not abruptly constricted in profile at caudal end; dorsal body setae strongly developed, well surpassing base of seta next behind; collar trachea U-shaped, the reflexed arm of same caliber as main arm ..... *hicoriae* new species

21. Barb of aedeagus not conspicuous 22
Barb of aedeagus conspicuous 23

22. Shaft of aedeagus abruptly narrowed into the hook element; anterior end of barb devoid of a projecting process ..... *piercei* new species
Shaft narrowing gradually into the hook element; anterior end of barb with a weak process ..... *marianae* new species

23. Barb of aedeagus with a rounded boss both anteriorly and posteriorly ..... *equatorius* new species
Barb of aedeagus not with a rounded boss both anteriorly and posteriorly 24

24. Barb of aedeagus acutely angled posteriorly, but with anterior projection consisting of a rounded boss 25
Barb of aedeagus acutely angled anteriorly; barb caudally strongly acute, inconspicuous, or lacking 26

25. Tarsus I of female with 4 setae proximad of proximal set of duplex setae; axial length of barb of aedeagus fully one-third the length of the shaft proper ..... *atlanticus* McGregor
Tarsus I of female with 5 or 6 setae proximad of proximal set of duplex setae; axial length of barb of aedeagus barely one-fifth the length of shaft ..... *multisetis* new species

26. Terminal segment of palpus (female) with greatest thickness about equalling its length; terminal sensilla (female) nearly three-fourths again as long as thick; posterior projection of barb of aedeagus inconspicuous, often seemingly lacking ..... *bimaculatus* Harvey
Terminal segment of palpus (female) with greatest thickness about one-third more than its length; terminal sensilla of palpus (female) little longer than its thickness; posterior projection of barb of aedaegus acute, equally as prominent as anterior process ..... *althaeae* Von Hanstein

TETRANYCHUS ALTHAEAE Von Hanstein

Tetranychus althaeae Von Hanstein, 1901, Zeitschr. f. wissensch. Zool. 70(1), 74.

Female.—Body oval. Striations on dorsum of abdomen between and behind internal lumbales setae transverse on a small, rhombic pseudoshield; striations behind and laterad of this rhomboid mostly longitudinal. Thirteen pairs of strongly developed, linear-lanceolate dorsal setae, these minutely setose, not arising from tubercles. One perfect and one imperfct eye cornea each side. Mandibular plate unnotched, rounded in front. Collar tracheae U-shaped. Legs shorter than body; relative lengths of segments of leg I as follows: Coxa, 23; trochanter, 11; femur, 31; patella, 21; tibia, 21; tarsus, 32. Tarsus I dorsally with 2 sets of duplex setae, rather well separated; 4 setae proximad of proximal set of duplex setae; onychial claw split deeply into 6 spinelike divisions, the proximal pair strongest basally. Last segment of palpus ("thumb") with greatest thickness about one-third more than its length, bearing a terminal sensilla which is not much longer than thick, and is more than half the thickness of "thumb" at tip; dorsal sensilla rather large; 5 additional setae on thumb, about as usual.

Male.—Smaller and thinner than female. Legs somewhat longer proportionately than in female, but not longer than body. Palpus with hornlike spur

on second segment. Terminal "finger" of palpus longer and narrower than in female. Aedeagus with inner lobe expanding dorsally to the basilar lobe which is obtuse angled and not very prominent; shaft with axis continuous with that of inner lobe, narrowing somewhat caudad and bent upward almost 90° from its axis; hook barely one-third as long as shaft, terminating in a barb which projects both anteriorly and posteriorly as rather prominent acute tips.

Type material.—Location not known.

Type locality.—Not known to the writer.

Distribution.—Europe and England. (A mite which may be identical occurs in the United States.)

Food plants.—Described originally from material on hollyhock. Reported by Zacher (15) from 43 species of plants, mostly non-woody. The writer has identified this mite from grape (Sweden), hollyhock (Germany), and *Caladium,* cotton, *Cymbidium,* hops, *Laburnum,* lemon, melon (England).

Geijskes (9) considers *althaeae* to be a synonym of *urticae* Koch, but Koch's (16) description was such that one cannot be certain as to which species he had in mind. Since *althaea* originally was described from hollyhock, and specimens from this plant in Europe agree with the mite above discussed; and since, moreover, *urticae,* as defined by Geijskes (9), differs in certain particulars from the mite from hollyhock and other plants observed by the writer, it is considered best to place the common spider mite of soft tissue plants of Europe under *althaeae.*

TETRANYCHUS ATLANTICUS McGregor

Tetranychus atlanticus McGregor 1941, Ent. Soc. Wash. Proc. 43(2): 26-28, pl. 2.

Female.—Body from above elliptic-ovate. Striations on a rhombic area of dorsum between inner lumbales and sacrales setae transverse, striations behind and laterad of this rhomboid mostly longitudinal. Twenty-six dorsal setae (counting caudal pair), these strongly developed, linear-lanceolate, minutely setose, not arising from tubercles. Mandibular plate rounded anteriorly at maturity. A single perfect eye cornea on each side. "Thumb" of palpus barely longer than greatest thickness, bearing terminally a non-clavate "finger" which is rotundate terminally, fully two-thirds again as long as thick, and is more than one half as thick as "thumb" at tip; the unusually thick dorsal sensilla is nearly as long as the terminal "finger," the other five hairs and setae of the "thumb" about as usual. Legs of moderate length, foreleg about two-thirds the length of the body. Tarsus I dorsally with 2 sets of duplex setae, well separated; 4 setae proximad of proximal set of duplex setae. Relative lengths of the segments of foreleg as follows: Coxa, 28; trochanter, 11; femur, 28; patella, 17; tibia, 19; tarsus, 27. Tip of tarsus (female) bearing a claw which is sharply bent and is cleft into three pairs of subequal needlelike spurs, the inner pair being the thickest at base. The usual four tenent hairs arise from the onychium, a pair on each side of the claw base.

The collar tracea is of the conventional *Tetranychus* type, in the shape of a U with one long and one short arm.

Male.—Body somewhat wedge-shaped, much shorter and narrower than that of female; legs proportionately longer. Aedeagus with inner lobe rodlike; basilar lobe reduced to an obtuse prominence; shaft about three-fourths again as long as its basal thickness, bent abruptly upward nearly 90° from axis of main shaft, expanding terminally to form the prominent barb whose axial length slightly exceeds the length of the "hook" of the shaft, and is fully one-third the length of the shaft proper; posterior portion of barb produced into an acuminate point; anterior portion of barb produced into an equally prominent rounded boss; axis of barb directed somewhat upward posteriorly. Tarsal claw of foreleg differing from those of the other three pairs of legs and from those of female, as is usual with spider mite males; distal portion (corresponding to the main claw) straight and relatively weak, the proximal portion (analogous to the deflexed spurs in certain genera) much thicker at base and appearing to be 3-pointed terminally.

Type material.—U. S. National Museum No. 1380.

Type locality.—Chadbourn, North Carolina.

Distribution.—California, Connecticut, Delaware, Idaho, Louisiana, Maryland, Mississippi, New York, North Carolina, Ohio, Oregon, Virginia.

Food plants.—Alfalfa, bean, clover, cotton, eggplant, *Ligustrum* sp., lima bean, parsley, red clover, soya bean, strawberry, sunflower, violet, walnut.

TETRANYCHUS BIMACULATUS Harvey

Tetranychus bimaculatus Harvey, 1892 (1893), Ann. Rept. Maine Agric. Exp. Sta., pp. 133-146.

Female.—Color very variable, depending on food plant and season. Body from above, ovate-elliptic. Legs shorter than body to front of cephalothorax. Striations on dorsum of abdomen on a rhombic area between inner lumbales and sacrales setae transverse, striations laterad and behind this area mostly longitudinal. Thirteen pairs of dorsal body setae; these linear-lanceolate, strongly developed, finely setose, not arising from tubercles. One perfect eye cornea each side. Mandibular plate with a slight emargination in front. Tarsus I bearing dorsally 2 sets of duplex setae, these well separated; 4 or 5 setae borne proximad of proximal pair of duplex setae. Onychial claw cleft deeply into 6 spinelike divisions, the proximal pair strongest basally. Last segment of palpus ("thumb") with its length about equal to its greatest thickness; the terminal sensilla averaging three-fourths again as long as thick; dorsal sensilla spindle-shaped, narrower but nearly as long as terminal "finger"; "thumb" bearing 5 additional setae, about as usual. Collar trachea U-shape, the inner arm usually shorter than main arm. Leg I with segments arranged in decreasing order of length as follows: Tarsus, femur, tibia, coxa, patella, trochanter. Eggs spherical, at first colorless. A rather copiously web-spinning species.

Male.—Much smaller than female, body from above rhombic-sagittate. Forelegs about equaling length of body to front of cephalothorax. Palpus with second segment bearing dorsally a hornlike spur. Onychial claw of leg I stout, not strongly bent, with a straightish, narrow spur arising dorsally from midpoint, and the main claw cleft terminally into 6 short, dentate divisions. Aedeagus with inner lobe expanding abruptly dorsally to the basilar lobe which projects slightly backward as a sharply rounded point; shaft narrowing caudad, about two-thirds again as long as its greatest thickness, bent upward about 90° to form the hook; posterior projection of barb inconspicuous, at times seemingly lacking; anteriorly with a more noticeable acute projection.

Type material.—Location unknown.

Type locality.—Orono, Maine.

Distribution.—Throughout the United States. Occurring in parts of Canada, Mexico, and the Hawaiian Islands.

Food plants.—Originally reported by Harvey (5) on 37 species of cultivated plants in Maine, who also reported it from New York and Pennsylvania. The writer, in addition, has critically identified this species from 67 food plants in the United States and elsewhere. It is of interest to note that most of the host records pertain to soft-tissued plants.

Of all the spider mites of the United States, this is the species most widely distributed and most frequently received by the writer for identification.

TETRANYCHUS CALIFORNICUS McGregor

Tetranychus californicus McGregor, 1928, Ent. Soc. Wash. Proc. 30(1): 11-15, pl. 1.

Female.—A small species, color pale yellowish, with darker markings. Body somewhat flattened. Dorsum with 13 pairs of long, linear-lanceolate, finely setose bristles; dorsal abdominal striations mostly transverse. Legs all shorter than body to front of cephalothorax; relative lengths of segments of leg I as follows: Trochanter, 12; femur, 42; patella, 21; tibia, 22; tarsus, 35. Tarsus I dorso-terminally bearing close together 2 sets of duplex setae; 6 or 7 setae borne proximad of proximal set of duplex setae. Onychial claw cleft into 2 sets of 3 spines each, claw bent strongly at its inner third, to which point the cleavage extends; the usual 4 tenent hairs are present. Palpus rather short; last segment thicker than long, terminal sensilla longer than thick; the usual dorsal sensilla and 5 additional setae borne on "thumb." Collar trachea hooked inwardly, forming a long and a short arm. Mandibular plate rounded in front.

Male.—Body smaller than female, sagittate in outline from above; legs shorter than usual for this genus, distinctly shorter than body. Onychium of tarsus I with claw cleft deeply into 2 sets of 3 prongs each, the middle of these the strongest and longest. "Thumb" of palpus with terminal sensilla much smaller than in female, in the form of a sharp cone. Aedeagus simple in

structure; the shaft very gradually attenuated backward to a thin, sharp tip; basal half of shaft barely convex ventrally, apical half barely convex dorsally.

Type slide.—U. S. Nat. Museum Cat. No. 960.

Type locality.—Eight miles northwest of Porterville, California.

Distribution.—Strathmore, Porterville, Delano, and Lancaster, California.

Food plants.—*Populus* spp.

This mite is perhaps closest to *Tetranychus populi* Koch, but differs as follows:

T. californicus: Onychial claw of female split into 6 subequal divisions; collar trachea U-shaped, consisting of a long and a short arm, not anastomosing inwardly; terminal "finger" of "thumb" of palpus of male sharp-cone-shaped; aedeagus terminating in a sharp tip.

T. populi: Onychial claw of female with ventral division of each set much the stoutest; collar trachea anastomosing inwardly; terminal "finger" of palpus of male short-bullet-shaped; aedeagus terminating in a blunt tip.

Tetranychus caribbeanae, new species

Female.—Body from above oval, slightly more than one-third as long as wide. Striations on dorsum very tortuous and irregular, those on cephalothorax mostly longitudinal, those on abdomen mostly transverse. Twenty-six dorsal body setae, short clavate, each failing by much to reach base of seta next behind; four clublike, conspicuous, distinctly setose setae on the caudal margin, arising from tubercles. Evidently two eye cornea each side, hind one the larger. Legs shorter than body to front of cephalothorax; tarsus I with 2 sets of duplex setae, these rather close together; about 5 setae borne proximad of proximal set of duplex setae. Onychial claw split into 2 sets of 3 divisions each, lying closely appressed to one another, ventral pair strongest basally. Terminal segment of palpus thicker than long, bearing an apical sensilla that is twice as long as thick; a small dorsal sensilla and 5 additional setae borne on this segment. Collar trachea in the form of a short, straightish tube, expanding at its inner end into an oval chamber. Mandibular plate rounded in front.

The male of this species is unknown.

Type material.—U. S. National Museum No. 1716. Collected by G. N. Wolcott.

Type locality.—Loiza, Puerto Rico.

Distribution.—Haiti; Puerto Rico; Saint Kitts Island, Leeward Group.

Food plant.—Cassava.

T. manihotis Oudemans, also occurring on cassava, differs widely from *caribbeanae.*

Tetranychus deflexus, new species

Female.—Body outline from above rather narrowly elliptical. Striations on dorsum of abdomen transverse. Twenty-six dorsal body setae, these prominent, linear-lanceolate, finely setose, not arising from tubercles. One perfect eye cornea each side. Legs shorter than body to front of cephalothorax; leg I with relative lengths of segments as follows: Trochanter, 13; femur, 23; patella, 11; tibia, 15; tarsus, 27. Onychial claw of foreleg with claw typical of the genus; proximal pair of divisions the stoutest basally; tarsus I dorso-terminally with 2 sets of duplex setae, close together; 6 setae borne proximad of proximal pair of duplex setae. Terminal segment of palpus thicker than long, terminal sensilla about twice as long as thick; dorsal sensilla small, peglike; five additional setae on "thumb," about as usual. Mandibular plate rounded in front.

Male.—Body much smaller than in female, narrowly sagittate from above. Onychial claw cleft deeply into 2 sets of 3 diverging divisions each, the middle spur of each set the stoutest. Palpus with a "horn" on second segment; terminal segment with apical sensilla reduced to a rudimentary papilla. Aedeagus with inner lobe rodlike and expanding abruptly caudo-dorsally to the point of origin of shaft; length of shaft slightly less than twice its greatest thickness, narrowing rather abruptly caudad, and deflexed about 60° from axis of shaft to form the hook portion; the latter in turn is bent backward to form the barb which is devoid of an anterior projection, but is sharp-pointed at its distal tip.

Type material.—U. S. National Museum No. 1718. Slide mount containing 4 males and 3 females collected by the author July 31, 1940.

Type locality.—Sexton Grade, near Grant's Pass, Oregon.

Distribution.—Oregon, Alabama?, and South Carolina?

Food plant.—*Symphoricarpos* sp., *Azalea.*

The mite collected on Azalae in Alabama and South Carolina resembles, and may be identical with, *T. deflexus.*

TETRANYCHUS ELLIPTICUS Garman

Tetranychus ellipticus Garman, 1940, Tetranychidae of Connecticut, Conn. Agr. Sta. Bull. 431: 83-85, fig. 20.

Female.—Flesh color to greenish with obscure dark spots along sides. Body widely elliptical, rather flattened; dorsum with 26 unusually short, lanceolate, definitely pilose setae, mostly shorter than interval to seta next behind, submedian setae the shortest. Striations on dorsum of abdomen transverse. Mandibular plate broad, about one-half again as long as wide, rounded in front. Collar trachea extending inward as a long, narrow tube, then reflexed as a short arm which gives rise to several short, lobelike segments. A perfect and an imperfect eye cornea each side. Legs shorter than body to front of cephalothorax; tarsus I with 2 sets of duplex setae, rather close together, the longest of these hairs exceeding length of segment; 4 setae borne proximad of proximal

pair of duplex setae; tip of tarsus abruptly constricted; onychial claw short, split into 2 sets of 3 spines each, the ventral pair much the thickest for half their length, each then abruptly reduced to a fine, needlelike spine; the usual 4 tenent hairs arise from onychium, a pair each side at base of claw. Last segment of palpus bearing a terminal sensilla which is longer than thick. Eggs somewhat flattened dorso-ventrally, striated above, without papilla or stalk.

Male.—Flesh colored to orange. Legs longer than in female; tarsus I very abruptly constricted near tip; onychial claw like a stout talon, short, seemingly split into 2 very short points or teeth at tip; (appearing as a single point in profile); tenent hairs much longer than claw. Palpus with a hornlike spur on second segment; last segment with terminal sensilla reduced to an obscure papilla. Aedeagus with rodlike inner lobe which expands abruptly dorsally to the beginning of the shaft; basilar lobe inconspicuous; shaft narrowing gradually caudad, and deflexed almost 90° from its axis to form the hook which is nearly one-third as long as shaft; barb clawlike, longer than hook portion of aedeagus, its anterior tip obtuse, its distal tip sharply acuminate; axis of barb parallel to that of shaft.

Type material.—Conn. Agri. Exp. Sta. No. 2.

Type locality.—New Haven, Connecticut.

Distribution.—Connecticut.

Food plant.—Honey locust (*Gleditsia triacanthos*).

Tetranychus equatorius, new species

Female.—Body widely oval from above. Dorsal striations on abdomen in region of lumbales and sacrales setae mostly longitudinal. Legs shorter than body to front to cephalothorax. Dorsal body setae linear-lanceolate, strongly developed, barely setose, not arising from tubercles. One perfect and one imperfect eye cornea each side. Mandibular plate rounded in front. Collar tracheae U-shaped, the reflexed arm nearly as long as main arm, and of similar caliber. Relative lengths of segments of leg I as follows: Coxa, 23; trochanter, 12; femur, 35; patella, 17; tibia, 21; tarsus, 35. Tarsus I narrowing gradually toward tip; dorsally with 2 sets of duplex setae, well separated, the proximal pair well behind middle of segment; 4 hairs borne on tarsus proximad of the latter; onychial claw deeply cleft into 6 divisions, the proximal pair the stoutest basally; a pair of tenent hairs arising as usual each side at base of claw. Last segment of palpus about as thick as long, its terminal sensilla about one-half again as long as thick; dorsal sensilla clavate, unusually ample, slightly longer than terminal sensilla; 5 additional setae borne on "thumb," as usual.

Male.—Body from above sagittate, much smaller and narrower than female. Leg I slightly longer than body to front of cephalothorax. Palpus with hornlike spur on second segment; terminal sensilla of last segment well developed, two and one-half times as long as thick. Tarsus I with onychial

claw very stout for over half its length, cleft near tip into 5 short spurs. Aedeagus with inner lobe about as usual, expanding abruptly dorsally to form the acute angled basilar lobe; shaft narrowing caudad, and bent upward about 55° from general axis of aedeagus; hook about one-third as long as shaft, terminating distally in an oval barb whose posterior face is almost devoid of a projection, and whose anterior profile consists of a prominent rounded boss.

Type material.—U. S. National Museum No. 1719. Three males and many females, collected by E. Lucas, March 19, 1941.

Type locality.—Waipahu School, Oahu, T. H.

Distribution.—Honolulu, Kailua, Waipahu, and Tantalus, Hawaii; Suva, Fiji Is.; El Valle, Venezuela; Mayaguez, Puerto Rico.

Food plants.—*Cinchona* sp., *Cracca vogeli, Grammatophyllum,* peanut, string bean, water hyacinth, watermelon.

In addition to the type material collected by E. Lucas, collections of this species have been made by T. F. Chong, A. Suehiro, C. H. Ballou, and A. C. Browne.

The writer has suspected that his species *Tetranychus willamettei* might be identical with *T. flavus* Ewing, and recently he collected specimens from the type localities and type hosts of these two species. It was found that the structural details of the female palpus varied somewhat between material from the Hood River Valley and the Willamette Valley, but no significant difference could be found in the aedeagi. Whatever variations exist between specimens east and west of the Cascade Mountains of Oregon would seem to be of no more than subspecific value, and the writer herewith reduces *willamettei* McGregor to synonymy with *flavus* Ewing.

TETRANYCHUS FLAVUS Ewing

Tetranychus flavus Ewing, 1913, Ent. Soc. Amer. Ann. 6, 458. *Tetranychus willamettei* McGregor, 1917, U. S. Nat. Museum Proc. 51(2167): 586, pl. 105.

Female.—Color, pale lemon-amber, with a few blackish blotches along the sides. Narrowly ovate from above, about three-fourths again as long as wide. Fourteen pairs of dorsal setae (including caudal pair), finely setose, reaching well beyond seta next behind; 5 pairs on cephalothorax, 9 pairs on abdomen. Dorsal striations on abdomen mostly transverse. One perfect and one imperfect eye cornea each side. Mandibular plate rounded in front, without an emargination. Collar trachea consisting of a straightish tube terminating in an oval chamber. Legs rather short, legs I shorter than body to front of cephalothorax; tarsus I longer than tibia, dorso-terminally with two sets of duplex setae, their basal rings touching; 6 setae borne proximad of proximal pair of duplex setae. Tarsal claw split deeply into six divisions (2 sets of 3 spines each), the proximal spines distinctly the stoutest; 4 tenent hairs borne on onychium, a pair at each side of claw base. Last segment of palpus ("thumb") thicker than long; terminal sensilla varying from twice as long (Hood River

Valley) to four times as long (Oregon City) as thick; dorsal sensilla very thin, spindle-shaped; "thumb" with 5 additional setae.

Male.—Body smaller, narrower, and paler than in female. Second segment of palpus with hornlike spur dorsally; terminal sensilla more slender than in female. Onychial claw of leg I shallowly split into two sets of three short spurs each. Aedeagus with inner lobe thickening caudo-dorsally to point of origin of shaft; the latter consisting of a long, undulating, very gradually acuminate structure, terminating in a fine, sharp, unbarbed tip.

Type material.—In H. E. Ewing's personal collection. Collected on apple leaves by H. Lawrence, September 15, 1911.

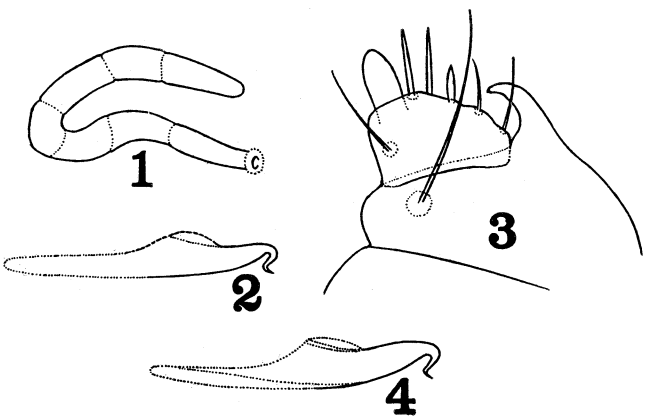
Type locality.—Hood River, Oregon.

Distribution.—California, British Columbia, Connecticut, Oregon, Washington.

Food plants.—*Amelanchier alnifolia,* apple, a shrub, *Ceanothus velutinus,* elm, grape, *Lonicera* sp., maple, oak, pear, raspberry, *Salix* sp., *Vaccinium parvifolium.*

Tetranychus hicoriae, new species

Female.—Body broadly elliptical. Legs shorter than body to front of cephalothorax. Striations on dorsum of abdomen transverse. Thirteen pairs of dorsal body setae, not arising from tubercles, these linear-lanceolate, finely but distinctly setose, length much exceeding interval to base of seta next behind. One perfect and one imperfect eye cornea each side. Mandibular plate widely oval, rounded in front. Collar tracheae U-shaped, the reflexed arm similar to the main arm. Legs I with 2 sets of duplex setae, interval between them about one-sixth the length of segment; 5 setae proximad of



Text. fig. 4. *Tetranychus hicoriae.*—1, collar trachea; 2, aedeagus, lateral view; 3, tip of palpus of female, lateral view; 4, aedeagus.

proximal set of duplex setae. Onychial claw of foreleg deeply cleft into 6 fine divisions; the usual 4 tenent hairs borne on onychium. Last segment of palpus thicker than long, with terminal sensilla longer than thick.

Male.—Body smaller and narrower than that of female, legs proportionately longer. Second segment of palpus with hornlike spur above; terminal sensilla more slender than that of female. Leg I with tarsal claw weakly curved, evidently cleft apically into 4 short, dentate divisions. Aedeagus with inner lobe rodlike, expanding distinctly dorsally to point of beginning of shaft; the latter narrows gradually and evenly to its point of union with the hook; the basilar lobe appears to be a dorsal, lenticular boss; hook portion bent downward and forward fully 125° from the general axis of aedeagus, and then bent again backward to form a short, thin pseudo-barb which is rounded anteriorly and sharp pointed distally.

Type material.—U. S. National Museum No. 1720. Fourteen females and two males collected by J. P. Kislanko, Sept. 16, 1929.

Type locality.—Wiggins, Mississippi.

Distribution.—Mississippi, Florida, Georgia, Louisiana, Texas.

Food plant.—Pecan.

T. hicoriae, new species, is allied with *T. pallidus* Garman, but differs from it in the shape of the aedeagus and the collar trachea, as described and figured by Garman.

TETRANYCHUS LEWISI McGregor

Tetranychus lewisi McGregor, 1943, Wash. Ent. Soc. Proc. 45(5): 127, 128, pl. 13.

Female.—Averaging 0.36 mm. in length, and 0.17 mm. in width. Twenty-four strictly dorsal setae, not arising from tubercles; in addition, visible from above, a pair of similar setae on the lateral margin of body opposite coxa III, and an inconspicuous pair of setae at posterior tip of abdomen. Body oval from above; at first a pale greenish-amber color, but deepening in age to amber; a varying number of blackish spots along lateral margin, but usually one over each coxa III and a pair near hind tip of body. One perfect eye cornea on each side. The dorsal integument between the lumbal and sacral setae with transverse striations (as in *T. pacificus* McG.). Mandibular plate rounded anteriorly. "Thumb" of palpus fully one-fifth shorter than its greatest thickness; bearing terminally a "finger" with subparallel sides and rounded tip, when viewed laterally; terminal "finger" less than half as thick as "thumb" at tip; the dorsal sensilla spindle-shaped, about as long as terminal "finger"; "thumb" bearing five additional setae placed and proportioned about as usual. Relative lengths of the segments of the foreleg as follows: Coxa, 15; trochanter, 10; femur, 28; patella, 14; tibia, 17; tarsus, 24. Tip of tarsus (female) bearing a claw which is bent strongly downward and is cleft into three pairs of needlelike spurs, the proximal pair the strongest basally. Tarsus of leg I dorsally with two sets of duplex setae proximate; 5 or 6 seate borne proximad

of the proximal set of duplex setae. The usual four tenent hairs arising from the onychium, a pair on each side of the claw base. The collar trachea extends downward and backward as a slightly expanding tube, then abruptly bends upward at a right angle to form a somewhat swollen chamber which is about one-third as long as the main arm. Egg almost spherical, with a very slender axial stalk; at first almost colorless, but becoming straw-color before hatching; 0.12 mm. in diameter.

Male.—Body smaller, narrower, and more wedge-shaped than that of female; mustard-yellow color; legs proportionately longer. Aedeagus with inner lobe rodlike; basilar lobe inconspicuous; shaft three times as long as its basal thickness, inner half concave above, bent downward about 45° from its main axis, then again bent slightly upward at tip; portion of aedeagus distad of the shaft gradually acuminate to a sharp tip. Tarsal claw of foreleg fundamentally similar to that of female, but less strongly bent, the divisions very closely appressed and appearing under low magnification almost as a simple claw. "Thumb" of palpus more cone-shaped than in female; the terminal "finger" reduced to a nipple-like papilla.

Type material.—U. S. National Museum No. 1431.

Type locality.—Corona, California.

Distribution.—Riverside, Los Angeles, Ventura and Santa Barbara Counties.

Food plants.—Bur-clover, castor bean, lemon, orange.

Tetranychus libocedri McGregor

Tetranychus libocedri McGregor, 1936, Ann. Entom. Soc. Amer. 29(4): 771-773, pl. 2, text fig. 1.

Female.—General color pale, rather free from spots. Body broad oval. A series of measured females averaged 0.302 mm. in length by 0.224 mm. in width. Anterior margin of body above palpi produced as a conspicuous angle. Main dorsal suture near middle of body. A single perfect eye cornea on each side. Mandibular plate large, noticeably emarginate. Thirteen pairs of greatly reduced dorsal cuticular appendages, not arising from tubercles; of these, the most prominent are a pair anteriorly overlying the palpi; one on each lateral margin opposite middle of mandibular plate, about half the length of the anterior pair; the remaining 22 setae reduced to mere oblanceolate rudiments, of which 14 are marginal and 8 are submedian; of the latter, two pairs lie in front of the suture and two pairs behind it. Thumb of palpus about as long as thick, bearing at its tip a very attenuate, acute "finger" which is three and a half times as long as thick; on upper distal corner of "thumb" are two naillike digituli; on upper side about midway to base is a small spindle-shaped sensilla, one-third as long and less than one-half as thick as terminal "finger"; a weak hair arises at base of sensilla, and a strong hair arises dorsally half way between sensilla and base of thumb; a hair similar to the latter arises

laterally from near the center of the "thumb." The stout claw of the penultimate joint reaches well beyond the dorsal sensilla. Legs rather long, foreleg (to base of coxa) fully nine-tenths as long as body. Femur one-third again as long as tarsus; coxa unusually long, nearly two-thirds the length of the femur. Relative lengths of leg segments as follows: Coxa, 21; trochanter, 8; femur, 35; patella, 21; tibia, 22; tarsus, 26. Tarsus I with 2 sets of duplex setae proximate; 7 seta borne proximad of proximal set of duplex setae. Tip of tarsus (onychium) bearing a claw which is strongly arcuate and 6-cleft to near the base. The usual four tenent hairs arising from the onychium—a pair on each side of the claw base. Collar tracheae very difficult to observe, but appearing to consist of a narrow, gently curving tube which expands at its inner end to form a rather ample, elliptical chamber.

Male.—As usual, much smaller than female, and with legs proportionally longer. Palpus with terminal "finger" greatly reduced, it being greatly exceeded by the dorsal sensilla; spur on second joint very prominent. Legs I, II, and III each bearing a tarsal claw with the six terminal spines reduced to mere papillae; tarsal claw of leg IV much as in the female. Tarsus I with 3 curving, slightly swollen hairs; tibia I with 4 such hairs; tarsus II with 2 of these hairs; tibia II bearing 2 of these probably sensory hairs. Aedeagus very unlike that of any known spinning mite; inner lobe seemingly slender, rodlike, expanding abruptly to form the very thick shaft; basilar lobe present dorsally, but hardly prominent; axis of shaft continuous with that of inner lobe, becoming narrowed slightly distally, but terminating in a truncated, socket-like end whose thickness is greater than that of the inner lobe; no hook or barb present.

Type material.—U. S. Nat. Museum Cat. No. 1144.

Type locality.—Camp Nelson, California.

Distribution.—From type locality, and at great elevation in air over Texas.

Food plant.—*Libocedrus decurrens.*

Tetranychus malvastris, new species

Female.—Body elliptical, rostrum rather long; dorsal body setae 26, strongly developed, linear-lanceolate, finely setose, not arising from tubercles. Striations of dorsum of abdomen transverse. One perfect and one imperfect eye cornea each side. Legs shorter than body; relative lengths of segments of legs I as follows: Coxa, 22; trochanter, 9; femur, 25; patella, 14; tibia, 16; tarsus, 25. Mandibular plate obovate, fine-ninths again as long as broad. Collar tracheae tobacco-pipe-shaped, the inner, reflexed arm less than one-third as long as main arm. Terminal segment of palpus thicker than long; terminal sensilla slightly longer than thick, roughly oval in profile; dorsal sensilla spindle-shaped; 5 additional setae on "thumb." Tarsus I dorso-terminally with 2 sets of duplex setae, rather close together; 6 setae borne proximad of proximal set of duplex setae. Claw of onychium strongly bent near middle, and split into 2 sets of 3 divisions each; a pair of tenent hairs arise each side at base of claw.

Male.—Much smaller and narrower than female. Legs shorter than body. Onychium of tarsus I bearing a claw which is little bent and whose short divisions are so closely appressed that their number is difficult to determine. Aedeagus simple; rodlike inner lobe thickening at point of fusion, dorsally, with shaft; basilar lobe a mere obtuse angle; shaft tapering evenly backward, and terminating in a rather sharp tip; entire aedeagus almost in one continuous axis.

Type material.—U. S. National Museum No. 1721. Males and females collected by the author June 14, 1943.

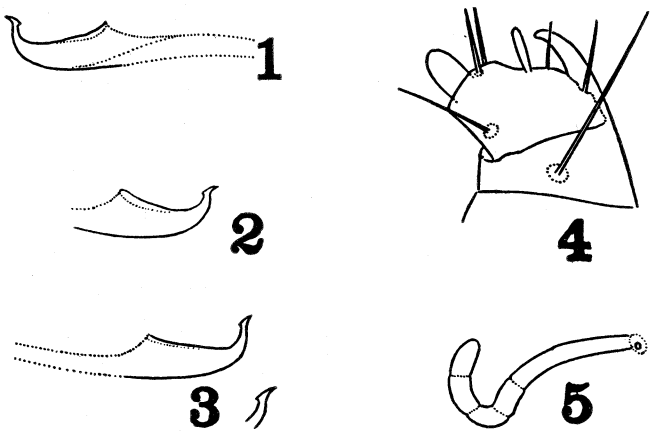
Type locality.—Whittier, California.

Distribution.—Whittier, California and Gila Bend, Arizona.

Food plant.—*Malvastrum* sp.

Tetranychus marianae, new species

Female.—Body from above elliptical. Legs all shorter than body to front of cephalothorax. Twenty-six dorsal body setae, well developed, longer than interval to base of set next behind. Striations on dorsum of abdomen mostly transverse back to the lumbales setae, chiefly longitudinal behind that point. Mandibular plate rounded in front, without an emargination. All segments of leg I bearing one or more hairs much longer than the segment. Tarsus I with two sets of duplex setae, well separated, longest seta much longer than tarsus; one or 2 setae borne porximad of proximal set of duplex setae. Claw on onychium rather typical of *Tetranychus;* ventral pair of claw divisions the thickest basally. Relative lengths of segments of leg I as follows: Coxa, ?; trochanter, 13; femur, 28; patella, 14; tibia, 19; tarsus, 31. Collar tracheae hooked inwardly, with the inner arm shorter than the main tube. Palpus with



Text fig. 5. *Tetranychus marianae.*—1, 2, 3, aedeagus, lateral view; 4, tip of palpus of female, lateral view; 5, collar trachea.

last segment thicker than long; terminal sensilla about one-half again as long as thick; dorsal sensilla, narrow, peglike.

Male.—Body smaller and narrower than in female. Second segment of palpus with hornlike spur dorsally. Terminal sensilla of last segment of palpus longer and thinner than in female. Onychial claw of leg I with ventral member strong, weakly curved, appearing simple in profile, but actually split distally into 4 short divisions; dorsal spur of claw thin, shorter than ventral member. Aedeagus with inner lobe expanding dorsally to point of inconspicuous basilar lobe; shaft in profile narrowing caudad, bent upward nearly 90° from its axis to form the thin hook which is hardly one-third as long as shaft; aedeagus distally terminating in a rather inconspicuous barb which anteriorly projects as a barely noticeable obtuse angle, projecting posteriorly as a more pronounced, acute tip; axis of barb directed somewhat upward.

Type material.—U. S. National Museum No. 1722. Collected by H. K Townes, June 12, 1946.

Type locality.—Mt. Lasso, Tinian Island (Marianne Group).

Distribution.—Saipan and Tinian Islands, western Pacific Ocean.

Food plants.—*Argyreia?* sp., *Melanolepis multiglandulosa. Passiflora foetida, Ricinus communis.*

TETRANYCHUS MCDANIELI McGregor

Tetranychus mcdanieli McGregor, 1931, Wash. Ent. Soc. Proc. 33(8): 193, 194, pl. 13.

Female.—General body color deep amber, with blackish spots distributed chiefly around body margin; legs about same color as body. A single pale eye cornea each side, behind and outward of subfrontal bristles. Body oval, in length averaging 0.40 mm.; width, averaging 0.25 mm. Dorsal body setae 26, pale, roughly in four rows. Mandibular plate rounded anteriorly with no noticeable emargination. "Thumb" of palpus fully as thick as long, bearing at its tip a strong "finger" whose base is nearly half the thickness of "thumb" at tip; on its upper distal corner are two pin-shaped pseudofingers; on upper side hardly midway to base is a "finger" or sensilla much smaller than terminal "finger," and between this and base are two strong setae somewhat exceeding the sub-basal "finger"; a strong hair arises lateroventrally half way from tip to base of "thumb." Claw on the penultimate joint of palpus less hooked than usual, barely reaching sub-basal "finger." The forelegs are about three-fourths the length of the body. Femur about three times as long as thick, just equaling the tarsus; tibia about one-fifth longer than patella, which is nearly twice as long as trochanter. Relative lengths of segemnts of leg I as follows: Coxa, 21; trochanter, 11; femur, 35; patella, 19; tibia, 23; tarsus, 35. Tarsus I dorso-terminally bearing 2 sets of duplex setae, the sets rather well separated; 4 setae borne proximad of proximal set of duplex setae. Tip of tarsus bearing a claw which is bent downward at about right angles at a point one-fourth out-

ward from base; basal portion uncleft, but distal portion made up of six component, subequal, straightish spurs. The usual series of four tenent hairs arise in pairs by the side of the claw base. The collar trachea is of the orthodox *Tetranychus* type, in the shape of a U with one long and one short arm.

Male.—Body more wedge-shaped than female, in length much smaller; legs proportionately longer. Aedeagus with inner lobe probably rodlike (extremely difficult to observe); basilar lobe rudimentary; shaft about twice as long as its basal thickness, bent abruptly upward and forward about 155° from general axis of aedeagus, then bent sharply backward as a sickle-shaped acuminate point, the distal portion thus forming a double or S-shaped hook.

Type material.—U. S. National Museum No. 1029.

Type locality.—Bridgman, Michigan.

Distribution.—Southwestern Michigan.

Food plant.—Cultivated raspberry.

TETRANYCHUS MONTICOLUS McGregor

Tetranychus monticolus McGregor, 1917, U. S. Nat. Mus. Proc. 51(2167): 584, 585, pl. 103.

Female.—Color, pale amber. Body from above ovate. Dorsal striations on abdomen mostly transverse. Thirteen pairs of dorsal body setae, distinctly setose, each well surpassing base of seta next behind; in addition, a pair of shorter setae on caudal margin. A perfect and an imperfect eye cornea each side. Mandibular plate over twice as long as broad, rounded anteriorly. Legs rather short, shorter than body to front of cephalothorax; relative lengths of segments of leg I as follows: Coxa, 8; trochanter, 7; femur, 20; patella, 12; tibia, 14; tarsus, 22. Tip of tarsus bearing a claw which is cleft to middle or beyond into 6 divisions, the proximal pair of spines the stoutest; onychium bearing four tenent hairs, a pair at each side of claw base; tarsus I dorsoterminally bearing two sets of duplex setae, their basal rings about touching; 5 setae borne proximad of proximal set of duplex setae. Last segment of palpus thicker than long; terminal sensilla twice as long as thick; dorsal sensilla spindle-shaped, very slender; "thumb" bearing 5 additional setae, two being naillike. Collar trachea evidently consisting of a short, thickish tube which expands at inner end into an ovate chamber.

Male.—Smaller and narrower than female. Claw of leg I split into 6 divisions which are much shorter and more abruptly acuminate than in the claw of female. Aedeagus with rodlike inner lobe expanding abruptly to form the dorsal, basilar lobe; the shaft thick basally, narrowing abruptly caudad, and for one-third its length directed parallel with axis of inner lobe, then deflexed about 40°, extending backward as a straight, slender lance, terminating distally in a sharp, unbarbed point.

Type material.—U. S. National Museum No. 20165.

Type locality.—South slope of Mt. Hood, Oregon, at 6,000 ft. elevation.

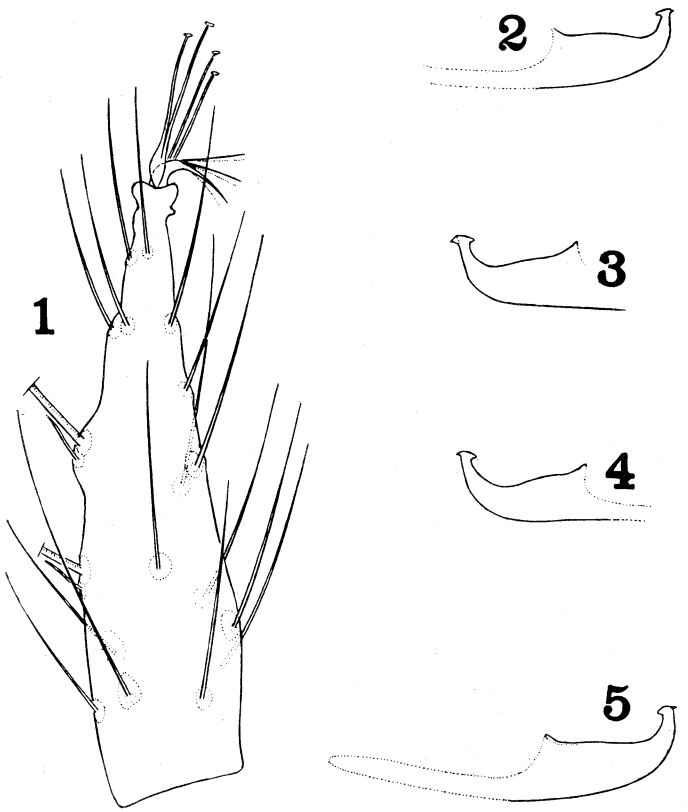
Distribution.—Known only from type locality.

Food plant.—*Vaccinium* sp.

Females of this species were re-collected in 1938 from the type locality; minor changes in the original description have been made, based on the study of this material; males were not found in 1938.

Tetranychus multisetis, new species

Female.—Dorsal body setae not arising from tubercles, moderately well developed. Dorsal striations on dorsum of abdomen iregular, with whorls around base of most of the setae. Legs shorter than body to front of cephalothorax. Tarsus I with two sets of duplex setae, these well separated; 5 or 6



Text fig. 6. *Tetranychus multisetis,* new species.—1, tarsus of female; 2, 3, 4, 5, aedeagus (2, 3, 4, Riverside, Calif.; 5, Glenn Dale, Md.).

setae proximad of proximal set of duplex setae. Relative length of segments of leg I as follows: Coxa, 12±; trochanter, 13; femur, 29; patella, 16; tibia, 21; tarsus, 37. Collar trachea somewhat U-shaped, with a long and a shorter arm. Palpus with terminal segment slightly thicker than long; terminal sensilla about four-fifths again as long as thick.

Male.—Aedeagus with inner lobe expanding abruptly dorsad to the shaft; basilar lobe dorsal, moderately prominent; shaft proper about two and one-half times as long as hook element; hook bent upward usually somewhat less than 90° from axis of shaft, terminating in a barb whose anterior process is narrowly rounded, and whose caudal tip consists of an acute projection; axial length of barb barely one-fifth as long as shaft element; axis of barb usually directed slightly upward caudad. (Species name refers to large number of setae on tarsus I of female, proximad of proximal pair of duplex setae.)

Type material.—U. S. National Museum No. 1893. Collected by M. M. Barnes, Sept. 13, 1949.

Type locality.—Riverside, Calif.

Distribution.—Orange, Riverside and San Bernardino counties, Calif., and Glenn Dale, Md.

Food plants.—Apple, bean, castor bean, *Porana racemosa,* and umbrella tree.

TETRANYCHUS OREGONENSIS McGregor

Tetranychus oregonensis McGregor, 1917, U. S. Nat. Museum Proc. 51(2167): 585, 586, pl. 104. *Tetranychus oregonensis* McGregor, 1919, U. S. Nat. Museum Proc. 56(2303): 661, 662, pl. 79, fig. 2.

Female.—Color, straw color or pale yellowish amber, lateral spots lacking or very inconspicuous. Body from above elliptic-ovate, vertical thickness of body much reduced, 0.304 mm. long by 0.142 mm. wide. Eyes pale, one on either side. Legs and palpi paler than body. Twenty-six dorsal body setae, well developed, pale, setose. Last segment of palpus short, nearly half again as thick as long; terminal "finger" about twice as long as thick, its base slightly more than one-third as thick as "thumb" at tip, dorsal sensilla small, spindle-shaped, five additional setae on segment distributed about as usual. Claw on penultimate segment of palpus about reaching to dorsal sensille. Legs rather short, about three-fourths as long as body to front of cephalothorax; relative lengths of segments of foreleg as follows: Trochanter, 10; femur, 21; patella, 11; tibia, 14; tarsus, 21. Onychial claw bent strongly below its middle; claw beyond this point cleft into 6 straightish spines, the inner pair somewhat the strongest; 4 tenent hairs borne on onychium, a pair at each side of claw base. Collar trachea extending backward and downward as a straightish, somewhat ample tube, then bending sharply upward to form a wider chamber, the two arms forming an angle of less than 90°.

Male.—Body smaller than in female, legs somewhat longer proportionately.

Second segment of palpi bearing a bradlike horn. Aedeagus with inner lobe expanding to the region of basilar lobe, which is dorsal and in the form of a rather conspicuous protuberance; shaft tapering gradually backward without noticeable marked curvature, terminating in a sharp, spinelike tip, without a barb; the entire aedeagus lying almost in a common axis.

Type material.—U. S. National Museum No. 20166.

Type locality.—Portland, Oregon.

Distribution.—Known only from type locality.

Food plant.—Wild cherry (*Prunus* sp.).

TETRANYCHUS PACIFICUS McGregor

Tetranychus pacificus McGregor, 1919, Proc. U. S. Nat. Museum, 56(2303): 657, 658, pls. 77, 79, fig. 12.

Female.—Color amber, salmon, orange-red, greenish-yellow, or other colors, depending on the food plant, stage of development, or season of the year; the dorsum unspotted or with as many as 4 blackish blotches along each side. Legs and palpi pale. Body outline from above widely elliptical. Striations on dorsum of abdomen transverse. Dorsal setae pale, well developed, 26 in number, including pair on caudal end. Legs shorter than body; leg I with relative lengths of segments as follows: Trochanter, 10; femur, 26; patella, 14; tibia, 17; tarsus, 27. One perfect eye cornea each side. Collar trachea scythe-shaped. Mandibular plate oval, almost two-thirds again as long as wide, unnotched in front. Terminal segments of palpus with length and greatest thickness subequal; terminal sensilla fully twice as long as thick, its base about one-half as thick as "thumb" at tip; dorsal sensilla peglike, shorter than terminal "finger"; five additional setae on "thumb," distributed about as usual. Tarsus I dorsoterminally bearing 2 sets of duplex setae, these rather widely separated; 4 setae borne proximad of proximal set of duplex setae; onychial claw split deeply into 6 divisions, 2 sets of 3 each, the ventral pair thickest basally; the usual 4 tenent hairs arising from the onychium, a pair at each side at base of claw.

Male.—Body much smaller than that of female, sagittate from above. Legs proportionately longer, forelegs barely exceeding length of body to front of cephalohorax. Palpus with a conical spur on second segment; terminal segment in the shape of a truncated cone, basal thickness about equaling length, its terminal sensilla spikelike, about 4 times as long as thick; dorsal sensilla less than half as long as terminal finger; "thumb" of palpus bearing 5 additional setae, about as suual. Aedeagus with a rodlike inner lobe expanding abruptly dorso-posteriorly to the point of beginning of shaft; the shaft contracting caudad, and bending upward fully 90° from its axis, to form the hook; distally the aedeagus ending in a barb, the axis of which is directed slightly upward, its anterior angle being inconspicuous but acute, its posterior extension being talonlike and sharp-pointed; length of barb roughly one-third that of shaft proper.

The eggs are spherical, at first colorless, eventually becoming deep amber.

Type material.—U. S. National Museum No. 22,292.

Type locality.—Portland, Oregon, and Tracy, California.

Distribution.—British Columbia, Washington, Oregon, California, Idaho, Utah, Colorado.

Food plants.—Almond, apple, apricot, banana-squash, blackberry, *Brassica* sp., cherry, Chinaberry, choke-cherry, cotton, fig, gourd, grape, grapefruit, horehound, *Juglans californica,* lemon, locust, *Malva* sp., milkweed, morning-glory, native lily, osoberry, peach, pear, *Philadelphus* sp., pigweed, plum, prune, *Prunus* sp., *Ribes* sp., *Rubus* sp., *Stachys* sp., *Vicia* sp., vinegar-weed, walnut.

The Pacific mite is one of the most destructive crop pests in the great agricultural interior valleys of the Pacific Coast. When crop plants, ornamental and shade trees are considered together, it may be the most serious pest in central California.

The predaceous thrips, *Scolothrips sexmaculatus* (Perg.), is a very active enemy of the Pacific mite. During a number of years, in late summer, this thrips has been observed nearly to eradicate *T. pacificus* in a short period of time.

TETRANYCHUS PALLIDUS Garman

Tetranychus pallidus Garman, 1940, Conn. Agr. Exp. Sta. Bull. 431: 86-87, fig. 23.

Female.—Body elliptical from above, pale yellow to almost white. Legs shorter than body to front of cephalothorax. Striations on dorsum of abdomen transverse. Thirteen pairs of lanceolate dorsal body setae, these shortish, but longer than interval to base of nearest seta, not arising from tubercles, slightly thick at base, distinctly pilose. One perfect and one imperfect eye cornea each side. Mandibular plate ample, rounded in front. Collar trachea consisting of a straight, narrow tube for most of its length, terminating inwardly in an enlarged, hooked chamber, often preceded by several smaller septae. Palpus with terminal segment slightly thicker at base than long; terminal sensilla nearly 3 times as long as thick, with sides subparallel in profile; dorsal sensilla less than one-half as long as terminal "finger"; 5 additional setae on "thumb," about as usual. Leg I barely as long as body to front of cephalothorax; relative lengths of segments as follows: Coxa, 18; trochanter, 9; femur, 23; patella, 13; tibia, 16; tarsus, 23. Tarsi not abruptly constricted near tips, onychium with claw rather typical of the genus, with 6 well-developed divisions, the proximal pair the stoutest basally; tarsus with 2 sets of duplex setae, these arising close together; 5 setae borne proximad of proximal set of duplex setae. Eggs pale, spherical.

Male.—Second segment of palpus bearing dorsally a spurlike horn; terminal sensilla reduced to a minute papilla. Onychial claw of leg I less curved than in female, the middle division each side the stoutest. the other claw divisions

very fine. Aedeagus with rodlike inner lobe which expands rather abruptly posterior-dorsally to the point of beginning of shaft; shaft hardly narrowing for three-fourths its length, then abruptly constricted to its point of bending; hook portion deflexed well over 90° from axis of shaft, the hook thin, less than one-fourth as long as shaft, its tip bent backward to form a pseudo-barb which ends in a sharp point.

Type material.—Conn. Agr. Exp. Sta. No. 3.

Type locality.—New Haven, Connecticut.

Distribution.—Connecticut.

Food plant.—Beech tree.

Tetranychus perplexus, new species

Female.—A small mite, pale rusty amber, with several blackish spots along the sides. Dorsum of abdomen with transverse striations. Legs shorter than body to front of cephalothorax. Thirteen pairs of dorsal body setae, each longer than interval to seta next behind, distinctly pilose, not arising from tubercles. One perfect eye cornea each side. Rostrum and palpi rather prominent. Mandibular plate rounded in front. Collar trachea consisting of a straightish tube, which at inner end is reflexed to form a short, somewhat swollen arm. Tarsus I bearing dorso-terminally 2 sets of duplex setae close together; 5 or 6 setae borne proximad of proximal set of duplex setae; onychial claw split into 2 sets of 3 spines each, these closely appressed; the usual 4 tenent hairs present. Terminal segment of palpus somewhat thicker than long, terminal sensilla about twice as long as thick, dorsal sensilla small, peglike; "thumb" with 5 additional setae, about as usual. Eggs pale, spherical.

Male.—Smaller than female, body from above sagittate. Legs proportionately longer than in female; tarsi I and II and tibia I with 2 or 3 very slightly swollen hairs. Legs I with onychial claw split deeply into 2 strong, little curved divisions, each again bifurcate. Palpus with a horn on second segment; terminal sensilla reduced to a rudimentary papilla; dorsal sensilla normal. Aedeagus in profile with inner lobe thicker than usual, expanding slightly to point of beginning of shaft which is continuous with axis of inner lobe; basilar lobe not conspicuous; upper face of shaft with proximal half concave, distal half with face straight, under face of shaft convex; shaft distally narrowing strongly and deflexed weakly to form the short hook; barb conspicuous, flange- or disc-shaped, acutely pointed above and below.

Type material.—U. S. National Museum No. 1723. Collected by the author August 3, 1936.

Type locality.—Lebec, California.

Distribution.—Southern and central California, Idaho.

Food plants.—*Cercocarpus* sp., *Prunus* spp., *Salix* sp. (No. 3, Exeter, '48 = *no host*)

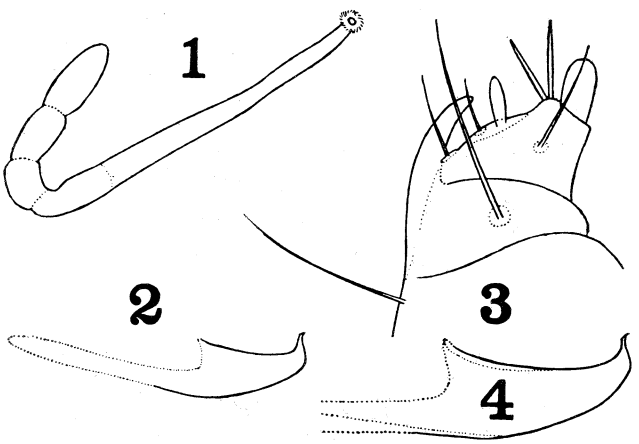
Specimens exhibit minor variations with reference to locality.

T. perplexus resembles the genus *Schizotetranychus* in the presence of slightly swollen hairs on legs I and II, but the onychial claw differs radically from those of members of that genus in that the spines are closely appressed, right and left, while in *Schizotetranychus* they are strongly divaricate.

Tetranychus piercei, new species

Female.—Dorsum of abdomen with the striations in the region of lumbales and sacrales setae mostly longitudinal. One perfect eye cornea each side. Dorsal body setae strongly developed, linear lanceolate, distinctly setose, not arising from tubercles. Collar trachea with reflexed arm about one-half as long as main arm. Terminal sensilla of palpus longer than thick. Legs shorter than body to front of cephalothorax; bearing rather long, conspicuous hairs. Tarsus I with 2 sets of duplex setae, somewhat separated, the longer of each set exceeding the tarsus in length; 4 setae borne proximad of proximal set of duplex setae. Onychial claw cleft well beyond middle into 6 subequal, fine divisions. Relative lengths of last 4 segments of forelegs as follows: Femur, 25; patella, 14; tibia, 19; tarsus 24.

Male.—Smaller than female. Second segment of palpus bearing dorsally a hornlike spur; last segment with terminal sensilla resembling that of the female. Onychial claw resembling that of *bimaculatus*. Aedeagus with inner lobe rodlike, expanding abruptly dorsally to the acute basilar lobe; shaft thickest posteriorly where it is more than twice as thick as inner lobe, then tapering rather rapidly backward to the point of beginning of hook; hook portion of aedeagus very short, less than one-fourth as long as shaft, bent upward about 90° from main axis of aedeagus; hardly a trace of a barb, the hook ending distally in a minute, sharp tip.



Text fig. 7. *Tetranychus piercei.*—1, collar trachea; 2, aedeagus, lateral view; 3, tip of palpus of female, lateral view; 4, aedeagus, lateral view

Type material.—U. S. National Museum No. 1724 collected by W. D. Pierce Feb. 9, 1928.

The type specimens are not in good condiiton for critical study.

Type locality.—Victorias Occ. Negros, Philippine Islands.

Distribution.—Known only from the type locality.

Food plant.—*Clitoria ternatea.*

Tetranychus planki, new species

Female.—Body elliptical, nearly one-half again as long as wide. Legs all shorter than body. Striations on dorsum of abdomen fine, inconspicuous, mostly transverse. Dorsal body setae 26, rodlike to clavate, rather conspicuously setose; mostly arising from slight swellings on dorsum, surface of swellings pebbled. Hairs on legs linear-acuminate, less setose than those of body. Distribution of body setae as follows: A pair on frontal margin; a pair laterally, opposite middle of mandibular plate; one near each humeral angle of cephalothorax; 4 in a transverse series on front of abdomen; a series of 4 across middle of abdomen; a series of 4 across hind third of abdomen; 4 short, clavate setae and 2 longer setae at caudal margin of body; a short seta behind humeral abdominal seta seeming to arise from under body margin; the 6 submedian setae each barely shorter than interval to seta next behind. Relative lengths of segments of leg I as follows: Trochanter, 8; femur, 35; patella, 12; tibia, 16; tarsus, 24. Tarsus I with onychial claw split fully one-half its length into 6 closely appressed divisions; this segment with 2 sets of duplex setae, close together; 7 setae borne proximad of proximal set of duplex setae. Terminal segment of palpus ("thumb") a little thicker than long, its terminal sensilla fully as thick as long; dorsal sensilla longer than terminal "finger"; 5 additional setae on "thumb." Collar trachea consisting of a short, straight tube, ending internally in an oval chamber.

Male.—Body smaller and narrower than in female; legs proportionately longer. Leg I with onychial claw split nearly to base into 2 stout, strongly curved divisions. Thumb of palpus with terminal sensilla much reduced, exceeded by dorsal sensilla. Aedaegus with inner lobe rodlike and continuous with axis of shaft, expanding dorsally to the point of beginning of shaft, and forming the inconspicuous basilar lobe; shaft at proximal end about twice as thick as inner lobe, narrowing gradually distad, its hook portion deflexed only slightly from its axis; aedeagus terminating distally in a triangular barb, with its posterior tip rounded and a little extended, and with anterior tip sharply pointed and directed more forward than downward.

Type material.—U. S. National Museum No. 1725. Numerous male and female specimens collected by H. K. Plank, June 25, 1945.

Type locality.—Mayaguez, Puerto Rico.

Distribution.—Known only from type locality.

Food plant.—*Erythrina berteroana.*

This mite evidently is allied to *T. carribeanae*, but differs in that its dorsal setae are longer and less clavate, and the terminal "finger" or palpus (female) is shorter and thicker.

TETRANYCHUS POPULI Koch

Tetranychus populi Koch, 1838, Deutsch. Crust. Myr. Arachn., fasc. 17, No. 14. *Tetranychus salicicola* Zacher, Privatdruck, dated May 17, 1920, p. 6, Abb. 7-10.

The following description is based on Garman's (17) account, and on a study by the writer, both on material collected in Connecticut.

Female.—Pale white or yellowish, 0.36 mm. long by 0.18 to 0.21 mm. wide. Striations on dorsum of abdomen transverse. Tarsi dorso-terminally with two sets of duplex setae, close together; tarsus I abruptly constricted beyond the distal set. Onychium of leg I bearing a claw which is split into two very stout proximal divisions and four fine, hairlike, distal divisions. Collar tracheae complex and forming a closed loop at the hooked, inner end. "Palp-tarsus" (Garman doubtless meant palptibia) with a heavy claw reaching the base of the terminal sensilla, the latter rather ample, little longer than thick. Thirteen pairs of dorsal body setae, these well developed, mostly longer than intervals to setae next behind, obscurely pilose. Egg white or pearllike, translucent, with an axial stalk above, which is as long as, or longer than, height of egg.

Male.—Color similar to female. Aedeagus long, lanceolate, very slightly curved, terminating distally in a distinctly blunt tip.

Type material.—Location unknown.

Type locality.—Regensburg, Germany.

Distribution.—Germany, Connecticut.

Food plants.—Lombardy poplar, *Populus* sp., *Salix* sp.

TETRANYCHUS SEXMACULATUS Riley

Tetranychus sexmaculatus Riley, 1890, Insect Life 2, 225.

Female.—Pale greenish yellow, often with six dusky spots on abdomen, body from above widely elliptical. Twenty-six dorsal body setae, distinctly pilose, longer than interval to base of seta next behind, not arising from tubercles; a pair of short setae on caudal margin. Striations on dorsum of abdomen mostly transverse. Legs shorter than body to front of cephalothorax. A perfect and an imperfect eye cornea each side. Mandibular plate ovate, four-fifths again as long as wide, unnotched in front. Collar trachea tobacco-pipe-shaped, the inner, reflexed arm slightly enlarged, and about one-third as long as main arm. Terminal segment of palpus one-half again as thick as long; terminal sensilla about twice as long as thick, obscurely pointed; dorsal sensilla and 5 additional setae borne on "thumb." Relative lengths of segments of foreleg as follows: Coxa, 14; trochanter, 10; femur, 25; patella, 12; tibia, 16;

tarsus, 25. Tarsus dorso-terminally with 2 sets of duplex setae, close together; 6 setae borne proximad of proximal pair of duplex setae; onychial claw cleft into 6 subequal divisions, with the usual pair of tenent hairs borne each side at base of claw. Egg spherical, without a stalk.

Male.—Body pale, much smaller than in female, outline from above sagittate, legs slightly longer proportionately than in female. Terminal segment of palpus with apical sensilla reduced to a peglike rudiment; dorsal sensilla spindle-shaped, conspicuous. Tarsus I with anychial claw little bent, split into 2 sets of 3 diviisons each, the middle spine of each set much the stoutest. Aedeagus with inner lobe rodlike, expanding dorsally to the obtuse basilar lobe; shaft narrowing rather abruptly to the midpoint where it is deflexed about 33° from general axis of aedeagus; caudal tip bent noticeably downward, sharp pointed.

Type material.—Location unknown.

Type locality.—Florida.

Distribution.—Florida, California.

Food plants.—Chiefly on citrus varieties, also on avocado, bean, carob, azalea, sycamore, *Vitis*, poplar, and sassafras.

Although this species was first described from Florida in 1890, specimens on a slide in the Bureau collection from San Diego, California, collected July 16, 1893, are undoubtedly *sexmaculatus*. This establishes its occurrence in California almost as early as it was recognized from Florida. The writer has never collected or received the six-spotted mite from points in California north of Santa Barbara County,[1] but it occurs on an old slide mount in the Bureau collection inscribed: "On *Vitis* at Berkeley, Calif."

Although the writer has not seen specimens of *T. talisiae* Hirst, it is almost certain, on the basis of the description and figures, that this exotic mite is a synonym of *T. sexmaculatus* Riley.

TETRANYCHUS TELARIUS (Linnaeus)

Acarus telarius Linnaeus, 1761, Faun. Suec., p. 431. *Tetranychus telarius* Koch, 1838, Deutsch. Crust. Mry. Arachn., fasc. 17, No. 12.

This is the mite known in Europe as the linden mite. It occurs commonly in Europe on trees, especially on species of *Tilia*, horsechestnut, and maple. It is reported as occurring in Sweden, Germany, Denmark, Norway, France, Italy, and England. The writer has no record of the occurrence of *telarius* in the United States, but the species is included in the present paper because the name has appeared so frequently in the American literature.

Over a period of time, an involved and extensive synonymy has accumulated for *T. telarius*. Since the writer knows of no American species which are

1 Since writing this manuscript, this mite was collected on maple at Berkeley, Calif., by Prof. Pritchard.

actual synonyms of *telarius,* no attempt is here made to show synonymy.

A sufficiciently detailed description of *T. telarius* (L.) has not been found by the writer in the European literature, and the following brief diagnosis has been prepared from a study of specimens from Germany, identified by Zacher, and sent by him to the writer.

Female.—Striations on the dorsal abdominal integument mostly transverse. Thirteen pairs of dorsal body setae, strongly developed and finely setose. All legs shorter than body to front of cephalothorax. Relative lengths of segments of leg I as follows: Coxa, 19; trochanter, 11; femur, 24; patella, 15; tibia, 17; tarsus, 24. Terminal segment of palpus thicker than long; terminal sensilla about twice as long as thick. Onychium with claw split into six divisions, (2 sets of 3 each), the sets of spines somewhat divergent; claw devoid of ventral appendages. Tarsus I dorso-terminally with two sets of duplex setae, proximate; 6 or 7 setae borne proximad of proximal set of duplex setae.

Male.—Onychial claw of tarsus I cleft into two sets (3 each) of short, subequal, divergent, spurlike divisions. Terminal segment of palpus with apical sensilla longer and thinner than that of female. Aedeagus with inner lobe not clearly seen, but expanding rather abruptly to point of origin of shaft, where an obtuse angled basilar lobe occurs ventrally; basally the shaft is thick, tapering backward rather abruptly for one-third its length; distal two-thirds of shaft consisting of a thin, attenuate tube, weakly curving, becoming almost filamentous; distal tip unbarbed, very obscurely truncate.

Type material.—Location unknown.

Type locality.—Europe.

Distribution.—Europe, British Isles.

Food plants.—*Acer campestre, A. negundo, A. saccharinum, Aesculus pavia,* hawthorn, hazel, *Salix* sp., *Tilia* (11 spp. and varieties).

Tetranychus thujae, new species

Female.—Portion of body anterior to base of forelegs (gnathosoma) bent sharply downward, forming an angle when viewed in profile. Twenty-two dorsal body setae, 16 of these reduced to peglike rudiments, a pair of somewhat stronger, lanceolate plumose bristles anteriorly over the palpi, and four clavate, plumose hairs at the posterior margin of body. Cuticular striations on dorsum of abdomen mostly transverse. Mandibular plate ample, with subparallel sides, not noticeably notched anteriorly. A single perfect eye cornea each side. "Thumb" of palpus unusually short, nearly twice as thick as long, bearing a reduced terminal "finger" nearly circular in profile; a tacklike digitulus just dorsad and one just ventrad of the terminal "finger," the dorsal sensilla more than twice as long as terminal "finger," its position unusual in that it arises near the middle of the outer face of "thumb"; two short hairs arising on "thumb" between the dorsal sensilla and the claw of the penulimate joint of palpus; a hair arising centrally from the ventral face of "thumb"; the

palpal claw surpassing the tip of "thumb." Legs somewhat shorter than usual for mites of this genus; forelegs about two-thirds as long as length of body. Body from above ovate, widest across front of abdomen. Females averaging 0.37 mm. in length to front of cephalothorax. Relative lengths of segments of foreleg as follows: Coxa, 16; trochanter, 13; femur, 26; patella, 13; tibia, 15; tarsus, 19. Tarsus (female) very abruptly narrowed at tip, bearing a claw much shorter than normal for mites of this genus, from one-fourth to one-third as long as tenent hairs; claw sharply bent, cleft to midpoint into three pairs of subequal, needlelike spurs. Tarsus I bearing 2 sets of duplex setae, proximate; 3 or 4 setae borne proximad of proximal set of duplex setae. The collar trachea appears to be a relatively straight tube, of even caliber.

Male.—Body much smaller and narrower than that of female, averaging 0.21 mm. in length to front of cephalothorax; legs not much longer than those of female. Palpus bearing a spur dorsally on second segment. Tarsus I and tibia I bearing 3 swollen setae; tarsus II and tibia II bearing 2 swollen setae. Aedeagus with inner lobe rodlike, expanding gradually to its point of fusion with the shaft; the basilar lobe dorsal, not prominent, in the form of an obtuse angle; anterior half of shaft rather abruptly narrowed and produced posteriorly in the form of a straight, blunt-tipped finger, devoid of a hook or a barb; the entire genital structure lying almost in a common axis.

Type material.—U. S. Nat. Museum No. 1475. Collected by A. M. Phillips, Aug. 8, 1941.

Type locality.—Monticello, Florida.

Distribution.—Alabama, Florida.

Food plants.—Arborvitae (*Thuja* sp.), evergreens.

The work of this mite became sufficiently serious by 1941 as to cause the Florida Experiment Station to suggest to Mr. A. M. Phillips of the Bureau of Entomology and Plant Quarantine that he attempt to work out a method of control.

TETRANYCHUS YUMENSIS McGregor

Tetranychus yumensis McGregor, 1934, Ent. Soc. Wash. Proc. 36(8, 9): 256-259, pl. 27.

Female.—General body color rusty red or ferruginous, usually with a few small dark spots; legs paler. A single perfect eye cornea on each side. Body oval, in length averaging 0.32 mm.; width averaging 0.18 mm. (in preserved material). Striations on dorsum of abdomen mostly transverse. Dorsal body setae finely setose, each reaching well beyond base of seta next behind, not arising from tubercles. Mandibular plate rounded anteriorly, with no emarginations. "Thumb" of palpus fully as thick as long, bearing at its tip a slightly spatulate terminal sensilla whose thickness is almost equal to its length; on

upper distal corner of "thumb" are two pin-shaped setae; on upper side near midpoint is a sensilla much more slender than terminal "finger," and between this and base are two shortish setae; a strong seta borne latero-ventrally about half way from tip to base of "thumb." Claw on penultimate segment of palpi about reaching dorsal sensilla. Foreleg fully as long as body to front of cephalothorax; relative lengths of segments of leg I as follows: Trochanter, 13; femur, 27; patella, 17; tibia, 18; tarsus, 25. Tarsus I bearing dorsally 2 sets of duplex setae, their basal rings about touching; 5 setae borne proximad of proximal set of duplex setae. Onychial claw bent sharply downward at a point rather near its base; portion of claw beyond point of bending split into 6 spines, the ventral pair strongest basally; 4 tenent hairs arising in pairs by the sides of the claw base. The collar trachea consisting of a narrow, straightish tube which is abruptly deflexed at its inner third, then bent upward as a somewhat swollen chamber, the whole structure being somewhat tobacco-pipe-shaped. Egg nearly spherical, barely compressed, with a weak dorsal stalk which is about half as long as the vertical thickness of egg; a few fibrils often extending from tip of stalk to supporting substratum.

Male.—Abdomen less oval, more wedge-shaped than in female, body length much shorter. Legs proportionately longer. Aedeagus with inner lobe seemingly rodlike; basilar lobe consisting merely of an obtuse dorsal prominence; shaft proper about two and one-half times as long as its basal thickness, bent upward near midpoint about 34° from axis of shaft, the upturned distal portion slightly longer than the shaft proper, and terminating in an acuminate tip.

Type material.—U. S. National Museum No. 1111.

Type locality.—Yuma, Arizona.

Distribution.—Near Yuma, Arizona, and near Indio, California.

Food plants.—Lemon, grapefruit, orange, tangerine.

It is reported that this mite usually is most abundant in March and April, and that it becomes scarce when temperatures reach 100° F. or higher.

Species of TETRANYCHUS not known to the author

TETRANYCHUS WELDONI Ewing, 1913, Entom. Soc. Amer. 6, 457.

The present writer has not seen this mite. Ewing's description is as follows: "*Female.*—Similar in all respects to the female of *T. telarius* Linn. *Male.*—Different from male of *T. telarius* Linn. in characters of penis and spur on palpus. Spur on palpus not so pointed as in *T. telarius* Linn. Penis very long, rodlike, equal to one-third the length of the body. Inner lobe short, rodlike, slightly swollen at its inner end. Shaft rodlike, not setiform; gradually tapering as you pass backward; posterior one-half turned upward; tip narrowly rounded, not pointed. Basilar lobe absent. Hook absent Barb absent. From Grand Junction, Colorado; on apple, prune, cottonwood."

TETRANYCHUS BOREALIS Ewing, 1913, Entom. Soc. Amer. Ann. 6, 457.

This mite also has not been seen by the writer. Of this species, Ewing states in his description: ". . . the female is similar to the female of *T. telarius* Linn., but smaller, and never orange or red." Of the male, Ewing states: ". . . similar to the male of *T. telarius* Linn., except for penis. Penis long, straight. Inner lobe about equal to basilar lobe in length. Shaft shaped like a slender rod. Basilar lobe very pronounced, cone-shaped, equal to about one-fourth the length of the shaft. Hook absent. Barb knoblike. From *Spirea* sp., Coast Range Mountains, Benton County, Oregon."

The aedeagus, as shown in a sketch from type specimens of *T. borealis* furnished by Baker to the writer, agrees closely with that of *T. flavus* Ewing, and Ewing (in correspondence) stated that the knob at tip of aedeagus is no longer visible in his type specimens. From the information above recorded, the writer is of the opinion that *borealis* and *flavus* may be identical. Should this prove to be the case, *borealis* would supersede *flavus,* on the basis of page priority.

TETRANYCHUS LUDENI Zacher, 1910, Mitt. Kaiserl. Biol. Anst. f. Land- und Forst., Heft. 9.

This mite has never been collected or received by the present writer. Garman (17) described and figured *ludeni* in his "Tetranychidae of Connecticut." References may be had to Zacher's original description (translated by McGregor), and to Garman's conception of this species, in the two following citations: *Tetranychus ludeni* Zacher, 1919, U. S. Nat. Museum 56 (2303): 653, pl. 79, fig. 10. *Tetranychus ludeni* Zacher, 1940, Conn. Agri. Exp. Sta. Bull. 431, 83, fig. 19.

TETRANYCHUS MULTIDIGITULI Ewing, 1917, Jr. Econ. Ent. 10 (5): 497, 498, figs. 2, 3.

This species, not seen by the author, differs from most other species of *Tetranychus,* according to Ewing, in having several digituli, or setae, near tip of "thumb"; in having the dorsal body setae relatively short, and in having the tip of tarsus broad and truncate.

TETRANYCHUS THERMOPHILUS Ewing, 1926, Ent. News, 37, p. 142.

This mite has not been seen by the writer. Ewing's description is such that the species cannot be properly recognized. Baker reported in correspondence that the type slide is in poor condition, but he furnished a sketch showing the aedeagus to have a short, upturned hook ending in a barb. (Ewing stated that the barb is lacking.) Baker's sketch of the aedeagus removes *thermophilus* from *Septanychus deserticola* McGregor, which occurs on the same plant.

Type material.—U. S. National Museum No. 957.

Type locality.—Death Valley, California.

Distribution.—Known only from type locality.

Food plants—Creosote bush (*Larrea tridentata*).

Genus SCHIZOTETRANYCHUS Trägårdh

Schizotetranychus Trägårdh, 1915, Stockholm Landtbr.-Akad. Handl. 54: 277.

Generic characters.—Mites closely allied with *Tetranychus* (subgenus *Eotetranychus*), and hardly distinguishable from the latter except in the structure of the onychial claw, in the presence of special sense setae on legs I and II of the male in some species, and in the shape of the collar tracheae. Onychial claw, viewed from above, split deeply, divaricate, Y-shaped. Collar tracheae not U-shaped, but with the main tube internally reflexed or hooked to form a short, somewhat enlarged arm. Basal, fused portion of onychial claw at times bearing ventrally minute spines.

Genotype.—*Tetranychus schizopus* Zacher.

KEY TO THE SPECIES OF SCHIZOTETRANYCHUS

1. Tarsal claw (female) split into two simple, divaricate divisions 2
   Tarsal claw (female) split into four main divisions, one strong and one weak division each side ..... *schizophus* (Zacher)
   Tarsal claw (female) split into six main divisions, one strong and two weak divisions each side 6

2. Fused basal portion of tarsal claw with two barely visible spines borne ventrally; shaft of aedeagus devoid of a hook ..... *cynodonis,* new species
   Fused basal portion of tarsal claw without ventral spines; shaft of aedeagus distinctly hooked 3

3. Dorsal body setae well developed, each much surpassing base of seta next behind ..... *elmyus,* new species
   Dorsal body setae mostly failing to reach bases of setae next behind 4

4. Tarsi I of male with swollen sense setae; hook portion of aedeagus not S-shaped; inner end of collar trachea not strongly hooked ..... *spireafolia* Garman
   Tarsi I of male without swollen sense setae; hook portion of aedeagus somewhat S-shaped; inner end of collar trachea strongly hooked 5

5. Last segment of palpus of female fully twice as thick as long; tarsus I of female almost squarely truncate beyond duplex setae ..... *celarius* (Banks)
   Last segment of palpus of female not twice as thick as long; tarsus I of female less abruptly truncate beyond duplex setae ..... *fluvialis* McGregor

6. Dorsal body setae well surpassing base of seta next behind; hook of aedeagus bent downward; fused base of tarsal claw bearing ventrally two barely visible spines ..... *cercocarpi,* new species
   Dorsal body setae failing to reach or barely exceeding base of seta next behind; hook of aedeagus bent upward; fused base of tarsal claw devoid of ventral spines 7

7. Terminal sensilla on last segment of palpus (female) 3 times as long as thick; tarsi I and tibiae I (male) with swollen, spindle-shaped setae..... *eremophilus,* new species
   Terminal sensilla on last segment of palpus (female) thicker than long; tarsi I and tibiae I (male) without swollen, spindle-shaped setae ..... *floridensis* (McGregor)

Schizotetranychus celarius (Banks), new combination

Stigmaeopsis celarius Banks, 1917, Ent. News 28, 196, pl. 15, figs. 9 and 11. *Schizotetranychus latitarsus* Ewing, 1917, Jr. Econ. Entom. 10(5): 498, 499, fig. 4, new synonymy.

Female.—Yellowish to greenish, body about twice as long as broad, somewhat compressed dorso-ventrally. Striations on dorsum of abdomen mostly transverse. Dorsal body setae mostly shorter than intervals to bases of setae next behind. Legs short, stubby, much shorter than length of body to front of cephalothorax. Rostrum longish, reaching about to front of patellae I. Mandibular plate notched in front. A single perfect eye cornea each side. Tarsus I about equaling tibia I, very thick, very abruptly truncated to the onychium; dorsally with 2 sets of duplex setae, barely separated, the longest seta longer than the segment; one seta borne proximad of proximal set of duplex setae; onychial claw cleft deeply into 2 simple, stout, divaricate divisions, evidently devoid of the minute spines on ventral face of fused base, present in some species; 4 tenent hairs arising from the onychium as usual. Collar trachea consisting of a straightish, narrow tube, expanding slightly internally; from inner end of expanded portion a short, narrow, semicircular tube doubling back a short distance on main tube. Last segment of palpus distinctly thicker than long; terminal sensilla one-third longer than thick, slightly angularly tipped; dorsal sensilla and 5 additional setae present on "thumb."

Male.—Body smaller than female. Legs shorter than body to front of cephalothorax; relative lengths of segments of leg I as follows: Coxa, 15; trochanter, 11; femur, 21; patella, 14; tibia, 16; tarsns, 14. Tarsi I and tibiae I without swollen setae. Second segment of palpus with hornlike spur dorsally; last segment with terminal sensilla greatly reduced or lacking. Onychial claw similar to that of female. Aedeagus with inner lobe thickening dorso-caudad to the shaft; shaft narrowing behind, then bent upward nearly 90° to form the slender hook which terminates in a sharp, unbarbed tip which is bent slightly backward.

Type material.—U. S. Nat. Museum No. 1727, collected by E. R. Sasscer, Aug. 8, 1913.

Type locality.—Oneco, Florida.

Distribution.—Florida, Georgia, California.

Food plant.—Bamboo.

Ewing has indicated in unpublished notes that his *latitarsus,* published October 1917, is a synonym of Banks' *celarius,* published May 1917.

Schizotetranychus cercocarpi, new species

Female.—Body from above ovate-elliptic. Dorsal abdominal striations transverse. Thirteen pairs of dorsal body setae, linear-lanceolate, minutely setose, strongly developed, not arising from tubercles. A single perfect eye cornea

each side. Mandibular plate rather ample, rounded in front. Rostrum rather long. Legs shorter than body. Tarsus I with 2 sets of duplex setae, close together; 5 setae borne proximad of proximal set of duplex setae; onychial claw stout and straightish at basal portion, cleft deeply into 6 divisions, the inner pair much the strongest basally, the spines divergent left and right, a minute spine borne ventrally on the fused basal portion of claw; 4 tenet hairs borne on onychium, a pair at each side of claw base. Collar trachea consisting of a long, slender, tortuous tube, ending internally in an enlarged, elliptical chamber. Last segment of palpus fully half again as thick as long; terminal sensilla fully one-third again as long as thick, little more than one-third as thick as terminal face of "thumb;" dorsal sensilla spindle-shaped, as long as terminal "finger;" five additional setae on segment, as usual.

Male.—Much smaller and narrower than female, body from above sagittate in outline. Palpus with terminal sensilla reduced to a minute papilla; dorsal sensilla spindle-shaped, much longer than terminal "finger." Tarsi and tibiae devoid of swollen sense setae. Aedeagus with inner lobe expanding gradually to the shaft; basilar lobe inconspicuous; shaft narrowing gradually caudad and bent downward slightly less than 90° from its axis; hook portion of aedeagus slender, little more than one-third as long as shaft, distal tip sharp, devoid of a barb, bent perceptibly backward.

Type material.—U. S. Nat. Museum No. 1728. Collected by the author Aug. 5, 1938.

Type locality.—Camp Nelson, California.

Distribution.—Tulare County, and Los Angeles County, California.

Food plant.—*Cercocarpus* sp.

Schizotetranychus cynodonis, new species

Female.—Body from above ovate-elliptic, somewhat compressed dorso-ventrally. Legs shorter than body to front of cephalothorax. Dorsal body setae 26, linear-lanceolate, definitely setose, shortish, mostly failing to or barely reaching bases of setae next behind, not arising from tubercles. Dorsum of abdomen with striations mostly transverse. One perfect and one imperfect eye cornea each side. Mandibular plate twice as long as wide, rounded in front. Rostrum rather long. Relative lengths of segments of leg I as follows: Coxa, 17; trochanter, 11; femur, 23; patella, 13; tibia, 14; tarsus, 20. Most hairs on legs conspicuously setose. Tarsus I bearing dorsally 2 sets of duplex setae close together, the longest hair exceeding the segment; 3 setae borne proximad of proximal set of duplex setae; onychial claw cleft almost to base into 2 simple weakly curved, divaricate divisions; a pair of easily overlooked spines, about as long as thickness of claw at that point, borne perpendicularly at a point one-fourth the length of claws from base ventrally. Four tenent hairs arising from onychium, a pair at each side of claw base, these only about one-

half again as long as claw. Last segment of palpus somewhat longer than thick; terminal sensilla about half again as long as thick, rather pointed distally; dorsal sensilla thin; 5 additional setae borne on "thumb," about as usual. Collar trachea consisting of a narrow, straightish tube which is bent slightly upward internally to form a short, somewhat enlarged septate arm.

Male.—Smaller than female, body from above somewhat kiteshaped. Dorsal body setae shortish. Second segment of palpus dorsally with a hornlike spur. Last segment of palpus with terminal sensilla greatly reduced; dorsal sensilla well developed. Onychial claw resembling that of the female. Aedeagus with inner lobe expanding rather rapidly dorso-caudad to basilar lobe, which is sharp-pointed; shaft near its point of beginning very abruptly contracted dorsally, then produced caudad as a lanceolate structure, at first directed slightly upward, then bending weakly downward near tip; sharply acuminate distally.

Type material.—U. S. Nat. Museum No. 1729. Collected by F. Stickney Nov. 6, 1934.

Type locality.—Sentenac Canyon, 14 miles east of Julian, California.

Distribution.—Sentenac Canyon, Palm Canyon, Redlands, California.

Food plants.—Bermuda grass, salt grass.

Schizotetranychus elymus, new species

Female.—Body from above ovate-elliptic. Legs shorter than body to front of cephalothorax. Striations on dorsum of abdomen mostly transverse, excepting a small area enclosing outer lumbales setae, these longitudinal. Fourteen pairs of dorsal body setae, including caudal pair, distinctly setose, each well exceeding base of seta next behind. One perfect and one imperfect eye cornea each side. Mandibular plate narrowly ovate, more than two and one-fourth times as long as wide, anterior half tapering, distinctly notched in front. Rostrum rather long, raeching almost to distal end of patellae I. Collar trachea of the general shape of a tobacco-pipe, with main tube long and narrow, bending upward and slightly forward to form internally a short, septate, somewhat enlarged, subcrescentic chamber. Tarsus I with 2 sets of duplex setae, not greatly separated, the longest hair of each pair longer than segment; 3 setae borne proximad of proximal set of duplex setae; onychial claw very deeply cleft into 2 strong, simple, divaricate divisions (the minute spines, present on the fused base in some species, lacking); 4 tenent hairs borne on onychium. Last segment of palpus distinctly thicker than long; terminal sensilla fully half again as long as thick, its tip rather acute; dorsal sensilla slender, clavate; 5 additional setae on "thumb" as usual.

Male.—Much smaller than female; body from above narrowly sagittate. Legs shorter than body to front of cephalothorax. Second segment of palpus dorsally with a slender, hornlike spur; last segment with terminal sensilla evi-

dently lacking. Tarsi I and tibiae I without the spindle-shaped setae present in some species. Onychial claw similar to that of female. Aedeagus similar to that of *S. eremophilus;* inner lobe rodlike, expanding rather abruptly caudad to the rather prominent basilar lobe; shaft tapering rather abruptly backward and bent upward about 90° from its axis to form the slender hook; the latter, in turn, bent backward near tip to form the sharp-tipped pseudo-barb.

Type material.—U. S. Nat. Museum No. 1730. Collected by the author August 22, 1935.

Type locality.—Pine Valley, San Diego County, California.

Distribution.—San Diego County, Orange County, and Los Angeles County, California.

Food plants.—The grasses *Elymus triticoides* and *E. condensatus.*

Schizotetranychus eremophilus, new species

Female.—Body from above, elliptical; somewhat compressed dorso-ventrally. Legs shorter than body to front of cephalothorax, somewhat stubby. Striations on dorsum of abdomen transverse excepting a small area embracing the outer lumbales setae, where they are mostly longitudinal. Thirteen pairs of dorsal body setae, including caudal pair, shortish, each either failing to reach, or barely exceeding base of seta next behind. Mandibular plate twice as long as wide, sharply rounded in front. One perfect and one imperfect eye cornea each side. Rostrum long, nearly reaching to front of patellae of legs I. Collar trachea U-shaped with inner portion reflexed. Last segment of palpus fully as thick as long; terminal sensilla fully 3 times as long as thick; dorsal sensilla thin, rodlike, about as long as terminal "finger"; 5 additional setae borne on "thumb" as usual; claw of penultimate segment reaching nearly to tip of palpus. Tarsus I abruptly contracted near tip, bearing dorsally 2 sets of duplex setae, rather close together; one or 2 setae borne proximad of proximal set of duplex setae; onychial claw deeply cleft, with 2 halves divaricate right and left, each half consisting of a strong inner spine and 2 weak outer spines; 4 tenent hairs borne on the onychium.

Male.—Body smaller and narrower than in female, from above sagittate in outline. Legs shorter than body to front of cephalothorax. Second segment of palpus dorsally with a hornlike spur; terminal sensilla of "thumb" like that of female. Tibia I with 2 spindle-shaped setae. Tarsus I with 3 spindle-shaped setae, and 2 sets of duplex setae; claw consisting of 2 stout, simple divisions, these divaricate left and right from a point near claw base. Aedeagus with inner lobe expanding gradually to point of origin of shaft; basilar lobe dorsal, inconspicuous; shaft narrowing backward, bent upward nearly 90° from its axis to form the slender hook portion which, in turn, is bent somewhat backward and downward near its tip to form a pseudo-barb; aedeagus ending distally in a sharp point.

Type material.—U. S. Nat. Museum No. 1731. Collected by the author Aug. 22, 1935.

Type locality.—Plaster City, California.

Distribution.—Imperial Valley, Coachella Valley, and San Bernardino Valley, California.

Food plant.—Bermuda grass.

Schizotetranychus floridensis (McGregor), new combination

Divarinychus floridensis McGregor, 1930, Ent. Soc. Wash. Proc. 32(9): 161-163, figs. 1-6.

A critical reexamination of cotype material of this species has convinced the writer that it should be placed in the genus *Schizotetranychus,* and that the genus *Divarinchus* should be suppressed as a synonym. In certain respects this species resembles *S. asparagi* (Oudemans), as described and figured by Geijskes (9), but it appears to differ in the complete lack of cylindrical or swollen sense hairs on tibia I and tarsus I of the male, and in the structure of the collar tracheae. Geijskes' figure of the aedeagus is of little value, since it is not shown in profile. For the present, therefore, the writer prefers to retain *floridensis* as a valid species.

Female.—Body ovate-elliptic, salmon pink to greenish yellow, with dark blotches laterally; averaging 0.41 mm. long to front of cephalothorax. Legs shorter than body. Striations on dorsum of abdomen mostly transverse. Twenty-six dorsal body setae, including caudal pair, these distinctly setose, much shorter than interval to base of seta next behind. Relative lengths of segments of leg I as follows: Trochanter, 14; femur, 33; patella, 20; tibia, 21; tarsus, 33. Tarsus I with two sets of duplex setae dorsally, close together; 5 setae borne proximad of proximal set of duplex setae; without spindle-shaped or cylindrical setae in either sex; onychial claw cleft very deeply into two stout, divaricate, fanglike divisions, each bearing dorsally two very fine, hairlike spines; inner face of fused claw base without minute spine (present in some species); onychium bearing four tenent hairs as usual. Last segment of palpus thicker than long, its terminal sensilla fully as thick as long, and three-fourths as thick as end of "thumb;" dorsal sensilla spindle-shaped, longer than terminal "finger;" five additional setae borne on "thumb," as usual. Collar tracheae extending inward as a narrow, straightish tube, gradually expanding and deflexing slightly to terminate in a pseudo-chamber. Eggs spherical, salmon pink.

Male.—Body smaller than female, averaging 0.26 mm. in length; ovate-cuneate from above. Swollen sense hairs lacking on tibia I and tarsus I. Aedeagus with inner lobe expanding ventrally to the basilar lobe; shaft narrowing caudad, then bent upward nearly 90° to form the hook which is about one-fourth as long as shaft; distally the aedeagus ends in a barb which is

about as long as the hook, is directed backward and slightly upward, barely projecting anteriorly but produced posteriorly as a prominent spur.

Type material.—U. S. Nat. Museum No. 1004.

Type locality.—Longwood, Florida.

Distribution.—Florida.

Food plant.—*Asparagus plumosus.*

SCHIZOTETRANYCHUS FLUVIALIS McGregor

Schizotetranychus fluvialis McGregor, 1928, Ent. Soc. Wash. Proc. 30(1): 13, pl. 2, figs. 1-9.

Female.—Color pale. Body rather elongate, somewhat compressed dorsoventrally, averaging 0.335 mm. long to front of cephalothorax. Rostrum rather long. Striations on dorsum of abdomen mostly transverse. Twenty-six dorsal body setae, these very short, distinctly setose. One perfect and one imperfect eye cornea each side. Legs stubby, much shorter than length of body to front of cephalothorax; relative lengths of segments of foreleg as follows: Trochanter, 10; femur, 25; patella, 12; tibia, 13; tarsus, 16. Tarsus I dorsally with 2 sets of duplex setae, these approximate; 2 sets borne proximad of proximal set of duplex setae. Onychial claw cleft deeply into 2 stout, divaricate divisions, each weakly hooked and devoid of supplementary spines; fused base of tarsal claw devoid of ventral spines; the 4 usual tenent hairs borne on onychium. Terminal segment of palpus slightly thicker than long; its terminal sensilla about twice as long as thick, and only about one-third the thickness of "thumb" at tip; dorsal sensilla small, spindle-shaped; 5 additional setae on "thumb" as usual. Collar tracheae consisting of a straightish, narrow tube, internally bent at nearly a right angle into a very short, slightly larger arm. Mandibular plate two and two-thirds as long as wide, rounded in front.

Male.—Much smaller than female, averaging 0.217 mm. long. Legs shorter than body. Tarsi I and II without swollen sense setae. Aedeagus with inner lobe expanding dorsally to the obtuse angled basilar lobe; shaft tapering backward and bent upward nearly 90° from its axis to form the hook portion which is less than one-fifth as long as shaft; distally the hook is bent sharply backward to form a short, sharp tipped pseudo-barb.

Type material.—U. S. Nat. Museum No. 961.

Type Locality.—Banks of Kaweah River, near Lemon Cove, California.

Distribution.—Known only from type locality.

Food plant.—A native grass, *Epicampes rigens.*

SCHIZOTETRANYCHUS SCHIZOPUS (Zacher)

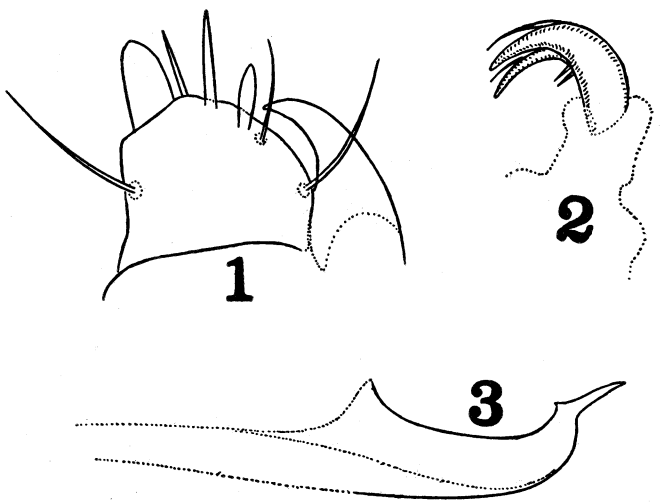
Tetranychus schizopus Zacher, 1910, Mitt. Kais. Biol. Anst. F. Land-und Forst. 9, 40. *Schizotetranychus schizopus* (Zacher), Trägårdh, 1915, Ztschr. f. angew. Entom. 2. Bd., p. 162.

Female.—Light brown to yellow in front, reddish yellow behind, color variable. Striations on dorsum of abdomen mostly transverse. Dorsal body setae 26, finely setose, not arising from tubercles, barely surpassing base of seta next behind. One perfect eye cornea each side. Collar tracheae consisting of a straightish, narrow tube, ending internally in an enlarged, non-reflexed, elliptical chamber. Mandibular plate rather ample, rounded in front. Tarsus I dorsally with 2 sets of duplex setae arising close together; 2 setae borne proximad of proximal set of duplex setae; onychial claw stout at base, sharply bent at midpoint where claw splits into 2 diverging divisions, each with a fine spine arising from midpoint of its outer face; on inner face of fused, basal portion of claw are borne perpendicularly 2 inconspicuous, tacklike spines, shorter than thickness of claw. Last segment of palpus thicker than long; terminal sensilla almost twice as long as thick; dorsal sensilla spindle-shaped; 5 additional setae borne on "thumb," as usual.

Male.—Fused basal portion of onychial claw evidently without the minute, tacklike spines, present in female. Tarsi and tibiae with barely swollen sensory setae. Aedeagus with inner lobe expanding to the rather acute basilar lobe; shaft narrowing backward and curving to the barb; the latter about three-sevenths as long as shaft proper, and acutely pointed both anteriorly and posteriorly; the distal tip prominent as an attenuate, sharp projection. (The specimen studied by the writer lay in such a position that it could not be determined whether the hook of the aedeagus bent downward or upward.)

Type material.—Location not known to the writer.

Type locality.—Location not known to the writer.



Text fig. 8. *Schizotetranychus schizopus.*—1. tip of palpus of female, lateral view; 2, claw of tarsus I of female, lateral view; 3, aedeagus lateral view.

Distribution.—Europe and Connecticut.

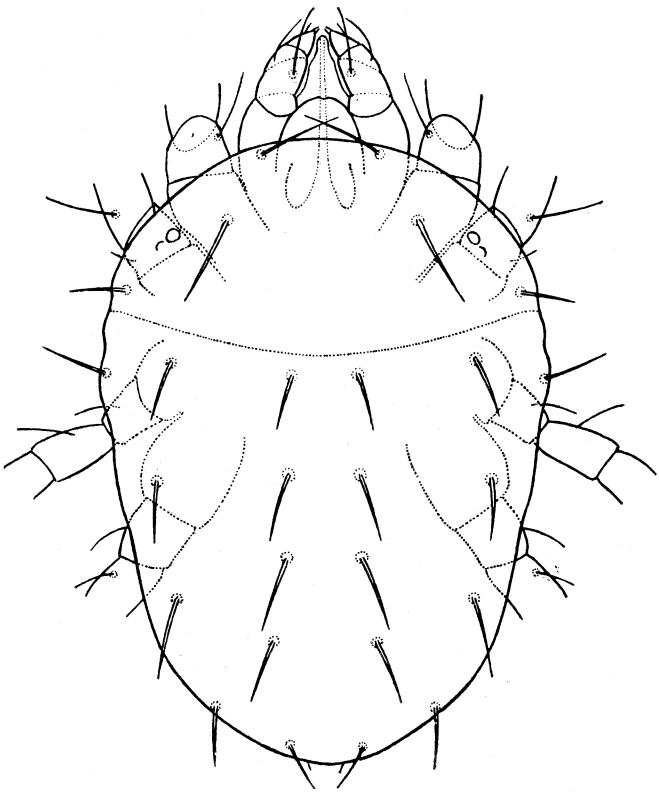
Food plants.—*Salix* spp., *Vaccinium uliginosum.*

The above description is based on European material identified and furnished by Zacher, and on specimens from Connecticut loaned by Garman.

SCHIZOTETRANYCHUS SPIREAFOLIA Garman

Schizotetranychus spireafolia Garman, 1940, Conn. Agr. Sta. Bull. 431.

Female.—White to yellowish with obscure darker blotches and conspicuous carmine eye spots. Body rather widely oval, widest across humeral region of abdomen, rather flattened dorso-ventrally. Striations on dorsum of abdomen mostly transverse. Dorsal body setae 26, lanceolate, slightly thick at base, each shorter than interval to base of seta next behind, not arising from tubercles. One perfect and one imperfect eye cornea each side. Mandibular plate



Text fig. 9. *Schizotetranychus spireafolia.*—Female mite, dorsal view (only basal portion of legs shown).

ample, barely emarginate in front. Legs stubby, much shorter than body to front of cephalothorax. Tarsus I abruptly constricted near tip; onychial claw cleft to its middle into 2 stout, divergent talons, with no supplementary spines; base of claw without minute spines ventrally; 4 tenent hairs borne on onychium as usual. Relative lengths of segments of leg I as follows: Coxa, 15; trochanter, 10; femur, 19; patella, 12; tibia, 12; tarsus, 18; tarsus I with 2 sets of duplex setae close together; evidently 4 setae proximad of proximal set of duplex setae. Collar tracheae slender, the terminal chamber elongate-elliptical. Palpus not viewed in proper position for critical study, but "thumb" appears to be thicker than long; terminal sensilla appears to be slightly longer than thick. Egg pear-like in color, slightly lenticular in profile.

Male.—Shorter and narrower than female. Legs I only about four-fifths as long as body to front of cephalothorax; tarsi I and II bearing centrally above a swollen seta, possibly a sensilla (lacking in female). Onychial claw quite like that of female. Aedeagus with inner lobe expanding gradually to point of beginning of shaft; basilar lobe dorsal, inconspicuous; shaft narrowing evenly caudad, bent upward more than 90° to form the slender, sharp-pointed hook; barb lacking.

Type material.—Connecticut Agricultural Experiment Station, No. 4

Type locality.—Bethlehem, Connecticut.

Distribution.—Connecticut.

Food plant.—*Spiraea latifolia.*

The present writer has not seen the types of this species, but he has studied material from Connecticut loaned by Garman.

Genus SEPTANYCHUS McGregor

Septanychus McGregor, 1919, U. S. Nat. Museum Proc. 56(2303): 663.

Generic characters.—Mites in some respects resembling *Tetranychus*. Striations on dorsum of abdomen usually somewhat tortuous; those on hind third of abdomen usually mostly longitudinal. Dorsal body setae linear-lanceolate, well developed, not arising from tubercles. Onychial claw (female) consisting typically of seven divisions, all arising from a common base; major, ventral portion deeply cleft into 6 long, slender spines (8? in one species); a single, straightish spur, distinctly shorter than the main claw divisions, and tangent to them arising dorsally at point of claw's greatest curvature. Collar tracheae usually reflexed inwardly to form a shorter arm. Aedeagus, in all species studied, with shaft bent strongly upward, and terminating in a conspicuous barb.

A KEY TO THE SPECIES OF SEPTANYCHUS

1. Barb of aedeagus with anterior process acutely angular 4
   Barb of aedeagus with anterior process not acutely angular 2
2. Tarsus I of female bearing only 1 or 2 setae proximad of proximal set of duplex setae; terminal sensilla of last segment of palpus of female about as thick as long ..... *tumidus* (Banks)

Tarsus of female with 4 or 5 setae proximad of proximal set of duplex setae; terminal sensilla of "thumb" of female distinctly longer than thick 3

3. Barb of aedeagus averaging two-thirds as long as shaft .....*schoenei* (McGregor)
Barb of aedeagus averaging barely one-third as long as shaft .....*canadensis,* new species

4. Tarsal claw of female with 10 divisions .....*braziliensis,* new species
Tarsal claw of female with 7 divisions 5

5. Palpus of female with terminal sensilla thicker than long .....*argentinus* McGregor
Palpus of female with terminal sensilla longer than thick 6

6. Barb of aedeagus rounded caudally, with hardly a trace of a process .....*deviatarsus,* new species
Barb of aedeagus with an acute process caudally 7

7. Tarsus I of female bearing one or no hairs distinctly proximad of proximal set of duplex setae 8
Tarsus I of female bearing 4 hairs distinctly proximad of proximal set of duplex setae 9

8. Aedeagus with caudal end of shaft slightly angular ventrally; barb in profile with conspicuous projections anteriorly and caudally, the caudal process curving sharply downward like the claw of a hammer .....*deserticola,* new species
Aedeagus with shaft ventrally curving evenly into the hook element; barb with anterior and caudal processes inconspicuous, acute .....*texazona,* new species

9. Dorsal tangent spur of tarsal claw I (female) very conspicuous; barb of aedeagus in profile with anterior process much less conspicuous than caudal projection .....*mexicanus,* new species
Dorsal spur of tarsal claw (female) inconspicuous, barb of aedeagus with anterior process about as strongly developed as caudal projection .....*cocosi,* new species

SEPTANYCHUS ARGENTINUS McGregor

Septanychus argentinus McGregor, 1943, Ent. Soc. Wash. Proc. 45(7): 176-178, pl. 16.

Female.—Body outline from above rather widely oval. Striations on dorsum of abdomen somewhat tortuous, those on anterior half mostly transverse; those on posterior half mostly longitudinal. Twenty-six conspicuous, linear-lanceolate, finely setose dorsal body setae, not arising from tubercles. A single eye cornea on each side. Mandibular plate rounded anteriorly at maturity. "Thumb" of palpus shortened axially, greatest thickness about one-third more than length, bearing terminally a dome-shaped "finger" which is slightly thicker than long; the rather ample dorsal sensilla nearly twice as long as the terminal "finger;" the other five hairs and digituli of the "thumb" about as usual. Legs rather long, especially first and last pairs, but none as long as body. Relative lengths of segments of foreleg as follows: Coxa, 12; trochanter, 7; femur, 18; patella, 10; tibia, 13; tarsus, 20. Tip of tarsus (female) bearing a claw which is sharply bent at a point one-fifth the distance from base to tip, at which point there arises dorsally a straight, tangent spur and there is ventrally a stronger division which soon splits into 6 equal, slender, spine-like parts much longer than the dorsal spur. Tarsus I with 2 sets of duplex setae widely separated; 1 or 2 setae borne proximad of proximal set of duplex setae. The usual four tenent hairs arising from the onychium, a pair on each side of the claw base. Collar trachea U-shaped with the arms subequal.

Male.—Body smaller and narrower than that of female. Legs not conspicuously long. Penis with inner lobe rodlike; basilar lobe inconspicuous; shaft from two to three times as long as its basal thickness, bent upward and backward more than 90° from axis of main shaft, expanding terminally to form the prominent barb whose axial length slightly exceeds the length of the "hook" of the shaft; anterior portion of barb slightly acute-angled; posterior portion of barb bent strongly downward and acuminate, resembling the claw of a hammer. Tarsal claw of legs I and II differing from those of other two pairs of legs and from those of female; distal portion (corresponding to the main claw) rather straight and relatively weak, the proximal portion (analagous to the deflexed spurs in certain genera) much thicker at base and appearing to be split indistinctly at tip into 3 or more closely appressed, dentate, divisions.

Type material.—U. S. Nat. Museum No. 1437.

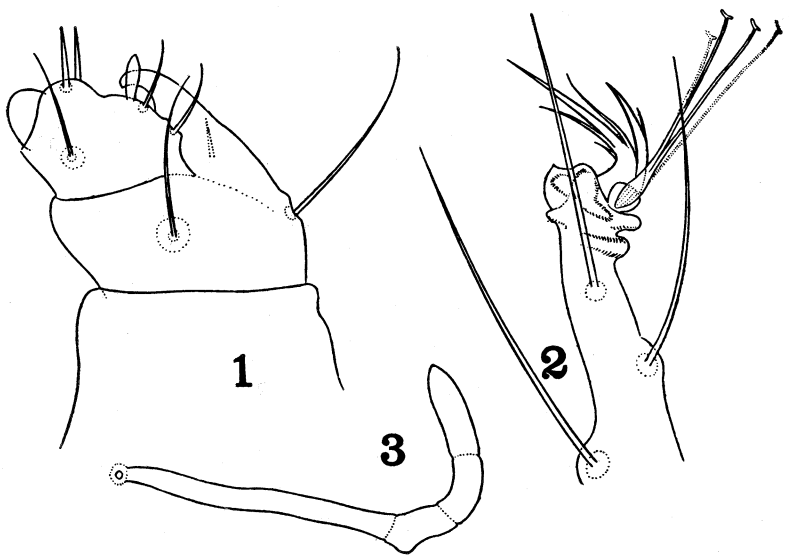
Type locality.—Argentina.

Distribution.—Argentina and Chile.

Food plants.—Pear, alfala, and an unknown plant.

Septanychus braziliensis, new species

Female.—Rather large, oval mites. Striations on dorsum very fine, irregular, somewhat tortuous. Twenty-six dorsal body setae, lanceolate, rather conspicuously setose, not rising from tubercles. Legs not quite as long as body to front



Text fig. 10. *Septanychus braziliensis.*—1, tip of palpus of female, lateral view; 2, tip of tarsus I of female, lateral view; 3, collar trachea.

of cephalothorax. A single perfect eye cornea each side. Mandibular plate ample, rounded in front. Collar tracheae somewhat scythe-shaped, the inner arm shorter and of slightly larger caliber than main tube. Relative lengths of segments of leg I as follows: Coxa, 16; trochanter, 17; femur, 37; patella, 21; tibia, 25; tarsus, 46; Tarsus I with 2 sets of duplex setae, well separated; 1 or 2 setae borne proximad of proximal set of duplex setae; onychial claw somewhat divergent from the structure typical of the genus; the 6 inner divisions present as usual, but the middle pair of spines distinctly strongest and longest, and 1 or 2 short, inconspicuous spurs arising ventrally at point of claw's greatest curvature; the outer, tangential division borne on the united base of the main claw, more than half as long as the main claw divisions, and, giving rise to a fine, inconspicuous spine at its dorsal midpoint; 4 tenent hairs arising from onychium, a pair at each side of the claw base. Last segment of palpus about as thick as long; terminal sensilla only about half as long as thick, semicircular in profile, nearly as thick as distal face of "thumb;" dorsal sensilla clavate, slightly longer than terminal "finger;" 5 additional setae borne on "thumb;" penultimate segment of palpus with a strong claw dorsally. Male specimens have not been seen.

Type material.—U. S. Nat. Museum, No. 1732. Five females collected by E. J. Hambleton, Sept. 21, 1932, on quince.

Type locality.—Vicosa, Brazil.

Distribution.—Known only from type locality.

Food plants.—Quince and banana. E. J. Hambleton also collected the specimens from banana, May 22, 1933.

Septanychus canadensis, new species

Female.—State of preservation such that shape of body is difficult to determine, but appears to be elliptical. Legs shorter than body. Striations on dorsum of abdomen all transverse back to a point midway between lumbales and sacrales setae; behind that point they are mostly longitudinal (intermediate between the *Tetranychus* and *Eotetranychus* types). Thirteen pairs of dorsal body setae, linear-lanceolate, setose, strongly developed, not arising from tubercles. One perfect and one imperfect eye cornea each side. Mandibular plate unnotched in front. Tarsus I with 2 sets of duplex setae. Collar separated; 4 or 5 setae borne proximad of proximal set of duplex setae. Collar tracheae U-shaped, with one arm longer than the other. Last segment of palpus considerably thicker than long; terminal sensilla about half again as long as thick; dorsal sensilla spindle-shaped, about as long as terminal "finger;" 5 additional setae borne on "thumb," about as usual. Claw on onychium cleft deeply into 6 needlelike divisions, the inner pair stoutest basally; a short, straight, inconspicuous spur arising dorsally from the claw, tangent to its point of greatest bending; 4 tenent hairs arising from onychium, a pair at each side of claw base.

Male.—Body much smaller than in female. Legs porportionately longer. Last segment of palpus with terminal sensilla, about 3 times as long as thick. Onychial claw of leg I resembling that of female, but the inner divisions are shorter and stouter. Aedeagus with inner lobe expanding rather abruptly dorsally to the basilar lobe; shaft concave above, convex below, tapering backward; hook portion bent upward about 70° from axis to shaft, expanding distally to form the rather conspicuous barb, which projects forward as a rounded boss, and backward as a beak-shaped, acute-tipped extension.

Type material.—U. S. Nat Museum No. 1733.

Type locality.—Ontario, Canada.

Distribution.—Known only from type locality.

Food plant.—Apple.

This mite is the northermost known species in the genus. *Septanychus* occurs chiefly in the southeastern United States, Cuba, and Mexico.

Septanychus cocosi, new species

Female.—Body from above ovate; in life, pale chestnut red. Striations on dorsum of abdomen resembling those of *Tetranychus bimaculatus* Harv. Thirteen pairs of linear-lanceolate dorsal body setae, not arising from tubercles, strongly developed, minutely setose. One perfect eye cornea each side. Mandibular plate rounded in front. Legs shorter than body to front of cephalothorax. Relative lengths of segments of leg I as follows: Coxa, 20; trochanter, 15; femur, 40; patella, 23; tibia, 25; tarsus, 40. Onychial claw of foreleg cleft deeply into 6 spinelike divisions; proximal pair stoutest basally; a fine, straightish spur arising dorsally at point of claw's greatest curvature, tangent to this curve; a pair of tenent hairs arising from onychium each side at base of of claw; tarsus I dorsally bearing two sets of duplex setae, these well separated, and with four setae proximad of the proximal pair of duplex setae. Last segment of palpus ("thumb") slightly longer than thick, its terminal sensilla nearly twice as long as thick; dorsal sensilla ovate-clavate; "thumb" bearing five additional setae, about as usual. Collar tracheae U-shaped, with the inner arm slightly inflated. Eggs spherical, at first colorless, becoming pale chestnut red; devoid of an axial stalk. Spins much webbing, causing palm leaves to become pale.

Male.—Body smaller and narrower than female, sagittate in outline from above. Legs longer proportionately than in female, but hardly as long as body to front of cephalothorax. Palpus with hornlike spur on second segment; terminal sensilla of "thumb" longer and thinner than that of female. Aedeagus with inner lobe thickening rather abruptly to point of beginning of shaft; basilar lobe not prominent; shaft in profile narrowing abruptly to the hook element which is bent upward about 45° from axis of shaft; aedeagus distally with a very conspicuous barb whose axis lies nearly parallel with that of the shaft

and inner lobe; barb provided anteriorly and posteriorly with an acute projection, each more than one-third as long as the entire barb.

Type material.—U. S. Nat. Museum No. 1717. Collected by F. Stickney, September 27, 1935.

Type locality.—Whittier, Calif.

Distribution.—Known only from type locality.

Food plant.—*The royal palm* (*Cocos plumosa*).

Septanychus deserticola, new species

Female.—Body to front of cephalothorax one-half again as long as wide. Striations on dorsum of abdomen rather tortuous, running in various directions. Dorsal body setae 26, linear-lanceolate, finely setose, not arising from tubercles. Legs shorter than body. A single perfect eye cornea each side. Mandibular plate not distinctly notched in front. Tarsus I dorsally with 2 sets of duplex setae, well separated; no setae borne proximad of proximal set of duplex setae (according to E. W. Baker). Femur I bearing the longest of all hairs, these being one-fourth the length of the body. Collar trachea U-shaped, the inner arm somewhat the shorter. Relative lengths of segments of leg I as follows: Coxa, 14; trochanter, 10; femur, 29; patella, 13; tibia, 18; tarsus, 31. Last segment of palpus barely thicker than long; terminal sensilla nearly as thick as long, slightly obtuse-angled distally; dorsal "finger" slender, longer than terminal "sensilla"; 5 additional setae borne on "thumb," about as usual. Tarsus I with onychial claw composed of 7 divisions, as follows: The claw, at a point about one-fourth its length from base bending rather sharply downward, at which point it splits into 6 strong, spinelike divisions, the inner pair strongest basally; at point of claw's sharpest bending, a slender, straightish, tangential spine arising dorsally, which is about one-third as long as the main claw divisions; 6 tenent hairs arising from onychiums, a pair each side of claw base.

Male.—Body smaller and narrower than female. Structure of onychial claw of leg I similar to that of female, but the main claw division is cleft into much shorter spurs. Second segment of palpus dorsally bearing a hornlike spur. Aedeagus with inner lobe expanding rather abruptly dorsally to the basilar lobe; shaft straightish above, convex below, distal half narrowing rapidly to point of origin of hook, bent sharply upward nearly 90° from axis of shaft; hook portion about one-seventh as long as shaft; aedeagus terminating distally in a conspicuous barb, projecting anteriorly as an acute process; posteriorly extending backward and downward like the claw of a hammer, and sharp-tipped.

Type material.—U. S. Nat. Museum No. 1734. Collected by the author Jan. 2, 1938.

Type locality.—Palm Springs, California.

Distribution.—Coachella Valley, California; Arizona; Texas.

Food plant.—Creosote bush (*Larrea tridentata* (D.C.)), cotton, *Stillingia treculeana.*

Ewing (18) described *Tetranychus thermophilus* from creosote bush in Death Valley, California, but, on the basis of Ewing's description, it differs significantly from the above mite in the structure of the tarsal claw and the aedeagus.

Septanychus deviatarsus, new species

Female.—Body from above broadly elliptical; a rather large mite, fully mature individuals averaging 0.53 mm. in length to front of cephalothorax. Legs all shorter than body. Twenty-six dorsal body setae. including caudal pair; these linear-lanceolate, finely setose, not arising from tubercles. Striations on dorsum of abdomen between inner sacrales and lumbales setae transverse on a small, rhombic pseudoshield; striae behind and laterad of this rhomboid mostly longitudinal. One perfect and one imperfect eye cornea each side. Mandibular plate rounded in front. Relative length of segments of leg I as follows: Coxa, 18; trochanter, 14; femur, 39; patella, 20; tibia, 24; tarsus, 43. Terminal segment of palpus fully as thick as long; its dorsal profile somewhat indented distad of dorsal sensilla which is fully as long as terminal sensilla; terminal sensilla about one-half again as long as thick. Collar trachea reflexed near middle, the two arms nearly equal in length and thickness. Tarsus I with onychial claw rather typical of the genus, but with ventral pair of spines abruptly thickened basally, and with the single, dorsal, tangential spur short and inconspicuous. Tarsus I with distal set of duplex setae arising at a point on the segment one-half its length from tip; proximal set of duplex setae borne at point only about one-fourth length of tarsus from its base; at most, with only one hair borne on tarsus proximad of the proximal set of duplex setae, often with none.

Male.—Body much smaller and narrower and legs proportionately longer than in female. Tarsus I with proximal set of duplex setae borne at a point about one-half the distance from distal set to proximal end of the segment. Aedeagus with inner lobe expanding dorso-caudally to the rather prominent basilar lobe; shaft in profile narrowing caudad to the short hook portion, which is thin distally and bent upward noticeably less than 90° from general axis of shaft; caudal tip of aedeagus with an inconspicuous pseudo-barb which is rounded caudally without a projection, and which is produced anteriorly as an acute angle.

Type material.—U. S. Nat. Museum No. 1862. Collected by G. T. Bottger, May 26, 1947. (The type slide contains several females and 1 male of the above species; in addition it contains several males and 3 females of *Tetranychus* sp.)

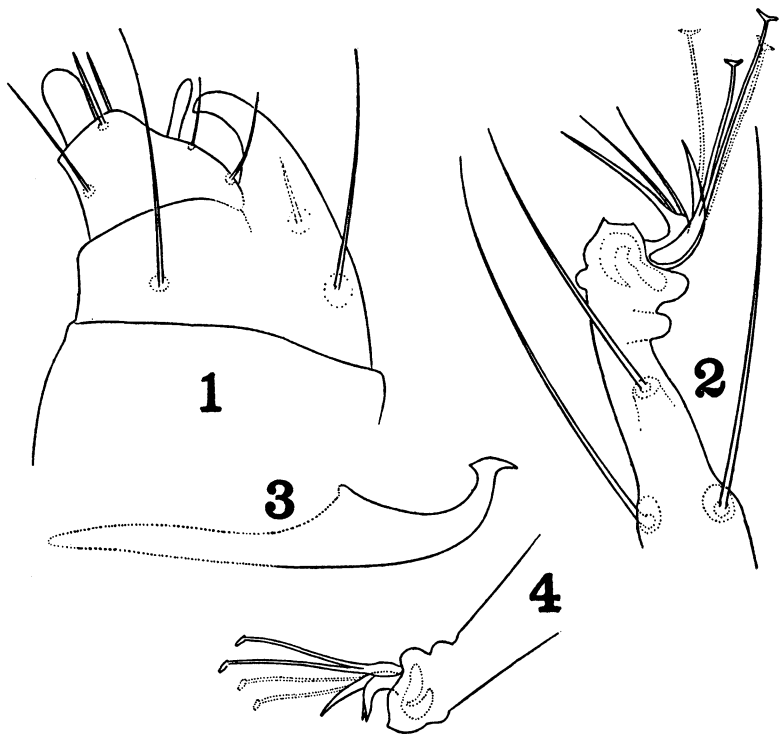
Type locality.—Two miles south of Anaheim, Calif., on highway 101.

Distribution.—Southern California, west central California, Missouri, Maui and Oahu, Hawaii.

Food plants.—Burr-clover, carrot, celery, castor bean, greenhouse plants, guayule.

Septanychus mexicanus, new species

Female.—Striations on dorsum of abdomen back to a point midway between lumbales and sacrales setae, mostly transverse; behind this point, mostly longitudinal. Twenty-six dorsal body setae, these linear-lanceolate, finely setose, strongly developed, not arising from tubercles. One perfect and one imperfect eye cornea each side. Specimens in poor condition for study, but legs I and IV seemingly longer than body to front of cephalothorax. Mandibular plate rounded in front, with an inconspicuous notch. Tarsus I with 2 sets of duplex setae dorsally, somewhat separated; 4 setae borne proximad of proximal set of duplex setae (according to E. W. Baker); onychial claw strongly bent at a



Text fig. 11. *Septanychus mexicanus.*—1, tip of palpus of female, lateral view; 2, tip of tarsus of female, lateral view; 3, aedeagus, lateral view; 4, tip of tarsus I of male, lateral view.

point one-fifth its length from base, and split into 6 needlelike spines; a straightish spur arising at the base of these spines tangent to the claw and more than half as long as the spines; 4 tenet hairs arising from the onychium, a pair at each side of the claw base. Last segment of palpus thicker than long, distally with a terminal sensilla which is fully one-half again as long as thick; dorsal sensilla clavate, thinner but almost as long as terminal "finger;" bearing 5 additional setae.

Male.—Body from above sagittate, much smaller than female. Second segment of palpus bearing a hornlike spur dorsally; last segment with terminal "finger" twice as long as thick. Leg I with onychial claw roughly like that of female, but the main, inner claw apparently cleft at tip into 4 short, dentate spurs. Aedeagus with inner lobe expanding dorsally to the obtuse basilar lobe; shaft narrowing rapidly caudad, bent upward somewhat less than 90° from its axis, and expanding into a well-defined barb; the latter projects anteriorly as an inconspicuous angle, and posteriorly as a prominent beaklike process, terminating in a sharp tip.

Type material.—U. S. Nat. Museum No. 1735. Collected by S. H. Coleman, May 6, 1945.

Type locality.—Mexico (Intercepted at Laredo, Texas.).

Distribution.—Known only from type locality.

Food plant.—Orange.

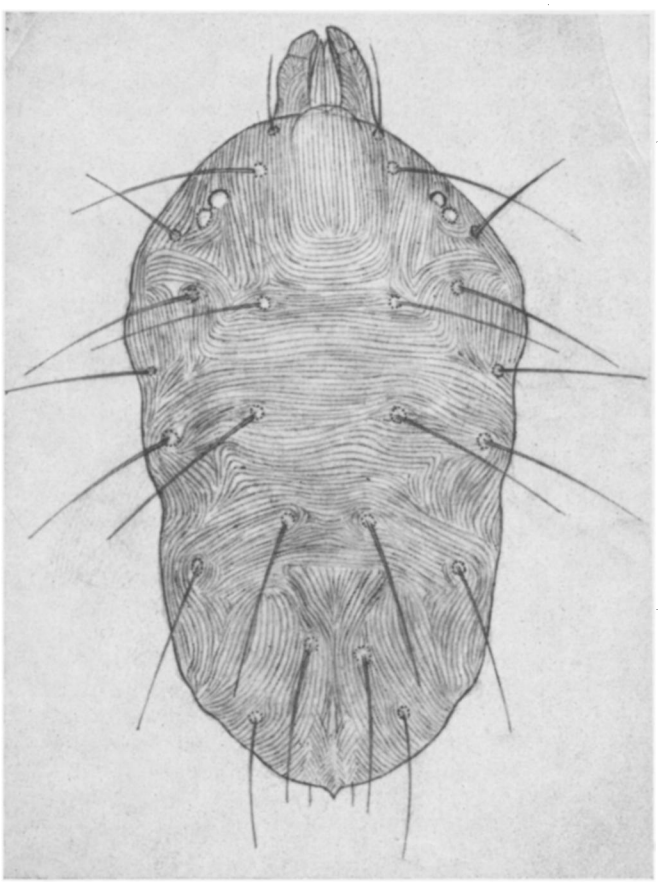
SEPTANYCHUS SCHOENEI (McGregor)

Tetranychus schoenei McGregor, 1941, Ent. Soc. Wash. Proc. 43(9): 223-225, pl. 24.

Female.—Dorsal body setae fairly conspicuous, not arising from tubercles, 26 in number. Body rather widely oval, broadest across hind margin of cephalothorax, averaging 0.391 mm. in length and 0.235 mm. in width. Striations on dorsum of abdomen of the *bimaculatus* type (see figure 12). One perfect and one imperfect eye cornea each side. Mandibular plate relatively broad, rounded anteriorly at maturity. "Thumb" of palpus about four-fifths as long as its greatest thickness; bearing terminally a "finger" with subparallel sides and angular terminal point, when viewed laterally; terminal "finger" nearly two-thirds as thick as "thumb" at tip; the dorsal sensilla slender, peglike. Legs shorter than body to front of cephalothorax. Relative lengths of segments of foreleg as follows: Coxa, 19; trochanter, 9; femur, 31; patella, 14; tibia, 19; tarsus, 33. Tip of tarsus (female) bearing a claw which is bent strongly downward, and is deeply cleft into three pairs of subequal, needlelike spurs; a fine, easily overlooked spur arises dorsally, tangent to the claw near its point of greatest curvature. Tarsus of leg I with two sets of duplex setae dorsally, well separated, and with four setae proximad of these. The usual four tenent hairs arising from the onychium, a pair on each side of the claw base. The collar

tracheae of the conventional *Tetranychus* type, in the shape of a U with one long and one shorter arm.

Male.—Body smaller and narrower than in female, obpyriform; legs proportionately longer, about equaling body to front of cephalothorax. Aedeagus with inner lobe rodlike; basilar lobe seemingly an obtuse prominence; shaft about one half to two-thirds again as long as its basal thickness, bent abruptly upward about 75°. from axis of main shaft, expanding terminally to form the unusually prominent barb whose axial length well exceeds the length of the hook element, and is fully one-half the length of the shaft proper; posterior portion of barb produced into an acuminate, ventrally-directed point, resembling the claw of a hammer; anterior portion of barb produced into a strong, rounded boss; axis of barb nearly parallel to that of shaft. Tarsal claw of forelegs with



Text fig. 12. *Septanychus schoenei.*—Dorsum of female showing striations and setae.

distal element relatively straight, the ventral portion (analagous to the deflexed spurs in certain genera) of about equal thickness at base to that of distal spur and appearing to be 3-pointed terminally.

Type material.—U. S. Nat. Museum No. 1419.

Type locality.—Winchester, Virginia.

Distribution.—Virginia, West Virginia.

Food plants.—Apple and bean leaves.

SEPTANYCHUS TUMIDUS (Banks)

Tetranychus tumidus Banks, 1900, Tech. Bull. 8, Div. Ent. U. S. Dept. Agri. 73, fig. 9. *Septanychus tumidus* (Banks), McGregor, 1919, U. S. Nat. Mus. 56(2303), 663, 664, fig. 5. *Septanychus quinquenychus* (McGregor), 1919, loc. cit. 664, 665, fig. 6.

Female.—Body from above widely elliptical. Striations on dorsum of abdomen similar to those of *Tetranychus bimaculatus* Harvey. Legs shorter than body to front of cephalothorax. Twenty-six dorsal body setae, linear-lanceolate, finely setose, strongly developed, not arising from tubercles. One perfect and one imperfect eye cornea each side. Mandibular plate rounded anteriorly, without an emargination. Collar tracheae U-shaped, the inner arm slightly swollen and shorter than main arm. Relative lengths of segments of leg I as follows: Coxa, 22; trochanter, 13; femur, 41; patella, 20; tibia, 23; tarsus, 40. Tarsus I with 2 sets of duplex setae, well separated; one or 2 setae proximad of proximal set of duplex setae; onychial claw thick and simple for half its length, then split into 7 divisions, consisting of 6 long, needlelike spines, with a straightish spur arising dorsally at point of greatest curvature of main claw and tangent to the latter; four tenent hairs borne on onychium, a pair at each side of claw base. Last segment of palpus one-half again as thick as long; terminal sensilla ample, slightly thicker than long, its base three-fourths as thick as distal face of "thumb;" dorsal sensilla clavate, longer than terminal "finger;" 5 additional setae on "thumb" about as usual.

Male.—Much smaller than female; body from above sagittate. Legs proportionately longer. Palpus with hornlike spur dorsally on second segment; terminal sensilla fully twice as long as thick. Tarsus I with onychial claw stout and simple for more than half its length, split distally into 4 short, dentate spurs; a short, straightish spine borne tangentially and dorsally at point of greatest curvature of claw. Aedeagus with inner lobe expanding dorsally to the bosslike basilar lobe; shaft thick, tapering little backward to hook, which is bent upward nearly 90° from axis of shaft; hook about one-third as thick as shaft, terminating in a conspicuous barb, whose hind tip is acutely pointed, and whose anterior projection is a rounded boss.

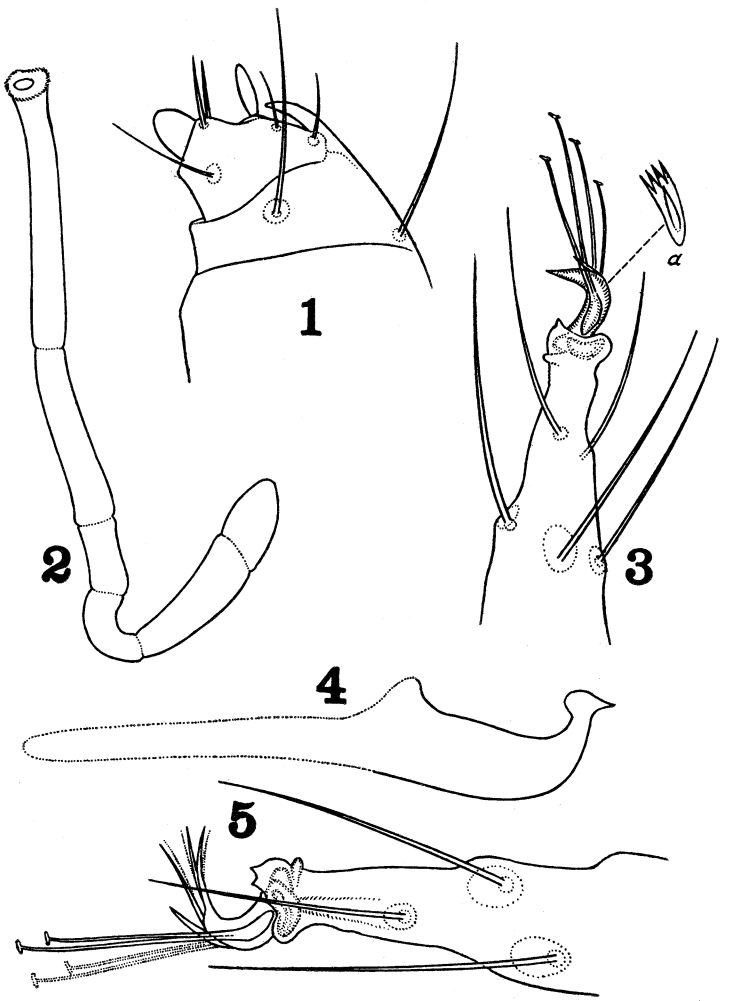
Type material.—U. S. Nat. Museum No. 1736.

Type locality.—Eustis, Florida.

Distribution.—Cuba, Florida, Georgia, Guam, Louisiana, Mexico, South Carolina, Texas.

Food plants.—Bean, beet, castor bean, dahlia, eggplant, limabean, *Mentha* sp., morning glory, native vine, okra, pea, plant, royal palm, sweet potato, water hyacinth, waterlily, *Zanthoxylum* sp.

All mites in this genus from Florida that have been observed by the writer



Text fig. 13. *Septanychus tumidus.*—1, tip of palpus of female, lateral view; 2, collar trachea; 3, tip of tarsus I of male, lateral view "a," dorsal view of claw; 4, aedeagus, lateral view; 5, tip of tarsus I of female, lateral view.

since he described *S. quinquenychus* in 1914 (10), have been *tumidus*. It is believed that *quinquenychus* must be reduced to synonymy with *tumidus*.

Septanychus texazona, new species

Female.—A rather large spider mite; a series of mature females averaged 0.49 mm. in length to front of cephalothorax. Thirteen pairs of dorsal body setae, including caudal pair, lineat-lanceolate, not arising from tubercles. Striations of dorsal integument of abdomen mostly transverse; those caudad and laterad of sacrales setae mostly longitudinal. Mandibular plate elongate-ovate, not clearly emarginate in front. Last segment of palpus nearly one-third thicker than long; terminal sensilla barely longer than thick; dorsal sensilla rather swollen, prominent. Collar trachea U-shaped; the outer arm somewhat the longer; one of the inner septa usually with a swollen extension. Relative length of segments of leg I as follows: Coxa, ?; trochanter, 14; femur, 37; patella, 20; tibia, 25; tarsus, 39. Tarsus I with 2 sets of duplex setae dorsally, well separated; at most one, usually no hairs borne distinctly proximad of proximal set of duplex setae. Onychial claw of leg I cleft for over half its length into 6 spines, the inner pair the stoutest basally; a short, straightish spur borne dorsally tangent to claw's point of sharpest curvature.

Male.—Body smaller and narrower and legs proportionately longer than in female. Aedeagus with inner lobe expanding dorsally to the point of the basilar lobe; shaft in profile narrowing gradually caudad and bent upward nearly 90° to form the thin hook element; hook one-fourth as long as shaft, terminating in a barb which bears a sharp, inconspicuous tip anteriorly, and a slightly larger sharp, beaklike, ventrad-directed projection caudally; general axis of barb directed slightly upward from front to back.

Type material.—U. S. Nat. Museum No. 1861. Twelve males and 12 females collected by Mr. Iglinsky, April 5, 1948.

Type locality.—College Station, Texas.

Distribution.—Arizona, California, Mississippi, So. Carolina, Texas.

Food plants.—Carrot, cotton, turnip.

The genera *Paratetranychus* Zaccher, *Oligonychus* Berlese, and *Metatetranychus* Oudemans have been thought to be similar in respect to the structure of the tarsal claw and supposedly constitute a 3-genus complex. *Oligonychus* predates *Paratetranychus,* and some workers have held that these two genera are synonyms and have suppressed *Paratetranychus*. The present writer, however, prefers to follow Zacher (19), who explained that Berlese's diagnosis of *Oligonychus* was vague and failed to mention the presence of the radiating ventral appendage on the onychial claw, or the nonreflexed collar tracheae, characteristic of *Paratetranychus*. Zacher's description of *Paratetranychus* contained the first mention in the literature of this unique structure

of the claw. For the present, at least, it seems advisable to leave *Oligonychus* unrecognized.

Oudemans (20) created the genus *Metatetranychus* to include mites, otherwise *Paratetranychus,* which have six spines borne at a common point on the ventral face of the main tarsal claw. In a critical study of species in the *Oligonychus-Paratetranychus-Metatetranychus* complex, the writer has found that the number of ventral spines on the tarsal claw may be six, eight, or ten. Furthermore, there appears to be no correlation between the number of these spines and other structural characters within this mite complex. With all of the foregoing facts in mind, it would appear to be logical to include all of these species within a single genus, and in the present treatment the writer places them in the genus *Paratetranychus.*

Genus Paratetranychus Zacher

Paratetranychus Zacher, 1910, Mit. Kais. Biol. Anst. f. Land u. Forst. Heft 9, pp. 37-41.

Generic characters.—Spider mites with onychial claw of female complex, consisting of a simple, uncleft, dorsal talon, and a series of 6 to 10 spines arising with approximately a common origin from a point on the ventral face of the main talon, usually not far removed from its base; these ventral spines may be longer or shorter than the main claw. The collar tracheae (a single exception) consisting of a straightish tube, non-reflexed internally, terminating in a swollen chamber.

Genotype.—Paratetranychus ununguis Jacobi.

Key to the Species of Paratetranychus

1. Aedeagus caudally with a true barb; tarsal claw of female ventrally bearing 6 deflexed spines 2
   Aedaegus without a true barb at its caudal tip; tarsal claw of female ventrally bearing 6 to 10 deflexed spines 7
2. Barb of aedeagus naerly as long or longer than shaft, its anterior process angular 3
   Barb of aedeagus one-half or less as long as shaft, its anterior process a rounded boss 4
3. Barb slightly shorter than shaft, its caudal process curving; collar trachea U-shaped ..... *hawaiiensis,* new species
   Barb one-third longer than shaft, its caudal process straight; collar trachea a straightish tube ..... *pritchardi,* new species
4. Axis of barb of aedeagus nearly at right angles to axis of shaft; ventral spines of tarsal claw of female extending about as far as tip of claw ..... *gramineus,* new species
   Axis of barb either parallel to or at an angle of much less than 90° with axis of shaft; ventral spines of tarsal claw of female not extending as far as tip of claw 5
5. Palpal "thumb" of female with terminal sensilla twice as long as thick; shaft of aedeagus with dorsal and ventral outlines subparallel, abruptly narrowed behind ..... *stickneyi* McGregor
   Palpal "thumb" of female with terminal sensilla nearly as thick as long; shaft of aedeagus in lateral profile tapering caudad, not abruptly narrowed behind 6

6. Aedeagus with shaft twice or more as long as its basal thickness; posterior tip of barb upturned ..... *simplex* (Banks)
Shaft of aedeagus not more than one-half again as long as its basal thickness; posterior tip of barb directed downward ..... *afrasiaticus* McGregor

7. Hook portion of aedeagus bent upward from shaft 8
Hook portion of aedeagus bent downward from shaft 10

8. Aedeagus with distal portion of hook strongly deflexed; collar trachea not strongly expanding at inner end into a chamber ..... *sacchari* McGregor
Aedeagus with distal portion of hook not strongly deflexed; collar trachea expanding at inner end into a chamber 9

9. Thickness of shaft of aedeagus at hind point of origin of basilar lobe about equal to length of shaft proper; femur I of female somewhat longer than tarsus; "thumb" of palpus (female) with terminal sensilla not strongly spatulate and longer than thick; egg subspherical, stalk with guy-fibrils ..... *citri* (McGregor)
Thickness of shaft of aedeagus at point of origin of basilar lobe less than length of shaft proper; femur I (female) not longer than tarsus; "thumb" of palpus (female) with terminal sensilla distinctly spatulate and about as thick as long; egg distinctly flattened, stalk without guy-fibrils .... *pilosus* (Canestrini and Fanzago)

10. Tarsal claw of female bearing 10 spines ventrally 11
Tarsal claw of female bearing 8 spines ventrally 16
Tarsal claw of female bearing 6 spines vnetrally 21

11. Hook of aedeagus less than one-fourth as long as shaft, deflected less htan 90° from axis of shaft; tip of aedeagus conspicuously truncated ..... *coniferarum,* new species
Hook of aedeagus more than one-fourth as long as shaft, deflexed 90° or more from axis of shaft; tip of aedaegus not conspicuously truncate 12

12. Hook portion of aedeagus less than half as long as shaft 13
Hook portion of aedeagus distinctly more than half as long as shaft 14

13. Basilar lobe of aedeagus inconspicuous; hook deflexed about 90° from axis of shaft; inner chamber of collar trachea one-third as thick as length of tube ..... *americanus* (Ewing)
Basilar lobe of aedeagus conspicuous; hook deflexed more than 90° from axis of shaft; inner chamber of collar trachea not greatly expanded.... *insularis* new species

14. Dorsal sensilla borne at dorsal angle of frontal face of palpal "thumb"; mandibular plate about half as long as body to front of cephalothorax ..... *alpinus* McGregor
Dorsal sensilla borne near middle of upper face of "thumb"; mandibular plate much less than half as long as body 15

15. Hook of aedeagus longer than shaft, tapering evenly to tip, deflexed more than 90° from axis of shaft ..... *yothersi* (McGregor)
Hook of aedeagus not longer than shaft, abruptly narrowed near tip, deflexed about 90° from axis of shaft ..... *ununguis* (Jacobi)

16. Dorsal body setae minute or short, less than one-fourth as long as greatest thickness of body; terminal palpal sensilla not placed distally on "thumb," but at its ventro-distal angle 17
Dorsal body setae long, more than one-fourth thickness of body; terminal sensilla arising apically from "thumb" 18

17. Hook portion of aedeagus less than half as long as shaft; dorsal body setae peglike ..... *subnudus,* new species
Hook portion of aedeagus nearly as long as shaft; dorsal setae rodlike ..... *milleri,* new species

18. Hook of aedeagus continuing thick almost to its very tip; tarsus of female with 5 setae proximad of proximal set of duplex setae ..... *coiti* McGregor
Hook of aedeagus not thick to near its very tip; tarsus of female with 4 setae proximad of proximal set of duplex setae 19

19. Dorsal body setae arising from tubercles; tarsal claw of female with ventral spines not distinctly surpassing the main claw ..... *ilicis* (McGregor)
Dorsal body setae not arising from tubercles; tarsal claw of female with ventral spines distinctly surpassing the main claw 20
20. Shaft of aedeagus in profile tapering evenly to the hook; shaft and hook with dorsocaudal outline forming an even curvature ..... *viridis* (Banks)
Shaft of aedeagus equally thick its entire length, strongly concave dorsally, with a distinct swelling above, just anteriorad of the hook ..... *newcomeri,* new species
21. Dorsal body setae mostly shorter than interval to base of seta next behind; tarsal claw (female) with ventral spines less than one-half as long as portion of claw beyond their bases ..... *peruvianus* (McGregor)
Dorsal body setae long; tarsal claw of female with ventral spines more than half-as long as portion of claw beyond their base 22
22. Hook of adedeagus at least half as long as shaft, tapering evenly to a sharp tip; ventral spines of tarsal claw (female) distinctly shorter than portion of claw beyond their bases; third dorsal seta from tip of palpal "thumb" not widely spaced distad of dorsal sensilla ..... *bicolor* (Banks)
Hook of aedeagus not half as long as shaft, at first thick, then abruptly constricted near tip which is obscurely truncate; ventral spines of tarsal claw (female) projecting as far as tip of claw; third dorsal seta from tip of palpal "thumb" widely spaced distad from dorsal sensilla ..... *platani,* new species

PARATETRANYCHUS AFRASIATICUS McGregor

Paratetranychus afrasiaticus McGregor, 1939, Ent. Soc. Wash. Proc. 41(9): 254-256.

Female.—Body 0.293 mm. long to tip of mandibular plate, by 0.182 mm. wide (as received). Preserved specimens pale in color (described as yellowish to greenish by other workers). Twenty-six dorsal body setae including caudal pair, distinctly setose, linear-lanceolate, well developed, not arising from tubercles. One perfect and one imperfect eye cornea each side. Mandibular plate about twice as long as wide, without emargination anteriorly. Striations on dorsum of abdomen transverse, excepting a small area, even with the inner sacrales setae, where they are longitudinal. Relative lengths of segments of foreleg as follows: Coxa, 20; trochanter, 19; femur, 45; patella, 31; tibia, 28; tarsus, 46. Tarsus I dorsally with 2 sets of duplex setae, well separated; 4 setae borne proximad of proximal set of duplex setae; onychial claw similar to that of *P. simplex,* except that the ventral spines about equal the main claw in length. Last segment of palpus with terminal sensilla ample, bluntly rounded at tip, not much longer than thick; dorsal sensilla spindle-shaped, as long as terminal "finger."

Male.—Body 0.234 mm. long to tip of mandibular plate, 0.267 mm. to tip of palpi. Tarsal appendages of legs II, III, and IV similar in arrangement to those of female; tarsal claw of leg I consisting of the simple claw, which is only slightly curved, and the usual ventral member, which is noticeably stouter and a little longer and more curved than the main claw; this ventral deflexed claw appearing simple when viewed in exact profile, but actually cleft almost to its middle into either two or four spurs (light refraction makes this point difficult to determine). Aedeagus with inner lobe apparently rodlike; shaft very thick, its greatest thickness from two-thirds to three-fourths its length,

narrowing rather abruptly posteriorly, with a pronounced convexity at upper midpoint of shaft; hook reflexed upward almost 90° from axis of shaft, and terminating in a clearly developed barb, the antero-posterior length of which is only about one-fifth that of the shaft; barb with a proximal, inconspicuous, rounded boss and a distal, acute point that is directed noticeably downward.

Type material.—U. S. Nat. Museum No. 1298.

Type locality.—Biskra, Algeria.

Distribution.—Algeria and Iraq.

Food plant.—Date.

PARATETRANYCHUS ALPINUS McGregor

Paratetranychus alpinus McGregor, 1936, Ent. Soc. Amer. Ann. 29(4):770, 771, 773, pl. 1.

Female.—Color rusty-green amber, with dark green lateral areas which embrace a number of blackish blotches; most of cephalothorax and median portion of abdomen paler. Legs and palpi rusty greenish amber. A single perfect eye cornea each side, deep carmine. Body setae pale, large for the size of the mite, linear-lanceolate, distinctly setose, not arising from tubercles, 26 in number. Body broadly oval, widest across middle of cephalothorax. A series of measured females averaged 0.26 mm. by 0.20 mm. wide. Anterior margin of cephalothorax conspicuously truncated. Mandibular plate abnormally large, often more than half length of body; emarginate anteriorly in younger stages, becoming rounded at maturity. Location of main dorsal suture aberrant in that it occurs behind the midpoint of body, thus resulting in a greatly reduced abdomen. Striae on dorsum of abdomen mostly transverse. Last segment of palpus much shortened axially, considerably thicker than long; terminal sensilla only slightly longer than thick; dorsal sensilla diminutive, clavate, arising from the anterodorsal angle of "thumb;" 5 additional setae borne on "thumb." Legs rather short, foreleg not over four-fifths the length of body, well supplied with strong hairs. Relative lengths of segments of leg I as follows: Coxa, 16; trochanter, 18; femur, 20; patella, 16; tibia, 16; tarsus, 18. Tarsus I dorsally with 2 sets of duplex setae, proximate; 5 setae borne proximad of proximal set of duplex setae; tip of tarsus bearing a strong, gently curving claw; 10 straightish spines arising at a point about one-fifth the length of claw from its base, their tips about equal that of the main claw, the proximal pair the stoutest basally; 4 tenent hairs borne on onychium, a pair at each side of claw base. Collar tracheae consisting of a straightish, narrow tube, terminating within in a slightly enlarged chamber. Egg lenticular.

Male.—Color orange-amber; body broadly obpyriform, width 85-100 of length, unusually broad for a male spider mite. Mandibular plate 58-100 the length of body, rounded anteriorly. Main dorsal stuture behind midpoint. Palpus bearing a spur dorsally on second segment. Aedeagus with inner lobe stout; basilar lobe dorsal, in the form of a rounded boss; shaft short and

thick, tapering little to point of bending; distal portion (hook) bent downward[2] almost 90° from main axis of aedeagus to form the strong, tapering hook, which is fully four-fifths as long as shaft, and terminates in a thin, unbarbed, but obscurely truncated tip.

Type material.—U. S. Nat. Museum No. 1145.

Type Locality.—Camp Nelson, California.

Distribution.—Washington, Oregon, California (mostly at high elevations).

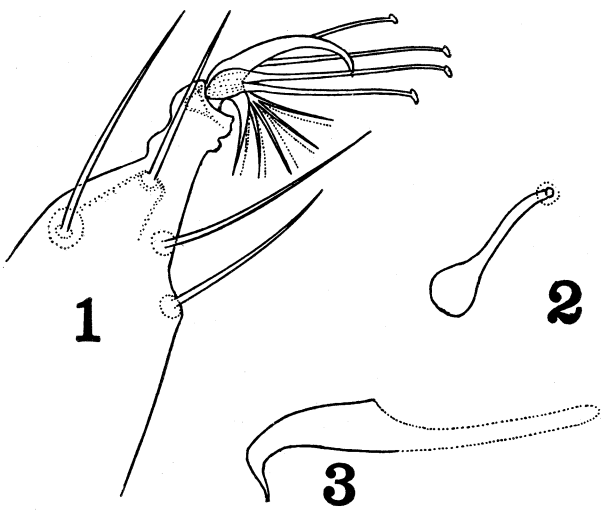
Food plants.—*Libocedrus decurrens* and other conifers.

2 In the original publication the hook was incorrectly shown bent upward from the axis of shaft.

PARATETRANYCHUS AMERICANUS (Ewing), new combination

Oligonychus americanus Ewing, 1921, U. S. Nat. Museum, Proc. 59(2394): 660, pl. 125, fig. 1.

Female.—Body oval from above. All legs shorter than body to front of cephalothorax; segments bearing conspicuous hairs. Thirteen pairs of dorsal body setae, these linear-lanceolate, setose, well developed, not arising from tubercles. Striations on dorsum of abdomen mostly transverse. Mandibular plate broad, not emarginate in front. One perfect eye cornea each side. Collar tracheae consisting of a short tube ending internally in a widely expanded, subspherical chamber. Last segment of palpus with basal thickness



Text fig. 14. *Paratetranychus americanus.*—1, tip of tarsus I of female, lateral view; 2, collar trachea; 3, aedeagus, lateral view.

distinctly greater than length; terminal sensilla somewhat longer than thick; dorsal sensilla small, clavate; 5 additional setae on "thumb," about as usual. Tarsus I dorsally with 2 sets of duplex setae, proximate; 4 or 5 setae borne proximad of proximal set of duplex setae; onychial claw with main, simple claw straightish for three-fifths its length, beyond which it is bent downward; at a point on ventral face of main claw one-fifth its length from base are borne 10 spines, which are shorter than the simple claw and arise from a common base. Length, 0.32 mm.; width, 0.19 mm.

Male.—Body shorter and narrower than female. Legs proportionately longer. Onychial claw resembling that of female. Palpus with horn-like spur on second segment. Aedeagus with inner lobe expanding dorsally to the point of origin of shaft which tapers caudad and is deflexed a little more than 90° from general axis of aedeagus to form the slender, attenuate hook; the latter about four-tenths as long as shaft, terminating in a barely truncate tip, without a barb.

Type material.—U. S. Nat. Museum No. 24026.

Type locality.—Experimental Farm, Saskatchewan, Canada.

Distribution.—Saskatchewan and Wyoming.

Food plants.—Spruce and fir.

Described from material on two slides identified by Ewing. The number of ventral spines on the onychial claw was difficult to determine; in most cases there appeared to be 10 of these, in others 8.

PARATETRANYCHUS BICOLOR (Banks)

Tetranychus bicolor Banks, 1894, Amer. Ent. Soc. Trans. 21, 218. *Paratetranychus bicolor* (Banks), 1919, U. S. Nat. Museum Proc. 56(2303): 675, 676, fig. 11.

Female.—Color (according to Banks) pale in front, dark red behind; as seen by Garman and the present writer, dark green. Body from above rotund-elliptic. Legs shorter than body. Dorsal body setae well developed, linear-lanceolate, distinctly setose, not arising from prominent tubercles, probably 26 (difficult to observe due to opacity). Details of dorsal striae could not be seen. One perfect eye cornea each side. Mandibular plate notched in front. Tarsus I dorsally with 2 sets of duplex setae, proximate; 4 setae borne proximad of proximal set of duplex setae; onychium bearing a long, simple claw which is weakly curved for two-thirds its length, then bent downward; 6 needlelike spines which are distinctly shorter than the main claw arising from a more or less common origin on the ventral face of claw one-fifth its length from base; the usual 4 tenent hairs present. Collar trachea consisting of a short, straightish tube which terminates internally in a swollen, oval chamber. Last segment of palpus barely thicker than long; terminal sensilla nearly as thick as long; dorsal sensilla inconspicuous, peglike; 5

additional setae borne on segment. Relative lengths of segments of leg I as follows: Coxa, 16; trochanter, 13; femur, 31; patella, 14; tibia, 16; tarsus, 26. Egg, according to Garman, lenticular.

Male.—Smaller than female, body from above elliptic-sagittate. Legs I somewhat longer than body to front of cephalothorax. Second segment of palpi above with a hornlike spur; terminal sensilla of last segment reduced, conelike. Onychial claw similar to that of female. Aedeagus with inner lobe expanding dorsally to the basilar lobe, which is an inconspicuous obtuse projection; shaft in profile with subparallel edges, tapering little caudad, deflexed about 90° to form the hook which is about half as long as shaft; hook tapering evenly to a sharp, unbarbed tip.

Type material.—U. S. Nat. Museum No. 1737.

Type locality.—Sea Cliff, New York.

Distribution.—Connecticut, New Jersey, New York, North Carolina, Washington.

Food plants.—Chestnut, hickory, maple, oak, spruce.

Since no male characters of importance were included in Banks' (21) original description, and since the present writer's (8) redescription contained no mention of the male, the true identity of *bicolor* may be open to question. Several old slide mounts in the U. S. National Museum, evidently identified by Banks as *bicolor*, were studied by the writer. A male present on one of these slides, agrees in the structure of the aedeagus with a mite on maple from Yakima, Washington. The above description of *bicolor* is based on these several samples, together with an early study of the types (males not properly showing aedeagus) by the author (8).

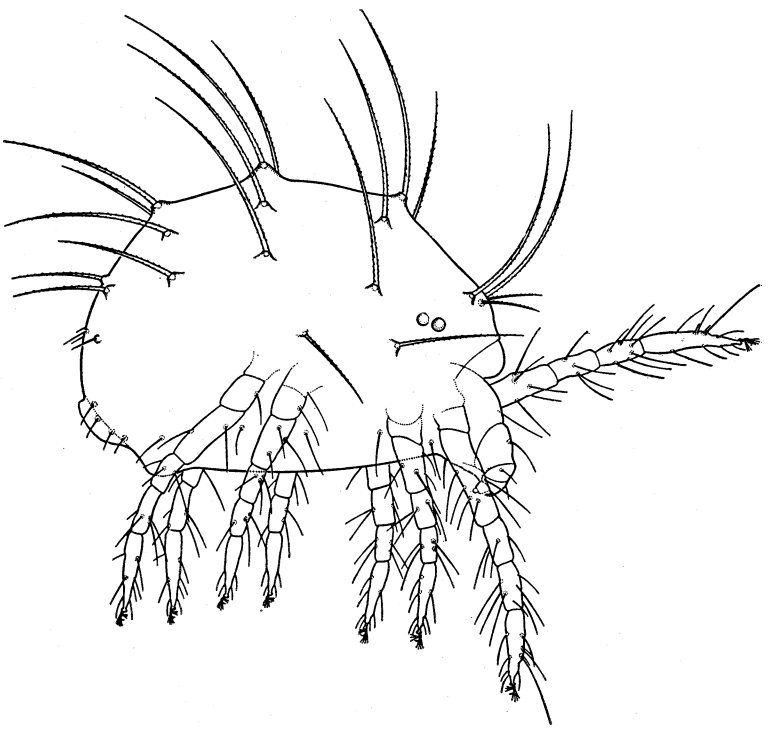
PARATETRANYCHUS CITRI (McGregor)

Tetranychus citri McGregor, 1916, Ent. Soc. Amer. Ann. 9(3): 284-288, pl. 14, figs. 1-9. *Paratetranychus citri* (McGregor), 1919, U. S. Nat. Mus. Proc. 56(2303): 672, 673, pl. 79, fig. 15 *Paratetranychus citri* (McGregor), 1928, Jr. Agric. Res. 36(2): 157 181, fig. 4.

Female.—Body from above, oval; color a velvety purplish red, with dorsal tubercles of almost the same color, and with bristles light reddish. Length averaging 0.305 mm., width 0.230 mm. Dorsal body bristles long, stout, linear-lanceolate, setose, arising from prominent tubercles, 3 pairs on cephalothorax, 10 pairs on abdomen of which 2 pairs on caudal margin evidently do not arise from tubercles. Striations on dorsum of abdomen mostly transverse backward to lumbales setae; caudad of this point the extremely fine striae appearing mostly longitudinal. One perfect and one imperfect eye cornea each side. Collar tracheae consisting of a straightish, narrow tube ending internally in a somewhat enlarged oval chamber. Legs all shorter than body to front of cephalothorax; relative lengths of segments of leg I as follows: Coxa, 11; trochanter, 11; femur, 32; patella, 15; tibia, 17; tarsus, 28. Tarsus dorsally with 2 sets of duplex setae, proximate; 4 setate borne proximad

of proximal set of duplex setae. Onychial claw consisting of a simple main element which is thickest at base, its distal third bent strongly downward; at a point one-third the length of claw from its base, 6 spines arising from a common origin, their tips surpassing that of the main claw; 4 tenent hairs arising from onychium, a pair at each side of claw base. Mandibular plate anteriorly with an inconspicuous emargination. Last segment of palpus slightly thicker than long; terminal sensilla slightly spatulate, somewhat longer than thick; dorsal sensilla much reduced; 5 additional setae on "thumb" about as usual. Egg somewhat compressed vertically, at first pale, becoming bright red, bearing dorsally a vertical stalk, in length about twice that of the egg's vertical axis, normally with a series of guy fibrils radiating from tip of stalk to supporting plant surface.

Male.—Color typically bright red. Body much smaller than that of female, averaging 0.216 mm. long by 0.146 mm. wide. Legs proportionately longer than in female, longer than body to front of cephalothorax. Palpus with a hornlike spur on second segment; last segment with terminal sensilla reduced, about equaling dorsal sensilla. Tarsus I with claw resembling that of female. Aedeagus with inner lobe expanding dorsally to the srtong, conical



Text fig. 15. *Paratetranychus citri.*—Lateral view of female mite.

basilar lobe; shaft short, stout, shorter than its thickness in region of basilar lobe; in profile, narrowed abruptly distad, bent upward about 65° from general axis of aedeagus to form the attenuate hook which, in turn, is bent slightly backward distally, devoid of a barb, spinelike terminally.

Type material.—U. S. Nat. Museum No. 20362.

Type locality.—Orlando, Florida.

Distribution.—Alabama, Florida, Georgia, Louisiana, Mississippi, South Carolina, southern California.

Food plants.—Castor bean, *Catoniaster, Choysia, Eleagnus,* English laurel, grapefruit, lemon, orange, *Philadelphus,* satsuma, Scotch broom.

PARATETRANYCHUS COITI McGregor

Paratetranychus coiti McGregor, 1941, Ent. Soc. Wash. Proc. 43(4): pl. 9, figs. 2-12.

Female.—Body outline widely ovate, about a third longer than wide. Dorsal armature consisting of 26 strong, linear-lanceolate, pale bristles, distributed about as usual; not arising from tubercles. Greater portion of cephalothorax pale, rusty pink to pink; a pattern of darker spots and blotches occupies much of the lateral area and at times the median area of the abdomen, these blotches purplish brown to blackish brown; forelegs and palpi rusty pink, the other legs pale. Two carmine eye corneas each side, just laterad of the subfrontal bristles. A series of measured females averaging 0.397 mm. long (tip of mandibular plate to hind body margin). Striae on dorsum of abdomen transverse, excepting whorls around base of setae on hind portion. Mandibular plate tapering gradually forward, and distinctly emarginate anteriorly. Dorsal suture separating cephalothorax and abdomen rather indistinct. "Thumb" of palpus much shortened axially, almost twice as thick as long, bearing at its tip a nonclavate "finger" which is about as thick as long; the dorsal sensilla unusually slender and situated unusually near the base of the "thumb;" the customary pair of tacklike digituli arising just dorsad of the terminal "finger;" a weak hair arising near the base of the dorsal sensilla, and a similar seta arising dorsally from the "thumb" at its base; a hair arising near the ventro-distal angle of the "thumb." Legs relatively short; foreleg longest, barely two-thirds length of body proper, four-fifths the width of body; supplied with strong hairs. Relative lengths of the segments of foreleg as follows: Coxa, 18; trochanter, 16; femur, 28; patella, 18; tibia, 17; tarsus, 20. Tarsus I dorsally with 7 strong hairs and 2 weak hairs, including 2 proximate sets of duplex setae; 5 setae borne proximad of proximal pair of duplex setae; tarsus II dorsally with 6 strong hairs and one weak hair; tarsi III and IV with only 4 hairs dorsally. Tip of tarsus bearing a simple claw, which is thick at base, straightish to about midpoint, where it bends downward about 90°; at a point about one-third the length of the claw from its base eight gently curving ventral apurs arising in pairs, their tips conspicuously exceeding that of the main claw, the proximal pair the strongest; the usual four tenent hairs arising at the base of the main claw.

Collar trachea for the most part a straightish tube, ending in a somewhat enlarged elliptical chamber. Egg oblate to lenticular, bearing dorsally a slender axial stalk which somewhat exceeds the axial diameter of the egg.

Male.—Much smaller than female, a measured series averaging 0.297 mm. long to front of cephalothorax. Body from above narrowly sagittate. Color paler than female. Palpus bearing a spur dorsally on second segment. Tarsus I with the main claw somewhat stouter and less abruptly bent than in female; at a point about one-fourth the length of claw from its base ventrally, 3 weak, straightish spines arise which are surpassed by the main claw. Aedeagus with inner lobe thickening gradually to the dorsally placed basilar lobe, which is an inconspicuous, rounded boss; anterior third of shaft rather thick, its axis continuous with that of inner lobe; posterior two-thirds of shaft deflexed fully 40° from axis of inner lobe; hook portion of aedeagus unusually thick, bent downward and forward fully 75° from axis of hind two-thirds of shaft, and abruptly constricted to a short, thin, slightly truncate tip; entire shaft nearly 3 times as long as hook. (In the original publication the hook was incorrectly shown bent upward from axis of shaft.)

Type material.—U. S. Nat. Museum No. 1379.

Type locality.—Chula Vista, California.

Distribution.—San Diego County, Orange County, Los Angeles County, California.

Food plants.—Avocado, camellia, English laurel, walnut.

Paratetranychus coniferarum, new species

Female.—Body oval, length to front of cephalothorax averaging 0.27 mm. One perfect and one imperfect eye cornae each side. Evidently 24 dorsal body setae, these linear-lanceolate, distinctly setose, rather strongly developed, not arising from tubercles. Striations on dorsum of abdomen mostly transverse. Mandibular plate elliptical, about twice as long as wide, not emarginate anteriorly, about three-eighths as long as body to front of cephalothorax. Last segment of palpus about one-third thicker at base than axial length; terminal sensilla ample, slightly spatulate in profile; dorsal sensilla tack-shaped, inconspicuous; two tack-shaped setae and three additional hairs arising from the "thumb" somewhat as usual. Foreleg about nine-tenths as long as body; relative lengths of segments as follows: Coxa, 13; trochanter, 8; femur, 24; patella, 12; tibia, 15; tarsus, 24. Tarsus I dorsally with 2 sets of duplex setae, proximate; 5 or 6 setae borne proximad of proximal set of duplex setae. Onychium bearing a single stout claw which is straightish for nearly three-fourths its length, curving sharply near tip, bearing ventrally near its base a deflexed claw which splits into 10 slender spines not surpassing the main claw, and having a common base; these deflexed spines occurring in two series of five each, of which the proximal pair are strongest; four tenent hairs arising in pairs at sides of claw base. The collar trachea in the form of a shortish tube, expanding at its inner end into an oval chamber.

Male.—Body smaller, more pointed behind than in female, averaging 0.23 mm. in length. Legs, especially the forelegs, proportionately longer than in female, legs I barely longer than body to front of cephalothorax. Spur present on second joint of palpus. Aedeagus with inner lobe rodlike; basilar lobe in the shape of a rounded swelling dorsally; basal thickness of shaft one-half its length; shaft about 5 times as long as the hook portion of aedeagus which is bent downward about 70° from the axis of shaft, and terminates in a distinctly truncated tip, without a barb.

Type material.—U. S. Nat. Museum No. 1474.

Type locality.—Glen St. Marys, Florida.

Distribution.—Florida.

Food plants.—Arbor vitae and other conifers.

Paratetranychus gramineus, new species

Female.—Body from above ovate-elliptic. Striations on dorsum of abdomen mostly transverse; a small area embracing the inner sacrales setae have longitudinal striae. Twenty-six dorsal body setae, including the caudal pair, linear-lanceolate, prominent, finely setose, not arising from tubercles. One perfect and one imperfect eye cornea each side. Mandibular plate rounded in front. Collar trachea consisting of a straightish, rather ample tube, gradually widening inwardly, and ending in an inconspicuous, oval chamber. Legs shorter than body to front of cephalothorax. Tarsus I dorsally with 2 sets of duplex setae, well separated; 4 setae borne proximad of proximal set of duplex setae; onychial claw consisting of a strong, simple, sickle-shaped element, with 6 needlelike spines borne ventrally near its base, these arising from a common base and as long as the main claw; 4 tenent hairs borne on onychium, a pair each side of claw base. Last segment of palpus slightly thicker than long; terminal sensilla three-tenths again as long as thick; dorsal sensilla spindle-shaped, slightly longer than terminal "finger;" 5 additional setae borne on "thumb," as usual.

Male.—Body sagittate in outline from above, much smaller than female. Forelegs slightly shorter than body to front of cephalothorax. Second segment of palpus dorsally with a hornlike spur; last segment with terminal sensilla more than twice as long as thick. Leg I with onychial claw consisting of a stout, simple, dorsal element, from near whose base arises ventrally a stout, supplementary spur which appears to be cleft near tip into 4 very short, dentate divisions. Aedeagus with inner lobe expanding rather abruptly dorsally to the inconspicuous basilar lobe; shaft narrowing backward to the short hook which is bent upward fully 90° from axis of aedeagus; aedeagus terminating distally in a prominent barb, one-half as long as shaft, directed strongly upward, its anterior tip rounded, the posterior tip prominent, acuminate, curving downward from axis of barb.

Type material.—U. S. Nat. Museum No. 1738. Collected by E. A. McGregor, Aug. 23, 1935.

Type locality.—Julian, California.

Distribution.—San Diego, County to Los Angeles County, California.

Food plants.—Grasses, bamboo.

Paratetranychus hawaiiensis, new species

Female.—Body oval from above. Striations on dorsum of abdomen mostly transverse, those on posterior third rather tortuous. Twenty-six dorsal body setae including caudal pair, these linear-lanceolate, well developed, not arising from tubercles. Mandibular plate evidently unnotched. One perfect eye cornea each side. Legs rather long, but shorter than body to front of cephalothorax; relative lengths of segments of leg I as follows: Coxa, 12; trochanter, 11; femur, 37; patella, 20; tibia, 25; tarsus, 45. Tarsus I dorsally with 2 sets of duplex setae, rather well separated; 5 setae borne proximad of proximal set of duplex setae; onychial claw with main division strong, straightish for two-thirds its length, then strongly deflexed; 6 needlelike spines arising ventrally from a common base at a point one-fifth the length of main claw from its base, the spines slightly surpassing the claw, the inner pair of spines the strongest basally; 4 tenent hairs arising from onychium, a pair each side of claw base. Last segment of palpus thicker basally than its axial length; terminal sensilla fully twice as long as thick; dorsal sensilla clavate, shorter than terminal "finger;" 5 additional setae on "thumb," as usual. Collar tracheae U-shaped, the inner arm somewhat shorter than main branch.

Male.—Smaller than female. Forelegs proportionately longer than in female, about equaling body length. Second segment of palpus dorsally with hornlike spur. Onychial claw of leg I fundamentally similar to that of female, but with the 4 outer of the 6 ventral spines much reduced. Aedeagus with inner lobe abruptly expanding dorsally to the acute angled basilar lobe; shaft tapering distad and curving upward to form the inconspicuous hook portion; aedeagus terminating distally in a very large barb, nearly as long as shaft proper, with a short anterior point, and a long, attenuate, sharp-tipped, downward-curving posterior process.

Type material.—U. S. Nat. Museum No. 1739. Collected by T. Nichida, Sept. 9, 1943.

Type locality.—Honolulu, T. H.

Distribution.—Hawaii, Antigua.

Food plants.—Loquat, litchi.

PARATETRANYCHUS ILICIS (McGregor)

Tetranychus ilicis McGregor, 1917, U. S. Nat. Museum Proc. 51(2167): 586-588, pl. 106, figs. 1-7. *Paratetranychus ilicis* (McGregor), 1919, U. S. Nat. Museum Proc. 56(2303): 673-675, pl. 79, fig. 17, text fig. 10.

Female.—Color ferruginous to reddish brown, pale pink on cephalothorax. Body from above rotund-elliptic. Striae on dorsum of abdomen transverse, excepting whorls around base of setae. Twenty-two stout, linear-lanceolate

dorsal body setae, well developed, distinctly setose, arising from conspicuous tubercles. Mandibular plate three-fourths again as long as wide, distinctly emarginate in front. One perfect and one imperfect eye cornea each side. Collar trachea consisting of a short, straightish tube which terminates internally in a somewhat swollen oval chamber. Legs shorter than body; tarsus I dorsally with 2 sets of duplex setae close together; 4 setae borne proximad of proximal set of duplex setae; onychial claw consisting of a stout, simple dorsal element, curving weakly for two-thirds its length, then bent sharply downward, talon-like; 4 pairs of ventral needlelike spines arise from a common point one-fifth the length of the claw from its base, hardly surpassing the main claw, the proximal pair stoutest basally; 4 tenent hairs arising from the onychium, a pair at each side of claw base, these less than twice as long as claw. Last segment of palpus somewhat thicker than long; terminal sensilla slightly clavate, its base less than half as thick as tip of "thumb;" dorsal sensilla spikelike; 5 additional setae borne on "thumb." Egg slightly compressed axially, bearing a dorsal stalk which about equals the axial diameter of egg.

Male.—Much smaller than female, body from above sagittate. Legs proportionately longer than in female, longer than body to front of cephalothorax. Claw of tarsus I with 6 ventral spines. Second segment of palpus dorsally with a hornlike spur; last segment with terminal sensilla much reduced. Aedeagus with inner lobe rodlike, expanding dorsally to the rather distinct, rounded basilar lobe; shaft hardly narrowing caudad to the hook, two and one-third times as long as the hook which is bent downward fully 90° from axis of shaft, and tapers abruptly to the tip which is almost indiscernibly truncated.

Type material.—U. S. Nat. Museum No. 20167.

Type locality.—Batesburg, South Carolina.

Distribution.—Alabama, South Carolina, Mass.

Food plants.—Azalea sp. Camellia sp., Camellia sp., Ilex opaca.

A mite widely distributed throughout California on various trees and shrubs bears considerable resemblance to *ilicis*, especially in the structure of the aedeagus. Smith (22), following the writer's tentative identifications, called this species the "ilicis mite." It is treated elsewhere in this paper under "*P. platani*, new species."

Paratetranychus insularis, new species

Female.—Body rotund-ovate, one-fourth again as long as wide. Legs rather stubby, legs I shorter than body to front of cephalothorax. Twenty-six dorsal body setae, including caudal pair, linear-lanceolate, distinctly setose, tapering little. A perfect and an imperfect eye cornea each side. Dorsal striations very fine, mostly longitudinal on the cephalothorax, mostly transverse on abdomen, but the latter also bearing tortuous striae. Mandibular plate elliptical, nearly twice as long as wide, notched in front. Collar trachea consisting of a straightish tube, not noticeably chambered at inner end. Forelegs with relative lengths of segments as follows: Trochanter, 13; femur, 23; patella, 14; tibia, 17; tarsus, 25. Tip of tarsus bearing a strong, simple, sickle-shaped claw, from

near whose base arise 10 appendiculate spines in 5 pairs; the proximal pair of spines much the stoutest basally, and reflexed more than 90° from the basal axis of the main claw; all spines evidently about equaling the main claw in length; a pair of tenent hairs borne on onychium each side of claw base, hardly twice as long as main claw. Tarsus I dorso-terminally with 2 sets of duplex setae, these somewhat remote from each other; 5 setae borne proximad of proximal set of duplex setae. All legs supplied with rather conspicuous, setose hairs. Last segment of palpus distinctly thicker than long; terminal sensilla domelike, much thicker than long; dorsal sensilla spatulate; 5 additional setae borne on "thumb," about as usual. Egg somewhat flattened axially, bearing a stalk dorsally which is fully as long as the axial diameter of egg.

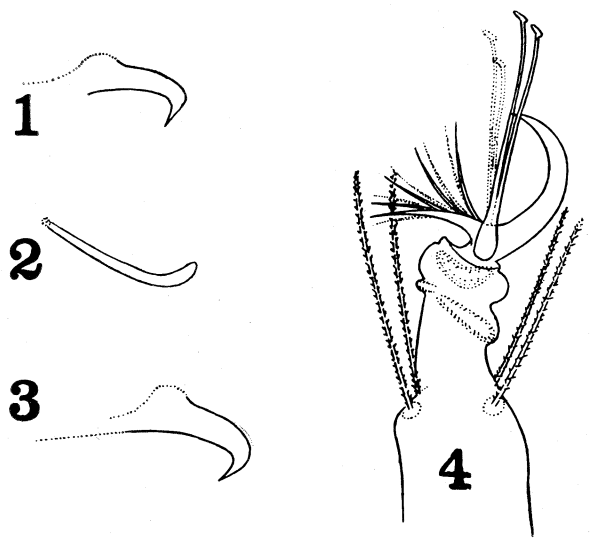
Male.—Body smaller and narrower than that of female. Tarsal claw rather similar to that of female, but the ventral spines apparently somewhat shorter. Aedeagus with inner lobe not easily discernible, due to body pigments; basilar lobe dorsal, consisting of a rounded boss; shaft tapering caudad, bent downward in excess of 90° from its axis, to form the hook portion of aedeagus; the hook less than half as long as shaft, and tapering abruptly to a sharp, unbarbed tip.

Type material.—U. S. Nat. Museum No. 1740. Collected by R. C. Linder, Aug. 30, 1945.

Type locality.—Poamoho, Oahu, Hawaii.

Distribution.—Known only from type locality.

Food plant.—Mango.



Text fig. 16. *Paratetranychus insularis.*—1, 3, aedeagus, lateral view; 2, collar trachea; 4, tip of tarsus of female, lateral view.

Paratetranychus major (Ewing), new combination

Oligonychus major Ewing, 1921, U. S. Nat. Mus. Proc. 59(2394): pl. 125, fig. 2.

This mite has never been collected or received by the writer. E. W. Baker reports in correspondence that the 2 sets of duplex setae on tarsi I of the female are proximate, and that 5 setae are borne proximad of the proximal set of duplex setae.

As explained elsewhere in the present paper, the peculiar structure of the tarsal claw attributed to *Oligonychus* never has been observed by the writer. Since Berlese's diagnosis of *Oligonychus* was extremely vague and since, moreover, *O. americanus* Ewing has been found to belong in *Paratetranychus*, it is here considered advisable to transfer *major*, along with *americanus*, to the genus *Paratetranychus*.

Type material.—U. S. Nat. Museum No. 24027.

Type locality.—Rockville, Maryland.

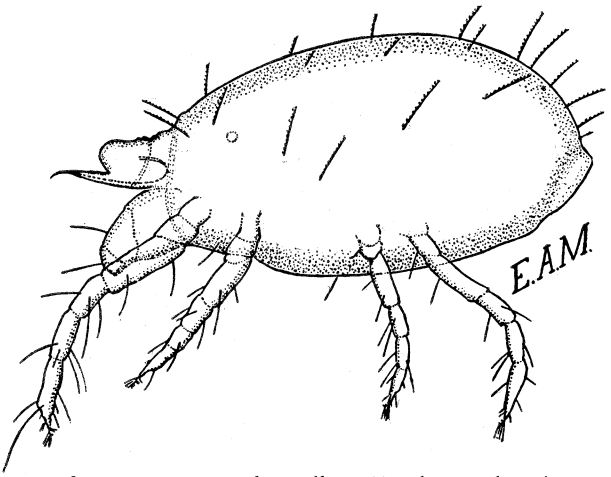
Distribution.—Known only from type locality.

Food plant.—Avodado.

Paratetranychus milleri, new species

Female.—Body oval, averaging 0.346 mm. in length to front of cephalothorax. Dorsal body setae rodlike, distinctly shorter than usual, the longer setae less than one-fourth as long as the greatest thickness of mite's body, nearly all setae conspicuously setose; seta at posterior-lateral margin of cephalothorax 0.054 mm. long; distribution of dorsal body setae about as usual. Mandibular plate barely emarginate anteriorly. One perfect and one imperfect eye cornea each side. "Thumb" of palpus slightly thicker at base than axial length, bearing at its ventro-distal angle a small rounded terminal sensilla whose thickness is about one-third that of the terminal face of "thumb;" the dorsal sensilla ample, clavate, more than twice as long as terminal sensilla, arising considerably ventrad of the dorsal margin of "thumb;" five additional setae borne on "thumb," distributed about as usual. Legs relatively short, the forelegs noticeably longer than others, but less than two-thirds as long as body to anterior margin of cephalothorax. Relative lengths of segments of foreleg as follows: Coxa, 22; trochanter, 9; femur, 29; patella, 15; tibia, 18; tarsus, 24. Tarsus rather abruptly narrowed toward tip which bears a relatively short, strongly curving claw; near its base the claw giving rise ventrally to 4 pairs of needlelike spines which appear to arise from a common base, and well exceed the main claw in length; the proximal-most pair of spines the strongest basally. Tarsus I with 2 sets of duplex setae, proximate; 2 setae borne proximad of proximal set of duplex setae. Four tenent hairs, as usual, arising in pairs on either side of the base of the main claw, and about three times as long as the claw. Collar trachea extending downward and backward as a short, straightish tube, ending in a slightly enlarged oval chamber.

Male.—Body paler in color than female, shorter and narrower; length 0.29 mm. Legs relatively somewhat longer than in female. Palpus bearing



Text fig. 17. *Paratetranychus milleri.*—Female mite, lateral view (only legs on left side shown).

a prominent spur dorsally on second segment. Inner lobe and shaft of aedeagus continuous in their profile outlines, being bowed downward near their point of fusion; a weakly developed domelike basilar lobe dorsally; shaft thickest near midpoint, then bent downward and backward at an angle of about 115° from main axis of the shaft to form the strong, tapering, unbarbed hook which terminates in a sharp point; hook portion of aedeagus nearly as long as the shaft.

Type slide.—U. S. Nat. Museum No. 1473. Collected by S. S. Yuill, May 15, 1939.

Type locality.—Placerville, California.

Distribution.—Arizona, California, Virginia.[3]

Food plants.—Pinus ponderosa, P. taeda.

PARATETRANYCHUS MODESTUS (Banks)

Tetranychus modestus Banks, 1900, U. S. D. A., Div. Ent., Tech. Ser. 8: 73. *Paratetranychus modestus* (Banks) McGregor, 1919, U. S. Nat. Mus. Proc. 56(2303): 670, fig. 8.

In his revision of the Tetranychidae published in 1919, the writer presented a diagnosis of *modestus,* but this did not include reference to the aedeagus. Baker has examined Banks' type material (now in poor condition), and has furnished the writer with a simple sketch of the aedeagus. Baker's sketch would seem to indicate that the shaft tapers abruptly backward, and is bent sharply to form a short, thin hook which seemingly terminates in a subacute, unbarbed tip.

3 Males were lacking in the lots from Arizona and Virginia, but the female characters agreed closely with those of the type material, with which they are evidently identical.

On an old slide (U. S. Nat. Museum collection), loaned to the writer, is a mite from corn, Salt Lake City, Utah, identified by Banks as *modestus*. This mite clearly is identical with *P. simplex* (Banks). If *modestus* from Washington, D. C., its type locality, should prove to be identical with *simplex*, the latter would become a synonym of modestus, which was described first.

Type material.—U. S. Nat. Museum No. 1751.

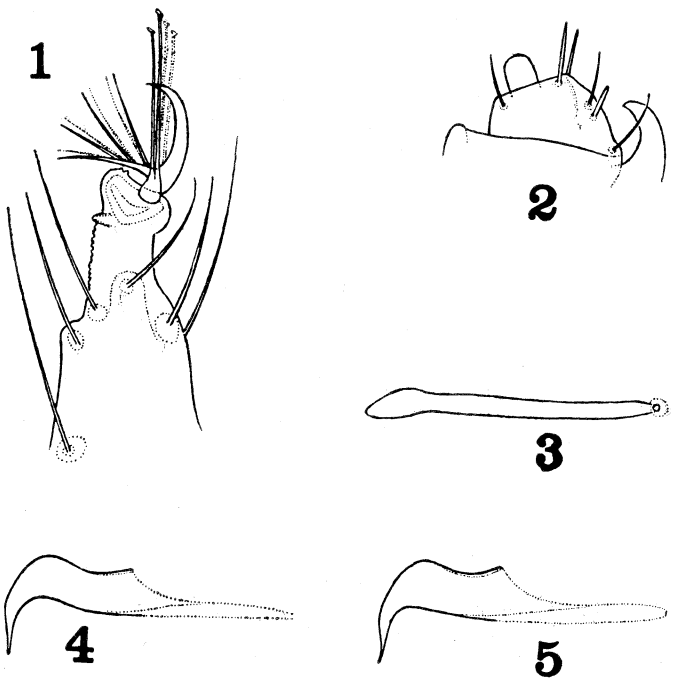
Type locality.—Washington, D. C.

Distribution.—District of Columbia, Utah?

Food plant.—Corn.

Paratetranychus newcomeri, new species

Female—Abdomen from above, purplish black; cephalothorax tan to buff. Dorsal body setae slender, of moderate length; not arising from tubercles; area at their base concolorous with rest of dorsal integument. Striations on dorsum of abdomen mostly transverse, excepting a small whorl around base of setae on caudal third. Legs relatively short. Collar trachea a rather straight tube, inner terminal chamber elliptical, not greatly enlarged. Tarsus



Text fig. 18. *Paratetranychus newcomeri,* new species.—1, tip of tarsus I of female; 2, tip of palpus of female; 3, collar trachea; 4, 5, aedeagus, lateral view.

I of female with two sets of duplicate setae proximate; four setae proximad of proximal set of duplex setae. Tarsal claw of leg I of female not strongly curving for most of its length; bearing four pairs of ventral spines, these slightly surpassing the main claw. Terminal segment of palpus much shorter than thick; terminal sensilla slightly longer than thick, barely spatulate; dorsal sensilla nail-like. Egg tan to buff color, strongly compressed dorso-ventrally, with a dorsal stalk.

Male.—Aedeagus with inner lobe rod- or spindle-shaped, expanding dorso-caudad to the shaft; basilar lobe dorsal, not conspicuous; shaft concave dorsally, expanding slightly caudad, prominent dorsally near caudal end; upper face of shaft sloping abruptly downward caudally; hook element shorter than shaft, deflexed nearly 90° from axis of shaft, and tapering gradually to its slender tip, which is almost imperceptibly truncate.

Type material.—U. S. Nat. Mus. No. 1894. Collected by R. W. Burrell.

Type locality—Yakima, Wash.

Distribution.—Known only from type locality.

Food plant.—Pear.

PARATETRANYCHUS PERUVIANUS (McGregor)

Tetranychus peruvianus McGregor, 1917, U. S. Nat. Museum Proc. 51(2167): 581, 589, pl. 101. (The misspelling *peruianus* was used on p. 581, but the correct form on p. 589.) *Paratetranychus peruvianus* (McGregor), 1919, U. S. Nat. Museum Proc. 56(2303): 667, 668.

Female.—Color yellowish-green. Body outline from above ovate, widest across hind portion of cephalothorax, one-half again as long as wide. Striations on dorsum of abdomen transverse, excepting whorls around the lumbales setae and on limited marginal areas. Twenty-six dorsal body setae, including pair on caudal margin, linear-lanceolate, setose, each shorter than interval to seta next behind, not arising from tubercles. A perfect and an imperfect eye cornea each side. Mandibular plate more than twice as long as wide, subrectangular, distinctly emarginate in front. Collar trachea consisting of a clavate, rather ample tube, the inner portion in the form of a somewhat swollen, elongate-elliptic chamber. Legs rather stubby, shorter than body to front of cephalothorax. Relative lengths of segments of leg I as follows: Coxa, 16; trochanter, 9; femur, 20; patella, 11; tibia, 12; tarsus, 16. Tarsus I with 2 sets of duplex setae, arising close together; 6 setae borne proximad of proximal set of duplex setae; onychium bearing a simple, stout, sickle-shaped claw, from near the base of which are borne 6 weak spines, much shorter than main claw; 4 tenent hairs borne on onychium, a pair each side of claw base, less than twice as long as claw. Last segment of palpus much thicker than long; terminal sensilla subconical, longer than thick; dorsal sensilla spindle-shaped; 5 additional setae borne on "thumb." Egg evidently spherical.

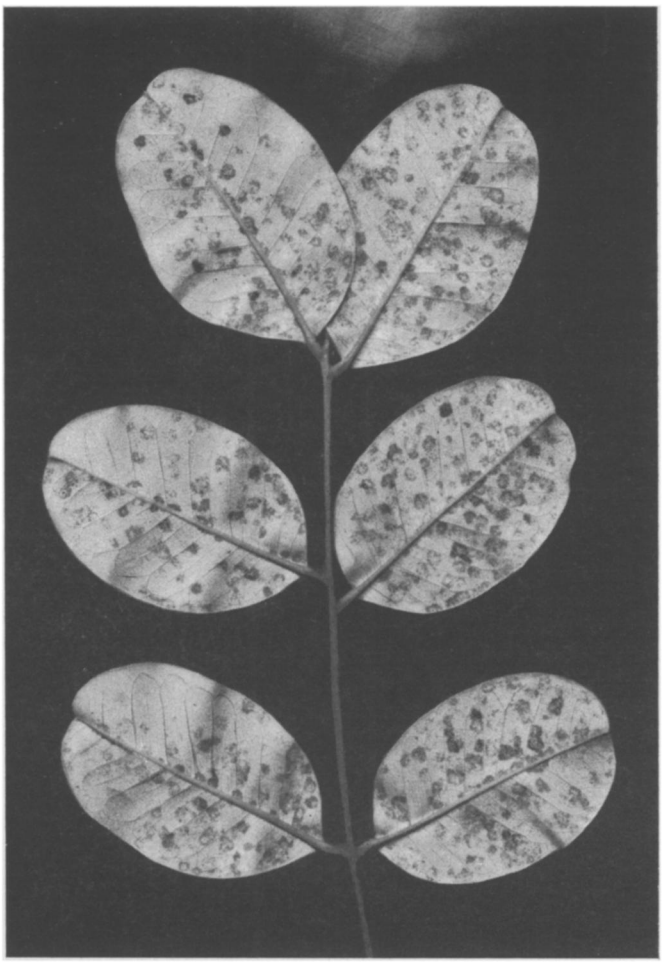
Male.—Much smaller than female. Body from above sagittate, truncate in front. Legs somewhat longer proportionately than in female, but legs I barely longer than body. Second segment of palpus dorsally with a minute,

conelike horn borne on a tubercle. Aedeagus with inner lobe rodlike; shaft at base little thicker than inner lobe, and its axis a continuation of the latter; shaft in profile tapering gradually caudad, deflexed near tip about 65° from its axis to form the hook portion of aedeagus, which is about one-fifth as long as shaft and terminates in a sharp-pointed, unbarbed tip.

Type material.—U. S. Nat. Museum No. 20164.

Type locality.—Near La Legua (between Lima and Callao, Peru).

Distribution.—Peru; Southern California.



Text fig. 19.—Ventral surface of carob leaves showing feeding scars of many colonies of *Paratetranychus peruvianus*. This type of restricted colony activity is very unusual.

Food plants.—*Bohenia coriumbosa, Ceratonia siliqua, Salix* sp.

The individuals of *P. peruvianus* live in restricted colonies under small, compact webs, resembling the egg covering of certain true spiders. (See text figure 19).

PARATETRANYCHUS PILOSUS (Canestrini and Fanzago)

Tetranychus pilosus Canestrini and Fanzago, 1876, Atti. Soc. Ven. Trent. Sci. Nat. 5, 133, 134.

Female.—Body oval from above; color reddish-brown. Striations on dorsum of abdomen transverse except for circular whorls of striae at base of setae. Thirteen pairs of dorsal body setae, including caudal pair, arising from prominent tubercles, the latter whitish in life; setae stout, lanceolate, distinctly setose. One perfect eye cornea each side. Mandibular plate rounded in front. Collar trachea consisting of a straightish tube ending in a rather ample, oval chamber. Last segment of palpus somewhat thicker basally than long; terminal sensilla noticeably spatulate in profile, about as thick as long; dorsal sensilla spindle-shaped, nearly as long as terminal "finger;" 5 additional setae borne on "thumb," about as usual. Tarsus I dorsally bearing 2 sets of duplex setae close together; 4 setae borne proximad of proximal set of duplex setae; onychial claw consisting of a dorsal element, thick at base, outer half srtongly deflexed, bearing ventrally at a point two-fifths its length from base, 6 spines arising from a common base and well surpassing the main claw; 4 tenent hairs borne on onychium, a pair at each side of claw base. Egg spherolenticular, red; the dorsal stalk barely longer than axial diameter, usually deflected from the vertical, devoid of guy fibrils.

Male.—Much smaller than female; body from above narrowly sagittate in outline. Legs proportionately longer than in female; legs I longer than body to front of cephalothorax. Onychial claw of leg I basically like that of female, but with the ventral spines not greatly surpassing main claw. Second segment of palpus dorsally with a hornlike spur; last segment with terminal sensilla reduced. Aedeagus with inner lobe rodlike, expanding caudad to the basilar lobe which projects dorsally as a rather prominent rounded boss; shaft convex ventrally, narrowing caudad, and bending upward about 50° from general axis of aedeagus; thickness of shaft at hind point of origin of basilar lobe less than length of shaft proper; distal spine of aedeagus deflexed weakly, and ending in a thin, sharp tip.

Type material.—Location unknown.

Type locality.—Italy.

Distribution.—British Isles, Canada, Europe, Japan, United States.

Food plants.—(U.S.A.) *Alnus* sp., apple, a shrub, blackberry, cherry, chestnut, *Choysia* sp., elm, fig, mountain-ash, peach, pear, prune, *Prunus* sp., raspberry, rose, *Rubus* sp., strawberry, walnut.

Some authorities identify the above mite under Koch's (23) species *ulmi.* Due to the brief, vague delineation in Koch's original description, one cannot be at all certain which mite he had in mind. The writer prefers to follow

Trägårdh, Zacher, and others in interpreting this form to be *pilosus* of Canestrini and Fanzago.

Paratetranychus platani, new species

Female.—Body dark colored with mouse-gray to slaty-black blotches (from pigments in underlying viscera), with a paler median band; cephalothorax greenish amber to olive green; legs pale, 1st and 2nd pairs salmon amber to rusty rufous. Dorsal body bristles 26, nearly colorless, not arising from tubercles (or from very obscure tubercles); eye carmine. Length of body averaging 0.34 mm.; width averaging 0.23 mm. Mandibular plate conspicuously notched anteriorly. Terminal segment of palpus nearly as thick as long, bearing at its tip a terminal "finger" whose greatest thickness (in mature female) is over half the thickness of "thumb" at tip, about as thick as long, spatulate or nearly orbicular in profile; two pin-shaped setae on upper distal corner of "thumb"; on upper side two-thirds the distance to base a sensilla about equal in length to, but much narrower than, terminal "finger," and between this and base one strong seta exceeding the dorsal sensilla; differing from most species of spinning mites in having a strong seta situated dorsally on the "thumb" midway between the dorsal sensilla and the two subterminal pin-shaped setae; a strong hair asising lateroventrally half way from tip to base of "thumb." Claw on the penultimate segment of palpus well surpassing the dorsal sensilla. The forelegs (in adult female) are about four-fifths the length of the body. Femur about one-fifth longer than tarsus. Relative lengths of segments of leg I as follows: Coxa, 19; trochanter, 14; femur, 35; patella, 21; tibia, 19; tarsus, 29. Tarsus I with 2 sets of duplex setae, slightly separated; 4 or 5 setae borne proximad of proximal set of duplex setae; tip of tarsus bearing a strong, simple claw which is rather straightish for over half its length, then strongly hooked downward; 6 deflexed needle-shaped spines about equal in length to the main tarsal claw arising ventrally from near the base of the main claw and arranged in 3 pairs; the proximal pair of spines strongest basally; the usual four tenent hairs present, a pair arising at each side of the claw base. The collar trachea extending inward as a fairly ample, straightish tube, expanding centrally, and again at its inner end into an elliptical chamber. Egg deep amber color, very slightly oblate, bearing an axial stalk that is very slender and about equaling or slightly exceeding the axial diameter of egg; stalk not equipped with guy fibrils.

Male.—Body sagittate from above; in length and width much smaller than female. Legs proportionately much longer than in female; forelegs one-half again as long as body. Aedeagus with inner lobe evidently rodlike (extremely difficult to observe); basilar lobe in the form of a rounded boss dorsally; shaft in profile very stout, with subparallel edges, about twice as long as its basal thickness, bent abruptly downward at an angle a little in excess of 90° from its main axis, forming a strong hook; hook portion abruptly narrowed distad; terminal point obscurely truncated, without barb.

Type material.—U. S. Nat. Museum No. 1432. Collected by S. F. Bailey on sycamore Aug. 16, 1940.

Type locality.—Davis, California.

Distribution.—California (a known north and south range of 450 miles).

Food plants.—Camphor, *Cotoneaster* sp., cypress, *Eucalyptus* spp., loquat, *Pyracantha* sp., *Quercus* spp., sycamore, toyon, yalnut, willow.

This species has been observed to damage sycamore trees throughout California since about 1924. It was tentatively thought to be the southern red mite (*Paratetranychus ilicis* (McG.)), and Smith (22) has published accounts of its economic importance under that species name. Smith, in fact, believed that the present species is the most injurious mite affecting trees and shrubs in California.

PARATETRANYCHUS PRATENSIS (Banks)

Tetranychus pratensis Banks, 1912, Wash. Ent. Soc. Proc. 14: 459. *Paratetranychus pratensis* (Banks), McGregor, 1919, U. S. Nat. Mus. Proc. 56(2303): 668, 669, fig. 7.

In 1913-1914, when the writer studied a number of Banks' type specimens, he determined that *pratensis* belongs in *Paratetranychus,* and at the same time recorded the characters of the tarsal claw and the palpus (the males remained unstudied). Recently Baker reported in correspondence that the type slide of *pratensis* contains no males, but he confirmed the fact that this species belongs in *Paratetranychus.* The revised description by the present writer appeared in his treatment of the family in 1919.

No specimens of this species have ever been collected or received by the writer, and as no additional data have accumulated since the original studies were made and the details of the structure of the aedeagus remain unknown, *P. pratensis* (Banks) has not been included in the present key to the species of *Paratetranychus.* For additional information on *pratensis* the reader is referred to the brief diagnosis in the second reference above cited.

Type material.—U. S. Nat. Museum No. 1741.

Type locality.—Pullman, Washington.

Distribution.—Known only from type locality.

Food plant.—Timothy grass (*Phleum pratense*).

Paratetranychus pritchardi, new species

Female.—Body from above subelliptical in outline, somewhat flattened dorso-ventrally. Thirteen pairs of dorsal body setae, of moderate length, not arising from tubercles. Striae on cephalothorax mostly longitudinal, those on abdomen mostly transverse. Mandibular plate elliptical, fully twice as long as wide, unnotched in front. Palpus with terminal segment slightly thicker basally than axial length; terminal sensilla about one-fourth longer than greatest thickness, rather angular at tip; dorsal sensilla thin, inconspicuous. Leg I with two sets of duplex setae, rather close together, 4 setae proximad of proximal set of duplex setae. Relative length of segments of leg I as follows: Coxa, 10; trochanter, 15; femur, 40; patella, 24; tibia, 26; tarsus, 35. Onychial claw sickle-shaped, with 6 ventral spines arising nearly from a common point near claw base, these slightly shorter than main claw. A perfect and an

imperfect eye cornea each side. Collar trachea consisting of a short, straightish tube, expanding at inner end into an oval chamber.

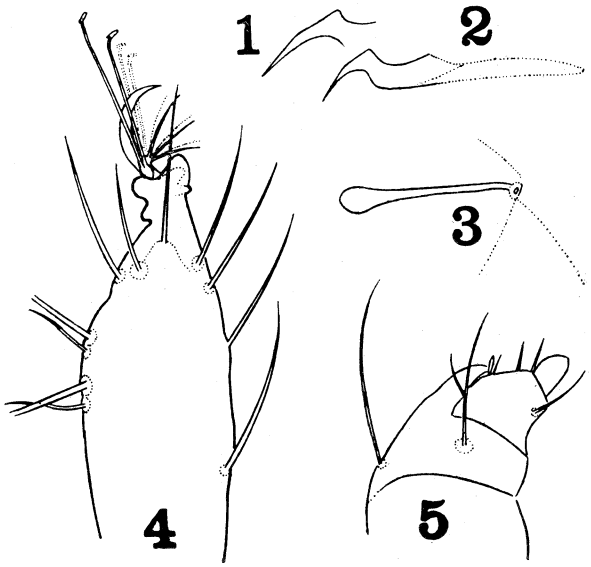
Male.—Body from above sagittate in outline. Legs not as long as in males of most species. Aedeagus with inner lobe expanding dorso-caudad to basilar lobe which is barely more than an obtuse prominence; shaft narrowing very slightly caudad and bent upward only about 50° from its main axis to form the thick hook element; hook terminating in a very prominent barb whose anterior process consists of an inconspicuous angle, and the caudal portion is deflexed and produced into a long, tapering, sharp-pointed spine; entire barb fully as long as shaft.

Type material.—U. S. Nat. Museum No. ..... Collected September 11, 1947, by A. E. Pritchard.

Type locality.—Berkeley, California.

Distribution.—Northern and southern California.

Food plant.—Valley oak (*Quercus lobata*).



Text fig. 20. *Paratetranychus pritchardi.*—1, 2, aedeagus, lateral view; 3, collar trachea; 4, tarsus I of female; 5, tip of palpus of female, lateral view.

PARATETRANYCHUS SACCHARI McGregor

Paratetranychus sacchari McGregor, 1942, Univ. Puerto Rico Jour. 26(4): 91-94, pl. I, figs. 1-7.

Female.—Color yellowish-green. Body outline (viewed from above) more narrowly elliptical than with most species of the genus. Dorsal bristles 26, linear-lanceolate, finely setose, well developed, not arising from tubercles.

Striations on dorsum of abdomen transverse, excepting a band embracing the sacrales setae. One perfect and one imperfect eye cornea each side. Mandibular plate not noticeably notched anteriorly. "Thumb" of palpus thicker than long, bearing at its tip a terminal "finger" whose greatest thickness is about two-thirds that of "thumb" at tip; terminal "finger" four-fifths as thick as its length, barely spatulate in profile; on upper disal angle of "thumb" 2 pin-shaped digituli; a sensilla arising from near the middle of the upper face of the "thumb" which is slightly longer than terminal "finger" and is thicker than usual; a short hair arising immediately behind the dorsal sensilla, and a strong seta arising dorsally from the "thumb" near its base; a hair arising from near the middle of the ventral face of the "thumb." Clay on penultimate segment of palpus hardly reaching dorsal sensilla. Forelegs barely more than one-half length of body to tip of mandibular plate. Relative lengths of segments of leg I as follows: Trochanter, 9; femur, 29; patella, 14; tibia, 16; tarsus, 29. Tarsus I dorsally bearing 2 sets of duplex setae, well separated; 4 setae borne proximad of proximal set of duplex setae; onychial claw consisting of a simple, strong, little bent claw, arising ventrally from near the base of which are 6 spines, shorter than main claw, and with a common origin; the usual four tenent hairs present, a pair arising at each side of the claw base. Collar trachea extending backward as a straightish tube, the inner end barely enlarged.

Male.—Length and width of body much less than in female. Forelegs proportionately longer than in female. Aedeagus with inner lobe rodlike, in profile expanding extremely abruptly dorsally at its point of fusion with the shaft; dorsal basilar lobe present in the form of a prominent, sharply rounded protuberance; shaft with greatest thickness almost equal to its length, narrowed very abruptly posteriorly and bent upward and forward more than 90° from its main axis in the form of a slender hook; the hook in turn bent sharply backward and downward, terminating in a sharp point; profile of shaft and hook together resembling that of the forebody, neck and head of a swan.

Type material.—U. S. Nat. Museum No. 1422.

Type locality.—Mayaguez, Puerto Rico.

Distribution.—Puerto Rico; New Hebrides; Windward Islands.

Food plants.—Sugarcane, *Dendrobium* sp., *Setaria* sp.

PARATETRANYCHUS SIMPLEX (Banks)

Tetranychus simplex Banks, 1914, Pom. Col. Jour. Ent. and Zool. 6, p. 57. *Paratetranychus simplex* (Banks), McGregor, 1939, Ent. Soc. Wash. Proc. 41(9): 248.

Female.—General body color usually flesh to pale amber, with a few olive-amber markings (more greenish when feeding on grasses). Frequently spots along margin of abdomen which vary in color according to the nature of the food plant. Striations on dorsum of abdomen mostly transverse except for a small area even with inner sacrales setae, where they are longitudinal. One perfect and one imperfect eye cornea each side, these deep carmine. Body oval, fully one and one-half times as long as broad, rounded behind, averaging

0.304 mm. in length and 0.187 mm. in width. Almost no trace of suture between cephalothorax and abdomen. Twenty-six dorsal body setae, linear-lanceolate, pale, not arising from tubercles. Forelegs pale salmon color; other legs flesh color. Mandibular plate somewhat narrowed anteriorly and rounded in front, with no emargination. "Thumb" of palpus one-third again as thick at base as its axial length; terminal digit varying in length from one-third to one-half again its thickness at base (this structure being proportionately longer in immature individuals); on upper distal corner of "thumb" two pin-shaped digituli which are slightly longer than the terminal digit; fusiform dorsal sensilla situated at midpoint of "thumb," slightly longer than terminal digit; "thumb" bearing three additional bristles, as usual. Foreleg about two-thirds length of body to front of cephalothorax; relative lengths of segments as follows: Coxa, 20; trochanter, 16; femur, 41; patella, 25; tibia, 27; tarsus, 41. Tarsus I dorsally bearing 2 sets of duplex setae, these well separated; 4 setae borne proximad of proximal set of duplex setae; tip of tarsus bearing a single stout claw, curving more strongly toward its tip, bearing ventrally at a point near its base six deflexed subequal spines, these slighlty more than half as long as main claw. The usual series of four tenent hairs arising in pairs at sides of claw base. The collar trachea consisting of a rather short, straightish tube, which increases in caliber toward its inner end. Egg spherical, without stalk, pale amber in color.

Male.—Body smaller, narrower, and more wedge-shaped than in female; legs, especially the forelegs, proportionately longer than in female, of salmon color. Palpal spur and supporting tubercle present as usual. Aedeagus of general type of that of *Tetranychus bimaculatus;* inner lobe rodlike, somewhat longer than shaft; basilar lobe represented by an obtuse prominence; shaft fairly stout, but over twice as long as its basal thickness, tapering gradually backward and bent upward and forward slightly beyond the 90° angle; hook short, about one-fourth as long as shaft, expanding terminally to form the barb, which is less than one-fourth as long as the shaft; the barb bearing a blunt inner and a sharp outer point, the latter being somewhat upturned. "Thumb" of palpus bearing a terminal digit that is twice as long as thick. Tarsal claw of foreleg differing from those of other three pairs of legs, as is usual with "red spider" males; the deflexed claw, instead of being split into six spurs, consisting apparently of a single simple claw which resembles and equals the main claw. Length of male, 0.224 mm.; width, 0.148 mm.

Type material.—Museum of Comparative Zoology, Harvard University.

Type locality.—El Centro, California.

Distribution.—Arizona, Florida, Missouri, Nevada, so. California, Texas, Utah.

Food plants.—Date, fan palm, grasses, sugarcane.

Paratetranychus stickneyi McGregor

Paratetranychus stickneyi McGregor, 1939, Ent. Soc. Wash. Proc. 41(9): 253.

Female.—Body outline and proportions similar to those of *P. simplex*

(Banks); color usually more greenish than in that species, and with abdominal spots blackish and more conspicuous. Twenty-six dorsal body setae, not arising from tubercles, linear-lanceolate, well developed, setose. Mandibular plate rounded anteriorly. "Thumb" of palpus in length equaling its thickness at base; upper distal angle of "thumb" removed from terminal "finger" by a distance equaling thickness of the latter, resulting in distal face of "thumb" being more than twice as thick as terminal "finger"; the latter only slightly, if at all, satulate in profile; dorsal sensilla spindle-shaped, fully as long as terminal "finger," but more slender; other appendages of "thumb" arranged as usual. Tip of tarsus bearing a single stout, weakly curving claw which is provided ventrally, near its base, with a deflexed claw cleft to its base into six subequal spines which are distinctly shorter than the main claw. Tarsus I with 2 sets of duplex setae, these well separated; 4 setae borne proximad of proximal set of duplex setae. Striations on dorsum of abdomen transverse backward to sacrales setae, mostly longitudinal behind this point. A single perfect eye cornea each side. Collar trachea consisting of a rather short, straightish tube, which is expanded at inner end a little more abruptly than in *P. simplex*. Egg pale, nearly globular, but very slightly compressed dorsoventrally; without stalk.

Male.—Body much smaller than in female. Legs longer proportionately than in female, but shorter than body to front of cephalothorax. Aedeagus differing substantially from that of *simplex;* inner lobe rodlike, nearly twice as long as shaft; basilar lobe consisting of an obtuse prominence; shaft very stout, a little less than twice as long as its basal thickness, in profile with subparallel sides, narrowing very abruptly distally into the hook; hook one-third as long and one-fifth as thick as shaft, bent upward about 90° from axis of shaft, expanding terminally to form the very prominent barb, whose length is nearly half that of the shaft; posterior portion of barb produced into an acuminate, slightly downward-directed point; anterior portion of barb produced into an equally prominent rounded boss. Tarsal claw of foreleg closely resembling that of *P. simplex;* the ventral deflexed claw consisitng of a single talon-shaped spur, resembling and equaling the main claw; the tarsal arrangement of legs II, III, and IV just as in the female.

Type material.—U. S. Nat. Museum No. 1236.

Type locality.—Whittier, California.

Distribution.—Eight counties in California from Yuba County southward to Imperial County, and Arizona.

Food plants.—Numerous grasses, including: *Arundo donax, Boutelova barbata, Cenchrus pauciflorus, Chloris virgata, Cynodon dactylon, Digitaria sanguinalis, Echinochloa colonum, Eragrostis cilianensis, Setaria viridis, Sorghum halapense, Sporobolus cryptandrus.*

Paratetranychus subnudus, new species

Female.—Abdomen, especially laterally, blackish or blackish green; cephalothorax salmon amber; eyes red; forelegs ferruginous. Body widely oval,

length to front margin of cephalothorax about one-sixth longer than wide, averaging 0.35 mm. in length. One perfect and one imperfect eye cornea each side. Evidently only 22 dorsal body setae; these, with the exception of a pair on the anterior margin of cephalothorax, reduced to peg-shaped plumose hairs, not arising from tubercles. Seta at posterio-lateral angle of cephalothorax 0.014 mm. long. The hairs borne on the legs mostly conspicuously setose. Due to the opaqueness of the body, the dorsal striae could not be studied. Mandibular plate subrectangular, tapering little, rather deeply notched anteriorly. "Thumb" of palpus almost twice as thick at base as axial length; position of terminal sensilla aberrant in that it arises from ventral face of "thumb" at a point nearly half way to its base, and consists of an inconspicuous hemispherical boss; dorsal sensilla ample, clavate, noticeably longer than terminal "finger," its position unusual in that it arises from near the center of the lateral face of "thumb"; two tack-shaped setae and three additional bristles arising from the "thumb" somewhat as usual. Foreleg slightly less in length than that of body to front of cephalothorax; relative lengths of segments as follows: Coxa, 15; trochanter, 10; femur, 35; patella, 19; tibia, 20; tarsus, 25. Tarsus I dorsally bearing 2 sets of duplex setae, proximate; 2 setae borne proximad of proximal set of duplex setae; onychium bearing a simple stout claw, curving more strongly near tip, bearing ventrally near its base a deflexed claw split into eight slender spines which exceed the main claw; these deflexed spines are in two series of four each, of which the proximal pair are the strongest basally; the usual series of four tenent hairs arising in pairs at sides of claw base. The collar trachea consisting of a straightish tube which is somewhat expanded at its inner end into an oval chamber. Egg chestnut-red, slightly flattened axially, and with longitudinal striations.

Male.—Body smaller, narrower, and more wedge-shaped than in female; legs especially the forelegs, proportionately longer than in female. Palpal spur and supporting tubercle present on second segment. Aedeagus with inner lobe rodlike, thickening caudad to point of origin of shaft; basilar lobe hardly more than an obtuse angle; shaft three times as long as its basal thickness, tapering gradually backward; hook portion of aedeagus one-third as long as shaft, bent downward and forward about 110° from the axis of shaft, slightly recurved backward near tip which is sharp-pointed. "Thumb" of palpus slightly longer proportionately than that of female; aberrant positions of terminal and dorsal "fingers" corresponding with those of female. Main tarsal claw of foreleg with basal two-thirds very thick, then bent abruptly at right angles; bearing evidently three fine, well separated hairs ventrally, which slightly exceed the main claw. Length of male, 0.23 mm.

Type material.—U. S. Nat. Museum No. 1472. Collected by Everett L. Smith Jan. 29, 1938.

Type locality.—Oxnard, California.

Distribution.—California.

Food plant.—*Pinus* spp.

In addition to numerous males, females, and immature stages of the present species, the type slide contains also a predaceous mite.

P. subnudus is probably closest to *P. brevipilosus* Zacher, but is distinct from it in several structural characters.

Paratetranychus uniunguis (Ewing), new combination

Tetranychus uniunguis Ewing, 1917, Jour. Econ. Ent. 10(5): 497, fig. 25 (1). *Neotetranychus uniunguis* (Ewing), McGregor, 1919, U. S. Nat. Museum Proc. 56(2303): 647.

In Ewing's original description of *uniunguis* he stated that the tarsus ends "in a single claw, which is not strongly curved, but is very sharp; two tenent hairs." In his revision of the Tetranychidae of 1919, the present writer transferred *uniunguis* to *Neotetranychus* since certain European workers had erroneously stated that the tarsal claw in this genus is simple and uncleft. Baker recently examined the type specimens of *T. uniunguis* and sent sketches of the palpus and the tarsal claw to the writer. The sketch of the claw reveals the presence of radiating ventral spines borne near its base (evidently overlooked by Ewing), thus establishing that the species belongs in *Paratetranychus*. Baker stated, in correspondence, that the specimens on the type slide are now in very poor condition, and he was unable to determine the characters in much detail.

Type material.—H. E. Ewing's personal collection.

Type locality.—Urbana, Illinois.

Distribution.—Known only from the type locality.

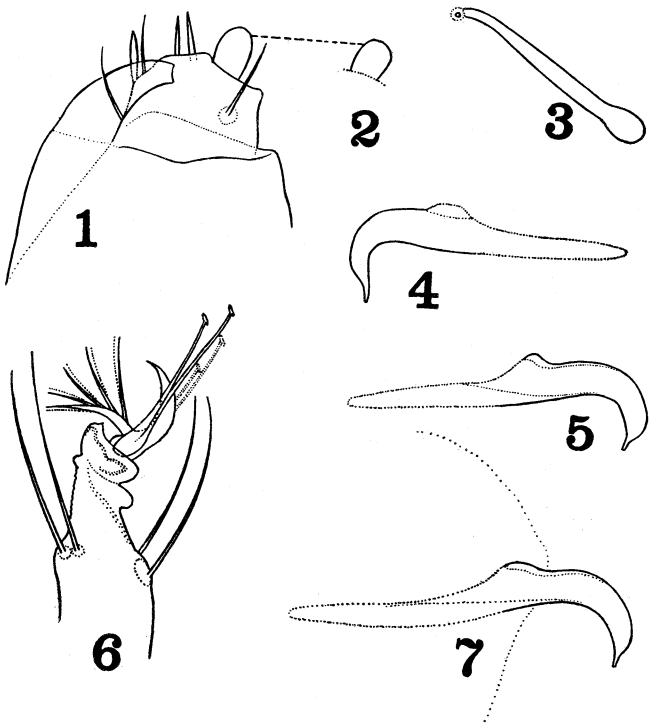
Food plant.—Arbor vitae (*Thuja occidentalis*).

PARATETRANYCHUS UNUNGUIS (Jacobi)

Tetranychus ununguis Jacobi, 1905, Naturw. Zeitschr. Land-u. Forstw. 3, p. 239.

Female.—Body from above widely oval. Color usually dark from underlying pigments. Legs shorter than body. Thirteen pairs of dorsal body setae, including caudal pair, well developed, linear-lanceolate, distinctly setose, not arising from tubercles. Striations on dorsum of abdomen mostly transverse. One perfect and one imperfect eye cornea each side. Mandibular plate ample, with a slight emargination in front. Leg I with relative lengths of segments as follows: Trochanter, 13; femur, 28; patella, 12; tibia, 16; tarsus, 23. Tarsus I dorsally with 2 sets of duplex setae rather close together; 4 or 5 setae borne proximad of proximal set of duplex setae; main onychial claw sickle-shaped, bearing near its base, from a common origin, 10 ventral spines, these somewhat exceeding the main claw, the proximal pair stoutest basally; 4 tenent hairs borne on onychium, a pair each side of claw base. Last segment of palpus definitely thicker than long; terminal sensilla fully one-third longer than thick; dorsal sensilla spindle-shaped; 5 additional setae borne on "thumb." Collar trachea consisting of a straightish tube, ending internally in an oval chamber. Eggs spherical.

Male.—Smaller than female, body from above sagittate in outline. Legs proportionately longer than in female, longer than body to front of cephalo-



Text fig. 21. *Paratetranychus ununguis* (Jac.).—1, tip of palpus of female, lateral view; 2, terminal sensilla of palpus (variant); 3, collar trachea; 4, 5, 7, aedeagus (variants), lateral view; 6, tip of tarsus I of female, lateral view.

thorax. Second segment of palpus dorsally with a hornlike spur; terminal sensilla in shape of an elongated cone. Aedeagus with inner lobe thickening dorsally to point of origin of shaft; basilar lobe dorsal, in shape of a dome-like boss; shaft in profile extending caudad with sub-parallel edges, bending downward nearly 90° from its axis to form the hook which is five-sixths as long as shaft, and is little reduced until near distal end, where it is abruptly narrowed into a very short, thin portion with an obscurely truncate tip.

Type material.—Location unknown.

Type locality.—Dahlem, Germany.

Distribution.—California, Connecticut, Georgia, Germany, Maine, Maryland, North Carolina, Pennsylvania, Sweden.

Food plants.—In Europe from *Picea* sp., other conifers, oak; in the United States from English walnut, maple, oak, *Picea* sp., pine.

PARATETRANYCHUS VIRIDIS (Banks)

Tetranychus viridis Banks, 1894, Amer. Ent. Soc. Trans. 21, 218. *Paratetranychus viridis* (Banks), McGregor, U. S. Nat. Mus. Proc. 56(2303): 671, 672.

Female.—Body from above, oval. Predominating color greenish, deeply pigmented. Thirteen pairs of dorsal body setae, including caudal pair, strongly developed, linear-lanceolate, setose, not arising from tubercles. Dorsal striae on abdomen mostly transverse, excepting whorls around base of sacrales setae. Collar trachea consisting of a straightish tube terminating internally in a somewhat enlarged oval chamber. Mandibular plate not clearly emarginate in front. Legs shorter than body to front of cephalothorax. Last segment of palpus distinctly thicker basally than axial length; terminal sensilla ample, about as thick as long; dorsal sensilla spikelike; 5 additional setae borne on "thumb." Tarsus I dorsally with 2 sets of duplex setae, close together; 4 setae borne proximad of proximal set of duplex setae; onychium bearing a short, simple, sickle-shaped claw from the ventral face of which, one-fourth its length from base, arise 8 slender spines from a common base, exceeding the claw; 4 tenent hairs arising from the onychium, a pair at each side of the claw base. Relative lengths of segments of leg I as follows: Trochanter, 14; femur, 57; patella, 20; tibia, 28; tarsus, 45.

Male.—Much smaller than female. Tarsus I with onychial claw evidently bearing 3 pairs of ventral spines. Aedeagus with inner lobe expanding dorsally to the basilar lobe, which is in the form of a rounded boss; shaft narrowing gradually caudad and bent downward over 90° from its axis to form the hook; hook portion of aedeagus about five-eighths as long as shaft, terminating in a thin, obscurely truncated tip.

Type material.—Location unknown.

Type locality.—Texas.

Distribution.—South Carolina, Texas.

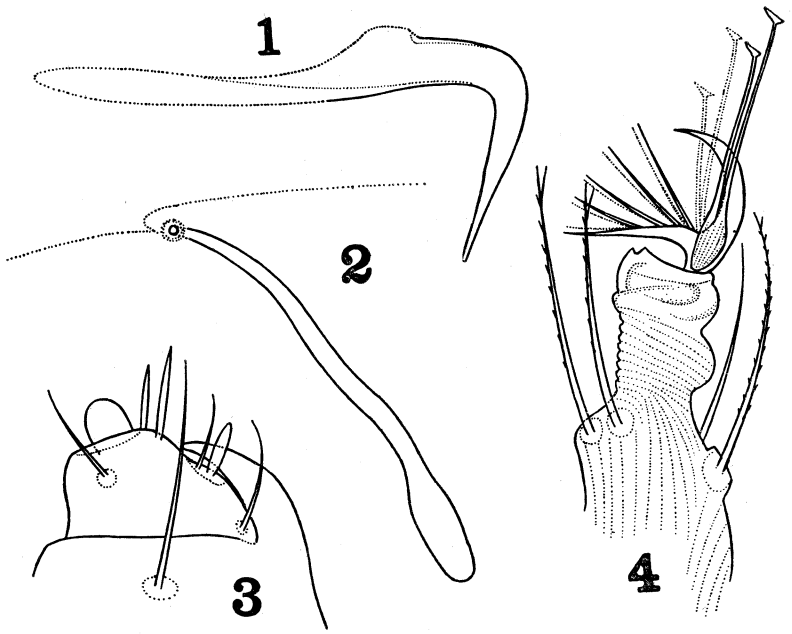
Food plant.—Pecan.

The writer (8) reduced *viridis* to synonymy with *P. simplex* (Banks), but later (24) he restored it to valid specific status.

PARATETRANYCHUS YOTHERSI (McGregor)

Tetranychus yothersi McGregor, 1914, Ent. Soc. Amer. Ann. 7(4): 355-357, pl. 43, figs. 1-8. *Paratetranychus yothersi* (McGregor), 1919, U. S. Nat. Mus. Proc. 56(2303): 676, 677.

Female.—Body from above oval. Color rusty red with a pinkish, shield-shaped area on cephalothorax. One perfect and one imperfect eye cornea each side. Thirteen pairs of dorsal body setae including caudal pair, these well developed, linear-lanceolate, finely setose, not arising from tubercles. Mandibular plate distinctly emarginate in front. All legs shorter than body to front of cephalothorax. Dorsum of abdomen with striae mostly transverse on anterior half, mostly sinuous on posterior half. Collar trachea extending inward as a slightly undulating tube, terminating in an enlarged sub-elliptical chamber. Tarsus I above with 2 sets of duplex setae close together; 5 setae borne proximad of proximal set of duplex setae; onychial claw consisting of a simple, sickle-shaped dorsal element from near whose base ventrally are borne



Text fig. 22. *Paratetranychus yothersi* (McGregor).—1, aedaegus, lateral view; 2, collar trachea; 3, tip of palpus of female, lateral view; 4, tip of tarsus I of female, lateral view.

10 spines (5 pairs) which slightly surpass the main claw; these spines arise from a common base, the proximal pair strongest basally; the usual tenent hairs borne on onychium, a pair each side of claw base. Last segment of palpus only about half as long as greatest thickness; terminal sensilla about as thick as long; dorsal sensilla spindle-shaped; 5 additional setae on "thumb," about as usual. Egg globose-lenticular, bearing a stalk dorsally, the length of which approaches the axial diameter of egg.

Male.—Much smaller than female, legs proportionately longer. Aedeagus with inner lobe expanding somewhat dorsally to point of origin of shaft; basilar lobe dorsal, rather weakly developed; shaft in profile with sub-parallel edges, deflexed sharply more than 90° from general axis of aedeagus to form the hook portion which is longer than shaft, tapering to a thin, unbarbed, obscurely truncate tip.

Type material.—U. S. Nat. Museum No. 19088.

Type locality.—Orlando, Florida.

Distribution.—Florida.

Food plant.—Properly identified specimens known only from *Camphora officinale.*

Genus TETRANYCHINA Banks

Tetranychina Banks, 1917, Ent. New 28, p. 195, pl. 14, fig. 7. *Neophyllobius* (in part), Ewing, 1909, Am. Ent. Soc. Trans. 35, p. 405, pl. 14, fig. 7. *Tenuicrus* Womersley, 1940, Roy. Soc. S. A. Trans. 64(2): 250, fig. 8.

Generic characters.—Body from above subovate, usually (one exception) with long, conspicuous dorsal seate arising from tubercles. Legs, especially forelges, from one-half again to two and one-half times as long as body. Palpi 4-segmented; third segment dorso-terminally with a strong claw; last segment fingerlike, from one to nearly one and one-half times as long as claw, bearing on its distal half a spindle-shaped seta and 5 or 6 additional setae. One or 2 eye corneae each side. Mandibles fused basally into a plate; stylets needlelike, recurved dorso-proximally into a short, stouter arm. Collar trachea (where studied) consisting of an ample, straightish tube which splits at inner end into 2 short, curved segments, not protruding. Tarsi usually somewhat swollen, much shorter than tibiae; onychium bearing a single strong, uncleft claw, curving little for two-thirds its length, bearing along each side a pectinate series of tenent hairs; a pair of longer tenent hairs borne on onychium each side of claw base, each pair fused basally into a stalklike pedicel. Aedeagus (where studied) consisting of a straightish, lanceolate shaft, tapering to a thin, truncate tip.

Genotype.—*Tetranychina apicalis* Banks.

KEY TO SPECIES OF TETRANYCHINA

1. Dorsal body setae (female) inconspicuous, not arising from tubercles, mostly much shorter than interval to base of seta next behind ..... *apicalis* Banks
   Dorsal body setae (female) conspicuous, arising from tubercles, mostly longer than interval to base of seta next behind 2
2. Forelegs of mature female about one-half again as long as body to front of cephalothorax ..... *lupini*, new species
   Forelegs of mature female twice or more as long as body to front of cephalothorax 3
3. Dorsal body setae borne on conspicuous tubercles, slightly thickened at tip; "thumb" of palpus nearly one-half again as long as claw of preceding segment ..... *macdonoughi* McGregor
   Dorsal body setae borne on small tubercles, not thickened at tip; "thumb" of palpus about equaling claw of preceding segment ..... *harti* (Ewing)

TETRANYCHINA APICALIS Banks

Tetranychina apicalis Banks, 1917, Ent. News 28, p. 195, pl. 14, fig. 7.

Female.—Body from above, subovate, widest across main suture, narrowing anteriorly and slightly truncate in front. Dorsum with striae somewhat tortuous, but mostly transverse. One perfect and one imperfect eye cornea each side. Mandibular plate oval, sharply rounded in front. Thirteen pairs of strictly dorsal body setae, 3 pairs on cephalothorax, 10 pairs on abdomen, mostly very inconspicuous, short-lanceolate, blunt tipped, distinctly setose, failing to reach bases of setae next behind, not arising from prominent tubercles. Leg I about one-half again as long as body to front of cephalothorax. Tarsus

I, in fresh material, noticeably swollen toward tip, not bearing long tactile hairs, but with numerous short, lanceolate setae; dorso-terminally with 2 sets of duplex setae, proximate; 15 or 16 setae borne proximad of proximal set of duplex setae; relative lengths of segments of foreleg as follows: (Coxa ?); trochanter, 5; femur, 34; patella, 7; tibia, 34; tarsus, 18. Onychium bearing a single strong claw, straightish for two-thirds its length, a pectinate series of about 12 short tenent hairs borne along each side; 4 longer tenent hairs borne on onychium, a pair each side of claw base at distal end of a clavate pedicel. Claw of palpal tibia strong, reaching about to distal third of last segment of palpus; "thumb" fingerlike, its distal half bearing a spindlelike seta and 6 additional setae. Collar trachea consisting of a straightish, ample tube with inner end split into two short divisions.

Male.—Much smaller than female, legs proportionately longer, forelegs two and two-thirds times as long as body to front of cephalothorax. Segment II of palpus without a horn; onychial claw similar to that of female. Aedeagus with inner lobe expanding somewhat to point of origin of shaft; basilar lobe barely noticeable as an obtuse-angled prominence; shaft lanceolate, tapering gradually distad to the thin, truncate tip, without a barb.

Type material.—U. S. Nat. Museum No. 1742.

Type locality.—St. Bernard, Louisiana.

Distribution.—Georgia, Louisiana.

Food plants.—Clover, pea, vetch.

The above description is based largely on specimens on two slides determined by Banks, and labeled "*T. apicalis,* St. Bernard, La., 3-29-'12, on white clover, T. H. Parks, cotype." Material from localities in Louisiana and Georgia was also studied.

TETRANYCHINA MACDONOUGHI McGregor

Tetranychina macdonoughi McGregor, 1917, U. S. Nat. Museum Proc. 51(2167): 588, 590, pl: 107.

Female.—Color bright ferruginous to orange red. Body from above elliptic-ovate, widest at the middle; cephalothorax truncate in front; abdomen rounded behind. Dorsum with 26 conspicuous setae, longer than intervals to bases of setae next behind, and arranged as follows: One in front each side of rostrum, one over coxa, I, 5 along each lateral margin between legs II and IV, 8 grouped on caudal and subcaudal region, and 4 near middle of abdomen; all dorsal setae filiform to rodlike, appressed setose, tips thickened, arising from prominent tubercles. Mandibular plate subovate, rounded in front. Collar trachea apparently short, and divaricately branched at inner end. One perfect and one imperfect eye cornea over coxa II. Legs long; leg I two and one-half to 3 times as long as body to front of cephalothorax; leg IV nearly as long as leg I; leg II the shortest, a little longer than body. Tarsus I slightly swollen, dorsally with 2 sets of duplex setae close together; 9 setae borne proximad of proximal set of duplex setae; onychium bearing a single, strong claw, hardly curved for three-fourths its length, pectinate along each

side with 10 or 11 short, tenent hairs; on the onychium, each side of claw base, a short pedicel bearing 2 longer tenent hairs. Hairs of legs short, stiff, lanceolate. Relative lengths of segments of leg I as follows: Coxa, ?; trochanter, 4; femur, 35; patella, 5; tibia, 36; tarsus, 16. Palpi stout, third segment dorsally with a strong claw; last segment fingerlike, about 3 times as long as its thickness at middle, its distal half bearing 7 setae, one of which is spindle-shaped.

Male.—Much smaller than female; body from above sagittate; legs proportionately longer than in female. Dorsal body setae short, clavate, setose, shorter than intervals to bases of setae next behind, not arising from prominent tubercles. Second segment of palpus devoid of hornlike spur. Aedeagus similar to that of *T. apicalis,* as figured.

Type material.—U. S. Nat. Museum No. 20168.

Type locality.—Quincy, Florida.

Distribution.—Florida, Georgia, Louisiana, South Carolina.

Food plant.—*Oxalis stricta.*

Tetranychina lupini, new species

Female.—Body from above oval, in profile deepest over coxae IV, somewhat truncate caudally. All legs longer than body, forelegs one-half again as long as body to front of cephalothorax; relative lengths of segments of leg I as follows: Coxa, 5; trochanter, 3; femur, 21; patella, 6; tibia, 22; tarsus, 12. Twenty-six conspicuous dorsal body setae, linear-lanceolate, not thickened distally, coarsely setose, mostly arising from prominent tubercles, 6 occurring centrally on abdomen. Mandibular plate ovate, half again as long as wide, at front rounded and with many sharp papillae. One perfect and one imperfect eye cornea each side. Collar trachea consisting of an ample, straightish tube which splits at inner end into 2 short, curving tubes. Penultimate segment of palpus with a stout claw; last palpal segment about twice as long as its thickness at middle, bearing 7 setae, one of which is spindle-shaped. Tarsus dorso-distally with 2 sets of duplex setae, proximate; about 13 setae borne proximad of proximal set of duplex setae; onychium bearing a single strong claw, straightish for over half its length, with a pectinate series of 8 to 10 short tenent hairs along each side; onychium bearing 4 longer tenent hairs, a pair each side of claw base fused basally into a pedicel which is nearly half as long as claw. In the immature stages the legs are much shorter proportionately than in the adults.

Male.—Body much smaller and narrower than female. Legs proportionately longer than in female. Dorsal setae shortish, lanceolate, longer than intervals to bases of setae next behind; not arising from prominent tubercles. Aedeagus rather like that of *T. apicalis,* as figured, but distal tip barely truncate.

Type material.—U. S. Nat. Museum No. 1743. Collected by Chas. Henderson, April 9, 1940.

Type locality.—Oxnard, California.

Distribution.—San Francisco to Oxnard, California.

Food plant.—*Lupinus arboreus.*

Tetranychina harti (Ewing), new combination

Neophyllobius harti Ewing, 1909, Amer. Ent. Soc. Trans. 35: 405, 406, pl. 14, fig. 7.

Female.—Body from above oval, two-thirds as broad as long. Twenty-six dorsal body setae, these somewhat rodlike, blunt-tipped, setose, arising from tubercles, longer than intervals to bases of setae next behind. Legs long, forelegs twice as long as body, leg IV about equal to leg I, legs II and III somewhat shorter; relative lengths of segments of forelegs as follows: Coxa ?; trochanter, 4; femur, 42; patella, 5; tibia, 35; tarsus, 18. Legs with short, stiff bristles; tarsi only slightly swollen. Tarsus I with 2 sets of duplex setae, proximate; 17 setae borne proximad of proximal set of duplex setae. (Ewing mentions a shelf-like projection on anterior part of body, partly concealing the rostrum. It is quite possible that this structure was the mandibular plate.) Penultimate segment of palpus with a strong claw dorso-terminally, about equaling the terminal segment; "thumb" of palpus subcylindrical, bearing on distal half a spindle-shaped seta, and 5 additional setae. Male not known.

Type material.—In the collection of H. E. Ewing.

Type locality.—Carbondale, Illinois.

Distribution.—Illinois; Virginia.

Food plants.—Clover, moss.

The above description of *T. harti* is based on Ewing's original description, and on two females on a slide from the U. S. Nat. Museum, identified as this species, from clover, Vienna, Virginia, January 31, 1927, W. W. Davidson, collector.

Genus PETROBIA Murray

Petrobia Murray, 1877, Econ. Entom. Aptera I: 118.

Generic characters. Female.—Body from above oval. Cephalothorax anteriorly devoid of a free, projecting plate. Dorsum of body with 26 lanceolate, setose setae, all distinctly shorter than intervals to setae next behind (6 of them on cephalothorax). Dorsal integument on cephalothorax with striae mostly longitudinal; striae on abdomen mostly transverse, except near margin. A perfect and an imperfect eye cornea each side. Forelegs much the longest, longer than body. Palpus 4-segmented; penultimate segment dorsally with a stout claw; last segment subcylindrical, bearing 7 setae subdistally, one of which is clavate. Frontal tracheae protruding teatlike. Tarsi I as long or longer than tibiae I; onychium bearing a single claw with a pectinate series of tenent hairs along each of its sides; 4 long tenent hairs borne on onychium.

Genotype.—*Petrobia latens* (Müller).

PETROBIA LATENS (Müller)

Acarus latens Müller, 1776, Zool. Dan. Prodr. N. 2233, p. 187. *Trobidium lapidum* Hammer (in Hermann), 1804, Mem. Apt. no. 36, t. 7, f. 7, 8, R. S. *Tetranychus longipes* Banks, 1912, Ent. Soc. Wash. Proc. 14: 97, pl. 1, fig. 9. *Tetranobia decepta* Banks, 1917, Ent. News 28. 194, pl. 15, fig. 15, pl. 16, fig. 3. *Tetranychina tritici* Ewing, 1921, U. S. Nat. Museum 59(2394): 665, 666. pl. 125, figs. 8, 9.

Female.—Body from above oval. Dorsal integument on cephalothorax with striae mostly longitudinal; striae on abdomen transverse, except near lateral margin. Dorsum of body with 26 rodlike to lanceolate, setose setae, all distinctly shorter than intervals to bases of setae next behind (6 on cephalothorax, 20 on abdomen). One perfect and one imperfect eye cornea each side. Frontal tracheae protruding externally udderlike. Mandibular plate oval, rounded in front. Forelegs much the longest, longer than body. Tarsus I about as long as tibia I; dorsally with 2 sets of duplex setae close together; 12 setae borne proximad of proximal set of duplex setae; onychium bearing a single claw, curved mainly near tip, with a pectinate series of tenent hairs along each side (about 5 hairs in each series on claw I, more hairs on claws III and IV); 4 longer tenent hairs borne on onychium, a pair each side of claw, fused basally into a pedestal. Palpus 4-segmented; penultimate segment dorsally with a stout claw reaching nearly to tip of "thumb"; last segment subcylindrical, 7 setae on its distal third, one of them clavate.

Male not known.

Type material.—Location unknown.

Type locality.—Denmark?

Distribution.—Europe; Arizona, California, Idaho, Kansas, New Mexico, New York, Oklahoma, Oregon, Puerto Rico, Texas, Utah, Virginia, Washington.

Food plants.—Alfalfa, barley, burr-clover, gladiola, grass, in house, *Iris*, moss, rye-grass, sorghum, wheat, wild onion.

This mite has been reported on several occasions to have caused severe damage to wheat.

Müller's (25) original description of *Acarus latens* was limited to eight words in Latin. For this reason, Geijskes (9) decided to ignore Müller's species, and he redescribed it as *Petrobia lapidum*. Since only a single species has been recorded from Europe, and all specimens studied by the writer have conformed sufficiently to Geijskes' figures and description, it is considered best to restore Müller's original species name.

Genus BRYOBIA Koch

Bryobia Koch, *In* Panzer, 1835, Ins. Germ., Heft 133, tab. 9.

Generic characters.—Body broadly oval, somewhat flattened above, truncate caudally. Dorsal integument with striations very irregular. Cephalothorax anteriorly with a projecting, free plate provided with 4 well defined lobes, each bearing a leaflike seta. Mandibular stylets needlelike, reflexed

upward and forward behind. Body above with 28 spatulate to leaflike, serrate setae, 4 on the cephalothorax proper, 24 on the abdomen; 22 of these are around the margin, 6 are submedian. Forelegs conspicuously longer than the others, as long or longer than body. All tarsi with 2 strong claws; claw of legs I each bearing 2 long tenent hairs, a median pulvillus bearing 2 similar hairs also present; pulvillus of other legs each with 2 pectinate series of tenent hairs. Palpus 4-segmented; penultimate segment dorsally with a strong claw; last segment of palpus subtended from preceding segment. Frontal tracheae protruding externally as teatlike tubes. Aedeagus (according to Geijskes (9)) lanceolate, slender, attenuate to a fine tip.

Genotype.—(*Bryobia speciosa* Koch) = *Bryobia praetiosa* Koch.

BRYOBIA PRAETIOSA Koch

Bryobia praetiosa Koch, 1836, Deutsche. Crust. Myr. Arachn. 1(8). *Bryobia speciosa* Koch, 1838, Deutsche. Crust. Myr. Arachn., Fasc. 17, t. 10. *Bryobia pratensis* Garman, 1885, 14th Rept. State Ill. 73, 74, pl. 6. *Bryobia brevicornis* Ewing, 1921, U. S. Nat. Museum Proc. 59(2394): 662, pl. 125, fig. 3. *Bryobia longicornis* Ewing, 1921, loc. cit. 662, pl. 125, fig. 4.

Female.—Color reddish-brown to darker, at times with a greenish tinge. Body from above broadly oval, somewhat flattened dorsally, noticeably truncate caudally. Striations on dorsum irregularly tortuous. Body proper above with 14 pairs of spatulate to foliaceous setae; 2 each side submarginally behind coxae II; 8 each side near margin of abdomen from humeral angle to caudal end; a transverse series of 4 setae just behind main dorsal suture; 2 pairs of submedian setae near center of abdomen. Cephalothorax anteriorly bearing a free plate between coxae I, which is distinctly 4-lobed, each lobe distally bearing a foliaceous seta. Two eye corneae each side over and behind coxae II. Frontal tracheae terminating externally in teatlike tubes. Mandibular plate obovate, somewhat notched in front. Forelegs as long as, or longer than, body; other legs shorter than body, legs II the shortest; setae of legs from linear-lanceolate to serrate-clavate. All tarsi bearing 2 strong claws. Tarsus I dorsally with 2 sets of duplex setae, proximate. Seventeen or 18 setae borne proximad of proximal set of duplex setae. Onychium I with a long tenent hair borne each side near middle of each claw; a median pulvillus bearing 2 similar hairs. Tarsi II-IV each with pulvillus bearing pectinate series of tenent hairs. Last segment of palpus borne ventrally from preceding segment which bears a stout claw dorso-terminally; "thumb" subcylindrical, bearing apically a stout, lanceolate seta, and 6 additional setae on its distal half. Relative lengths of segments of legs I as follows: Trochanter, 6; femur, 29; patella, 11; tibia, 22; tarsus, 16.

The larval stage differs from the adult female as follows: The dorsal body setae are not leaflike, but are lanceolate to clavate, and conspicuously setose; the protruding tracheae are bosslike; the free, cephalothoracic plate is lacking, but is replaced by 4 rounded protuberances, each bearing a lanceolate, pilose seta.

Egg globular, red.

The male has not been studied, and is probably of seasonal occurrence.

Type material.—Location unknown.

Type locality.—Unknown.

Distribution.—A cosmopolitan species. Occurring throughout the United States.

Food plants.—Recorded by the writer in America from apple, barley, burr-clover, cantaloupe, *Capsella* sp., cherry, citrus, clover, flax, grain, grass, host?, in house, *Iris* sp., *Malva* sp., mustard, *Narcissus* sp., orange, peach, pear, *Picea engelmani,* prune, sweet pea, sycamore, walnut, weeds, wheat, wild oat.

Pseudobryobia, new genus

Body from above oval, cephalothorax and abdomen separated by a suture. A narrow, semihyaline plate, indistinctly lobed, projecting from front of body between mandibular plate and rostrum, overlying rostrum and coxae I and II, not bearing setae. Mandibles fused basally into a plate; distal portion consisting of two needlelike stylets, reflexed basally, retractile. Rostrum rather prominent, barrel-shaped, bearing distally the inconspicuous palpi which appear to be 4-segmented, the last segment subtended from preceding segment. Forelegs barely exceeding body to front of cephalothorax, other legs somewhat shorter. One perfect eye cornea each side. Collar trachea consisting of a straightish tube, enlarging at inner end and appearing somewhat septate or lobed; not protruding externally. Tarsus bearing two claws, each of which bears a pair of knobbed tenent hairs; a pulvillus arising from the onychium, between claws, and bearing two tenent hairs. Dorsum of body with numerous short setae; integument striated.

Genotype.—*Pseudobryobia bakeri,* new species.

Pseudobryobia bakeri, new species

Female.—Body from above ovate, about one-third longer than wide; a suture present between cephalothorax and abdomen. Dorsum of cephalothorax finely reticulated, the areolae longitudinal; dorsal integument of abdomen with coarser transverse striae. Forelegs barely exceeding body to front of cephalothorax, other legs somewhat shorter. Rostrum rather prominent, barrel-shaped, bearing the small palpi distally. A narrow, semihyaline plate projecting from front of body between rostrum and mandibular plate, overlying the rostrum and coxae I and II, indistinctly lobed and devoid of setae. Sixteen pairs of dorsal body setae, widely lanceolate to clavate, coarsely setose, all much shorter than interval to nearest seta, distributed as follows: Four at frontal margin over mandibular plate, one over base of coxae II, one between the latter and humeral angle of abdomen, a transverse series of four close behind main suture, one in front of trochanters III, a transverse series of four between coxae IV, one behind coxae IV, a circle of 8 overlying the genital area, two within this circle, a pair near caudal margin. Tarsus I with two sets of duplex setae, proximate; a few other simple hairs near tip of segment; 20

setae borne proximad of proximal set of duplex setae, these widely lanceolate to linear-lanceolate, coarsely setose, mostly shorter than interval to seta next in line. Relative lengths of segments of foreleg as follows: Coxa, 11; trochanter, 8; femur, 43; patella, 21; tibia, 31; tarsus, 30. Tarsus with onychium bearing two sickle-shaped claws; a pair of tenent hairs borne on each claw about one-third its length from base; on the onychium between claws, a weak pulvillus which bears two tenent hairs. Palpi evidently composed of four segments, the last segment subtended from the preceding segment, the latter bearing a very stout claw; terminal and dorsal sensillae of "thumb" naillike; five additional setae on this segment. Collar trachea consisting of a straightish tube, enlarging at inner end and evidently septate; not protruding externally. Mandibular plate widely elliptical, barely notched in front. One perfect eye cornea each side over base of coxae II. Ventrally the anal plate is bordered each side by 5 setae; the genital plate bears a transverse series of four similar setae.

Type material.—U. S. Nat. Museum No. 1744.

Type locality.—Near Pass at about 12,000 ft. alt., Mt. Pococatapetl, Mexico.

Distribution.—Known only from type locality.

Food plant.—Unknown. Collected in lichens on trunk of pine, by E. W. Baker.

E. W. Baker, in correspondence, reported that the type slide of *"Petrobia" drummondi* Ewing bears a single female, from which he made the writer a series of sketches, illustrating the important structural features. Baker believed that *drummondi* belongs in *Pseudobryobia.*

The writer has not had access to Ewing's lone type specimen of *drummondi* reported to be in a somewhat poor state of preservation, but since that species appears to resemble *bakeri,* it is tentatively assigned to that genus. It should be stated that *drummondi* cannot belong in *Petrobia,* which has a single tarsal claw and an externally protruding frontal peritreme; on the other hand, it agrees with *Pseudobryobia* in possessing tarsi with two claws and in not having the peritreme exserted.

Baker's examination of the single type specimen of *drummondi* would seem to reveal the following differences between it and *Pseudobryobia bakeri:*

P. bakeri: A free, narrow, lobed plate overlying rostrum and coxae I and II; palpi borne distally on rostrum; dorsum of cephalothorax areolate; four frontal body setae; two caudal setae; frontal peritremes unbranched at inner end.

P. drummondi: No free plate overlying rostrum and coxae I and II; palpi borne basally on rostrum; dorsum of cephalothorax finely striate; two frontal body setae; four caudal setae; frontal peritremes branched at inner end.

(The following description of *P. drummondi* (Ewing) is based on Baker's description of the type specimen, as reported in correspondence.)

Pseudobryobia drummondi (Ewing), new combination

Petrobia drummondi Ewing, 1926, Ent. News, vol. 37, p. 143.

Female.—Body from above ovate. Legs I a little longer than body to front of cephalothorax; other legs somewhat shorter. Dorsum of cephalothorax very finely striated longitudinally; dorsum of abdomen mostly transversely striate. Fifteen pairs of dorsal body setae, these mostly shorter than interval to nearest seta; distributed about as in *P. bakeri* (as figured) except that there are only two frontal setae and four caudal setae; all dorsal setae thickly linear from numerous secondary spines. A suture present between cephalothorax and abdomen. Palpi evidently 4-segmented, arising from near base of rostrum; last segment subtended from preceding segment which ends above in a strong hook. Mandibular plate ovate, rounded in front. Frontal peritremes branching terminally. Evidently two eye corneae each side. Hairs on legs short, some serrate, others entire. Tip of tarsus I bearing two claws, each with two tenent hairs; other appendages similar to those of *P. bakeri* (as figured).

Type material.—U. S. Nat. Museum No. 958.

Type locality.—Death Valley, California.

Distribution.—Known only from type locality.

Food plant.—Greasewood (*Larrea tridentata*).

Genus TUCKERELLA Womersley

Tuckerella Womersley, 1940, Roy. Soc. South Austral. Trans. 64(2): 244-246, fig. 5.

Generic characters.—Body from above elongate-oval, divided by sutures into propodosoma, metapodosoma and opisthosoma. Dorsum reticulated. Rostrum and palpi elongate. Mandibular stylets needlelike, recurved basally. Palpi 4-segmented, third segment with a strong claw nearly equaling the last segment which is deflexed from the preceding segment, is cylindrical and bears 5 setae. A domelike plate projecting from front of cephalothorax. Frontal tracheae protruding externally as long tubes. Two eye corneae each side. Body dorsally and lateraly bearing fanlike setae; caudally with 12 whiplike hairs. Onychium bearing 2 stout claws, each with pectinate series of tenent hairs; a median pulvillus with paired series of tenent hairs.

Genotype. — (*Tenuipalpus ornatus* Tucker) = *Tuckerella pavoniformis* (Ewing).

Tuckerella pavoniformis (Ewing), new combination

Eupalopsis pavoniformis Ewing, 1922, Ent. Soc. Wash. Proc. 24(4): 106, 107. *Tenuipalpus ornatus* Tucker, 1926, Union of So. Afr. Dept. Agr. Div. Ent. Mem. 5: 4-5, pl. II. *Tuckerella ornatus* (Tucker), Womersley, 1940, Roy. Soc. So. Austral. Trans. 64: 244-246.

Female.—Body from above elongate-oval, with 2 dorsal sutures dividing body into propodosoma, metapodosoma and opisthosoma; caudal end truncate. Dorsum coarsely reticulated. Rostrum narrow, elongate, surpassing the

palpi. Palpi conspicuous. Mandibles fused basally into the mandibular plate; distally in the form of needlelike stylets which are recurved basally. A domelike structure projecting over rostrum and palpi from front of body. Humeral tracheae protruding as long, narrow tubes, bending laterally over legs I. Two eye cornea each side, the hind one largest. Body dorsally and laterally bearing 22 pairs of conspicuous, foliaceous to fan-shaped setae, distributed as follows: A pair on front margin of cephalothorax, one submedially each side of mandibular plate, 6 in a transverse series behind first suture, 6 transversely behind second suture, a circle of 8 over and around genital region, 10 along each lateral margin between legs I and caudal end. A series of 12 whiplike, setose hairs, nearly as long as body, borne on caudal end of body, on small tubercles; in addition, a small foliaceous seta between the second and third whiplike hairs each side of this series. Legs short and stubby; all segments except tarsi bearing conspicuous, foliaceous setae. Tarsus bearing two stout claws between which is a pulvillus; pectinate series of tenent hairs borne along base of claw and on the pulvillus (the latter not shown in the figure). Tarsus I dorsally, not far from tip, bearing a blunt, fingerlike seta; duplex setae lacking. Palpi seemingly 4-segmented; third segment produced into a strong claw; last segment subtended from preceding segment, cylindrical, 4 times as long as thick, slightly exceeding claw, bearing 2 naillike setae terminally and about 3 additional setae on its distal half. Venter with anal plate bordered by 3 setae each side.

Type material.—U. S. Nat. Museum No. 24721.

Type locality.—Hawaii.

Distribution.—Hawaii, New South Wales, South Africa, also intercepted at Los Angeles, Calif.

Food plants.—Citrus, Eucalyptus, Hibiscus, pine, privet.

This unique mite resembles *Tenuipalpus* and *Brevipalpus* in the structure of the tarsal appendages, and in the stubby legs; it resembles *Bryobia* and *Petrobia* in the external peritremes, but is very distinct from these genera in other respects. The protruding frontal tracheae evidently were overlooked by Ewing, Tucker, and Womersley.

Genus MONOCERONYCHUS McGregor

Monoceronychus McGregor, 1945, Ent. Soc. Wash. Proc. 47(4): 100-102, pl. 11.

Body from above subelliptic, twice as long as wide. Dorsal integument of cephalothorax inconspicuously pebbled and with fine, obscure, mostly longitudinal striae; a band across middle of body with coarse, transverse striations; dorsum of abdomen with integument like that of cephalothorax. Twenty-four dorsal body setae, including 6 on caudal margin, these all spatulate-foliaceous. Two eye corneae each side. Anterior margin of body with a median fingerlike process, and laterad of this each side with a strong tubercle, bearing a foliaceous seta. Legs I longest, but much shorter than body; tarsus I shorter than preceding segment. Tarsi devoid of true claws; onychium bearing 2 pairs of tenent hairs and medially a pulvillus with 2 pectinate series of shorter tenent hairs.

Palpus evidently 4-segmented, the last segment forming a "thumb" to the preceding segment which is produced into a strong claw. Mandibles fused basally into a plate; stylets needlelike, recurved basally. Collar tracheae not protruding externally. Anus ventral, near caudal end; female genital opening just in front of anus.

Genotype.—Monoceronychus californicus McGregor.

MONOCERONYCHUS CALIFORNICUS McGregor

Monoceronychus californicus McGregor, 1945, Ent. Soc. Wash. Proc. 47(4): 100-102, pl. 11.

Female.—Length, 0.33 mm. Much flattened mites, elongate-elliptical in outline, length to front of cephalothorax fully twice as great as width. Two eye corneae each side even with coxae II. Mandibular plate subrectangular, tapering slightly in front to a notched tip. Cephalothorax between one-third and one-half as long as body, separated from abdomen by a suture. Dorsal integument of cephalothorax somewhat pebbled, and with obscure, mostly longitudinal striae; a zone of coarse, transverse striations across body behind main suture; dorsum of abdomen with integument similar to that of cephalothorax. Twenty-four spatulate-foliaceous dorsal body setae, including 6 on caudal margin, distributed as follows: A pair on frontal margin over bases of palpi, one each over trochanters II, one behind eyes, a transverse series of 4 behind the main suture, a transverse series of 4 between legs III and IV, a series of 4 even with the middle of legs IV, and 6 along caudal margin; all dorsal setae arising from small tubercles; much shorter than interval to nearest seta. The front margin of cephalothorax abnormal in that it bears medially a projecting, free, fingerlike process, this flanked on each side by a strong marginal tubercle bearing an ample, feather- or scalelike seta. Legs I longest, but only about four-sevenths as long as body; other legs subequal, short; femur of leg I the longest segment, tarsus I somewhat shorter than tibia. Tip of tarsus devoid of true claws, bearing 2 pairs of tenent hairs, arising basally from bladelike structures between which is a pulvillus bearing paired series of shorter tenent hairs. Tarsus I dorsoterminally with 2 sets of duplex setae, proximate, the longer of each pair longer than the tarsi; 6 setae borne on tarsus I proximad of proximal set of duplex setae. Relative lengths of segments of forelegs as follows: Coxa, 15; trochanter, 9; femur, 36; patella, 14; tibia, 18; tarsus, 15. Many of the setae on legs borne on small tubercles. The collar trachea apparently a narrow, straightish tube, non-reflexed and barely swollen at inner end. Palpi evidently of 4 segments, the first bearing dorsally a strong, ciliate seta; the third segment produced apically into a strong claw, barely as long as the last segment; "thumb" subtended from preceding segment, bearing about 7 needlelike setae. Venter of rostrum with a pair of simple hairs anteriorly, and a similar pair of hairs below coxae I.

Male.—Body outline resembling that of female. All setae of legs apparently nonfoliaceous. Second segment of palpus lacking the hornlike spur, but with a plumose seta. Aedeagus with basal portion cylindrical, tapering caudad

to form the styliform, pointed distal portion.

Type material.—U. S. Nat. Museum No. 1466.

Type locality.—Laguna Beach, California.

Distribution.[4]—Laguna Beach, Palm Canyon, Santa Ysabel, Yokohl Valley, California.

Food plants.—Bermuda grass, salt grass.

Allochaetophora, new genus

Body elongate, from above narrowly elliptical. Dorsal integument with striations mostly longitudinal. A suture separating cephalothorax from abdomen, situated about one-third distance from front of cephalothorax to caudal margin. Legs I and II very widely separated from legs III and IV. Rostrum long, slender, reaching almost to middle of patellae I. Palpi small, borne on distal third of rostrum, evidently 5-segmented; fourth segment with a claw dorso-terminally; last segment forming a "thumb" to the preceding segment, bearing about 7 setae. Mandibular stylets filiform, first extending backward, then looping forward. A perfect eye cornea each side over coxae II. Dorsally, near front of cephalothorax is a rather deep, transverse invagination, nearly surrounded by tracheal tubes. Legs all much shorter than body. Tarsus with onychium bearing a pair of comblike structures, each consisting of a blade bearing a pectinate series of short tenent hairs; between these a pulvillus of similar structure, bearing two pectinate rows of tenent hairs. Tarsi bearing several dichotomous setae. Caudal portion of abdomen also bearing similar setae. Anal plate terminal; genital plate just cephalad of anal plate.

Genotype.—Allochaetophora californica, new species.

Allochaetophora californica, new species

Female.—Body elongate, narrowly elliptical from above. Legs much shorter than body, stubby, legs I-II remote from legs III-IV. Dorsal body integument with striations mostly longitudinal. Cephalothorax and abdomen separated by a suture situated about one-third distance from anterior to posterior margin of body. Rostrum long, slender, reaching almost to middle of patellae I. Palpi small, arising at a point about one-third caudad from tip of rostrum, evidently 5-segmented; fourth segment produced dorsally as a claw, reaching nearly to tip of last segment which forms a "thumb" to the penultimate segment; "thumb" cylindrical, bearing terminally 2 nail-shaped setae, and with 5 additional setae on distal half. Mandibular stylets filiform, first directed backward, then looping forward and protruding free. A perfect eye cornea each side over coxa II. Anteriorly a fleshy fold separated from cephalothorax by a groovelike invagination; 2 frontal tracheal tubes circumscribing this fold. Numerous longish hairs on body and legs (arrangement of dorsal

4 The specimens from Palm Canyon and Santa Ysabel differ somewhat from the type material in that the dorsal body setae are less foliaceous. It is considered best, however, to refer all to one species.

body setae could not be determined). Venter with setae and hairs distributed as follows: On rostrum a short seta each side of oral opening; a pair of long hairs submedially opposite coxae I; a well separated pair of longish hairs midway between coxae II and III; a pair of short submedian setae between trochanters IV; a transverse series of 4 setae at hind border of genital plate; a dichotomous seta each side of anus, and a similar pair on upper caudal margin. Tarsus with several branching setae near tip; tarsus I with 2 spindle-shaped sensillae dorsally on distal half of segment; duplex setae evidently lacking; tarsus II with one of these; onychium bearing a pair of comblike structures, each consisting of a blade bearing a pectinate series of short tenent hairs, a pulvillus between these bearing 2 pectinate series of tenent hairs. Relative lengths of segments of leg I as follows: Coxa, 27; trochanter, 8; femur, 16; patella, 16; tibia, 13; tarsus, 10.

Type material.—U. S. Nat. Museum No. 1438.

Type locality.—Redlands, California.

Distribution.—San Bernardino and Imperial Counties, California.

Food plant.—Bermuda grass.

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All drawings are by the author.

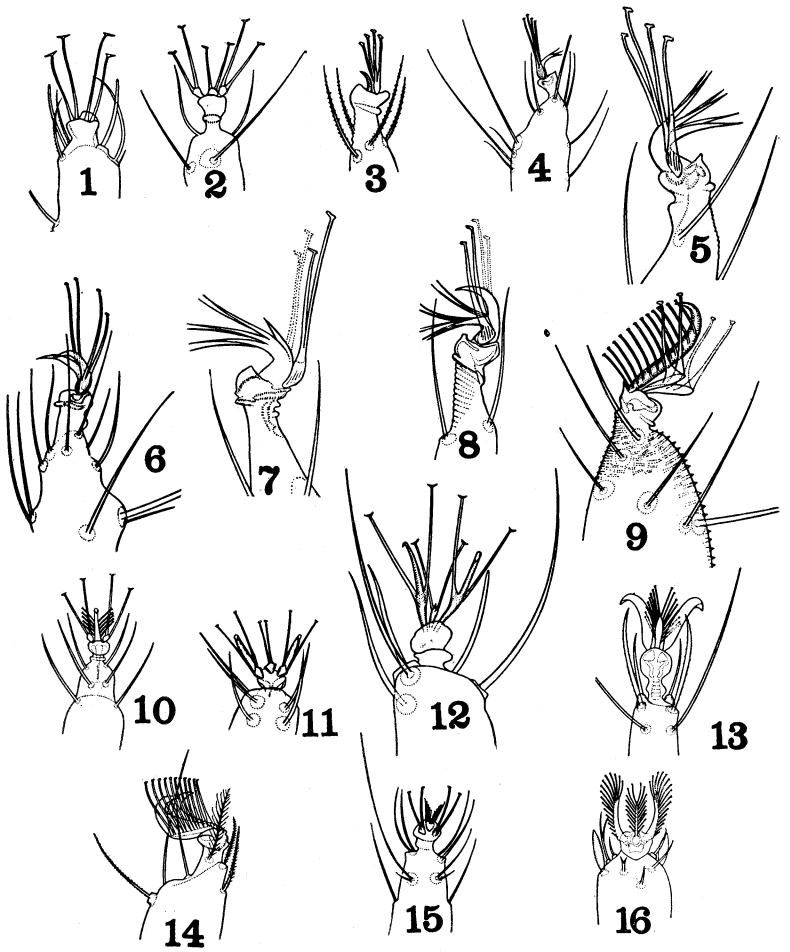

PLATE I. Terminal tarsal appendages (female) of 16 genera of tetranychid mites.—1, Eutetranychus; 2, Hystrichonychus; 3, Simplinychus; 4, Neotetranychus; 5, Tetranychus; 6, Schizotetranychus; 7, Septanychus; 8, Paratetranychus; 9, Tetranychina; 10, Petrobia; 11, Bryobia; 12, Pseudobryobia; 13, Neophyllobius[5]; 14, Tuckerella; 15, Monoceronychus; 16, Allochaetophora.

5 The genus *Neophyllobius* has been removed from the family Tetranychidae. Figure 13, therefore, does not belong in this plate.

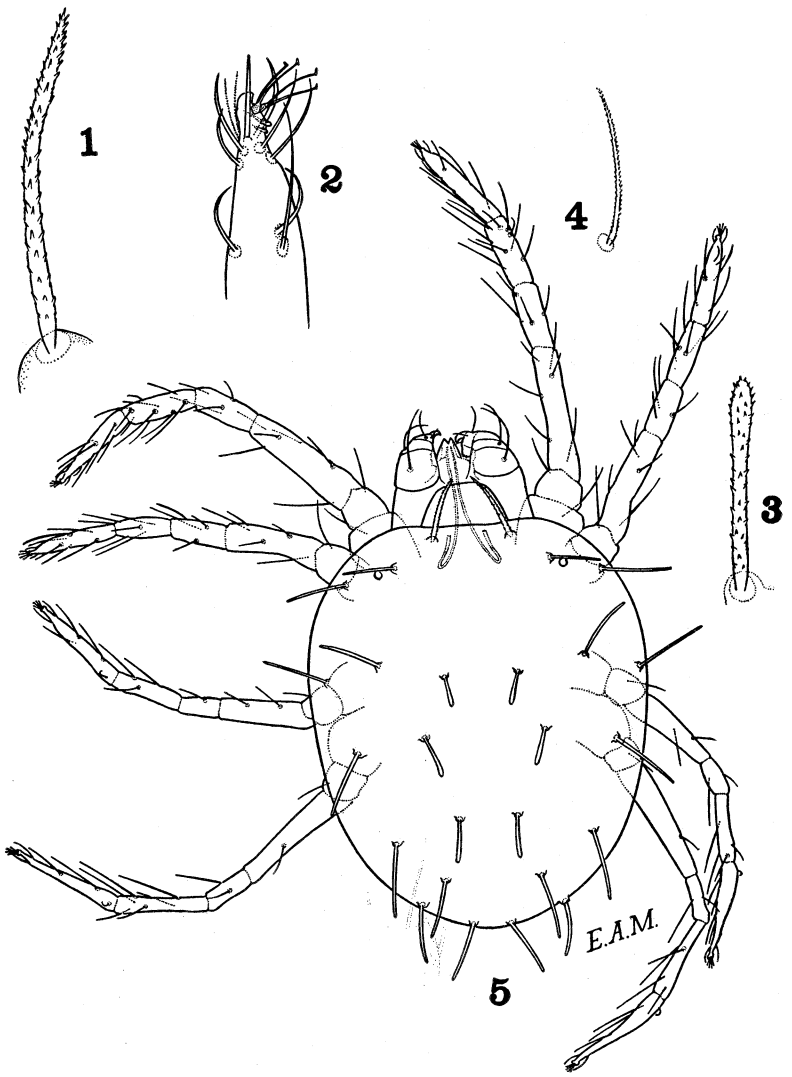

PLATE II. *Eutetranychus mexicanus,* new species.—1, humerales seta over coxa III; 2, tip of tarsus I of female, lateral view; 3, inner lumbales seta; 4, seta of patella II; 5, female mite, dorsal view.

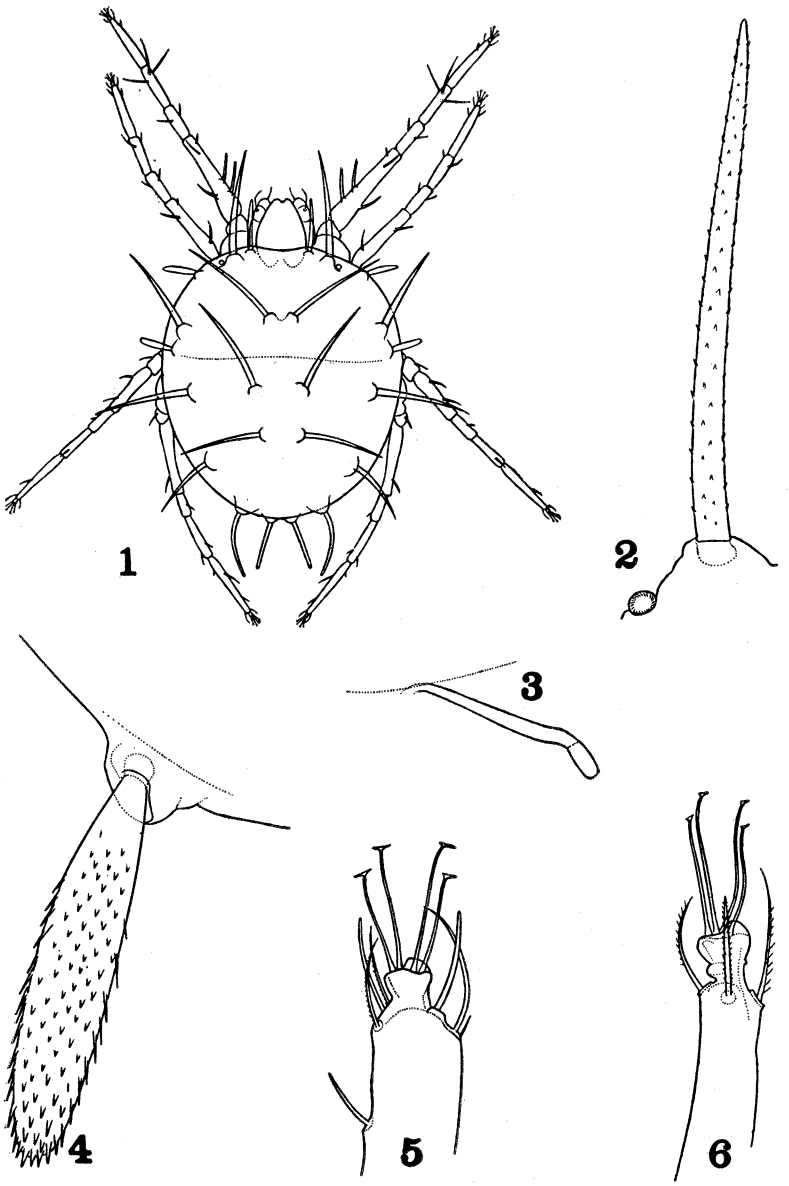

PLATE III. *Eutetranychus spinosa* (Banks).—1, female mite, dorsal view; 2, dorsal body seta; 3, collar trachea; 4, marginal clavate seta; 5, tip of tarsus I, dorsal view; 6, tip of tarsus II, dorsal view.

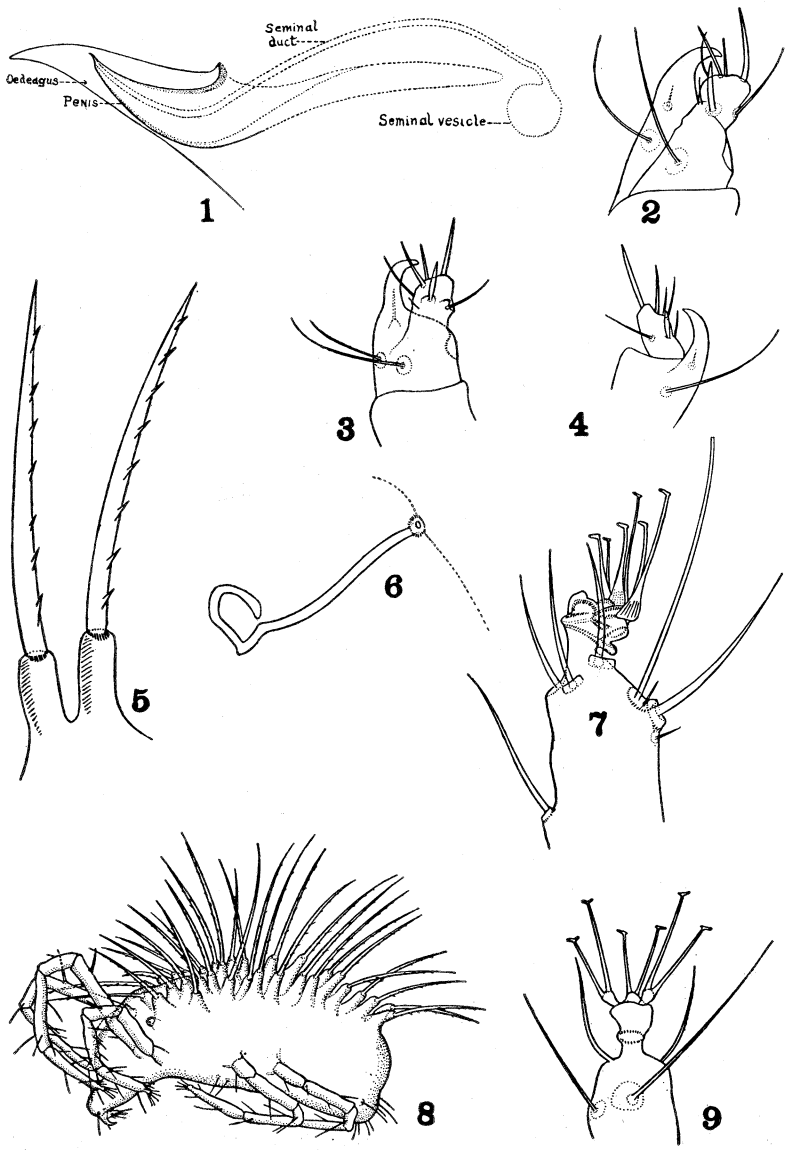

PLATE IV. *Hystrichonychus gracilipes* (Banks).—1, aedeagus and associated organs; 2, 3, 4, tip of palpus (3 localities); 5, two dorsal body setae; 6, collar trachea; 7, tip of tarsus I, lateral view; 8, female mite, lateral view; 9, tip of tarsus, ventral view.

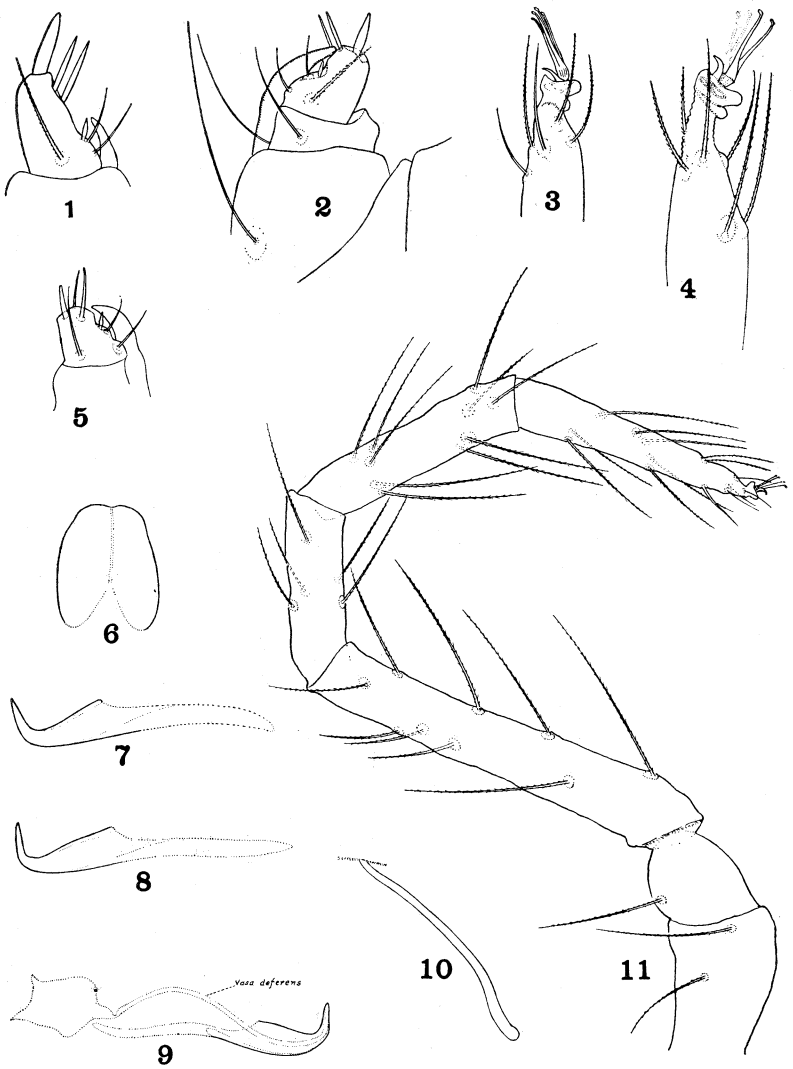

PLATE V. *Simplinychus buxi* (Garman).—1, 2, tip of palpus of female, lateral view; 3, 4, tip of tarsus I, lateral view; 5, tip of palpus of male, lateral view; 6, mandibular plate; 7, 8, 9, aedeagus, lateral view; 10, collar trachea; 11, foreleg of female.

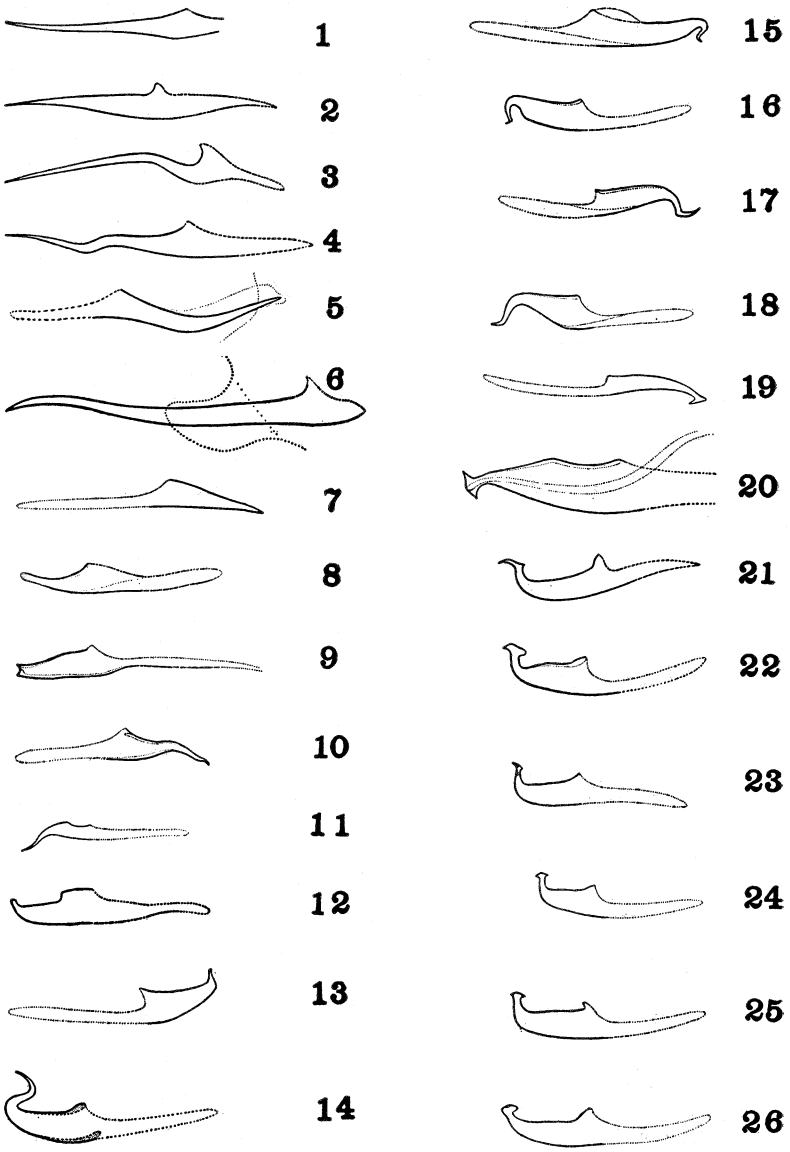

PLATE VI. Aedeagi of 26 species of Tetranychus.—1, *telarius;* 2, *oregonensis;* 3, *monticolus;* 4, *flavus;* 5, *yumensis;* 6, *californicus;* 7, *malvastris;* 8, *thujae;* 9, *libocedri;* 10, *sexmaculatus;* 11, *lewisi;* 12, *ludeni;* 13, *piercei;* 14, *mcdanieli;* 15, *hicoriae;* 16, *pallidus;* 17, *ellipticus;* 18, *deflexus;* 19, *planki;* 20, *perplexus;* 21, *pacificus;* 22, *atlanticus;* 23, *marianae;* 24, *althaeae;* 25, *bimaculatus;* 26, *equatorius.*

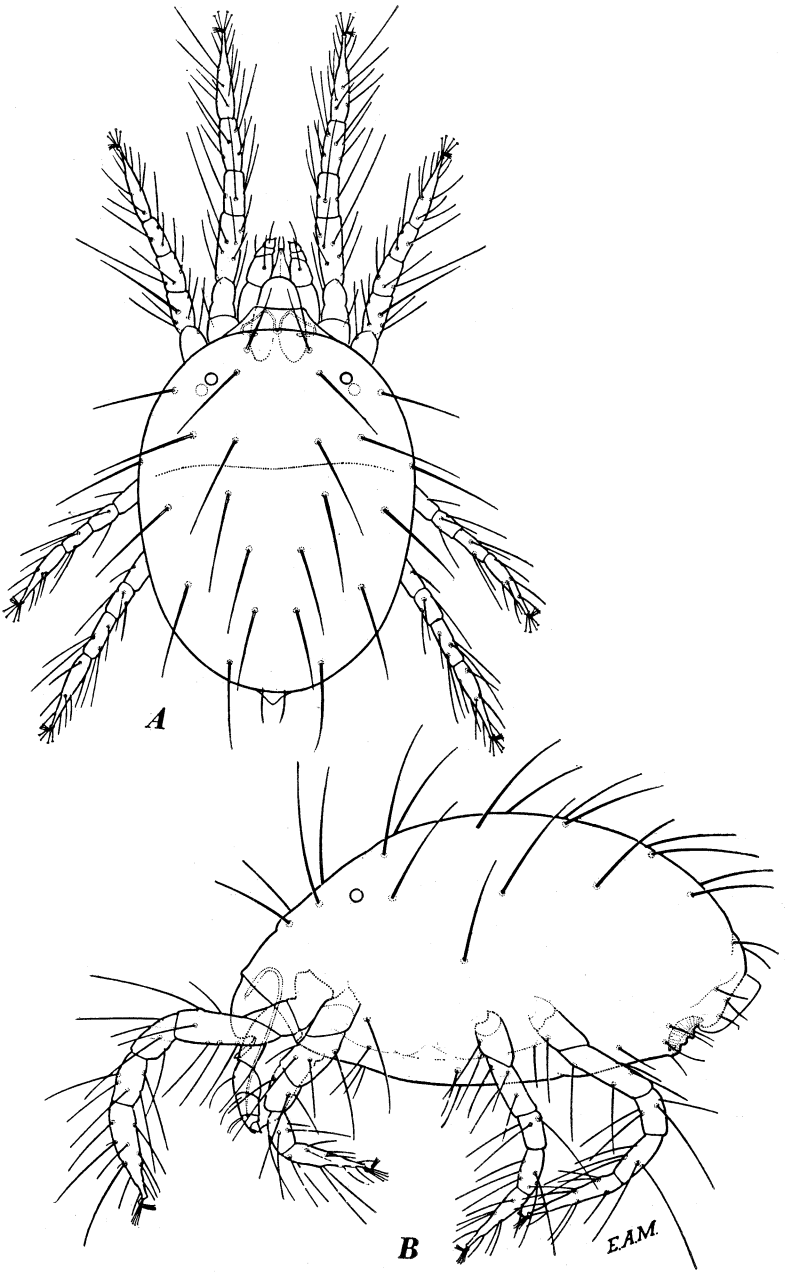

PLATE VII. *Tetranychus bimaculatus* Harvey.—Female mite; A, dorsal view; B, lateral view.

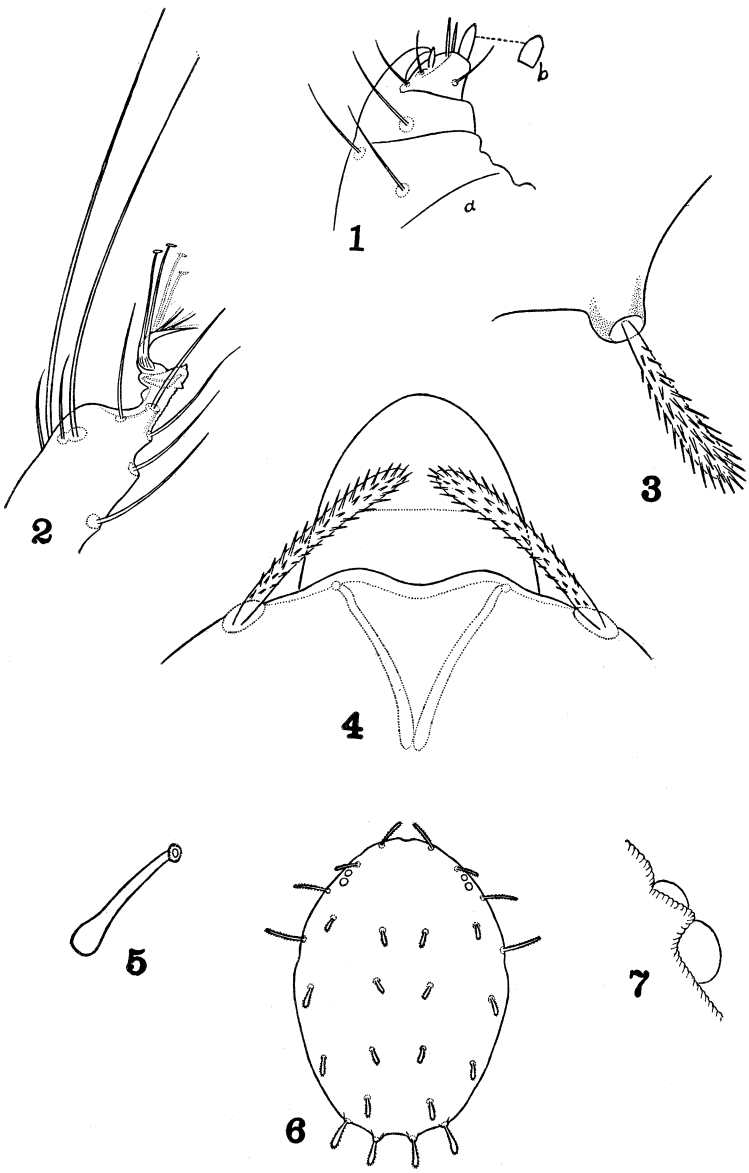

PLATE VIII. *Tetranychus caibbeanae,* new species.—1, tip of palpus of female "a" and "b", variants of terminal sensilla; 2, tip of tarsus I, lateral view; 3, dorsal body seta; 4, frontal setae and portion of mandibular plate; 5, collar trachea; 6, dorsum of female; 7, right eye corneae.

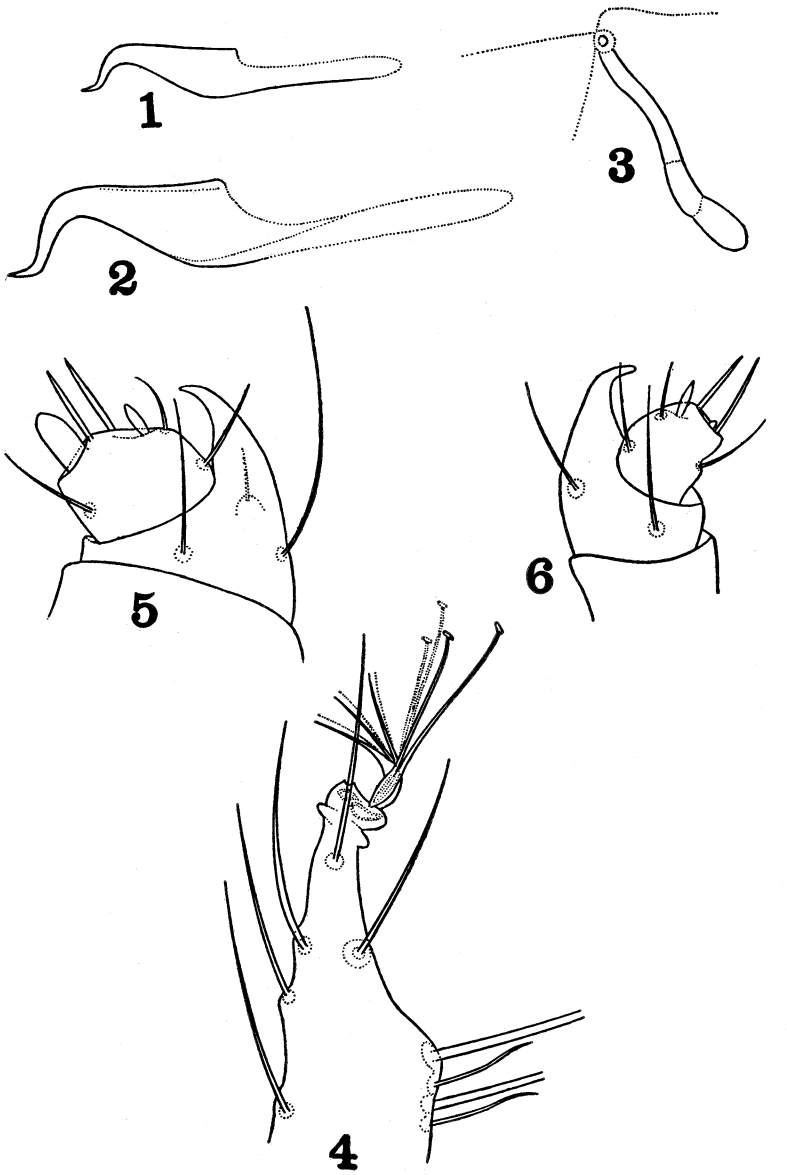

PLATE IX. *Tetranychus deflexus* new species.—1, 2, aedeagus, lateral view; 3, collar trachea; 4, tip of tarsus I, lateral view; 5, tip of palpus of female, lateral view; 6, tip of palpus of male, lateral view.

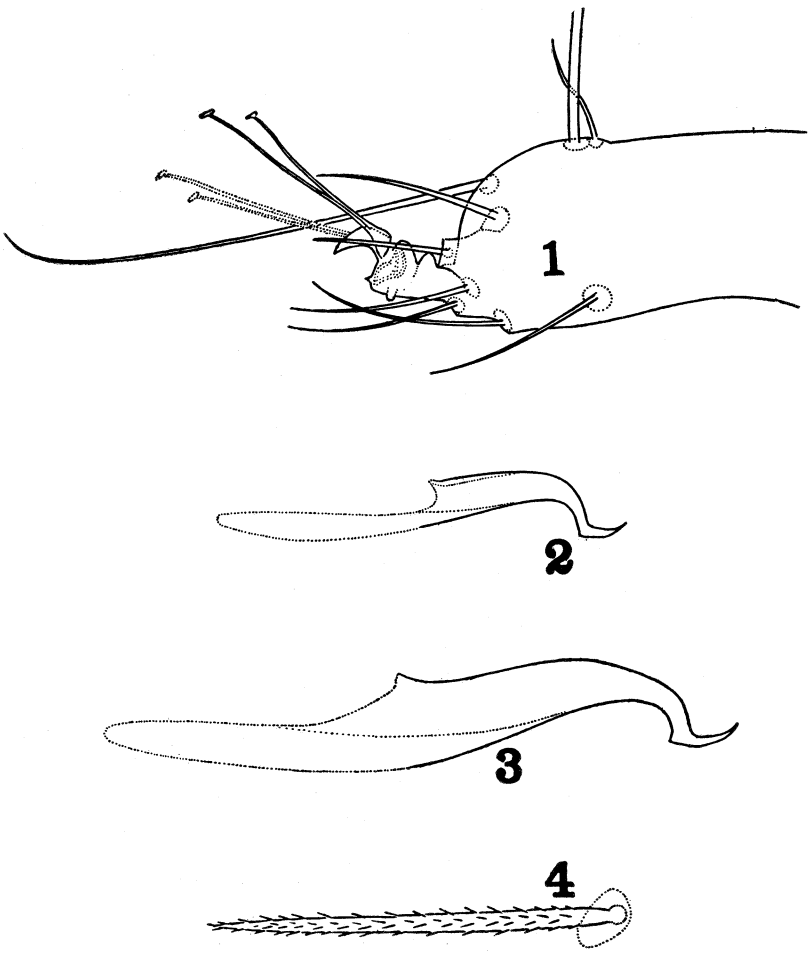

PLATE X. *Tetranychus ellipticus* Garman.—1, tip of tarsus I of male, lateral view; 2, 3, aedeagus, lateral view; 4, dorsal scapular seta.

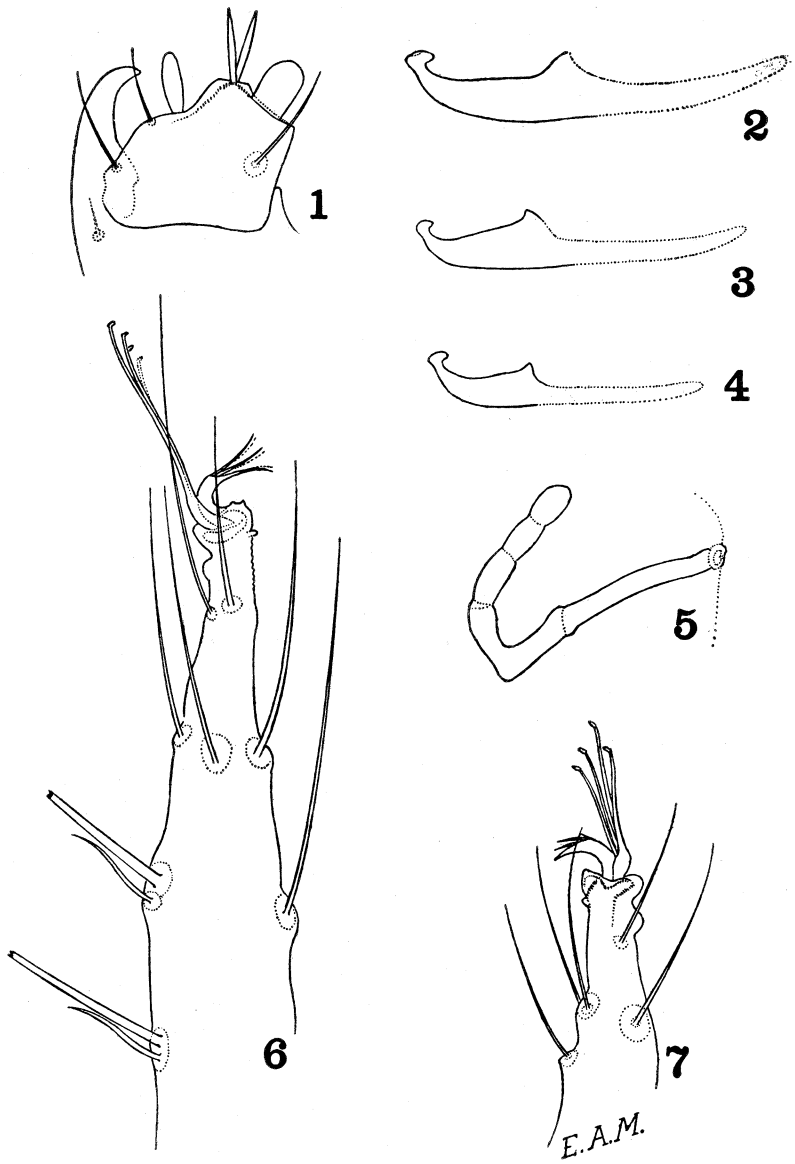

PLATE XI. *Tetranychus equatorius,* new species.—1, tip of palpus of female, lateral view; 2, 3, 4, aedeagus, lateral view; 5, collar trachea; 6, tip of tarsus I of female, lateral view; 7, tip of tarsus I of male, lateral view.

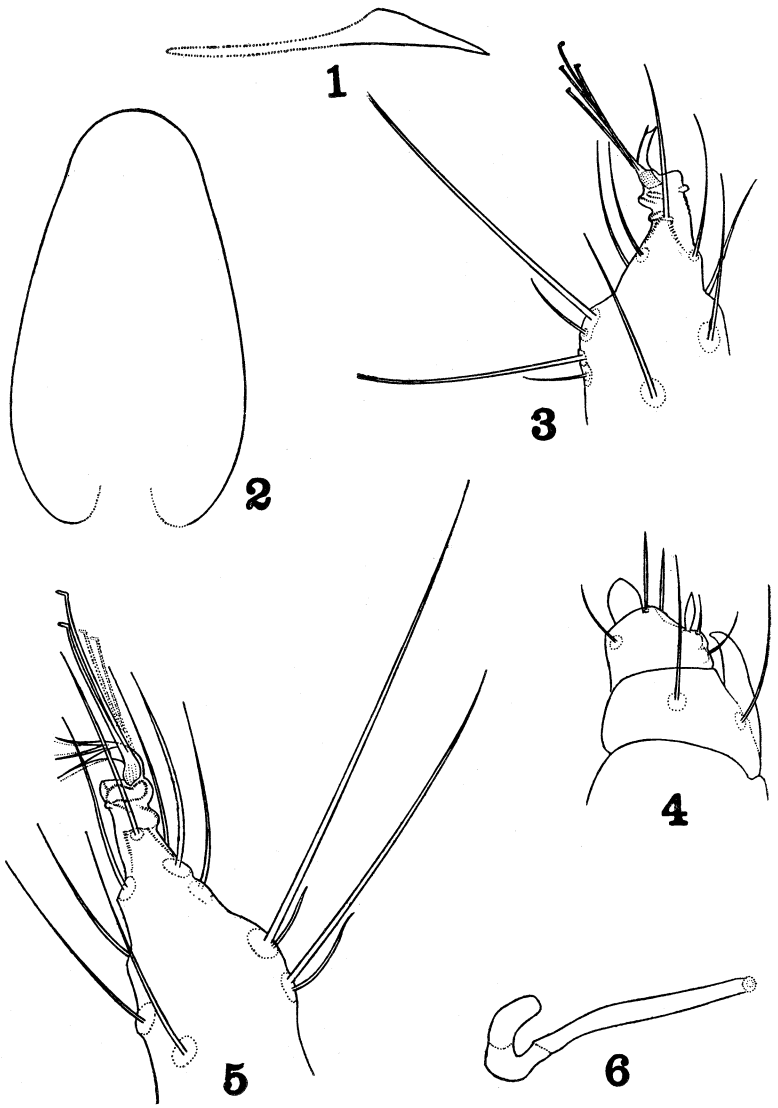

PLATE XII. *Tetranychus malvastris,* new species.—1, aedeagus, lateral view; 2, mandibular plate; 3, tip of tarsus I of male, lateral view; 4, tip of palpus of female, lateral view; 5, tip of tarsus I of female, lateral view; 6, collar trachea.

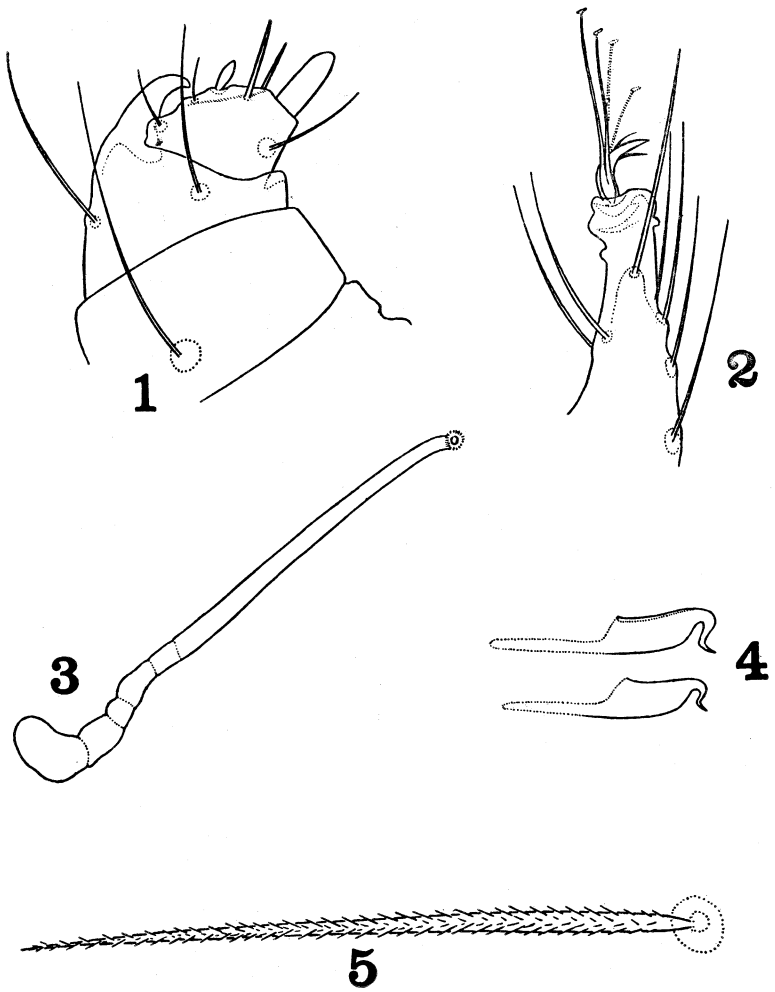

PLATE XIII. *Tetranychus pallidus* Garman.—1, tip of palpus of female, lateral view; 2, tip of tarsus I of male, lateral view; 3, collar trachea; 4, aedeagus, lateral view; 5, dorsal body seta.

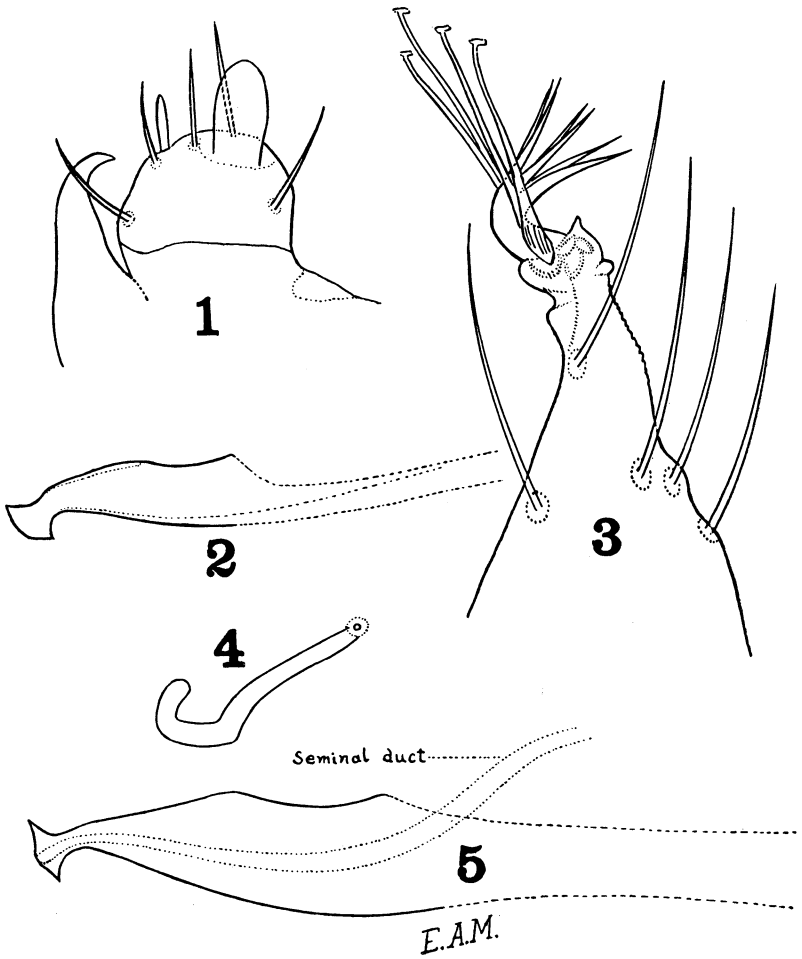

Plate XIV. *Tetranychus perplexus,* new species.—1, tip of palpus of female, lateral view; 2, aedeagus, lateral view; 3, tip of tarsus I of female, lateral view; 4, collar trachea; 5, aedeagus, lateral view.

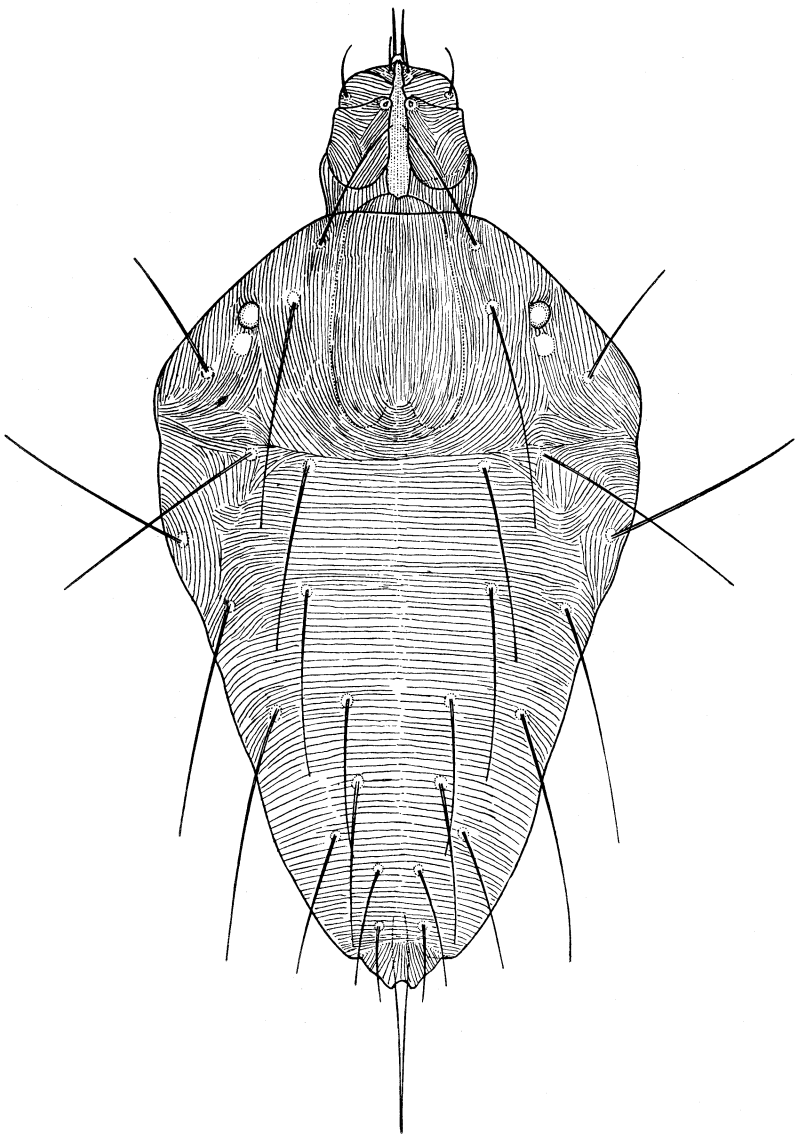

PLATE XV.—Dorsal view of male of *Tetranychus telarius* (Linnaeus) of Europe, showing aedeagus, body setae and striae of palpi, cephalothorax and abdomen (legs not shown).

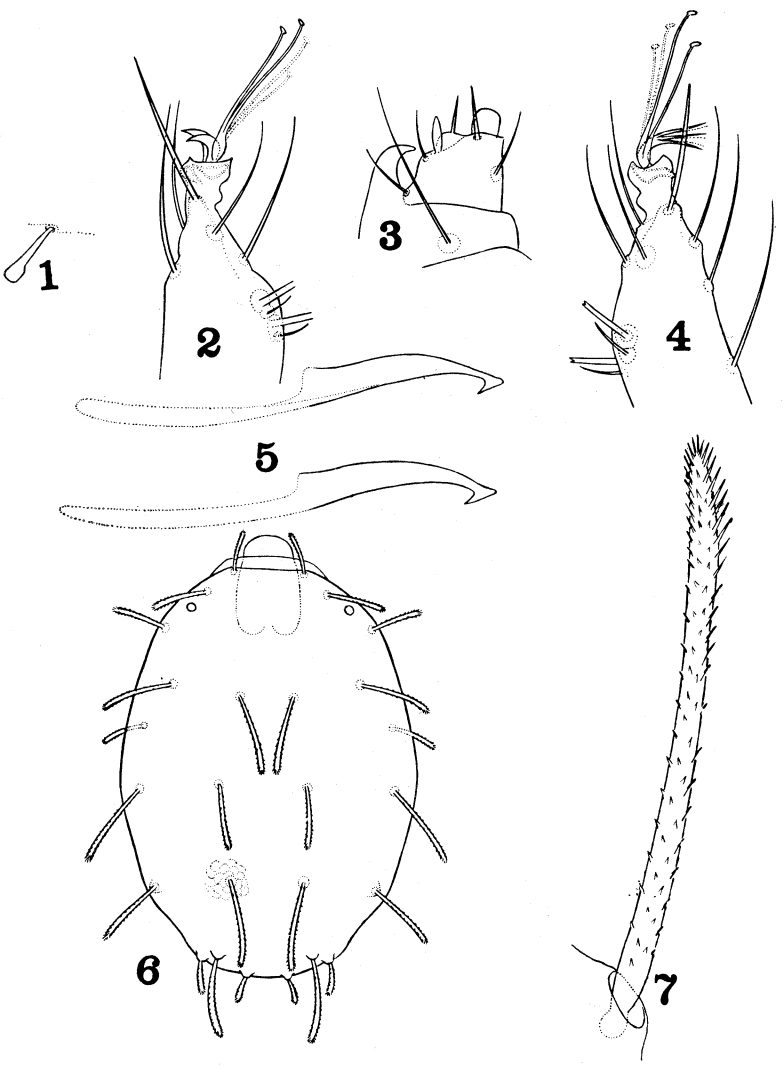

PLATE XVI. *Tetranychus planki,* new species.—1, collar trachea; 2, tip of tarsus I of male, lateral view; 3, tip of palpus of female, lateral view; 4, tip of tarsus I of female, lateral view; 5, aedeagi, lateral view; 6, dorsum of female; 7, dorsal body seta.

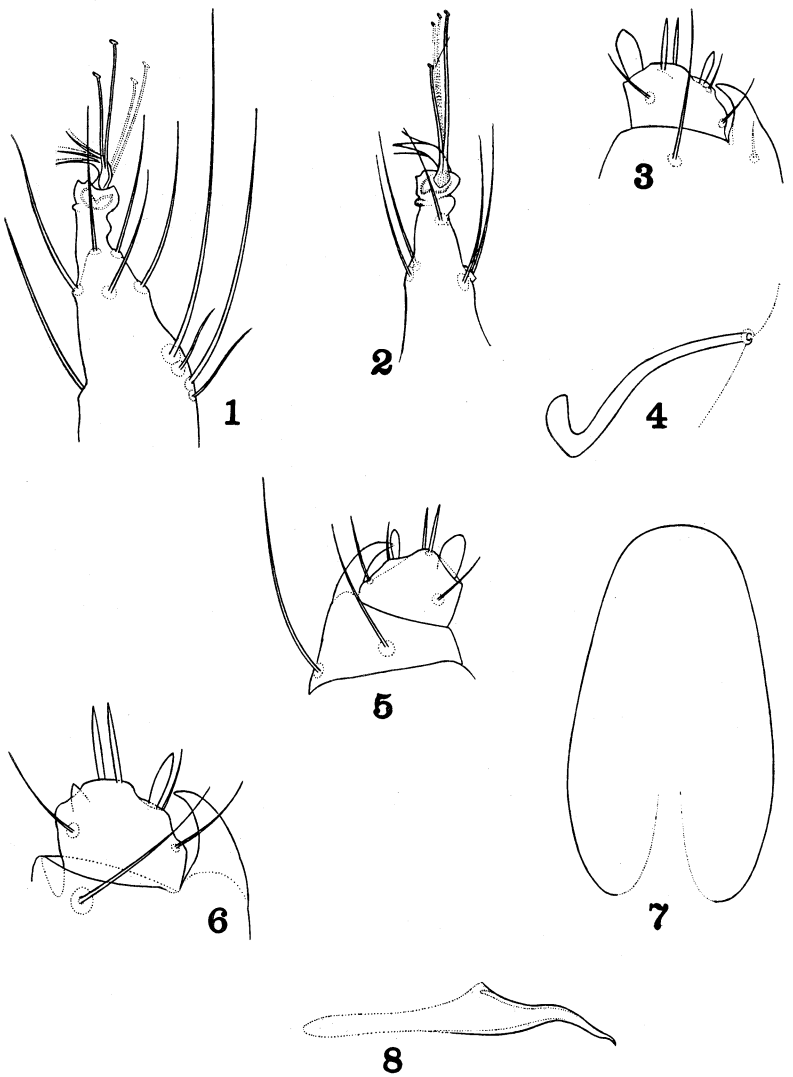

PLATE XVII. *Tetranychus sexmaculatus* Riley.—1, tip of tarsus I of female, lateral view; 2, tip of tarsus of male, lateral view; 3, tip of palpus of female, lateral view; 4, collar trachea; 5, tip of palpus of female, lateral view; 6, tip of palpus of male, lateral view; 7, mandibular plate; 8, aedeagus, lateral view.

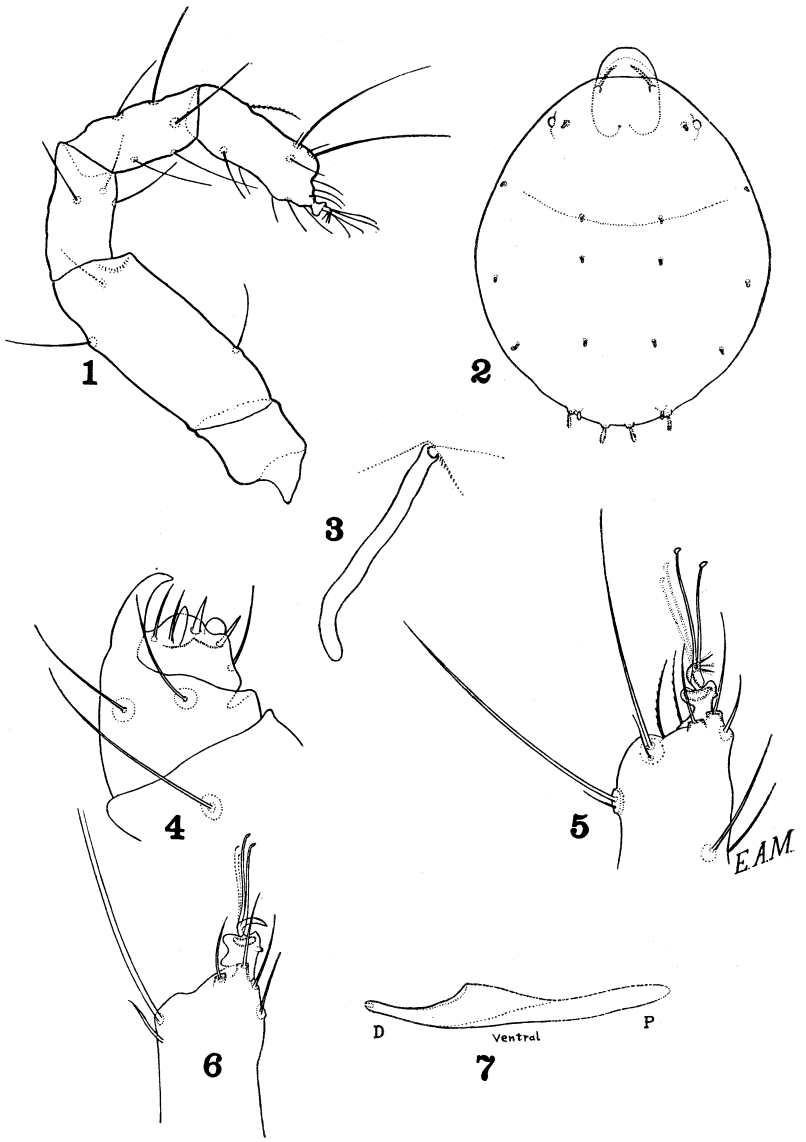

PLATE XVIII. *Tetranychus thujae,* new species.—1, leg I of female, lateral view; 2, dorsum of female; 3, collar trachea; 4, tip of palpus of female, lateral view; 5, tip of tarsus of female, lateral view ; 6, tip of tarsus of male, lateral view; 7, aedeagus, lateral view (D, distad; P, proximad).

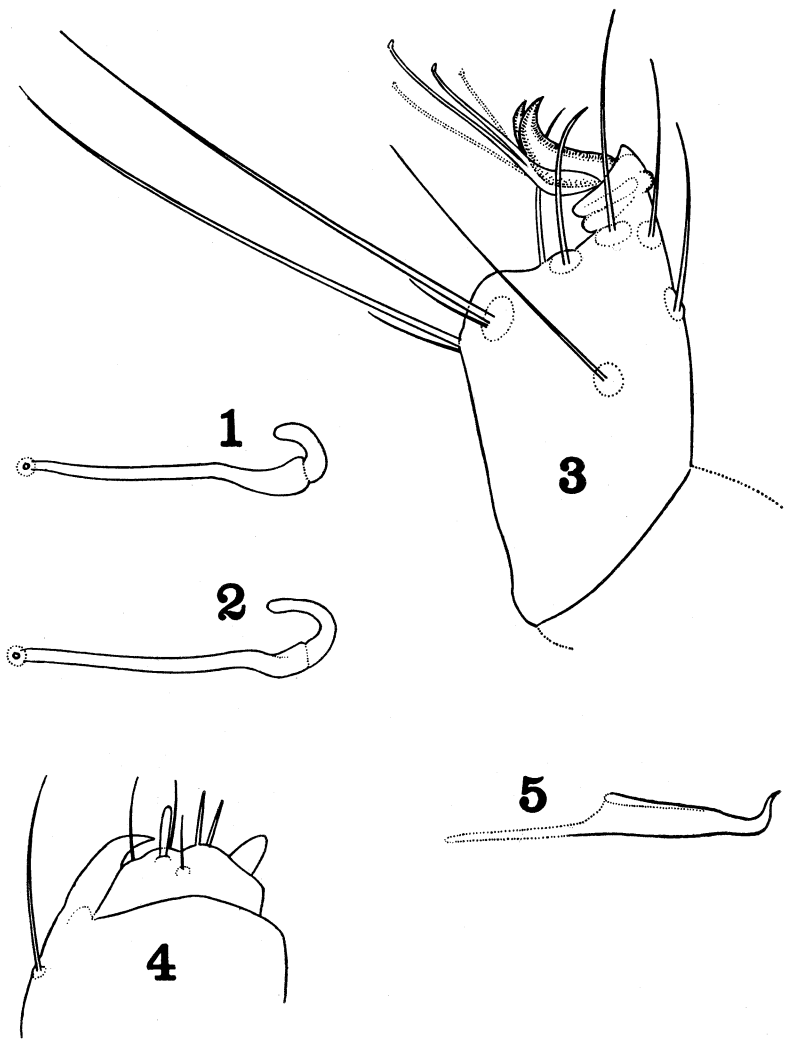

PLATE XIX. *Schizotetranychus celarius* (Banks).—1, 2, collar trachea; 3, tarsus I of female, lateral view; 4, tip of palpus of female, lateral view; 5, aedeagus, lateral view.

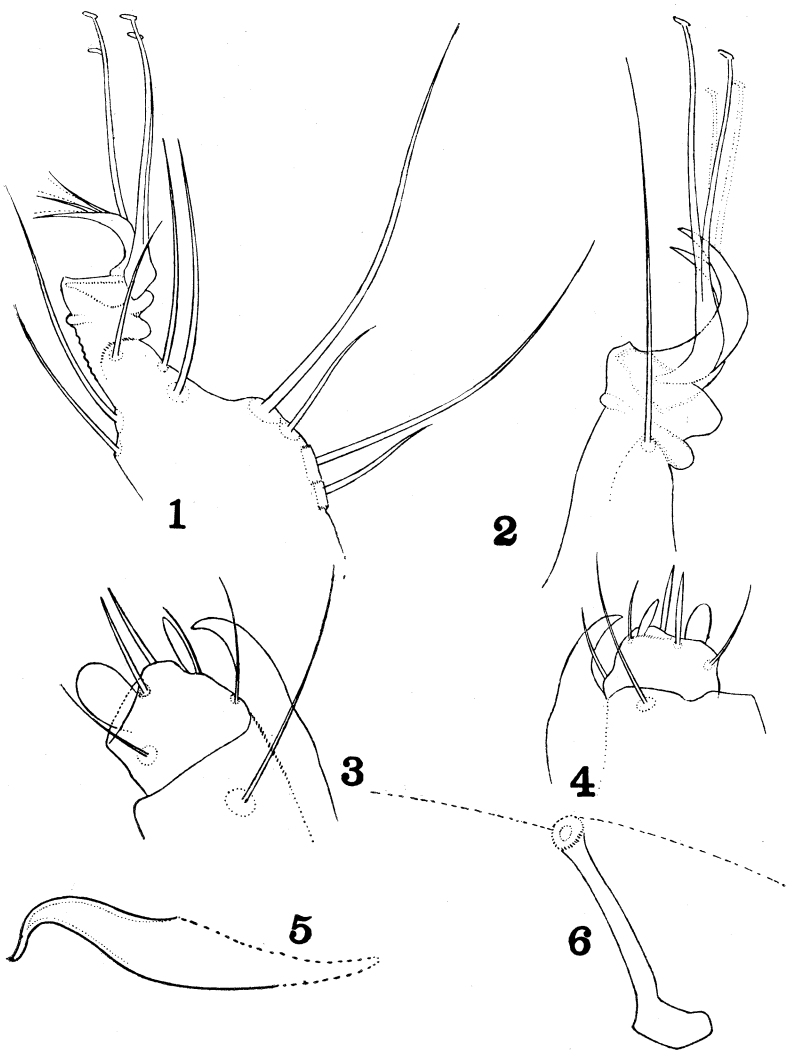

PLATE XX. *Schizotetranychus cercocarpi,* new species.—1, tip of tarsus I of female, lateral view; 2, tip of tarsus I of male, lateral view; 3, 4, tip of palpus of female, lateral view (3, from *Cercocarpus,* La Canada, Calif., 4, from wild cherry, Coeur d'Alene, Idaho); 5, aedeagus, lateral view; 6, collar trachea.

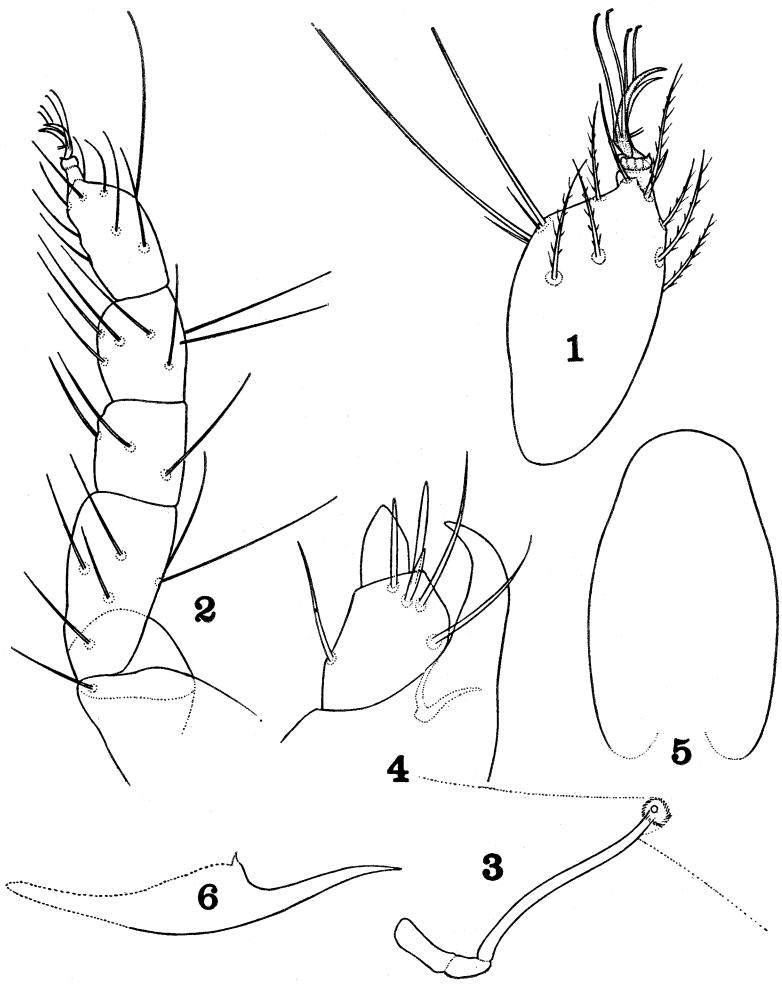

PLATE XXI. *Schizotetranychus cynodonis*, new species.—1, tarsus I of female, lateral view; 2, leg I of female; 3, collar trachea; 4, tip of palpus of female, lateral view; 5, mandibular plate; 6, aedeagus, lateral view.

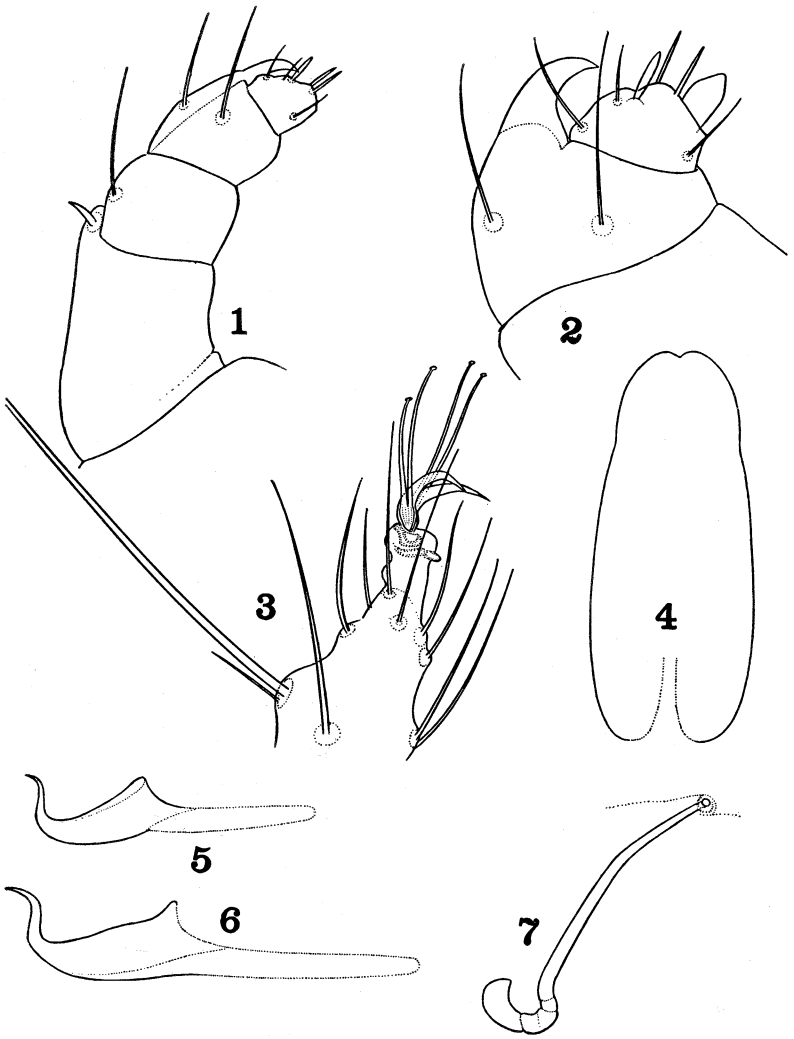

Plate XXII. *Schizotetranychus elymus,* new species.—1, palpus of male, lateral view; 2, palpus of female, lateral view; 3, tip or tarsus of female, lateral view; 4, mandibular plate; 5, 6, aedeagus, lateral view; 7, collar trachea.

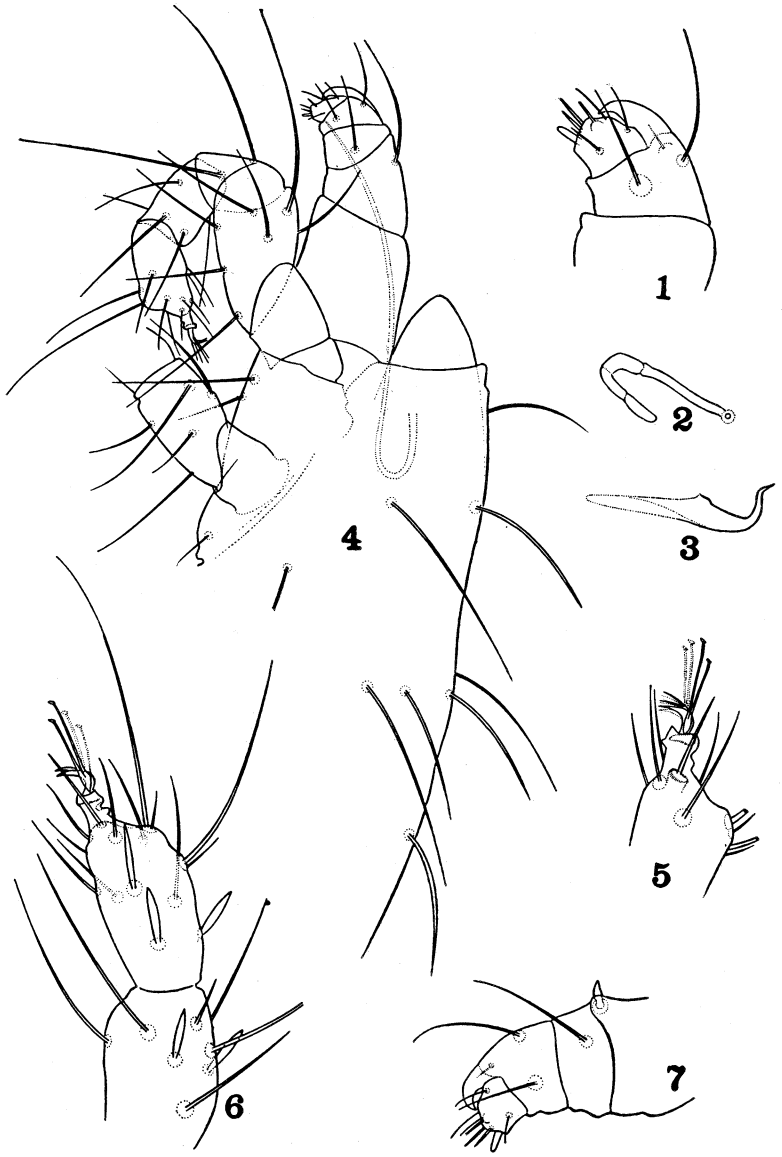

PLATE XXIII. *Schizotetranychus eremophilus,* new species.—1, tip of palpus of female, lateral view; 2, collar trachea; 3, aedeagus, lateral view; 4, forepart of body of female, lateral view; 5, tip of tarsus I of female, lateral view; 6, last 2 segments of leg I of male showing claws, hairs, and sensory setae, lateral view; 7, last 4 segments of palpus of male, lateral view.

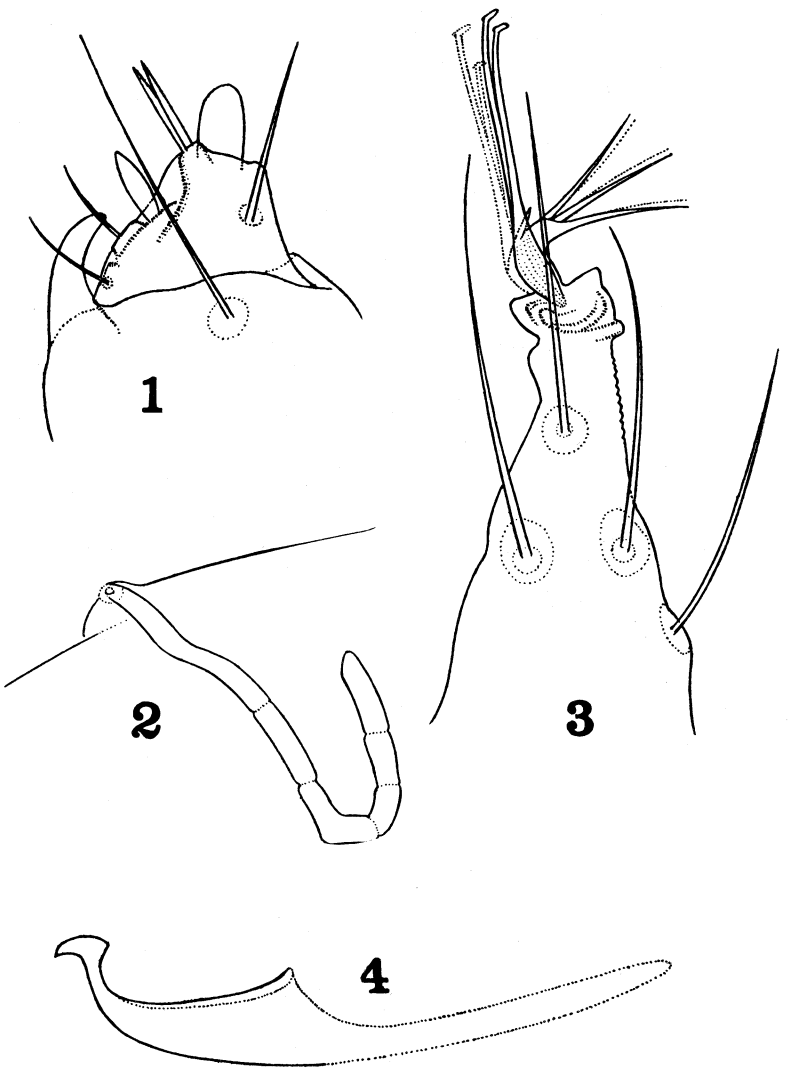

PLATE XXIV. *Septanychus canadensis,* new species.—1, tip of palpus of female, lateral view; 2, collar trachea; 3, tip of tarsus of female, lateral view; 4, aedeagus, lateral view.

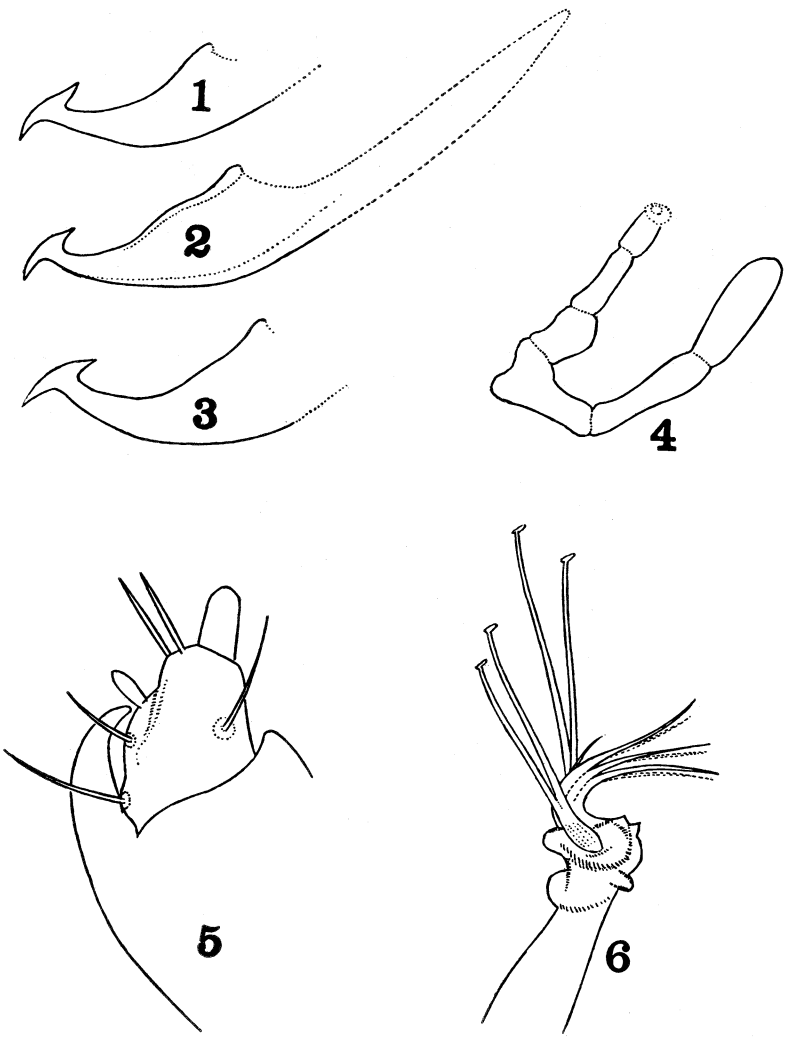

PLATE XXV. *Septanychus cocosi,* new species.—1, 2, 3, aedeagus, lateral view; 4, collar trachea; 5, tip of palpus of female, lateral view; 6, tip of tarsus I of female, lateral view.

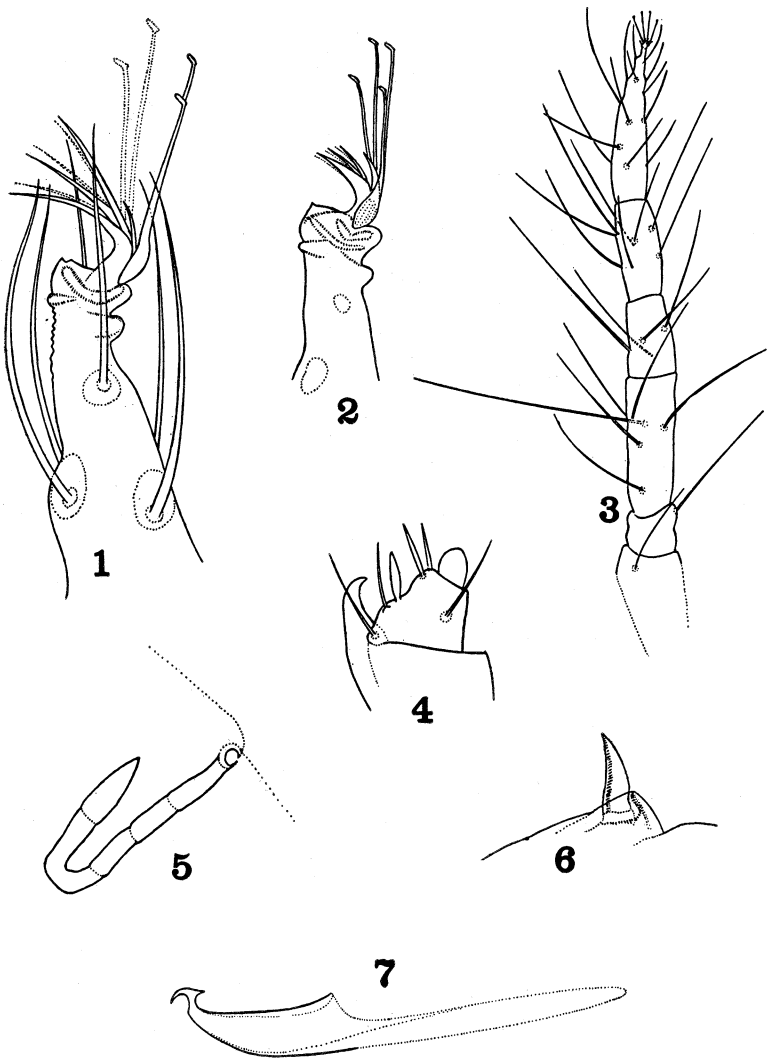

PLATE XXVI. *Septanychus deserticola,* new species.—1, tip of tarsus of female, lateral view; 2, tip of tarsus of male, lateral view; 3, leg I of female; 4, tip of palpus of female, lateral view; 5, collar trachea; 6, spur on second segment of palpus of male; 7, aedeagus, lateral view.

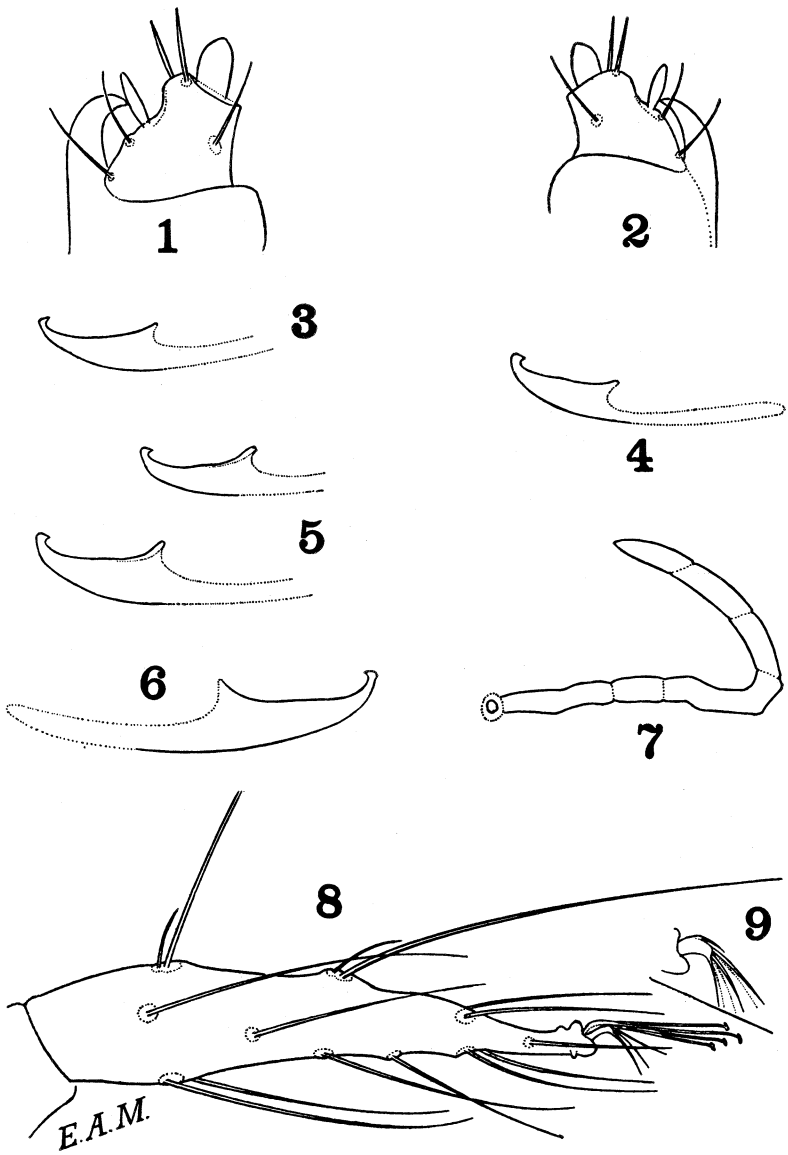

PLATE XXVII. *Septanychus deviatarsus,* new species.—1, 2, tip of palpus of female, lateral view; 3, 4, 5, 6, aedeagus, lateral view; 7, collar trachea; 8, tarsus I; 9, onychial claw of female (tenent hairs not shown).

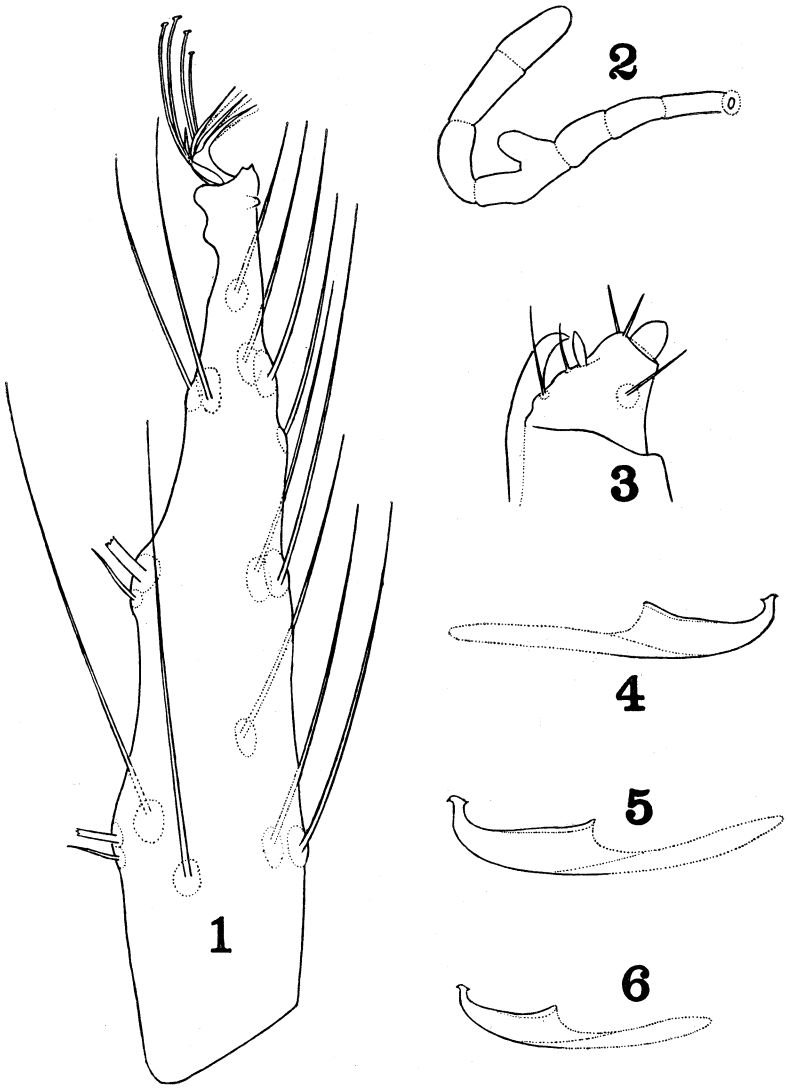

Plate XXVIII. *Septanychus texazona,* new species.—1, tarsus I of female, lateral view; 2, collar trachea; 3, tip of palpus of female, lateral view; 4, 5, 6, aedeagus, lateral view. (1, 2, 6, Arizona specimens; 3, 4, from Texas; 5, from Louisiana.)

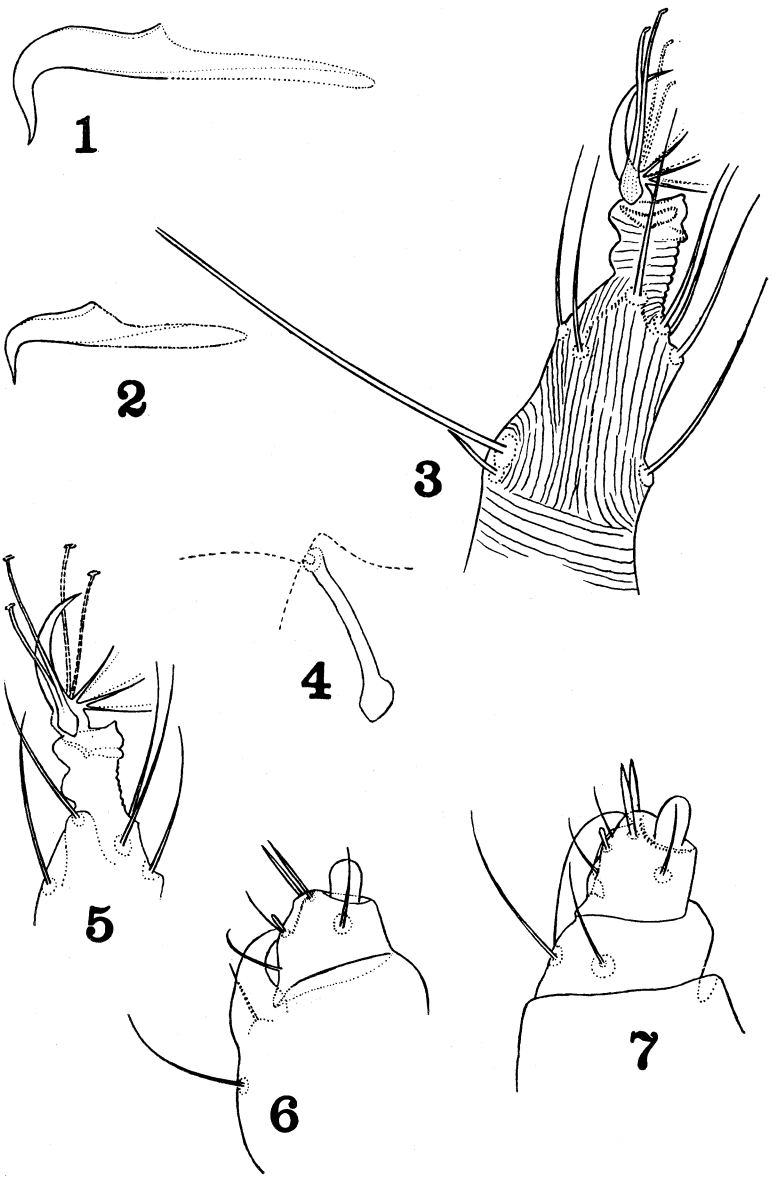

PLATE XXIX. *Paratetranychus bicolor* (Banks).—1, 2, aedeagus, lateral view; 3, tip of tarsus I of female, lateral view; 4, collar trachea; 5, tip of tarsus of male, lateral view; 6, 7, tip of palpus of female, lateral view. (Drawn from material from Yakima, Wash.)

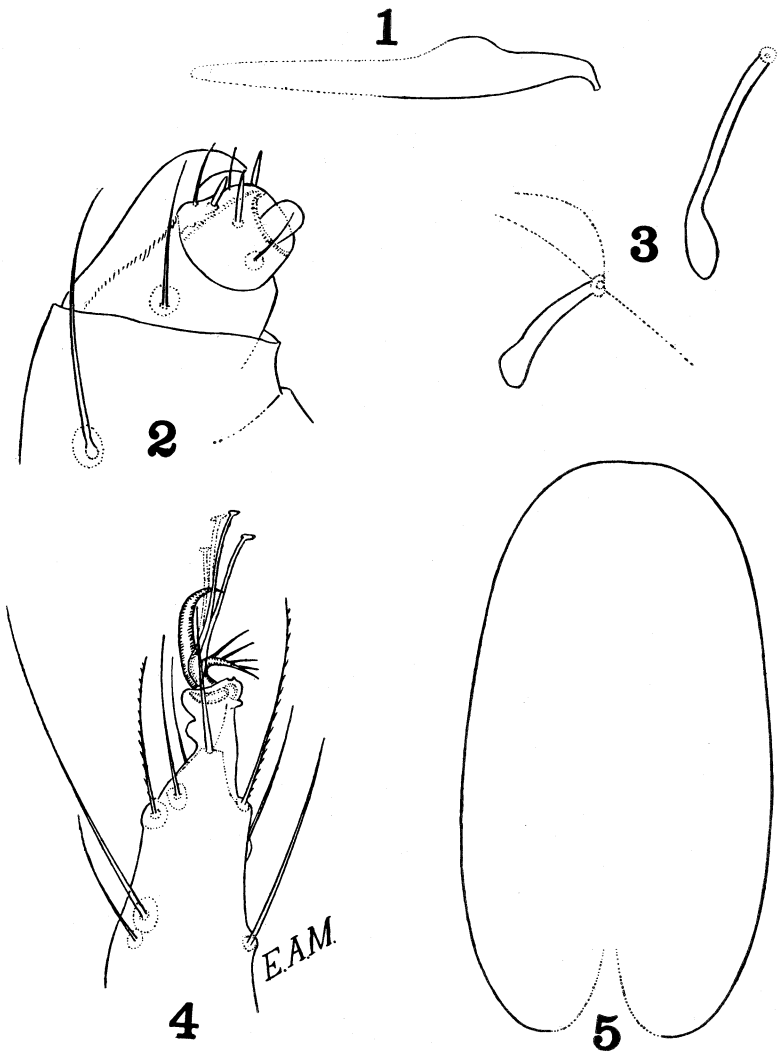

PLATE XXX. *Paratetranychus coniferarum,* new species.—1, aedeagus, lateral view; 2, tip of tarsus of female, lateral view; 3, collar trachea (variants); 4, tip of tarsus of female, lateral view (half of ventral spines not shown); 5, mandibular plate.

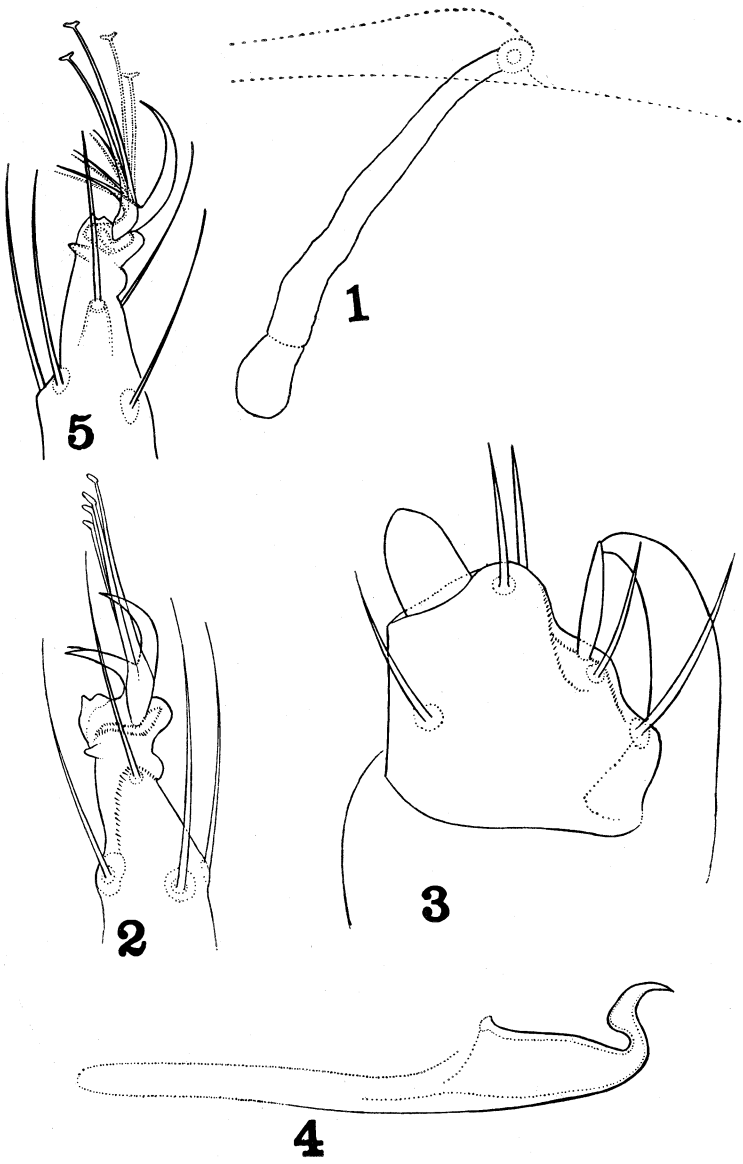

PLATE XXXI. *Paratetranychus gramineous,* new species.—1, collar trachea; 2, tip of tarsus I of male, lateral view; 3, tip of palpus of female, lateral view; 4, aedeagus, lateral view; 5, tip of tarsus I of female, lateral view.

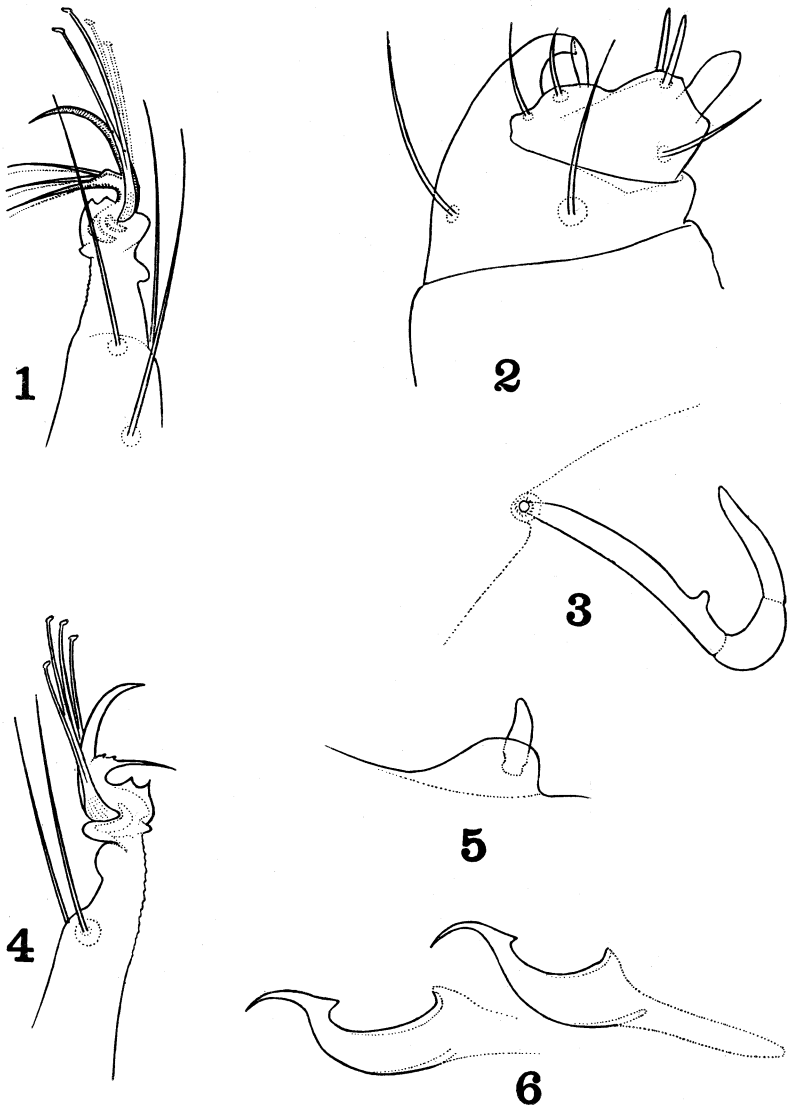

PLATE XXXII. *Paratetranychus hawaiiensis,* new species.—1, tip of tarsus I of female, lateral view; 2, tip of palpus of female, lateral view; 3, collar trachea; 4, tip of tarsus I of male, lateral view; 5, spur on segment II of palpus of male; 6, aedeagus, lateral view (variants).

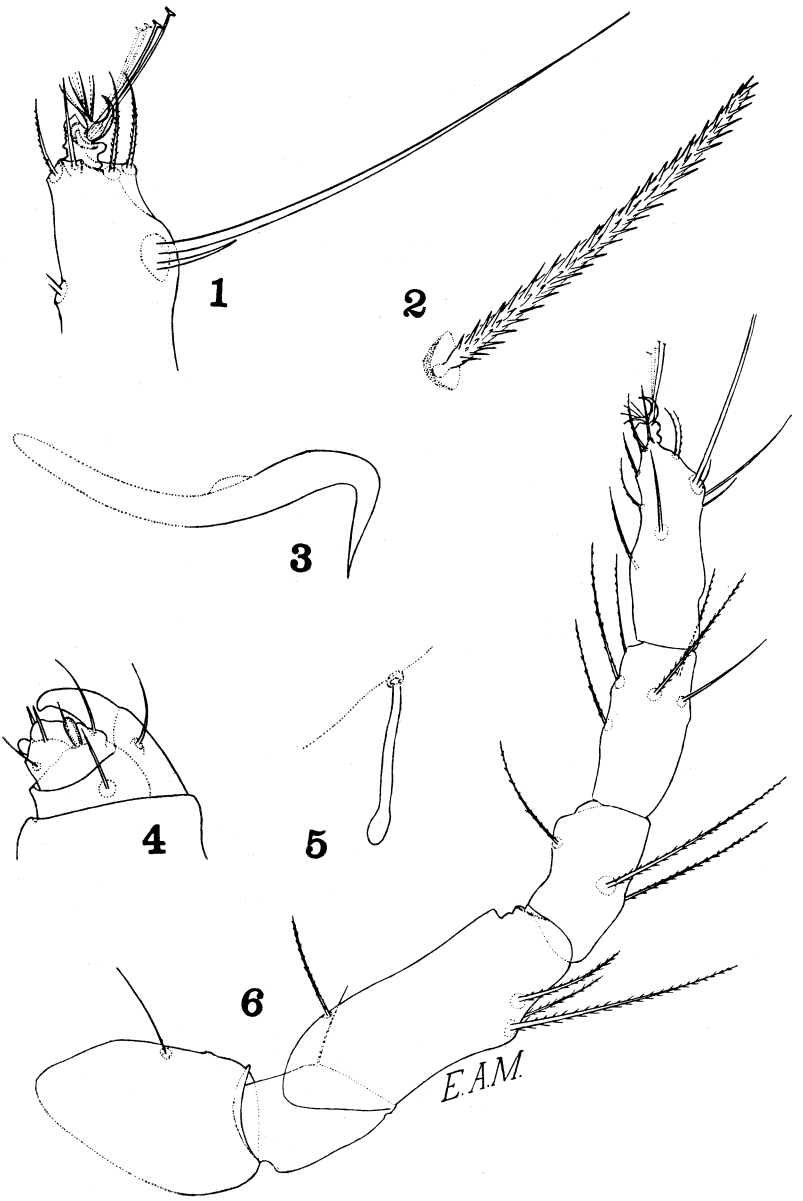

PLATE XXXIII. *Paratetranychus milleri,* new species.—1, tip of tarsus I of female, lateral view (half of ventral claw spines not shown); 2, dorsal body seta; 3, aedeagus, lateral view; 4, tip of palpus of female, lateral view; 5, collar trachea; 6, leg I of female.

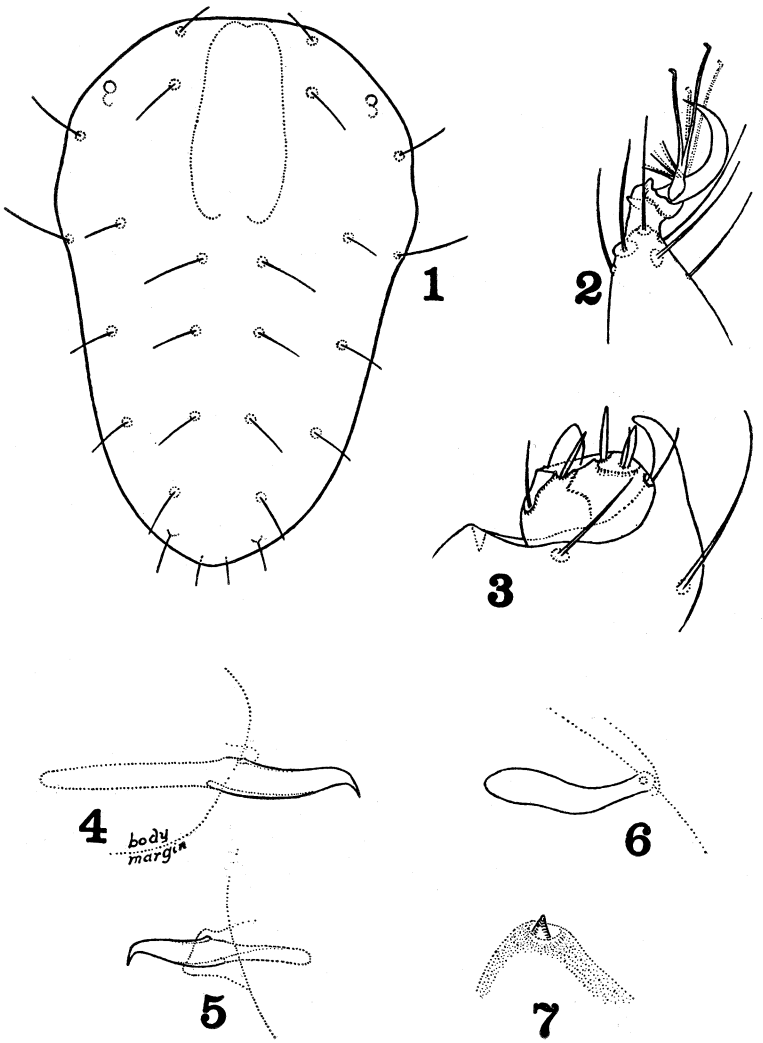

PLATE XXXIV. *Paratetranychus peruvianus* (McGregor).—1, dorsum of female showing dorsal setae; 2, tip of tarsus I of female, lateral view; 3, tip of palpus of female, lateral view; 4, 5, aedeagus, lateral view; 6, collar trachea; 7, tubercle bearing reduced spur on segment II of palpus of male.

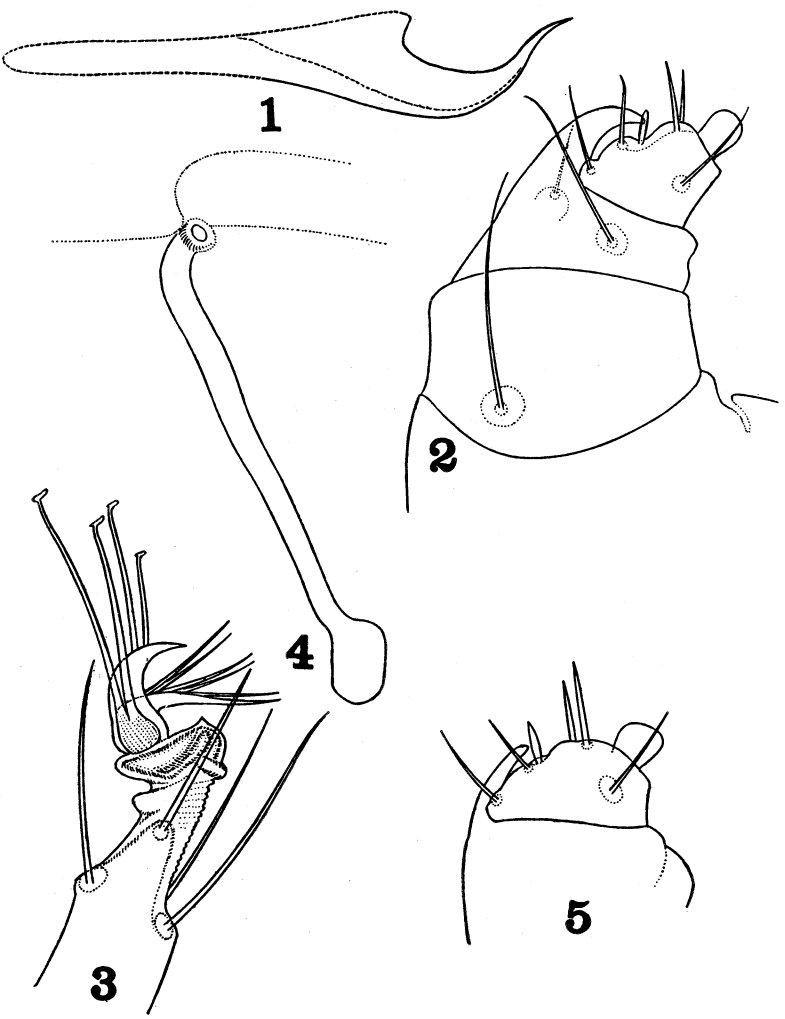

PLATE XXXV. *Paratetranychus pilosus* (C. & F.).—1, aedeagus, lateral view; 2, tip of palpus of female, lateral view; 3, tip of tarsus I of female, lateral view; 4, collar trachea; 5, tip of palpus of female (variant), lateral view.

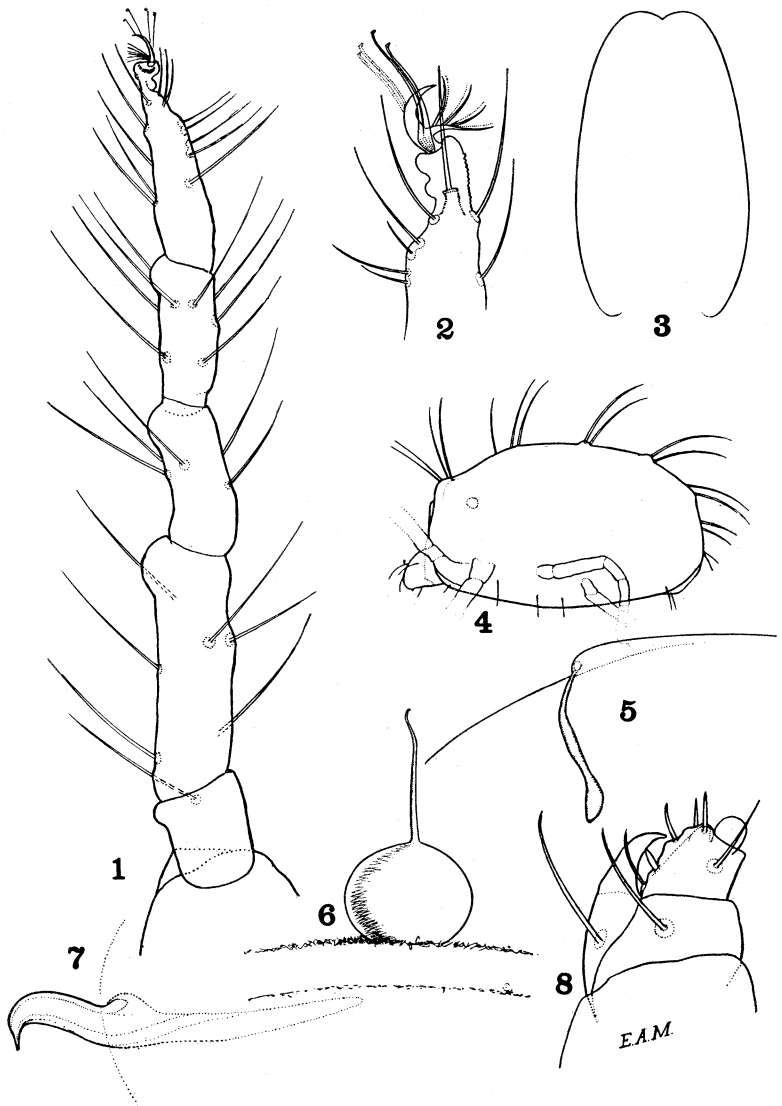

PLATE XXXVI. *Paratetranychus platani*, new species.—1, leg I of female; 2, tip of tarsus I of female, lateral view; 3, mandibular plate; 4, body of female, lateral view (only base of legs shown); 5, collar trachea; 6, egg, lateral view; 7, aedeagus, lateral view; 8, tip of palpus of female, lateral view.

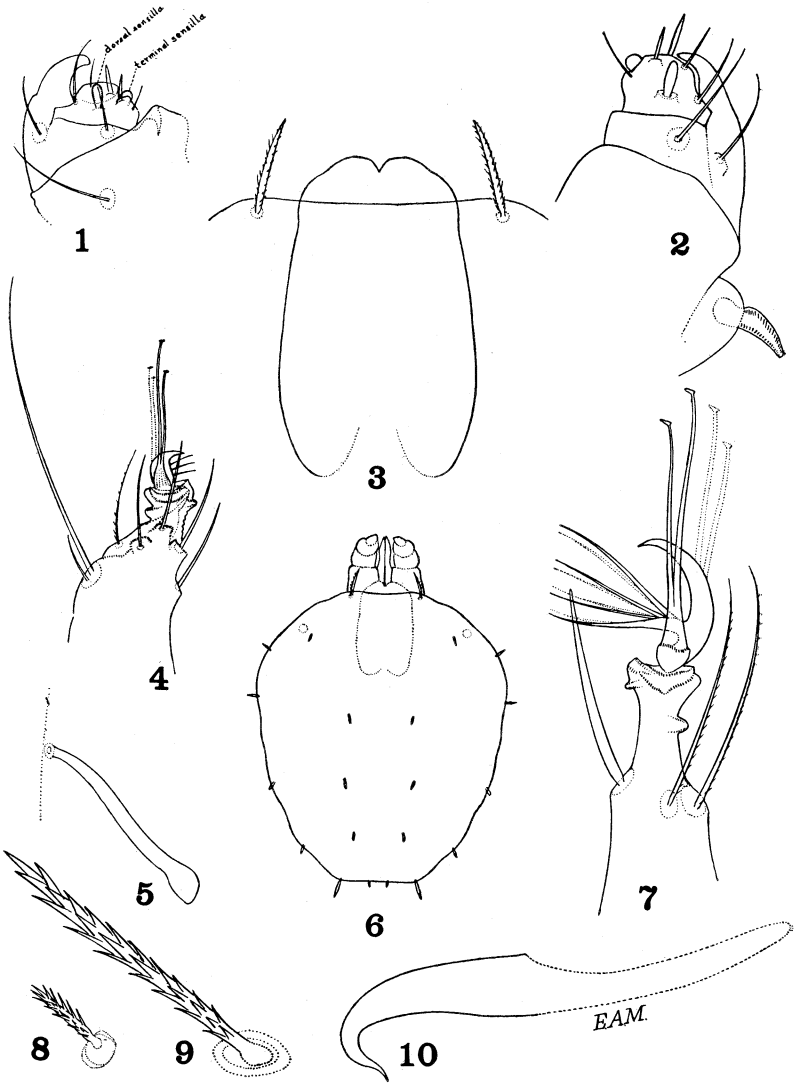

PLATE XXXVII. *Paratetranychus subnudus,* new species.—1, tip of palpus of female, lateral view; 2, last 3 segments of palpus of male, lateral view; 3, mandibular plate and frontal setae; 4, tip of tarsus I of male, lateral view; 5, collar trachea; 6, dorsum of female showing dorsal setae; 7, tip of tarsus of female, lateral view; 8, left scapulares seta; 9, left frontal seta; 10, aedeagus, lateral view.

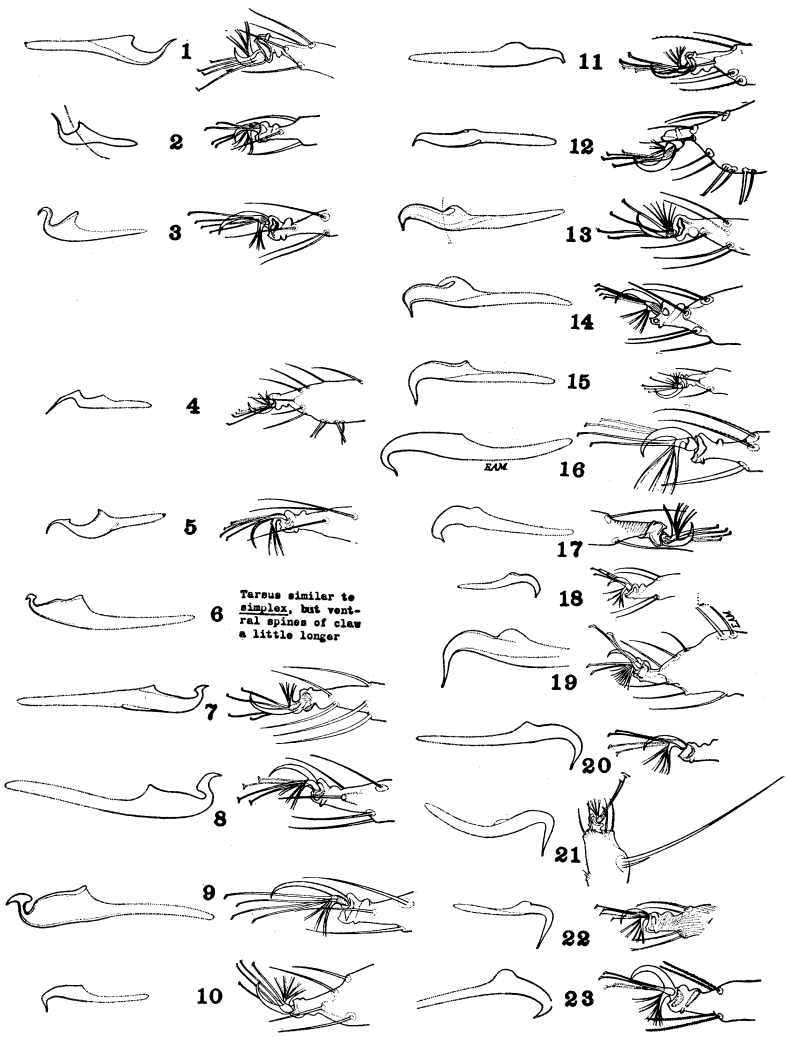

PLATE XXXVIII. The aedeagus, and tarsal claw I of the female, of all species of Paratetranychus treated critically in the present revision.—1, *pilosus;* 2, *citri;* 3, *sacchari;* 4, *pritchardi;* 5, *hawaiiensis;* 6, *afrasiaticus;* 7, *simplex;* 8, *gramineous;* 9, *stickneyi;* 10, *americanus;* 11, *coniferarum;* 12, *peruvianus;* 13, *platani;* 14, *ilicis;* 15, *bicolor;* 16, *subnudus;* 17, *coiti;* 18, *ununguis;* 19, *alpinus;* 20, *viridis;* 21, *milleri;* 22, *yothersi;* 23, *insularis.*

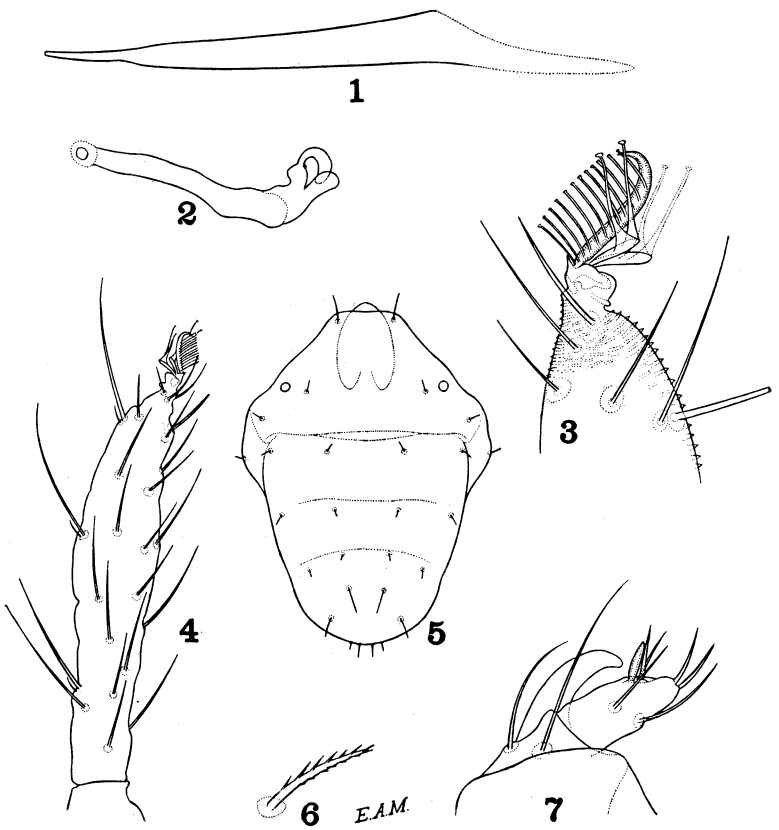

PLATE XXXIX. *Tetranychina apicalis* Banks.—1, aedeagus, lateral view; 2, collar trachea; 3, tip of tarsus I of female, lateral view; 4, tarsus I of female; 5, dorsum of female showing dorsal setae and mandibular plate; 6, dorsal body seta; 7, tip of palpus, lateral view. (Drawn in part from Banks' cotypes.)

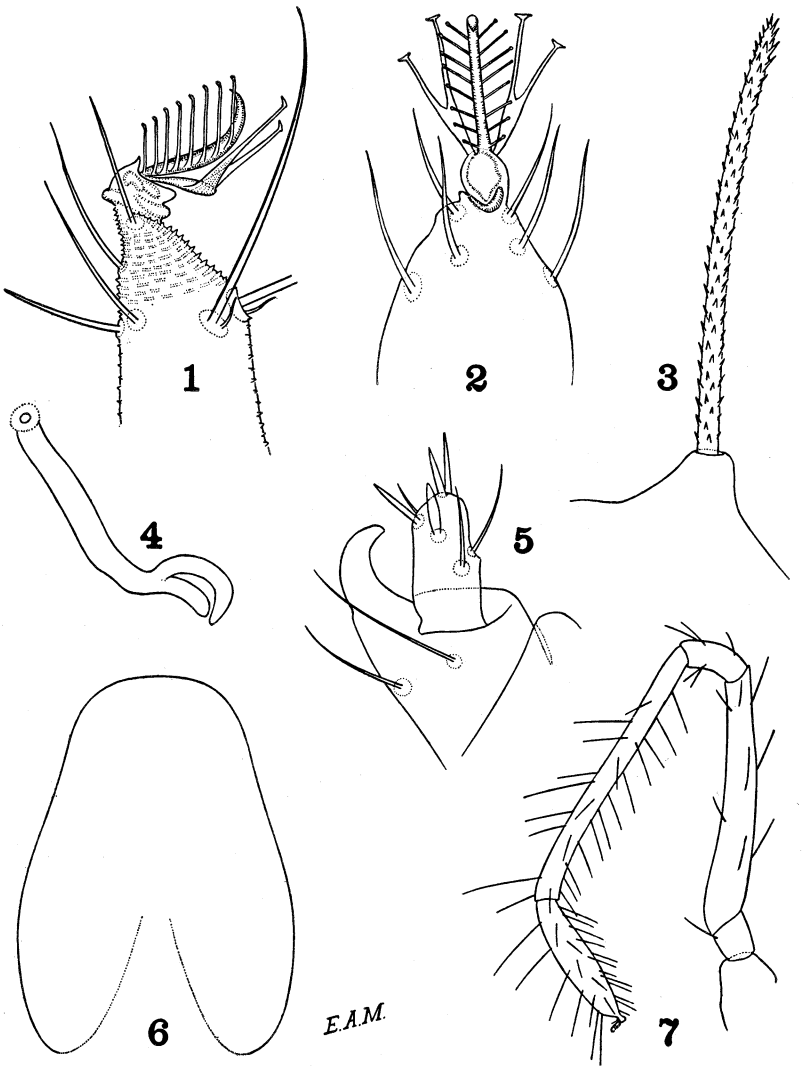

PLATE XL. *Tetranychina lupini*, new species.—1, tip of tarsus of female, lateral view; 2, same, ventral view; 3, dorsal body seta; 4, collar trachea; 5, tip of palpus, lateral view; 6, mandibular plate; 7, leg I of female.

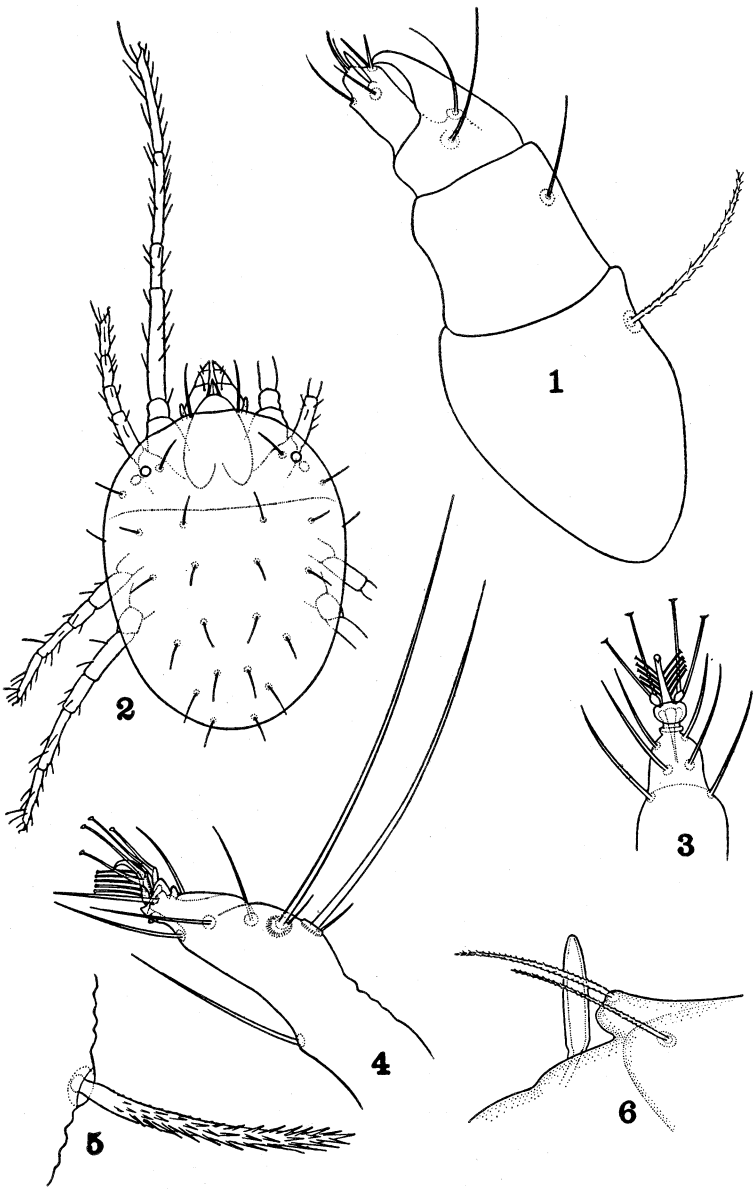

PLATE XLI. *Petrobia latens* (Müller).—1, palpus, lateral view; 2, female mite, dorsal view; 3, tip of tarsus I, ventral view; 4, tip of tarsus, lateral view (only one series of minute tenent hairs shown on claw); 5, dorsal body seta; 6, front of cephalothorax, base of mandible, and protruding tracheal tube, lateral view.

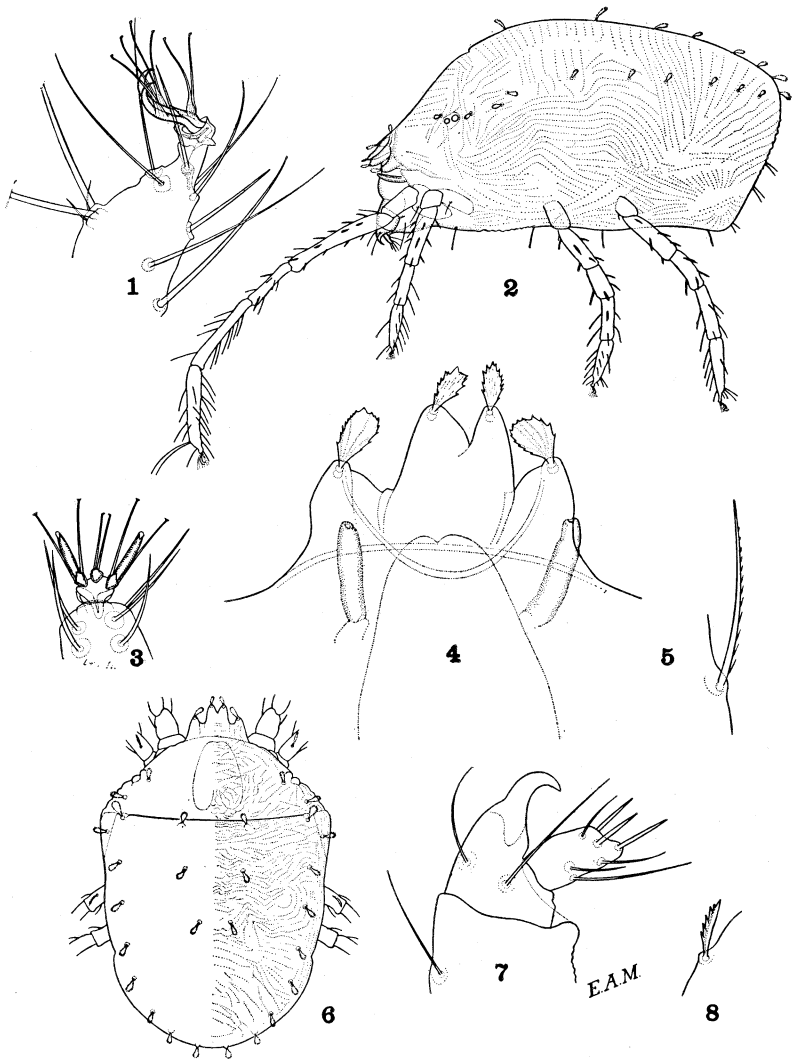

PLATE XLII. *Bryobia praetiosa* Koch.—1, tip of tarsus of female, lateral view; 2, female mite, lateral view; 3, tip of tarsus, ventral view; 4, front of cephalothorax showing 4-lobed free plate, leaflike setae, and protruding tracheae, dorsal view; 5, one of setae borne on tibiae and base of tarsi; 6, female mite, dorsal view (only base of legs shown); 7, tip of palpus, lateral view; 8, one of setae borne on femora and patellae.

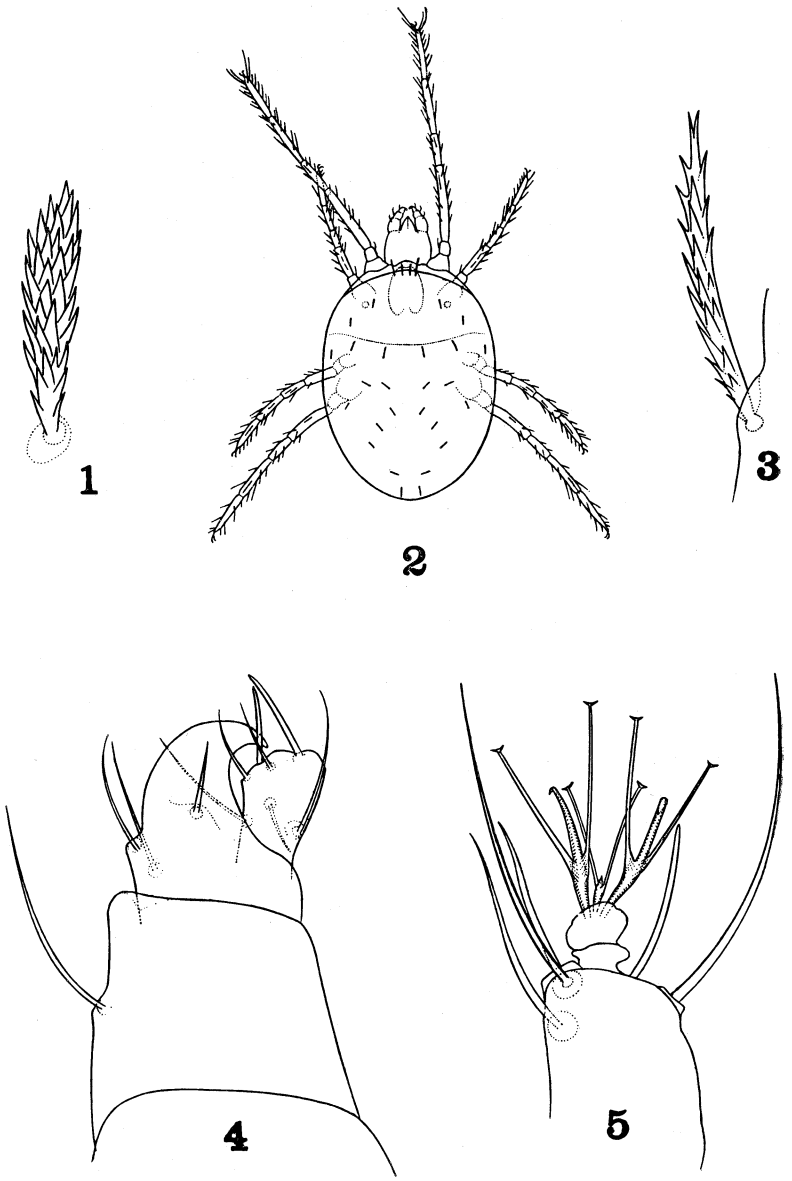

PLATE XLIII. *Pseudobryobia bakeri,* new genus, new species.—1, dorsal body seta; 2, female mite, dorsal view; 3, frontal seta; 4, tip of palpus, lateral view; 5, tip of tarsus I of female, dorsal view.

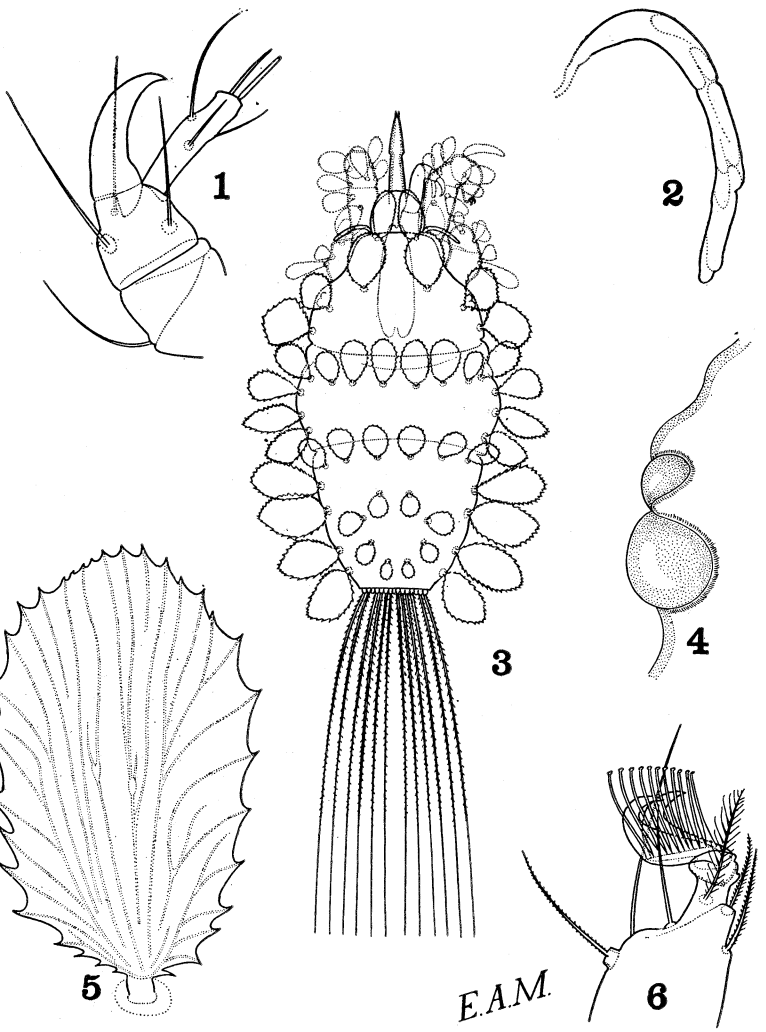

PLATE XLIV. *Tuckerella pavoniformis* (Ewing).—1, tip of palpus, lateral view; 2, protruding tracheal tube; 3, female mite, dorsal view (only forelegs shown); 4, left pair of eye corneae, from above; 5, a lateral body seta; 6, tip of tarsus I, lateral view (pulvillus not shown; only one series of tenent hairs shown on claw).

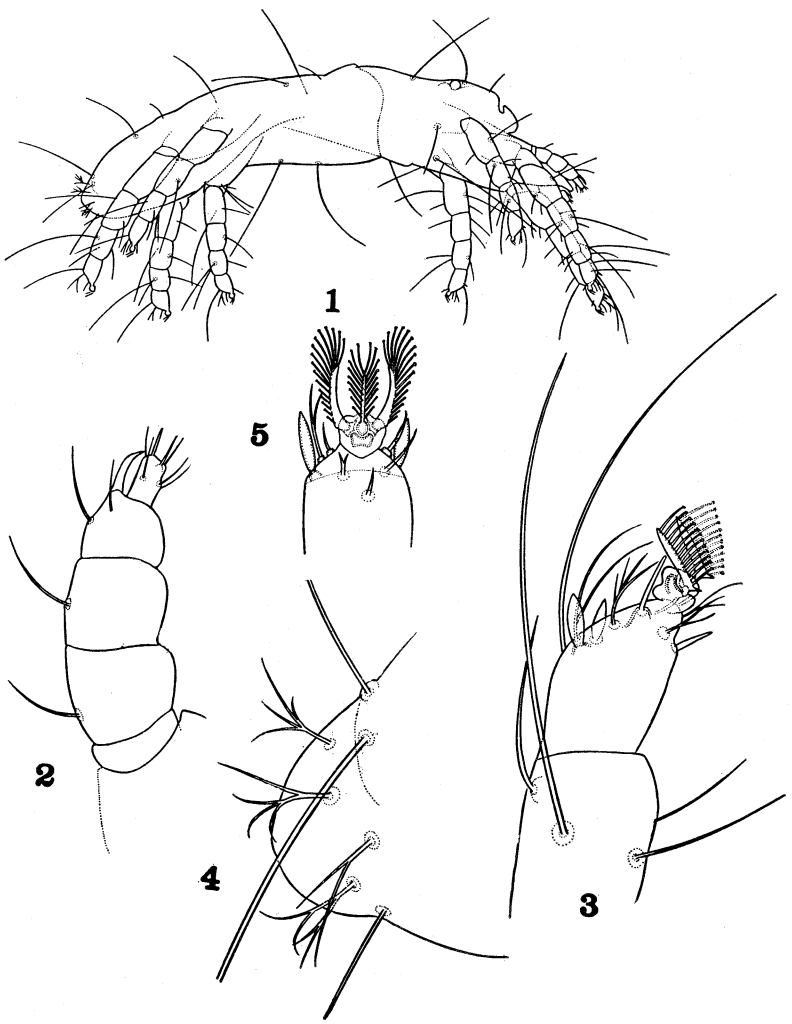

PLATE XLV. *Allochaetophora californica,* new genus, new species.—1, female mite, lateral view; 2, palpus, lateral view; 3, terminal portion of leg I, lateral view; 4, caudal portion of body with dichotomous setae, lateral view; 5, tip of tarsus I, ventral view.

* Italics denote synonyms.