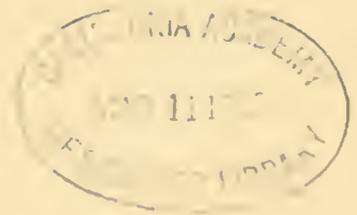


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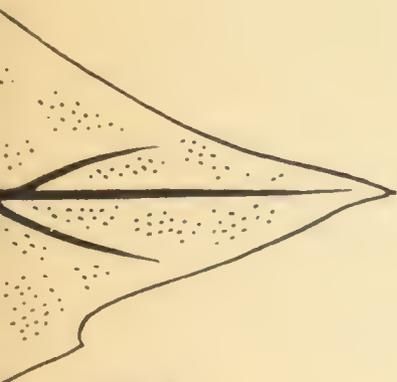
A Revision of the SPIDER MITE Family Tetranychidae



A REVISION OF THE
SPIDER MITE
FAMILY TETRANYCHIDAE

A. EARL PRITCHARD AND EDWARD W. BAKER

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Preface

The history of development of our knowledge of animal groups follows a uniform pattern. First there is the problem of identification, usually beginning with description of new forms. This is followed by first attempts at a classification. Then regional systematic treatments appear. Finally a monograph becomes possible, based on the accumulated work of many people.

Curiously, the mites have not followed this precise pattern. Because of their economic importance, mites have long attracted attention. Much has been written on these small but numerous and widely distributed arthropods. Yet for years scientists did little to further knowledge of the systematics of mites. Only recently have new species been described in precise terms and old species redescribed adequately. Now the time is propitious for monographic treatment, and it is indeed fortunate that two such outstanding specialists as Professor A. Earl Pritchard and Dr. E. W. Baker have dedicated themselves to the job and have chosen the group that is most destructive to agricultural crops, the spider mites. In the following pages the authors have not only considered all previous work in the group, but they have gone to original sources of type specimens and living material in the museums of North America and Europe and the type localities of two continents. The revision of the Tetranychidae presented in this book not only provides the essential information required by economic entomologists, but also provides illustrations of a caliber seldom equalled in taxonomic work and a sound classification for the use of taxonomists.

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Introduction

The family Tetranychidae contains many species that are important pests of agriculture. Practically all the major food crops and many ornamental plants are subject to attack. Especially during the past decade, a great deal of experimental work has been directed toward the control of these mites and a consideration of the particular species involved has become important.

The only comprehensive publications on the taxonomy of the family Tetranychidae in North America are by Banks (1900), McGregor (1919), and McGregor (1950). The last mentioned article is monographic in scope, and it is a noteworthy contribution.

A study of the taxonomy of European tetranychids has been considered only on a localized basis, but more recent papers by Hirst (1920) for England, Vitzthum (1929) for Germany, and Geijskes (1939) for Holland are worthy of mention. Womersley (1940) reviewed the knowledge of this family in Australia.

Reck (1947-1952) has been making important studies on the spider mites of Georgia, S.S.R., but we have seen only a few of his papers.

This is the first comprehensive treatment of the species of the world, and it is the over-all picture of the Tetranychidae with which we are primarily concerned. The recognition of subfamilies and tribes is intended to show phylogenetic relationships within the family, and the new interpretations of genera and the recognition of species groups are intended to further delineate these relationships.

A study of the taxonomy and nomenclature of tetranychids must be conducted on a world-wide basis. Man has undoubtedly transported many of the more omnivorous species throughout the world, and these mites are adjusting to new hosts in new geographical locations.

The present revision is largely synoptic, and the diagnoses and illustrations are presented for ready identification. There are undoubtedly a great many species that are undescribed, even as there are described species that cannot be recognized readily from the literature and species complexes that cannot be readily resolved on a morphological basis.

Collection of Samples

When it is possible to bring infested plant material into the laboratory, it is easy to ascertain that both sexes are obtained for study by selecting the specimens individually with the aid of a dissecting microscope.

In the field adequate samples of heavy infestations are often obtained by placing infested leaflets into wide-mouthed vials of alcohol. With lighter infestations, and particularly with conifers, it is practical to beat the plant material over a Boudreaux funnel—a hand funnel equipped with a wire screen at the top and bearing a vial of alcohol at the spout to catch the specimens (Boudreaux, 1954). Care must be taken that specimens are not left clinging to the sides of the funnel. A slower method is to beat the plant material over an enameled pan and remove the mites individually with a fine camel's-hair brush.

For collecting mites that feed on grass, the Berlese funnel is very practical. Heat, often in the form of an electric light bulb over the large funnel, is used to drive the mites from the plant material over a period of several days.

Slide Preparation

We have attempted the use of many mounting media for spider mites, including Canada balsam, Clarite, Euparal, Hyrax, polyvinyl alcohol (with lactic acid and phenol), methyl cellulose (Clark and Morishita, 1950), and glycerine. Hoyer's modification of Berlese's mounting medium has proved to be the most satisfactory. It is true that this is not a permanent mounting medium, but specimens may be remounted if necessary.

Our formula of Hoyer's is prepared by mixing in the following sequence:

Distilled water	50 grams
Gum arabic (flakes)	30 grams
Chloral hydrate	200 grams
Glycerine	20 grams

Specimens may be mounted directly into Hoyer's medium, either alive or from alcohol. Males must be oriented laterally for study of the aedeagus. An oil-immersion lens is necessary for critical study of spider mites, and the phase attachment is invaluable for detailed observations.

Acknowledgments

A large number of entomologists have contributed material for this study, and we have attempted to name the collectors whenever individual collections are cited. We have particularly credited colleagues throughout the world who were able to respond to our requests for needed material, with the gift of specimens collected by them or by the loan of types. To all of these coöperators we are indeed grateful.

We also acknowledge our appreciation to Frederick Cunliffe, of the Pinellas Biological Laboratory, for travel grants enabling survey work on the tetranychoid and other mites of Florida.

Dr. Josef R. Winkler, Charles University, Prague, Czechoslovakia, has been particularly helpful in obtaining otherwise unavailable articles by recent Russian workers. Dr. Shôzô Ehara, Hokkaido University, Sapporo, Japan, has also located for us Japanese articles unavailable in the U.S.A; moreover, he has been kind enough to make translations.

It is, indeed, a pleasure to work with acarologists internationally, each scientist being anxious to contribute unselfishly to an advancement of our knowledge of mites.



Systematics of the TETRANYCHIDAE

FAMILY TETRANYCHIDAE DONNADIEU

- TÉTRANYCHIDÉS Donnadieu, 1875, Recher. Scriv. Hist. Tetranych., p. 9.
- TETRANYCHIDAE Murray, 1877, Econ. Ent. Aptera, pp. 93, 97; Kramer, 1877, Archiv. Naturg., 43(2): 225, 228; Trouessart, 1891, Rev. Sci. Nat. Ouest, 1: 289, 308; Berlese, 1897, Acari Myr. Scorp. Prostig., pp. 7, 8, 51; Oudemans, 1897, Tijd. Ent., 40: 120; Banks, 1900, U. S. Dept. Agr., Div. Ent. Tech. Ser., 8: 70; Banks, 1907, Proc. U. S. Natl. Mus., 32: 598; Ewing, 1909, Univ. Ill. Bul., 7(14): 35; Oudemans, 1910, Bul. Ent. Res., 1: 112; Vitzthum, 1913, Mikrokos., 6: 99, 108; Banks, 1915, U. S. Dept. Agr. Rep., 108: 32; Ewing, 1929, Man. Ext. Parasites, pp. 20, 28; Vitzthum, 1929, Tierw. Mitteleur., 3(Lief 7): 47; Vitzthum, 1931, Handb. Zool., 3(1, 3): 145; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 11; Garman, 1940, Bul. Conn. Agr. Exp. Sta., 431: 67; Womersley, 1940, Trans. Roy. Soc. S. Australia, 64(2): 234; Vitzthum, 1942, Klass. Ordn. Tierr., 5(Abt. 4, Buch 5): 809; McGregor, 1950, Amer. Midl. Nat., 44(2): 257; Radford, 1950, Check List Mite Gen. and Type Spp., Intern. Union Biol. Sci. Sér. C. (Sect. Ent.), 1, p. 76; Reck, 1950, Trudy Inst. Akad. Nauk Gruz. S.S.R., 9: 117; Baker and Wharton, 1952, Intr. Acar., p. 211; Reck, 1952, Izd. Akad. Nauk S.S.R. 1952: 3.
- TETRANYCHINI Canestrini and Fanzago, 1878, Atti Reale Ist. Veneto Sci. Let. Arti (ser. 5), 4: 148; Canestrini, 1889, Atti Reale Ist. Ven. Sci. Let. Art. (ser. 6), 7: 491.
- TETRANYCHINA Berlese, 1886, Acari Dann. Piante Colt., p. 16.

The taxonomic revisions of Trägårdh (1915), Zacher (1916, 1933), McGregor (1919), and Ugarov and Nikolskii (1937) refer to the family only by a common name.

Systematics of the Tetranychidae

Concepts of the family Tetranychidae have undergone considerable evolution since the group was first given a suprageneric name in 1875. Only two genera, *Tetranychus* Dufour and *Bryobia* Koch were recognized prior to that time, and to the former genus had been assigned a number of species of predaceous mites properly belonging to several families of the Prostigmata. Even Donnadieu, in the dissertation proposing the family name, considered eriophyids to be immature stages of tetranychids, and some contemporary workers believed chiggers to represent their young.

Predaceous mites properly belonging to several genera of the Raphignathidae were once included in tetranychid genera, and the raphignathid genus *Neophyllobius* Berlese, 1886, was only recently removed from the Tetranychidae (McGregor, 1950).

The genus *Heteronychus* Canestrini and Fanzago, 1876, was referred by the original authors to the family Tetranychidae. The species on which the genus was based has not since been recognized. The description of the coloration of the mite and the setation of the legs is entirely inconsistent with our knowledge of the tetranychids, being, perhaps, more like that of a member of the genus *Neophyllobius*.

During recent years the tetranychoid mites have been segregated into separate units of family status. The latest and most comprehensive comparative treatment of these family categories is by Baker and Pritchard (1953). The genera *Tenuipalpus* Donnadieu, *Brevipalpus* Donnadieu, *Phytoptipalpus* Trägårdh, *Pseudoleptus* Bruyant, *Raoliella* Hirst, and *Tegopalpus* Womersley, all previously referred to the Tetranychidae, are now placed in the family Phytoptipalpidae. Similarly *Tuckerella* Womersley is now placed in the Tuckerellidae.

The superfamily Tetranychoida (Reck, 1952b; Baker and Pritchard, 1953) consists of those prostigmatic mites having the paired basal segments of the chelicerae fused into a pouch-like lobe called a stylophore: within the latter are anchored the curved proximal ends of the movable

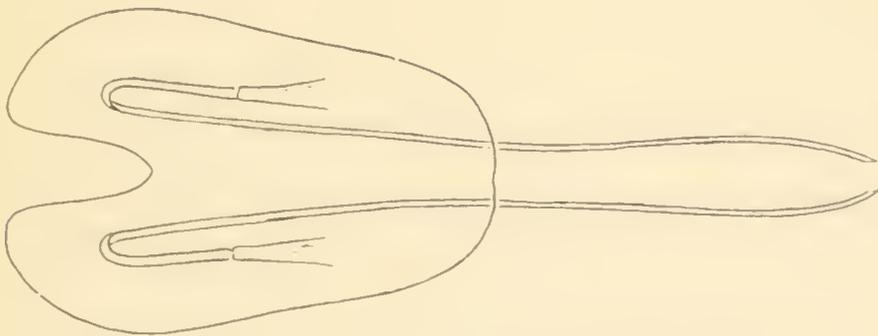


Fig. 1. Stylophore and chelicerae of a tetranychid mite (*Tetranychus telarius*).

Spider Mites

digits or stylets (fig. 1). In the family Tetranychidae, the fourth palpal segment bears a strong "claw" and the dorsum of the body bears not more than 16 pairs of setae. These obvious characteristics will separate the tetranychids from all other mites.

MORPHOLOGY

Mites of the family Tetranychidae bear two obvious types of setae (fig. 2): tactile and chemosensory (see Grandjean, 1948). The former are



Fig. 2. Sensory, tactile, and duplex setae of a tetranychid mite (*Tetranychus telarius*, female).

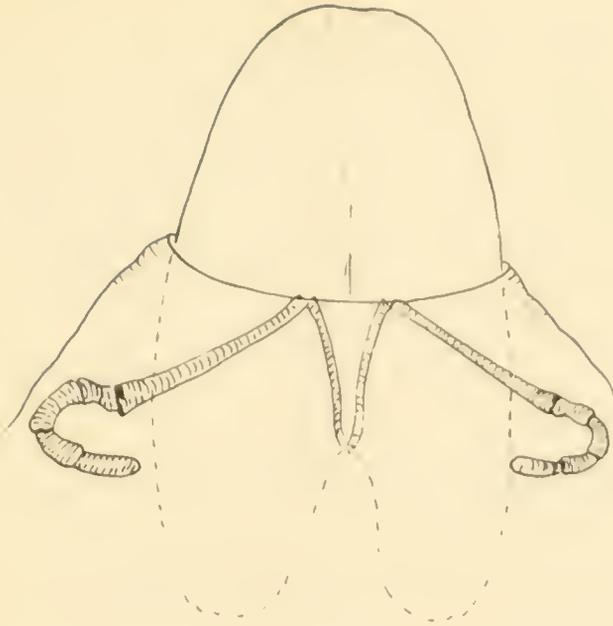


Fig. 3. Anterior portion of propodosoma of a tetranychid showing location of the peritremes (*Eotetranychus uncatatus*).

slender, finely pointed, with thick walls, and bearing pubescence. The latter have thin walls in which transverse striations may be evident, and they are nude. The chemosensory setae are referred to as sensory setae for convenience. The sensory setae are sometimes distinguished as to whether they are slender and tapering or else slender and broadly rounded at the distal end or fusiform.

A third type of seta, found on the tarsal appendages, is characterized by having a knob or hook at its distal end. Setae of this type are referred to as tenent hairs. They are always found on the claw, and usually a number of tenent hairs are amalgamated distally, each appearing to originate from a number of roots. Tenent hairs are also found on the empodium of the more generalized tetranychids, as in related tetranychoids, but they are replaced by tactile hairs in higher forms.

The tetranychid palpus bears a nearly constant number of setae. The dorsal seta on the second palpal segment of the male is usually swollen, and the terminal sensillum on the fifth palpal segment of the male is usually more slender than in the female. Seven setae occur on the fifth segment: three are tactile and four are sensory. Of the latter, the proximal one is fusiform, two are tapering, and the terminal sensillum is usually well developed and rounded at the tip but rarely reduced or absent.

The development of the stylophore is similar among various genera, but an anteromedian cleft may represent a species differentiation.

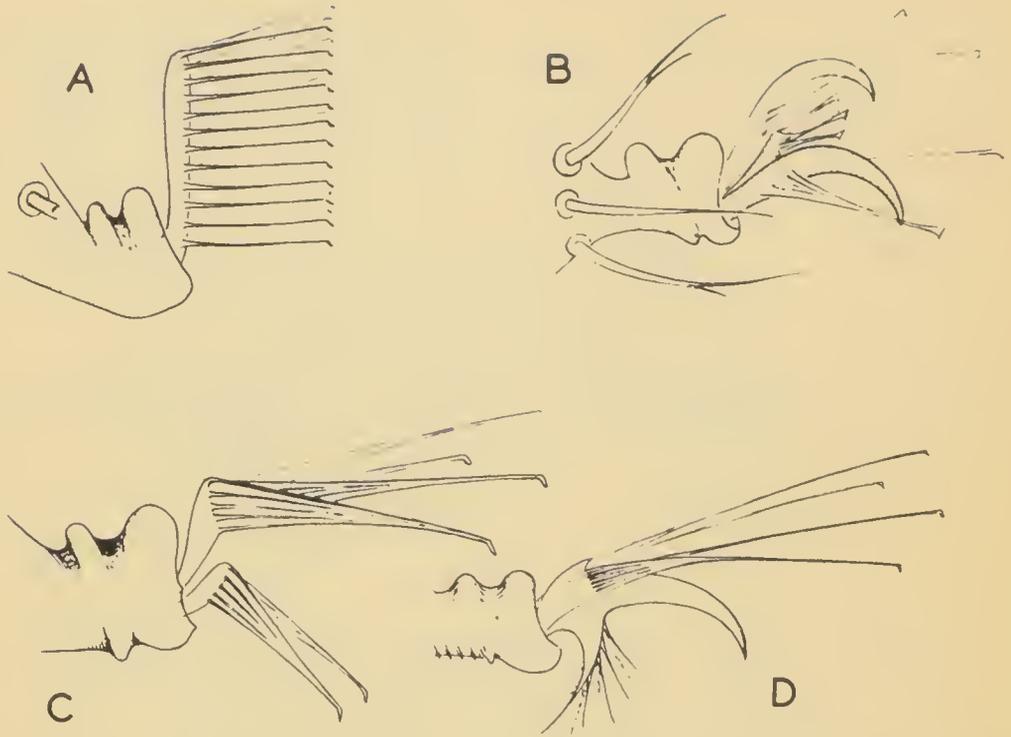


Fig. 4. Types of true claws found in the Tetranychidae: A.) *Tetranychopsis horridus* (an individual claw is shown); B.) *Bryobia drummondi*; C.) *Aplonobia acharis*; D.) *Oligonychus ununguis*.

The peritremes (fig. 3) consist of a pair of arms that arise medially near the anterior end of the body and diverge over the surface of the protrusible stylophore. The oil-immersion lens will sometimes suffice to demonstrate that these "tubes" are open dorsally as observed by Blauvelt (1939). The ends of the peritremes are anastomosing sacs of tracheae in the most generalized tetranychids. In the higher species they usually end simply but each may terminate in a simple bulb, or have several distal chambers and be simply hooked, or else the distal end is irregular or anastomosing.

The dorsum of the tarsus of leg I of the adult bears two pairs of intimately associated setae, a characteristic of the family Tetranychidae (except in one tribe where the close relationship of both pairs of setae is not apparent). These setae are termed the duplex setae (fig. 2). One pair of duplex setae is found on the dorsum of tarsus II. Development and placement of the duplex setae are sometimes valuable for species differentiation but more often serve for recognition of species groups or higher categories. The distal and comparatively long member of each duplex is sensory, and the proximal member is tactile.

Systematics of the Tetranychidae

The legs possess sensory setae, other than those of the duplexes, on all tarsi, the anterior tibiae, and sometimes tibiae II-IV. Other leg setae on all segments are tactile. The number of setae on a given tibia or tarsus may be variable, but in many cases the tactile or else the sensory setae will independently be constant in number; usually both numbers are constant. In contrast to other prostigmatic mites, the sensory setae are more apt to be variable.

The tarsal appendages consist of a pair of true claws laterally and a central empodium. Their evolutionary development is of considerable taxonomic value (fig. 4).

The claw is primitively clawlike or else padlike, and with lateroventral tenent hairs. Trägårdh (1915) first demonstrated that the higher tetranychids possess a claw derived from this type. The lateroventral tenent hairs of each claw form separate rows in *Tetranychopsis*, but they are fused distally to form one or several pairs in *Bryobia*. The distal end of the claw disappears; and the proximal portion of the remaining claw is slender in relatives of *Petrobia*, but it is strongly reduced in higher forms, leaving mainly the pair of tenent hairs.

The dorsal texture of the integument of the body of a tetranychid varies considerably. It is smooth, except for large folds in some of the more generalized forms. There may be a development of mediodorsal areas bearing areolate or punctate impressions on the propodosoma and opisthosoma. However, the higher tetranychids bear integumentary striations, irregular and widely spaced in some species but similar to that of a finger-print pattern in most. The striae may be characteristically dotted or else solid.

The chaetotaxy of the body of a spider mite is of tribal and generic significance. Only two genera have four pairs of dorsal propodosomal setae, the rest three. Three genera have nine pairs of dorsolateral and dorsosublateral hysterosomal setae. Other genera have only seven pairs of dorsolateral and dorsosublateral hysterosomal setae.

The hysterosoma always bears three pairs of setae mediodorsally, and these are called the dorsocentrals (fig. 5). Laterad of the first pair of dorsocentrals are two setae on each side: the outermost is called the humeral and the inner is the first dorsolateral. Laterad of each of the second and third dorsocentrals is a pair of setae in certain of the more generalized tetranychids. One member of each of these pairs of lateral setae may occupy a sublateral position, or else it is absent in the higher forms.

Caudad of the dorsocentral hysterosomals, there are three pairs of setae, the posterior, inner pair being the clunals. This interpretation differs from that of Oudemans and our own earlier work (Pritchard and

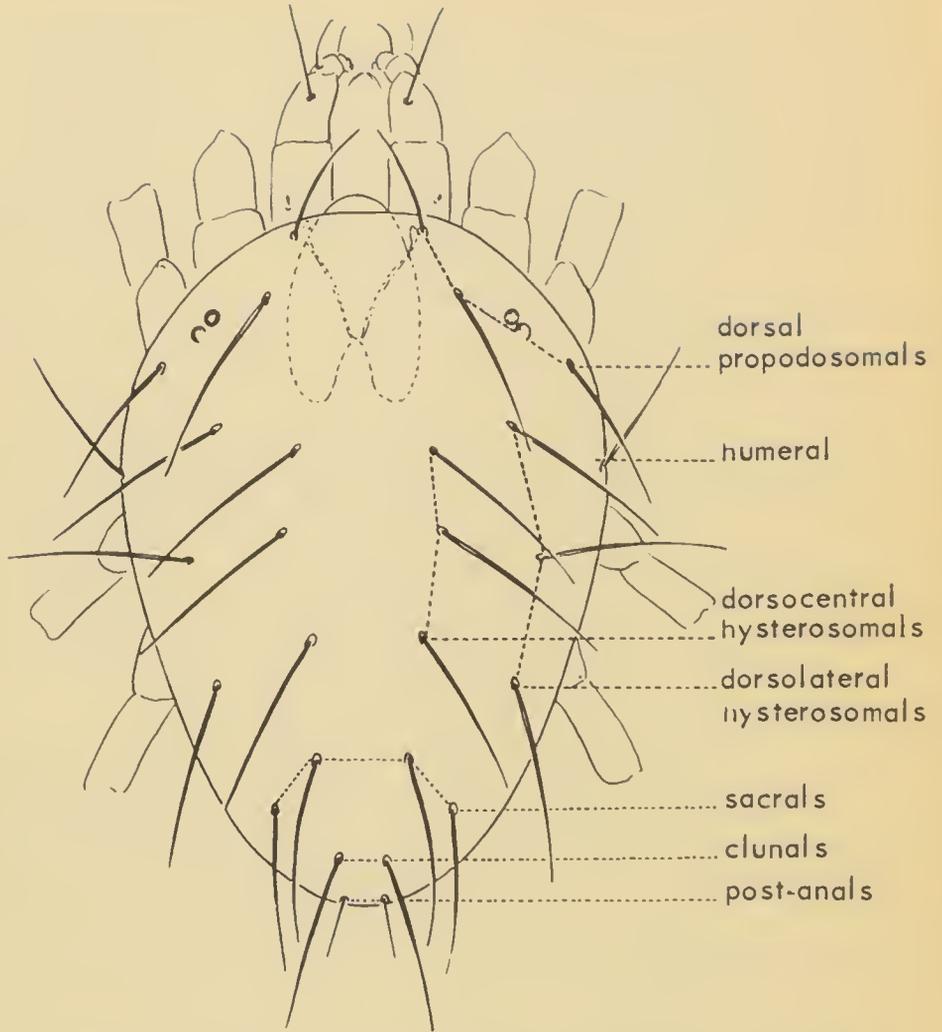


Fig. 5. Dorsum of body of a tetranychid showing nomenclature of the setae.

Baker, 1952) in which the clunals were regarded as being either present or absent (the caudal setae that drop out are now regarded as being the post-anals). The two pairs of setae between the dorso-centrals are conveniently referred to as the sacrals inasmuch as they may be marginal in some of the lower forms or else the inner pair resembles a fourth pair of dorsocentrals in higher forms.

Chaetotaxy of the venter is constant within the family, except for the opisthosoma. Females of the higher tetranychids have two pairs rather than three pairs of anal setae, and males have four pairs rather than five pairs of genito-anal setae. Certain genera of the tribe Tetranychini have the caudal set of the two pairs of para-anal setae displaced (fig. 6) to appear as a terminal pair of dorsal setae (the post-anals), and these setae are lacking in two genera.

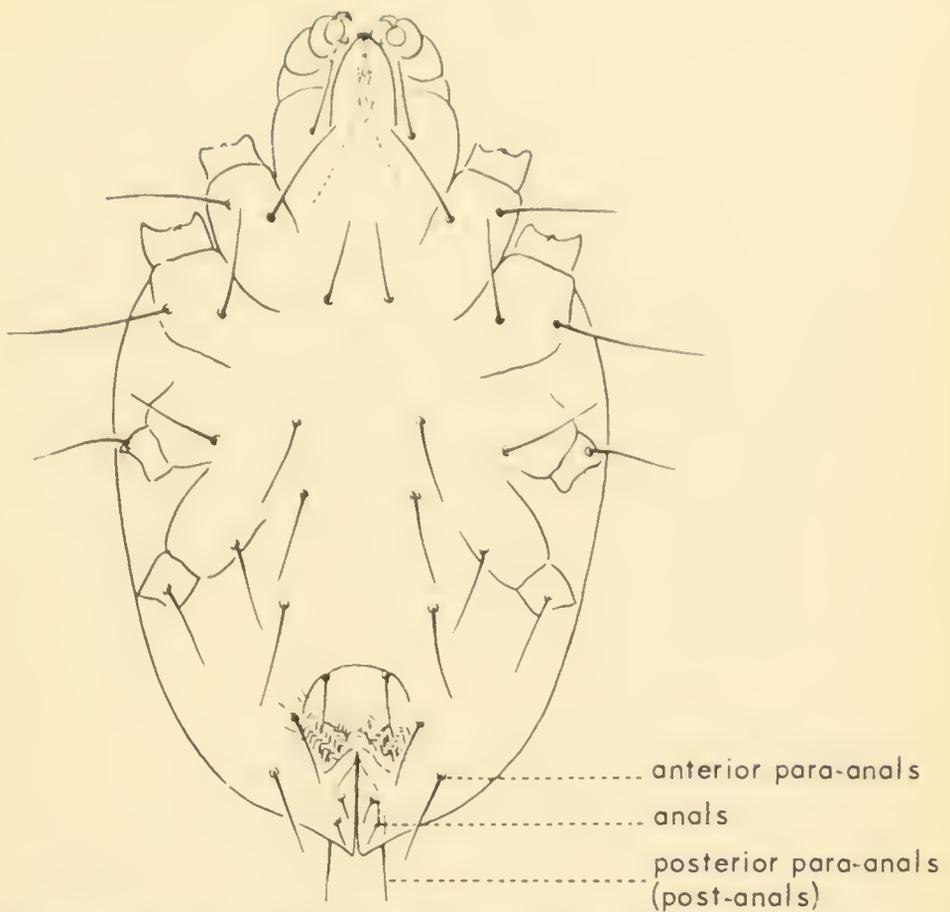


Fig. 6. Venter of body of a tetranychid showing nomenclature of the setae.

Taking into consideration other characters that represent a more generalized morphological structure within the family, it is thus evident that a reduction in the number of body setae is indicative of phylogenetic development.

Key to subfamilies of Tetranychidae

1. Empodium with tenent hairs; female with three pairs of anal setae and male with five pairs of genito-anal setae (fig. 7) BRYOBINAE (p. 12)
1. Empodium (rarely appearing absent) without tenent hairs, female with two pairs of anal setae and male with four pairs of genito-anal setae (fig. 7) TETRANYCHINAE (p. 96)

I

Subfamily BRYOBIINAE Berlese

Bryobiini Berlese, 1913, *Acaroth. Ital.*, p. 17.

Bryobiinae Reck, 1950, *Trudy Inst. Zool. Akad. Nauk Gruz. S.S.R.*,
9: 122; Reck, 1952, *Izd. Akad. Nauk S.S.R.* 1952: 24.

Bryobiidae Reck, 1952, *Soobsh. Akad. Nauk Gruz. S.S.R.*, 13(7): 422.

The subfamily Bryobiinae contains the most generalized members of the family. None of the species is known to produce silken strands.

The true claws are well developed in *Bryobia* and *Tetranychopsis* but each is reduced to a small but slender pad bearing a pair of distal tenent hairs in the other genera. The pad, however, is better developed than in the Tetranychinae and represents an intermediate stage in its reduction.

The peritremes each have a glomerate, elongate or saccular termination or, in some cases, the distal end is simple or else reflexed and multilobed.

The character of the duplex setae is distinctive of the subfamily. They are always placed at the abruptly declivate distal end of the tarsus, and the proximal member of each pair is minute and straight.

The most generalized species possess four pairs of dorsal propodosomals whereas others have three pairs of dorsal propodosomals. The hysterosoma bears twelve pairs of dorsal setae in the more generalized species and ten pairs of dorsal setae in the higher Bryobiinae. The female bears three pairs of anal setae and the male has five pairs of genito-anal setae (fig. 7).

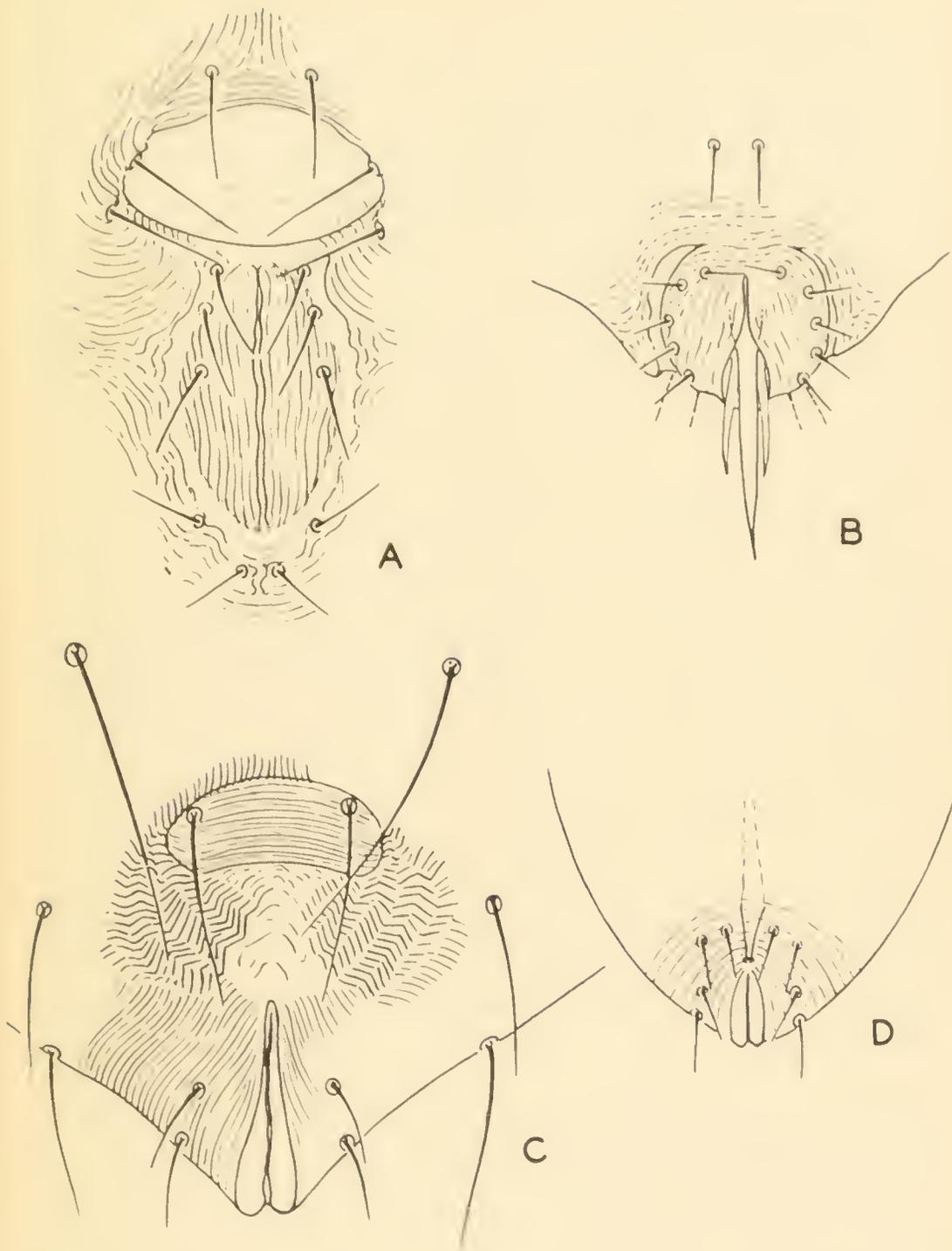


Fig. 7. Opisthosomal venters showing setation of the genital areas of the Bryobiinae: A.) female of *Petrobia harti*; B.) male of *P. harti*; and the Tetranychinae: C.) female of *Tetranychus telarius*; and D.) male of *T. telarius*.

Key to tribes of Bryobiinae

1. Propodosoma with four pairs of dorsal setae; true claw long and with tenent hairs mediolaterally BRYOBIINI (p. 14)
1. Propodosoma with three pairs of dorsal setae; true claw a short but slender pad with a pair of terminal tenent hairs 2
2. Hysterosoma with five pairs of dorsolateral and dorsosublateral setae (with twelve pairs of dorsal hysterosomals)
 HYSTRICHONYCHINI (p. 35)
2. Hysterosoma with three pairs of dorsolateral setae (with ten pairs of dorsal hysterosomals) PETROBIINI (p. 42)

TRIBE BRYOBIINI RECK

Bryobiinae Reck, 1952, Soobsh. Akad. Nauk Gruz. S.S.R. 13(7): 423.

The tribe Bryobiini is characterized by having four pairs of dorsal propodosomals and the true claw is developed as a curved hook or a long pad, with lateral tenent hairs. There are twelve pairs of dorsal hysterosomals.

Key to the genera of Bryobiini

1. True claw uncinatè, with one or several pairs of mediolateral tenent hairs *Bryobia* (p. 14)
1. True claw padlike, with two rows of ventrally directed tenent hairs *Tetranychopsis* (p. 34)

GENUS BRYOBIA KOCH

Bryobia Koch, 1836, Deuts. Crust. Myr. Arachn., 1: 8, 9; Koch, 1838, Deuts. Crust. Myr. Arachn., 17: 11; Koch, 1842, Uebers. Arach. Syst., 3: 31; Canestrini and Fanzago, 1878, Atti Reale Ist. Veneto Sci. Let. Arti (ser. 5), 4: 148; Berlese, 1886, Acari Dann. Piante Colt., p. 24; Canestrini, 1889, Atti Reale Ist. Veneto Sci. Let. Arti (ser. 6), 7: 494, 505; Oudemans, 1905, Tijds. Ent., 48: 242;

Subfamily Bryobiinae Berlese

Banks, 1907, Proc. U. S. Natl. Mus., 32: 598; Ewing, 1909, Univ. Ill. Bul., 7(14): 52; Banks, 1915, U. S. Dept. Agr. Rep., 108: 34; Ewing, 1921, Proc. U. S. Natl. Mus., 59(2394): 661; Vitzthum, 1929, Tierw. Mitteleur., 3(7): 48; Oudemans, 1930, Ent. Ber. 8(176): 172; Oudemans, 1937, Krit. Hist. Overz. Acar., 3(C): 1063; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 14; Womersley, 1940, Trans. Roy. Soc. S. Australia, 64(2): 23; McGregor, 1950, Amer. Midl. Nat., 44(2): 364; Radford, 1950, Syst. Check List Mite Gen. and Type Spp. Ser. C. (Sect. Ent.), 1: 76; Baker and Wharton, 1952, Introd. Acar., p. 213. *Type of genus: Bryobia praetiosa* Koch, by present designation (*B. speciosa*, the type designated by Koch and that usually cited, was not originally included).

Sannio Scheuten, 1857, Arch. Naturg., 23: 104. *Type of genus: (Sannio rubrioculus* Scheuten) = *Bryobia praetiosa*; monobasic.

Torynophora Cambridge, 1876, Proc. Zool. Soc. Lond., 168: 258. *Type of genus: (Torynophora serrata* Cambridge) = *Bryobia praetiosa*; monobasic.

Schmiedleinia Oudemans, 1930, Ent. Ber., 7(181): 290. *Type of genus: (Schmiedleinia tiliae* Oudemans) = *Bryobia praetiosa* Koch; monobasic.

Pseudobryobia McGregor, 1950, Amer. Midl. Nat., 44(2): 355. *Type of genus: Pseudobryobia bakeri* McGregor, by original designation. *New synonymy.*

McGregor (1950) proposed the generic name *Pseudobryobia* for those species of *Bryobia* in which the distal enlargement of the peritreme is not obviously slender and protruding from the body. This character is not valid for generic distinction inasmuch as the distal enlargement of the peritreme of *Bryobia praetiosa* is usually slender but is sometimes broadly rounded, and the peritreme is not protruding when the stylophore is protracted.

The arrangement of the more lateral dorsal hysterosomal setae is subject to displacement among the various species. The setae laterad of the three pairs of hysterosomal dorsocentrals are arranged in dorso-sublateral and lateral rows in *Bryobia curiosa* and *B. bakeri*; they form a single lateral row in *B. praetiosa* and *B. cristata*; and they are intermediate in *B. drummondi* and *B. sarothamni*.

Trägårdh (1904a, 1904b) considered *Acarus denticulatus* Linnaeus, 1758, to be a prior name for *Bryobia praetiosa*. However, Oudemans (1937) and others refer this Linnaean species to the family Labidostommidae; and the name is here given no further consideration.

All of the described species of *Bryobia* are included in the following



Fig. 8. *Bryobia curiosa*: dorsal aspect of female, type.

treatment, but two of the recognized species are not known from North America.

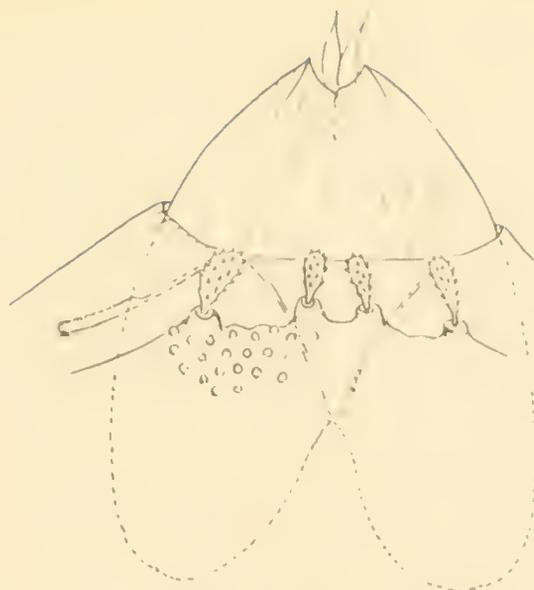


Fig. 9. *Bryobia curiosa*: dorsal aspect of propodosoma.

Key to the species of BRYOBIA

1. Empodia II-IV each consisting of a pair of tenent hairs . . . 2
1. Empodia II-IV padlike, each with two ventrally directed rows of tenent hairs 3
- 2.(1). Stylophore cleft mediolaterally; body with dorsal setae obviously spatulate *curiosa* (p. 19)
- 2.(1). Stylophore convex distally; body with dorsal setae lanceolate *bakeri* (p. 19)
- 3.(1). Propodosoma with anterior two pairs of setae arising directly from dorsum; body with dorsal setae slender even if subclavate 4
- 3.(1). Propodosoma with anterior two pairs of dorsal setae arising from strong projections; body with dorsal setae short and broadly spatulate 5
- 4.(3). Empodium I consisting of a pair of tenent hairs; propodosomal dorsum striate *drummondi* (p. 19)
- 4.(3). Empodium I consisting of a short pad with ventral rows of tenent hairs; propodosomal dorsum dotted, with smooth reticulations *sarothamni* (p. 20)
- 5.(3). Empodium I consisting of a short pad with ventral rows of tenent hairs; males common *cristata* (p. 22)

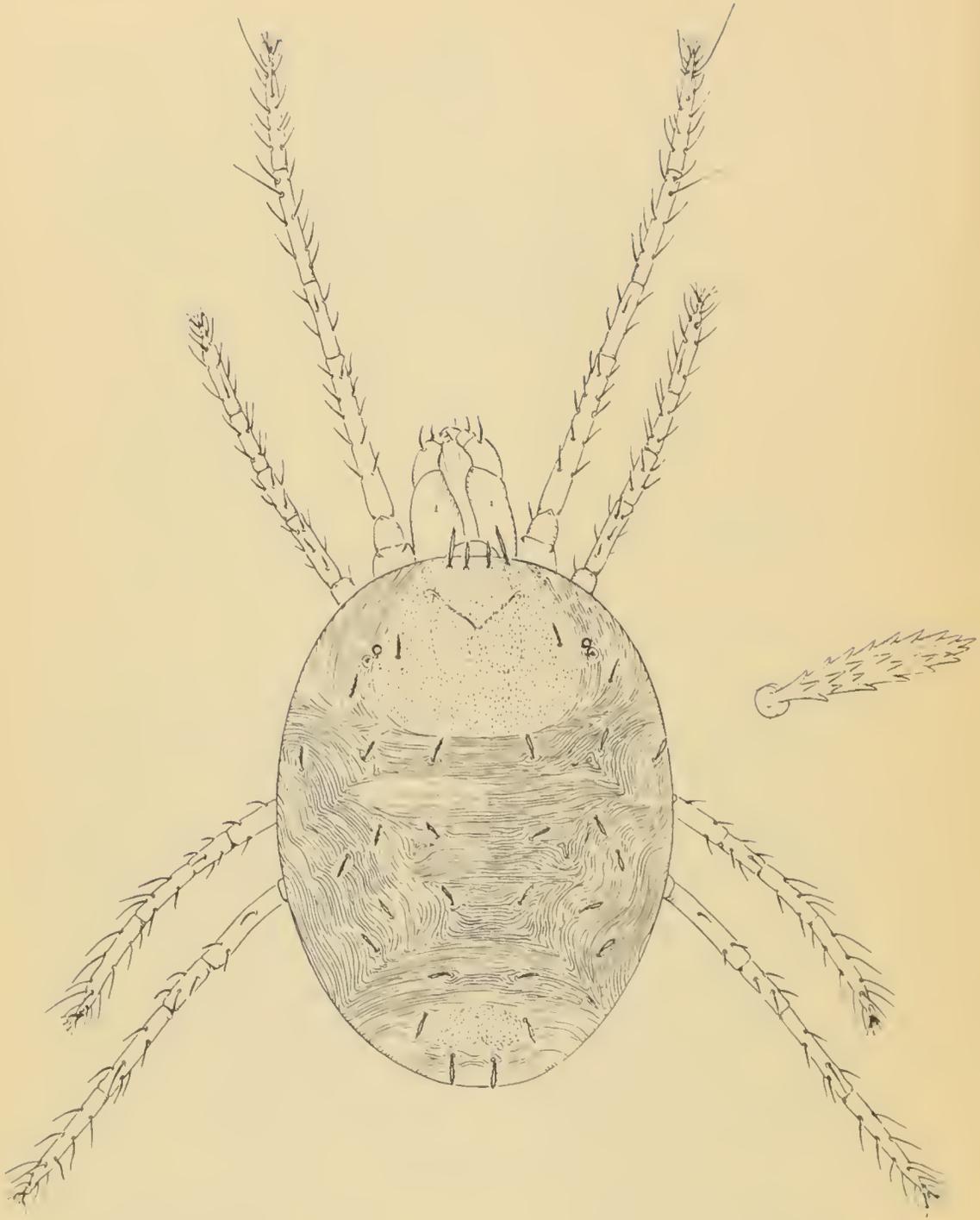


Fig. 10. *Bryobia bakeri*: dorsal aspect of female, type.

5.(3). Empodium I consisting of a single pair of tenent hairs; males unknown *praetiosa* (p. 26)

Bryobia curiosa Summers

(Figures 8, 9)

Bryobia curiosa Summers, 1953, Ann. Ent. Soc. Amer., 46: 290. Type: female, Mojave Desert, California, on unknown host; in the U. S. National Museum.

Adults of *Bryobia curiosa* may be recognized among other members of the genus by the sharply cleft stylophore. The adults resemble those of *B. bakeri* in that the empodia each consists of only a pair of tenent hairs. However, the dorsal setae of the body are broadly spatulate rather than being lanceolate as in *B. bakeri*, and there are four small projections anteriorly on the propodosoma.

This species is indigenous to the desert region of southern California, although its host is unknown. The only collection is that of the types from the Mojave Desert, California, beaten from mostly composite desert plants.

Bryobia bakeri (McGregor), new combination

(Figures 10, 11)

Pseudobryobia bakeri McGregor, 1950, Amer. Midl. Nat., 44(2): 366
Type: female, Mt. Popocatepetl, Mexico, 12,000 ft., from trunk of pine; in the U. S. National Museum.

Bryobia bakeri resembles *B. curiosa* in that the empodia each consists of a single pair of tenent hairs. However, the stylophore of *B. bakeri* is not cleft, and the dorsal setae of the body are slender and lanceolate.

This species is known from the type specimen from Mt. Popocatepetl near Mexico City, and from a female, Texas (R. K. Fletcher) on wheat. The latter specimen is smaller than the type, and the sensory setae on the tarsi are also shorter.

Bryobia drummondi (Ewing), new combination

(Figures 12, 13, 14)

Petrobia drummondi Ewing, 1926, Ent. News, 37: 143. Type: female, Death Valley, California, on creosote bush; in the U. S. National Museum.

Pseudobryobia drummondi, McGregor, 1950, Amer. Midl. Nat., 44(2): 368.

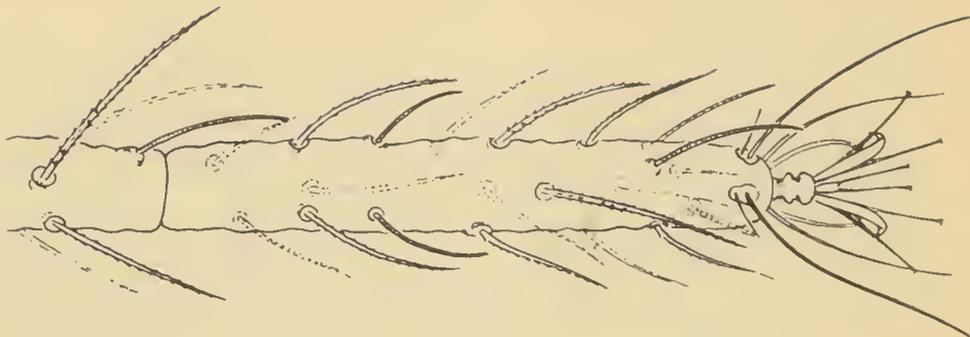


Fig. 11. *Bryobia bakeri*: tarsus I of female.

Bryobia drummondi may be recognized by having no cephalic propodosomal projections; empodium I consisting only of a pair of tenent hairs; and empodia II to IV padlike, one-half as long as the claws. The dorsal setae of the body are slender, and the dorsum of the body is striate.

This species is indigenous to the arid southwestern United States. It is found commonly in that region on creosote bush, *Larrea tridentata*.

Collections studied, other than the type, are from Little Rock, California, (E. W. Baker), on *Larrea tridentata*; Lucerne Valley, (A. E. Pritchard), on *Larrea tridentata*; Old Woman Springs, California (A. E. Pritchard), on *Larrea tridentata*; Pearblossom, California (A. E. Pritchard), on *Larrea tridentata*; and Ysleta, Texas (P. J. Netterville), on *Larrea tridentata*.

Bryobia sarothamni Geijskes

(Figure 15)

Bryobia sarothamni Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 14. Types: female, male, nymph, and larva, Holland, from *Sarothamnus vulgaris*; possibly in the Laboratorium voor Entomologie, Landbouwhoogeschool te Wageningen, Holland.

Bryobia sarothamni may be recognized by having no cephalic projections on the propodosomal dorsum and by having all the empodia padlike, as long as the claws, and bearing two ventrally directed rows of tenent hairs. The dorsal integument of the body is distinctive in being reticulate, and the dorsal setae are lanceolate.

This species is possibly common in Europe, although it was recognized only recently. Numerous specimens studied in connection with this revision were collected at East Malling, Kent, England. (A. M. Masee), on *Cytisus* sp.

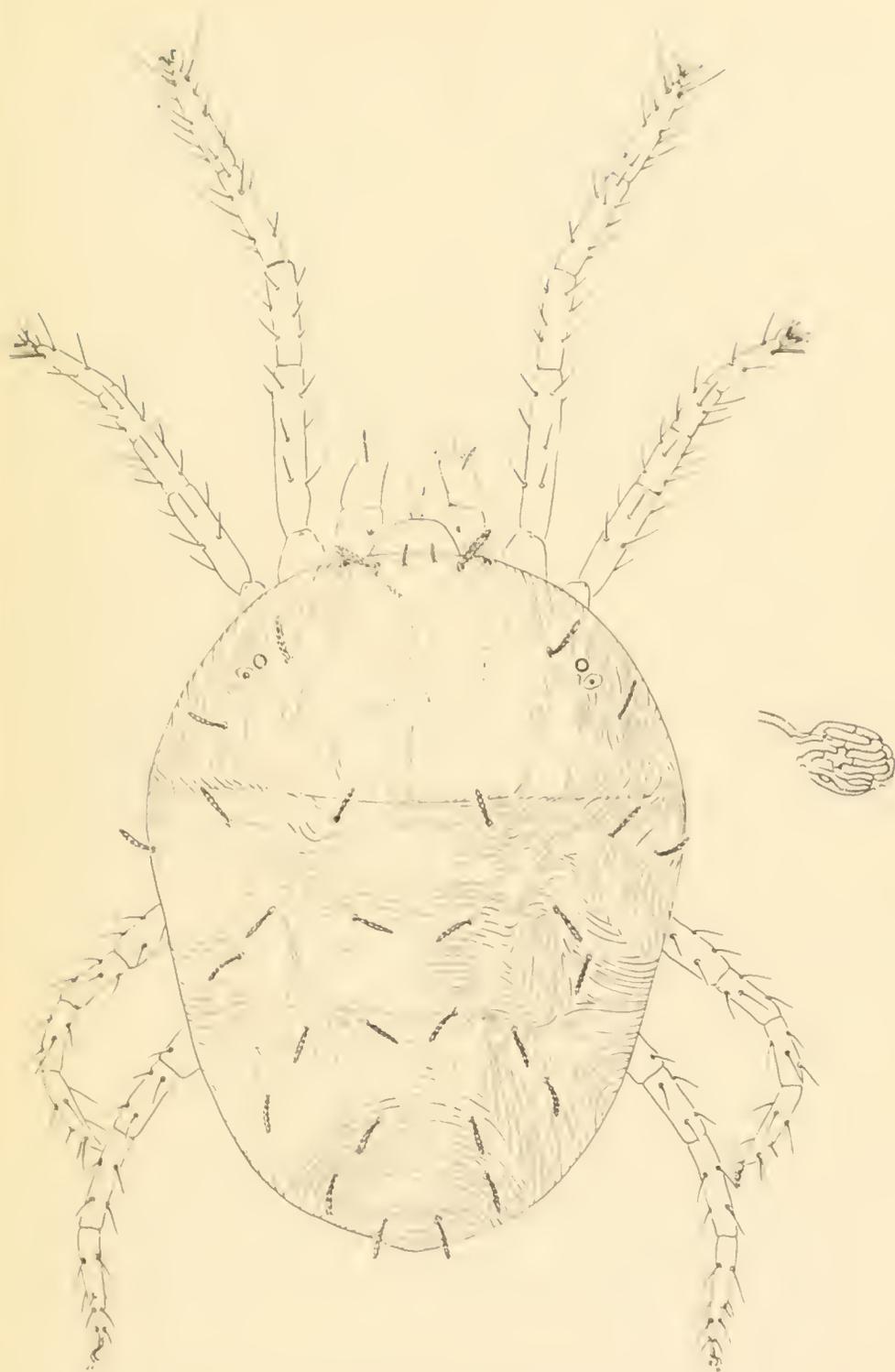


Fig. 12. *Bryobia drummondi*: dorsal aspect of female, Little Rock, California.

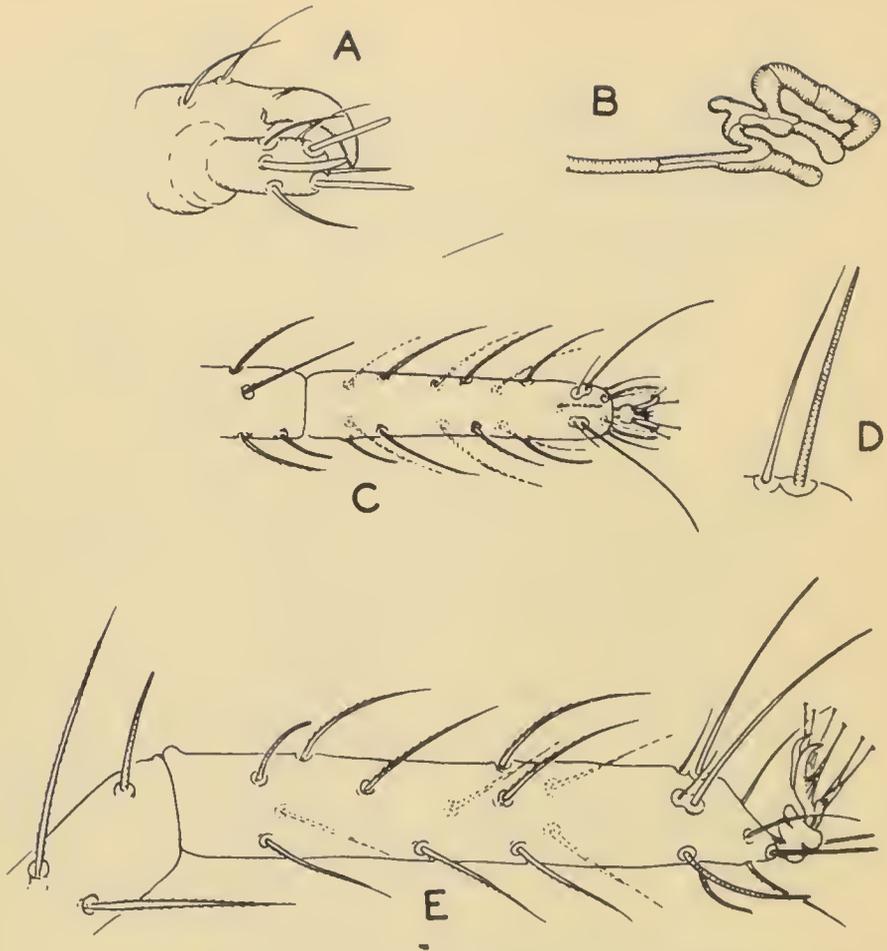


Fig. 13. *Bryobia drummondi*: A.) terminal segments of palpus of female; B.) distal end of peritreme of female; C.) tarsus I of male; D.) duplex setae of tarsus II of female; E.) tarsus I of female.

Bryobia cristata (Dugès)

(Figures 16, 17, 18)

Tetranychus cristatus Dugès, 1834, Ann. Sci. Nat. Paris (sér. 2), 1: 15, 28; Oudemans, 1937, Krit. Hist. Overz. Acar., 3 (C): 1064; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 17. Described from males and females from Paris, on numerous hosts and under stones.

Bryobia cristata, Oudemans; 1905, Tijd. Ent., 48: 242; Oudemans, 1906, Ent. Ber., 2: 60; Oudemans, 1937, Krit. Hist. Overz. Acar., 3 (C): 1065.

Bryobia praetiosa, Womersley (not Koch, 1836), 1940, Trans. Roy. Ent. Soc. S. Australia, 64(2): 246. *Misidentification*.

Bryobia urticae Sayed, 1946, Bul. Soc. Fouad 1^{er} Ent., 30: 86. *Types*: males and females, Dokki near Cairo, Egypt, on *Urtica urens* and



Fig. 14. *Bryobia drummondi*: dorsal aspect of male, Little Rock, California, with lateral view of aedeagus.

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other weeds; probably in the collection of M. T. Sayed. *New synonymy.*

Bryobia borealis Oudemans, 1930, Skrift. Sval. Isharet Oslo, 27: 102.
Types: females, Hiortham, Iceland, under boards and stones; probably in the Rijksmuseum van Natuurlijke Historie, Leiden, Holland. *New synonymy.*

Although Oudemans considered *cristata* Dugès to be a prior name for *praetiosa* Koch, Geijskes did not accept the synonymy because Dugès described males. Geijskes noted that males of *Bryobia praetiosa* were unknown in Europe, except for the Dugès reference.

Dugès' description, however, obviously refers to a species of *Bryobia*, and because he described the male in such detail, even observed in copulation, his scientific name should be applied to the close relative

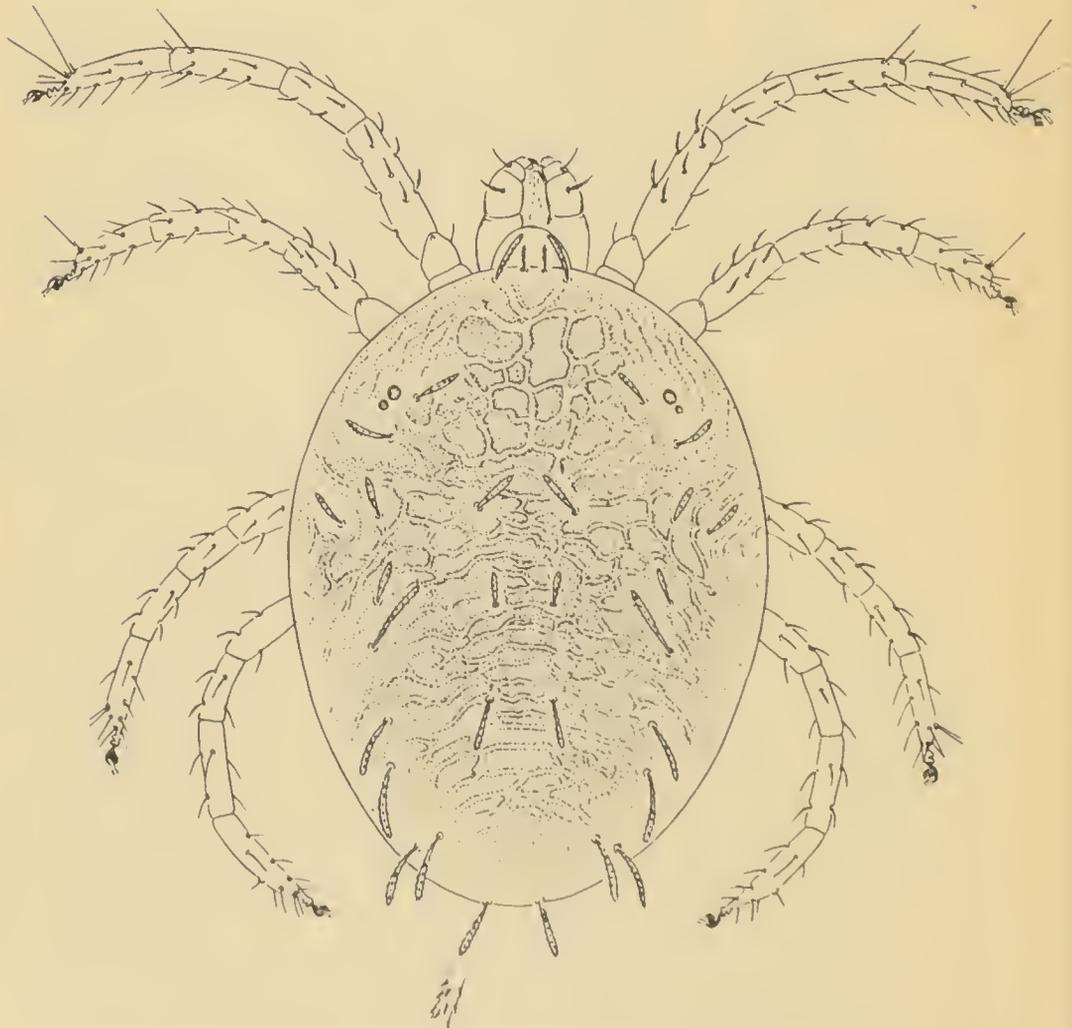


Fig. 15. *Bryobia sarothamni*: dorsal aspect of female, England.

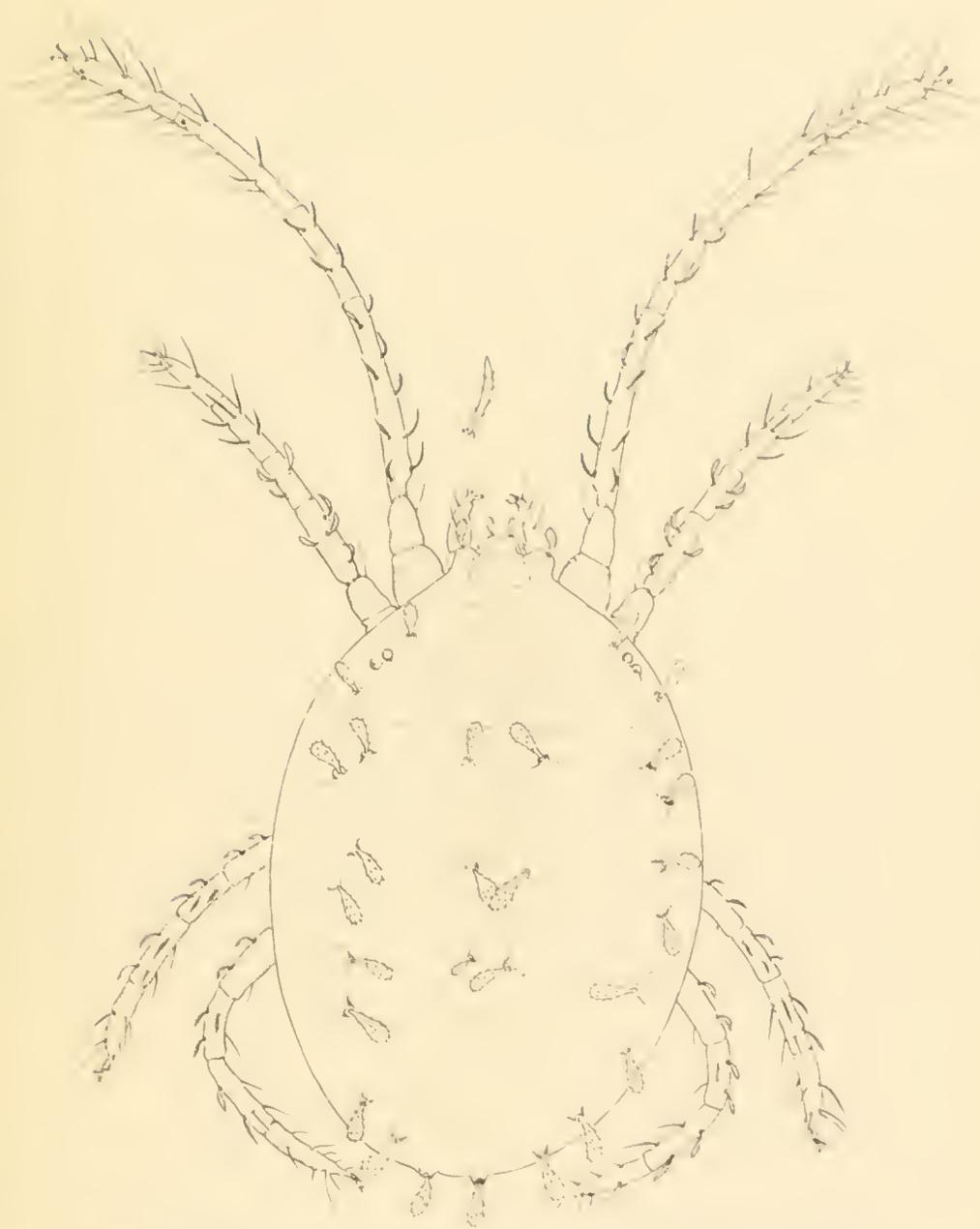


Fig. 16. *Bryobia cristata*: dorsal aspect of female, Japan.

of *B. praetiosa* in which males are common. Even though this species has not been recognized subsequently in Europe (except for Iceland), the description of *B. urticae* Sayed shows that the species occurs in the palaeartic region. *B. cristata* cannot be considered as an earlier name for *B. sarothamni*, because of the very long front legs of the female.

Bryobia cristata resembles *B. praetiosa* in that the first two pairs of dorsal propodosomals are borne on cephalic projections, and the

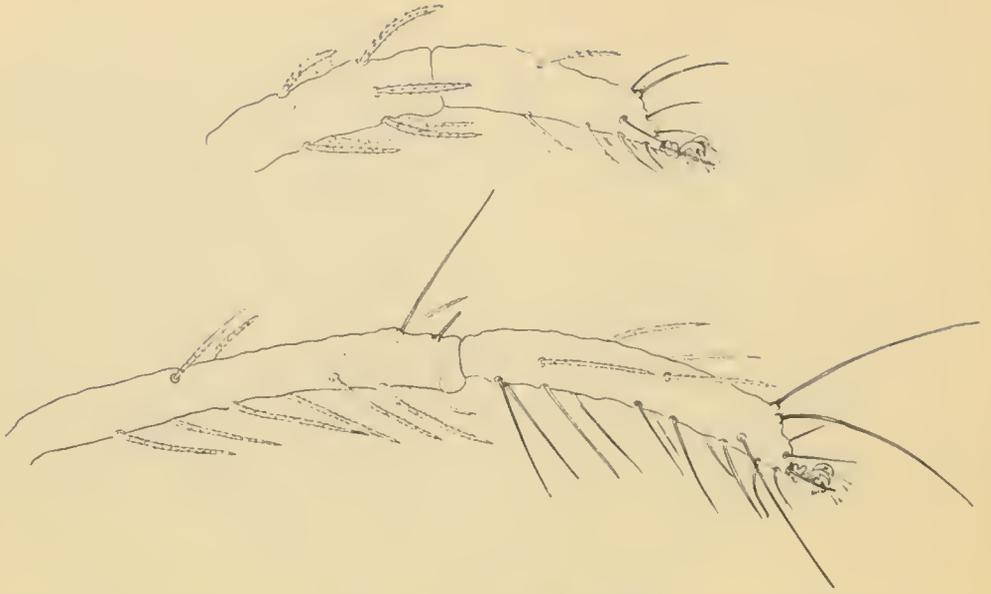


Fig. 17. *Bryobia cristata*, female: above, tarsus II; and below, tarsus I.

dorsal setae of the female body are subspatulate. However, the empodium of tarsus I of the adult female consists of a short stub bearing two rows of ventrally directed tenent hairs, and males are common. The dorsal setae of the body appear to be somewhat more slender. Otherwise, females of the two species are difficult to distinguish.

Bryobia cristata as thus recognized is known from Europe and North Africa, Australia, and Japan. Specimens studied by us are from Japan (intercepted in Seattle, Washington, by Bureau of Entomology and Plant Quarantine personnel), on chrysanthemums.

Bryobia praetiosa Koch

(Figures 19, 20)

Acarus graminum Schrank, 1781, Beytr. Natur., p. 8; Oudemans, 1906, Ent. Ber., 2: 60; Oudemans, 1929, Krit. Hist. Overz. Acar., 2: 289. Described from specimens from Germany, on grass.

Bryobia graminum, Oudemans, 1929, Krit. Hist. Overz. Acar., 2: 289; Oudemans, 1937, Krit. Hist. Overz. Acar., 3(C): 1067.

Bryobia denticulata, Trägårdh, 1904, Zool. Anz., 27: 565. *Misidentification.*

Bryobia praetiosa Koch, 1836, Den. Crust. Myr. Arach., 1: 8; Canestrini and Fanzago, 1878, Atti Reale Ist. Veneto Sci. Let. Arti (ser. 5), 4: 91; Berlese, 1886, Acari. Dann. Piante Colt., p. 24; Canestrini, 1889, Atti Reale Ist. Veneto Sci. Let. Arti (ser. 6), 7: 505;

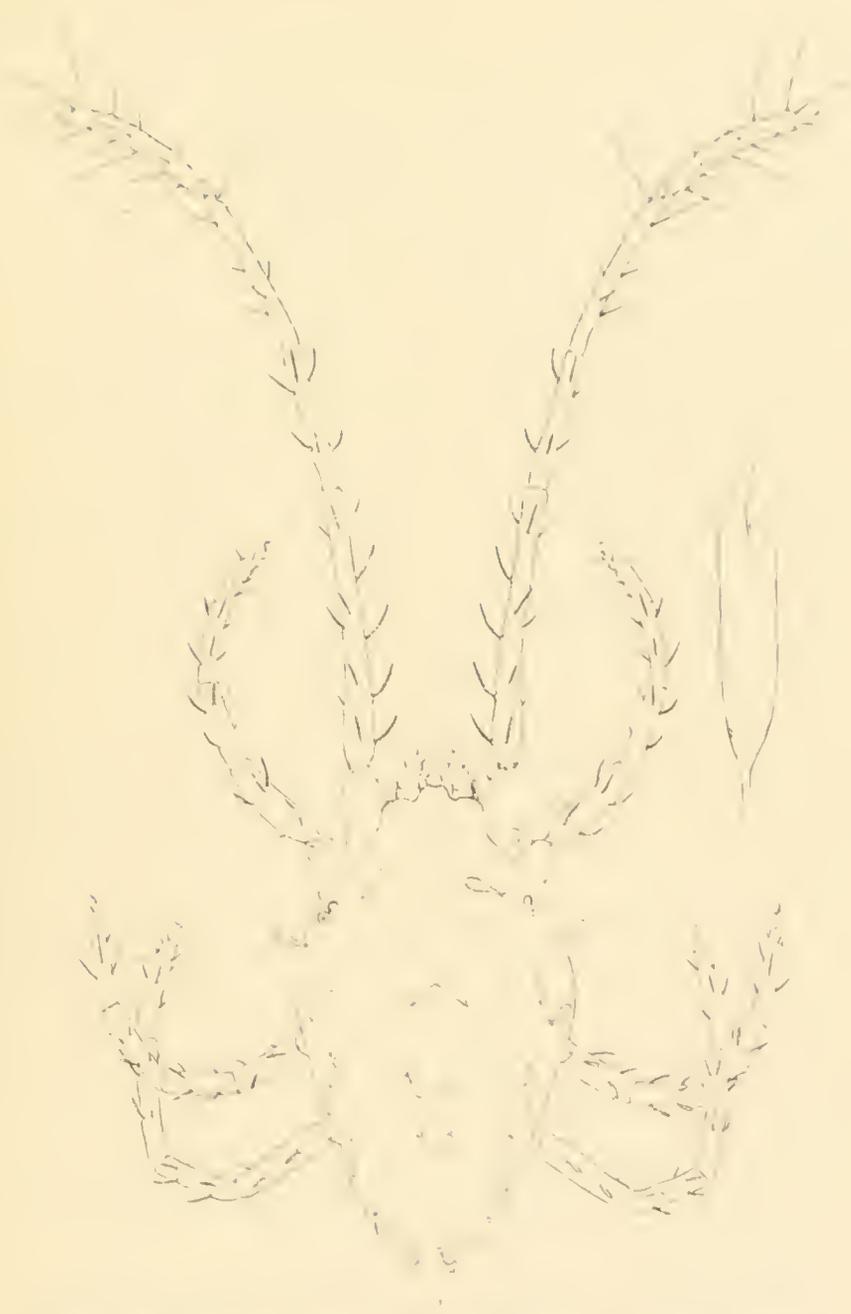


Fig. 18. *Bryobia cristata*: dorsal aspect of male, Japan,
with dorsal view of aedeagus.

Oudemans, 1900, Tijds. Ent., 43: 138; Oudemans, 1905, Tijds. Ent., 48: 242; Oudemans, 1906, Ent. Ber., 2: 60; Trägårdh, 1914, Meddel. Centralanst. Försöks. Jordbruk, 92: 3; Zacher, 1916, Mitt. kais. biol. anst. Land.-Forstw., 16: 23; Oudemans, 1927, Ent. Ber., 7: 259; Trägårdh, 1928, Rep. Sci. Res. Norveg. Exped. Nov. Zemlya, 40: 7; Vitzthum, 1929, Tierw. Mitteleur., 3(7): 48; Oudemans, 1930, Ent. Ber., 8: 172; Oudemans, 1937, Krit. Hist.

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- Overz. Acar., 3(C): 1069; Geijskes, 1939, Meded. Landbouwh. Wageningen, 4(4): 16; Garman, 1940, Conn. Agric. Expt. Sta. Bul., 431: 69; André, 1941, Bul. Mus. Natl. Hist. Nat. Paris (sér. 2), 13: 430; Reck, 1947, Soobsh. Acad. Nauk Gruz. S.S.R., 8(7): 653; McGregor, 1950, Amer. Midl. Nat., 44(2): 365. Described from specimens from Germany on shrubbery.
- Bryobia gloriosa* Koch, 1836, Deu. Crust. Myr. Arachn., 1: 9. Described from specimens from Germany, in fields.
- Bryobia speciosa* Koch, 1838, Deu. Crust. Myr. Arachn., 17: 10; Oudemans, 1905, Tijds. Ent., 48: 242; Oudemans, 1912, Ent. Ber., 3: 273; Oudemans, 1937, Krit. Hist. Overz. Acar., 3(C): 1070. Described from specimens from Germany, in woods.
- Bryobia nobilis* Koch, 1838, Deu. Crust. Myr. Arachn., 17: 11; Oudemans, 1937, Krit. Hist. Overz. Acar. (Gedeelte 3), C: 1069. Described from specimens from Germany; no host given.
- Rhyncholophus haustor* Hardy, 1850, Ann. Mag. Nat. Hist. (ser. 2), 6(33): 182. Described from specimens from England, on grasses and fruit trees.
- Bryobia haustor*, Oudemans, 1937, Krit. Hist. Overz. Acar., 3(C): 1067.
- Torynophora serrata* Cambridge, 1876, Proc. Zool. Soc. Lond. 168: 258. Described from specimens from Kerguelen Land, Indian Ocean, under stones.
- Bryobia pratensis* Garman, 1885, Fourteenth Rep. State Ent. Illinois, p. 73; Riley and Marlatt, 1890, Ins. Life, 3: 45; Banks, 1915, U. S. Dept. Agr. Rep., 108: 34. Described from females, Illinois, on grass.
- Bryobia weyerensis* Packard, 1889, Cave Memoir, p. 42. Described from Weyer's Cave, Virginia.
- Bryobia glacialis* Packard (apparently a *nomem nudum*, since we have not been able to find a reference to this species in Packard's articles, even though this is listed as a new species in the Zoological Record for 1889).
- Bryobia pallida* Garman, 1885, Fourteenth Rep. State Ent. Illinois, p. 74; Riley and Marlatt, 1890, Ins. Life, 3: 74. Described from nymphs, Illinois, on grass.
- Bryobia ribis* Thomas, 1896, Zts. Pflanzenk., 6: 80. Described from specimens from Germany, on *Grossularia* sp.
- Bryobia glacialis* Berlese, 1913, Redia, 9: 78. Type: probably nymph, Sandrio, Italy (no host given); probably in the Berlese collection at Florence, Italy.
- Bryobia brevicornis* Ewing, 1921, Proc. U. S. Natl. Mus., 59(2394): 662. Types: females, Arizona, on alfalfa; in the U. S. National Museum.

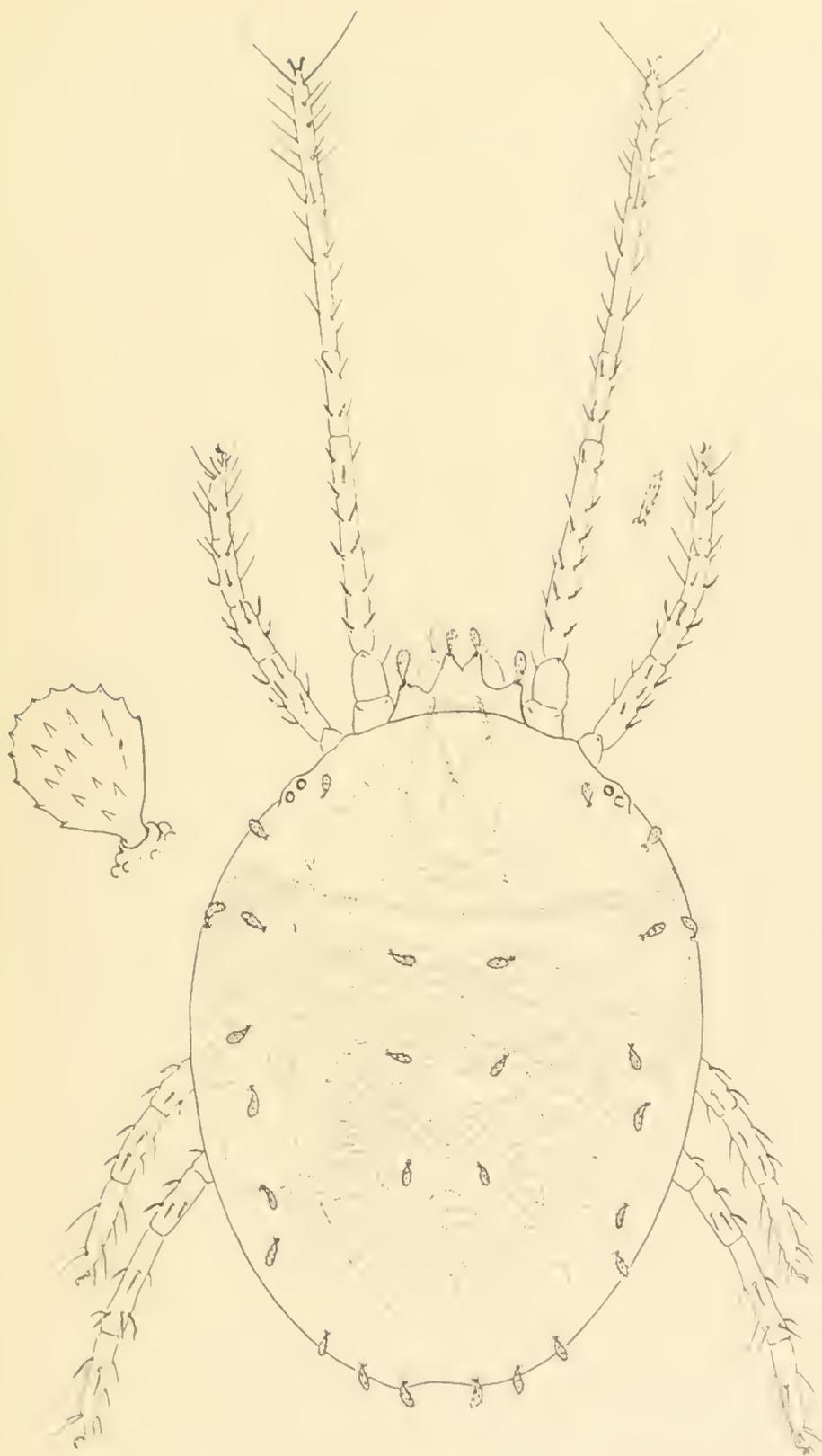


Fig. 19. *Bryobia praetiosa*: dorsal aspect of female, Los Alamos, New Mexico.



Fig. 20. *Bryobia praetiosa*: appendages of tarsi II and IV.

Bryobia longicornis Ewing, 1921, Proc. U. S. Natl. Mus., 59(2394): 662.

Types: females, Ashland, Nebraska, from Dutchman's breeches, *Bikukulla cucullana*; in the U. S. National Museum.

Bryobia humeralis Halbert, 1923, Jour. Linn. Soc. Zool., 35: 385. Types: females, Ireland, on garden walls and moss.

Schmiedleinia tiliae Oudemans, 1930, Ent. Ber., 7(176): 291. Types: larvae, Berlin Dahlem, Germany, on *Tilia* sp.; probably in the Rijksmuseum van Natuurlijke Historie, Leiden, Holland.

Bryobia praetiosa, as here identified, may be differentiated from other members of the genus by having strong anterior propodosomal projections and by having empodium I of the adult female consisting of a single pair of tenent hairs (a short empodial pad with several pairs of ventrally directed tenent hairs is present on this segment in the nymphs). Empodia II to IV are padlike, about as long as the claws, and with two rows of ventrally directed tenent hairs. Dorsal setae of the body are short and broadly spatulate. Males are unknown.

Oudemans (1905, 1927, 1937) considered the *praetiosa* complex to consist of at least two species, although he once (1900, 1906) considered the forms as being merely physiological races. Trägårdh (1914) considered *Bryobia praetiosa* to be a single, variable species, and Vitzthum (1929) stated that although specimens collected from enumerated hosts appear to be different species, still no morphological distinctions are evident.

Geijskes (1939) also pointed out that *Bryobia praetiosa* is not a sharply delineated species. He postulated that there must exist a number of probable subspecies or races on different hosts. Geijskes observed that the anterior legs of the female bear more setae on specimens collected from certain hosts and that populations on different hosts differ biologically, particularly in regard to overwintering habits. He was

unable to separate the forms morphologically and recognized no similar species in Holland.

McGregor (1950), without further comment, considered certain of the species described from North America (*Bryobia pallida* was disregarded), as well as the European *B. speciosa*, to be synonyms of *B. praetiosa*.

Roosje and Van Dintter (1953) recently reviewed the taxonomy and biological considerations of this mite in Holland. They found that populations from ivy transfer readily to the same host and to *Zinnia elegans*; but their transfers from ivy to gooseberry, red clover, and European boxwood were all negative.

Morphological distinctions are evident among collections of *Bryobia praetiosa* that are taken from different types of hosts. The most obvious differences are in the length of the fore legs of the female, accompanied by variations in the number of tactile setae on tibia I: from 11 to 17 in the specimens studied. These setae are not always constant on a single specimen, nor are these numbers correlative with a given host.

Females from England, California, and Chile—all from apple—appear to have the distal enlargement of the peritreme shorter and more globular (not projecting anteriorly when the stylophore is protracted). Other specimens have the peritremal enlargement slender and usually projecting. However, no sharp morphological distinctions are evident with this character, when all specimens are studied.

Summers (1952) made a detailed study of the biology of *Bryobia praetiosa* on California almonds. His findings differ considerably from the observed behavior of this mite on other types of plants and substantiate the observations by Geijskes (1939) and others that seasonal development may vary according to host.

It is evident, therefore, that there are a number of subspecies or species in the *Bryobia praetiosa* complex and that a morphological distinction of the various populations and their further delineation nomenclaturally is extremely difficult. In view of the fact that these mites are entirely parthenogenic, one might expect that a single mutation could give rise to a clone and subsequent population that differs to some extent from the parent, at least with regard to host relationships, biological development or minor morphological characters. It is very difficult to ascertain whether such mutations represent actual species differences, since reproductive isolation is always present.

In the meantime, the taxonomist can recognize only *Bryobia praetiosa* with its long list of synonyms. *Bryobia graminum* is undoubtedly a prior name, but its proposed use is withheld pending further studies on the species complex.

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Specimens of *Bryobia praetiosa* have been studied from Europe, Turkey, South Africa, North America, South America, and Australia.

Deciduous fruit trees such as apple, pear, plum, prune, cherry, peach, and nectarine are important hosts. Almond is a favorite host, and walnut is reported to be a host. Wild or native grasses commonly harbor the mite, as well as wheat, barley, and other grains. Clover and alfalfa are occasionally infested. Many weeds are favorable hosts. Ornamentals such as ivy, orchids, and shade trees are also subject to infestation.

Bryobia praetiosa commonly invades homes in both Europe and North America, particularly during the fall.

Bryobia amygdali Reck

Bryobia amygdali Reck, 1947, Soobsh. Akad. Nauk Gruz. S.S.R., 8(9-10): 658. Described from specimens from Georgia, S.S.R., on *Rhamnus pallasii*.

This and all of the following species described by Reck are presumed to belong to the *praetiosa* complex, because his keys identify the species by the anteromedian projections of the propodosoma, length of legs, type of setae on femora I, and coxae I setation.

Bryobia goriensis Reck

Bryobia goriensis Reck, 1947, Soobsh. Akad. Nauk Gruz. S.S.R., 8(9-10): 656. Described from specimens from Gori, Georgia, S.S.R., on *Rubus* sp.

Bryobia longisetis Reck

Bryobia longisetis Reck, 1947, Soobsh. Akad. Nauk Gruz. S.S.R., 8(9-10): 655. Described from specimens from Georgia, S.S.R., on *Salvia* spp.

Bryobia osterloffii Reck

Bryobia osterloffii Reck, 1947, Soobsh. Akad. Nauk Gruz. S.S.R., 8(9-10): 657. Described from specimens from Georgia, S.S.R., on *Astragalus caucasicus*.



Fig. 21. *Tetranychopsis horridus*: dorsal aspect of female, California.

Bryobia parietariae Reck

Bryobia parietariae Reck, 1947, Soobsh. Akad. Nauk Gruz. S.S.R., 8(9-10): 660. Described from specimens from Georgia, S.S.R., on *Parietaria judaica*.

Bryobia redikorzevi Reck

Bryobia redikorzevi Reck, 1947, Soobsh. Akad. Nauk Gruz. S.S.R., 8(9-10): 658. Described from specimens from Georgia, S.S.R., on *Prunus spinosa*.

Bryobia ulmophila Reck

Bryobia ulmophila Reck, 1947, Soobsh. Akad. Nauk Gruz. S.S.R., 8(9-10): 659. Described from specimens from Georgia, S.S.R., on *Ulmus* sp.

GENUS **TETRANYCOPSIS** CANESTRINI

Tetranychopsis Canestrini, 1889, Atti Reale Istit. Veneto Sci. Let. Arti (ser. 6), 7: 494, 504; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42: 26. *Type of genus: Tetranychus horridus* Canestrini and Fanzago; monobasic.

Tetranychopsis, Berlese, 1893, Acari Myr. Scorp. Prostig., 72: No. 8. Emendation for *Tetranychopsis* Canestrini.

The genus *Tetranychopsis* may be recognized by having the claws long and padlike, each with two rows of short, ventrally directed tenent hairs. The empodium resembles the claws. Similar tarsal appendages are found elsewhere only in the Linotetranidae and the Phytoptipalpidae.

A single species of *Tetranychopsis* has been definitely recognized. Four species have been erroneously assigned to the genus: *T. simplex* Trägårdh, *T. spinosa* Banks, *T. histricina* Berlese, and *T. paupera* Berlese. The status of *T. spiraeae* Reck has not been determined.

Tetranychopsis horridus (Canestrini and Fanzago)
(Figure 21)

Tetranychus horridus Canestrini and Fanzago, 1876, Atti Soc. Veneto-Trentino Sci. Nat., 5: 139; Canestrini and Fanzago, 1878, Atti Reale Istit. Veneto Sci. Let. Arti (ser. 5), 4: 151; Berlese, 1887, Acari Myr. Scorp. Prostig., 36: No. 9; Reck, 1948, Trudy Zool. Inst. Akad. Nauk Gruz. S.S.R., 8. Described from specimens from Italy, on unspecified host.

Subfamily Bryobiinae Berlese

- Neophyllobius horridus*, Berlese, 1886, Acari Dann. Piante Colt., p. 20.
Tetranychopsis horrida, Canestrini, 1889, Atti Reale Ist. Veneto Sci. Let. Arti (ser. 6), 7: 504.
Tetranychopsis horrida, Berlese, 1893, Acari Myr. Scorp. Prostig., 72: No. 8.
Tetranychopsis horridus, Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 26.

Tetranychopsis horridus is a very distinctive spider mite with long dorsal setae that are borne on strong tubercles. It feeds typically on the upper surface of the leaves of hazel, *Corylus maxima*, in southeastern Europe. However, Canestrini and Fanzago, as well as Berlese, recorded additional hosts.

This species was known only from Italy until Hirst and Reck recorded its occurrence on hazel in England and Georgia, S.S.R. respectively.

A moderate but persistent infestation occurs near Niles, California, on hazel trees imported many years ago from Europe.

Tetranychopsis spiraeae Reck

- Tetranychopsis spiraeae* Reck, 1948, Trudy Zool. Inst. Akad. Nauk Gruz. S.S.R., 8. Described from specimens from Georgia, S.S.R., on *Spiraea hypericifolia*.

We have not seen the article in which this species was described.

HYSTRICHONYCHINI PRITCHARD AND BAKER, NEW TRIBE

The tribe Hystrichonychini is rather intermediate between the Bryobiini and the Petrobiini, although it is more closely allied to the latter group. The hysterosoma possesses nine pairs of dorsolateral and dorso-sublateral setae in addition to the three constant pairs of dorsocentrals, as in the Bryobiini; but there are only three pairs of dorsal propodosomals. Moreover, the true claw consists of a slender pad bearing a pair of tenent hairs distally. The empodium consists of a pair of tenent hairs.

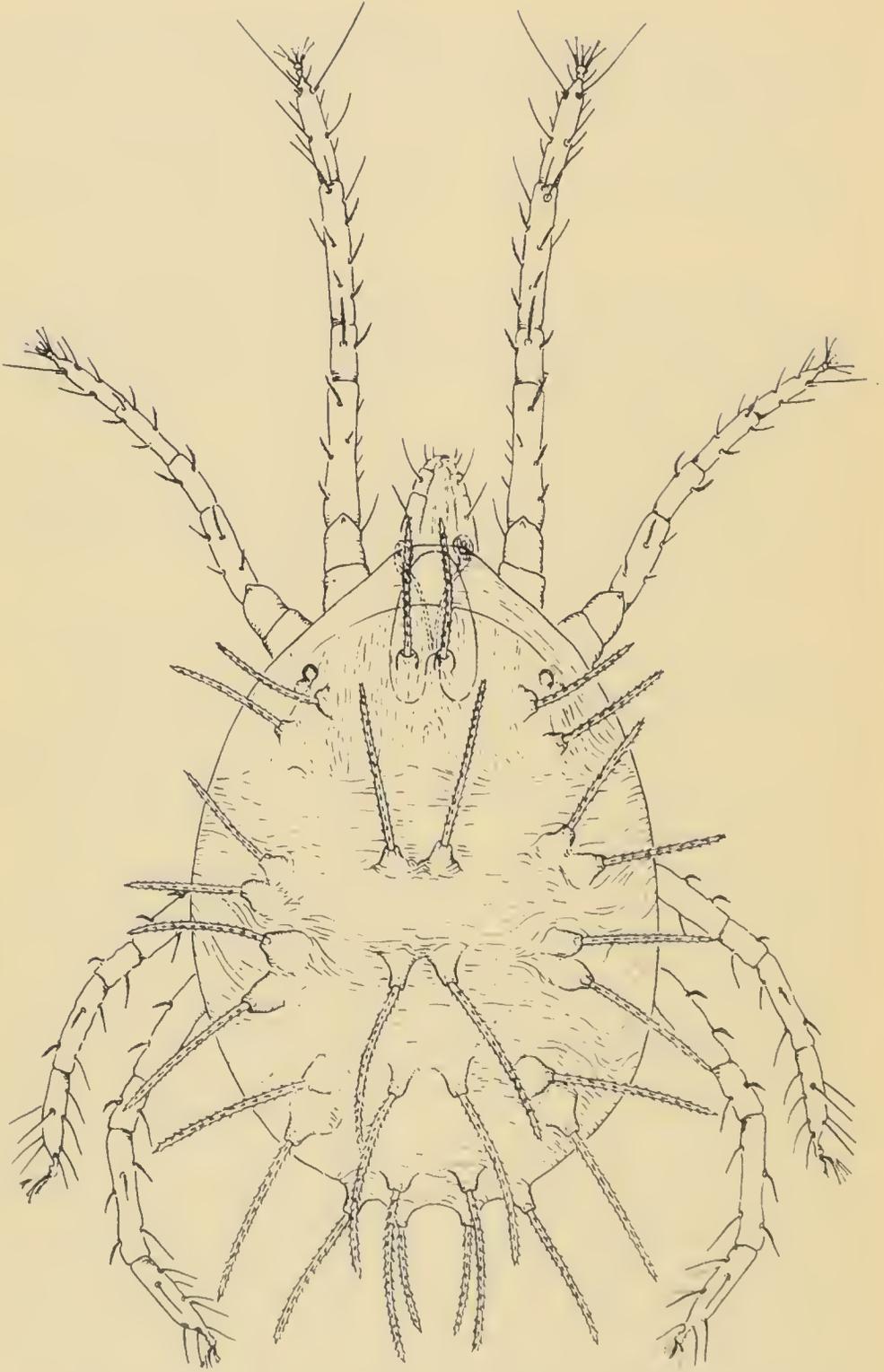


Fig. 22. *hystrichonychus gracilipes*: dorsal aspect of female, Texas.

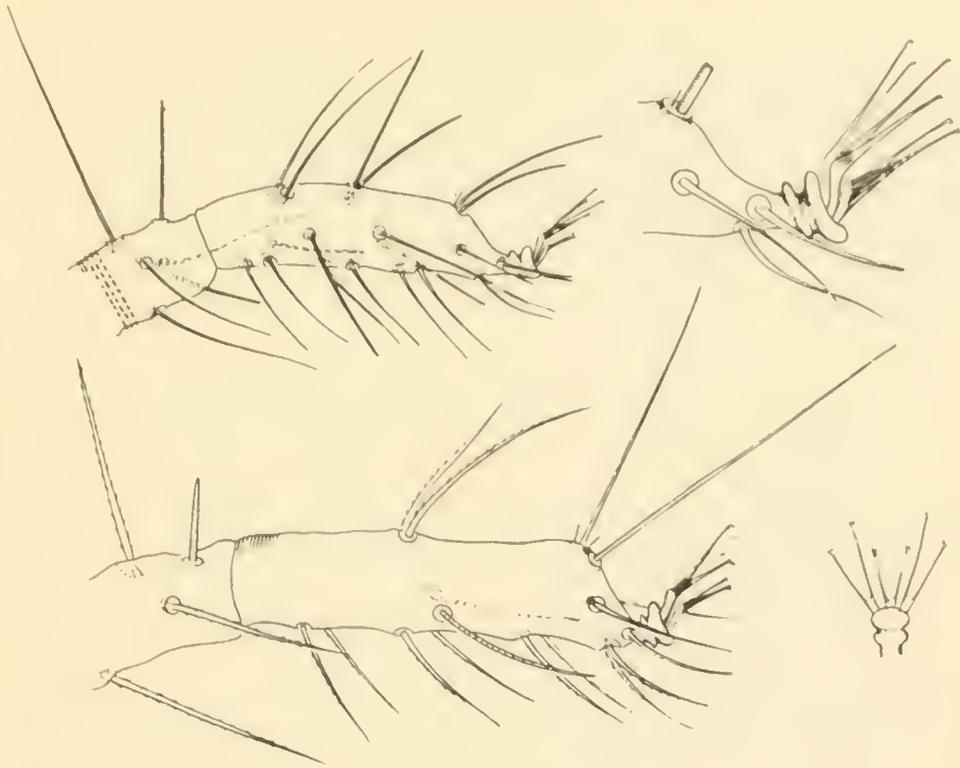


Fig. 23. *Hystrichonychus gracilipes*: above, tarsus I of male with lateral enlargement of appendages; below, tarsus I of female with dorsal enlargement of appendages.

GENUS **HYSTRICHONYCHUS** MCGREGOR

Hystrichonychus McGregor, 1950, Amer. Midl. Nat., 44(2): 272. Type of genus: *Tetranychus gracilipes* Banks; monobasic and by original designation.

Neotetranychopsis Bagdall, 1951. *New synonymy*. The original description of this genus has not been seen; the new synonymy is based on the key presented by Reck (1952a).

The genus *Hystrichonychus* is known to us only from the southwestern and western United States. It contains two species that feed on members of the family Malvaceae in the southwestern United States.

A third species was described by Bagdall (1951) from Armenia, S.S.R., but we have not seen this description nor the specific name proposed.



Fig. 24. *Hystrihonychus gracilipes*: dorsal aspect of male, Texas.

Key to the species of HYSTRICHONYCHUS

1. Peritreme terminating in a very complex enlargement; dorsal setae of body stout, nearly blunt distally . . . *gracilipes* (p.39)
1. Peritreme hooked distally, but sometimes irregularly sub-branched; dorsal setae of body slender, tapering to a fine point *sidae* (p.40)

Hystrichonychus gracilipes (Banks)

(Figures 22, 23, 24, 25)

Tetranychus gracilipes Banks, 1900, U.S. Dept. Agr. Tech. Ser., 8: 72.Types: females, Phoenix, Arizona, on *Sphaeralcea*; in the U. S. National Museum.*Hystrichonychus gracilipes*, McGregor, 1950, Amer. Midl. Nat., 44(2): 272.

Hystrichonychus gracilipes may be recognized by having the dorsal setae of the body stout, set on strong tubercles, and the distal end of the peritreme consisting of a complex enlargement.

This species, as here defined, is known only from *Sphaeralcea* in the southwestern United States. Aside from Banks' types, collections have been studied from El Centro, California, (E. A. McGregor), on *Sphaeralcea angustifolia*; and Ysleta, Texas (P. Netterville), on mallow.

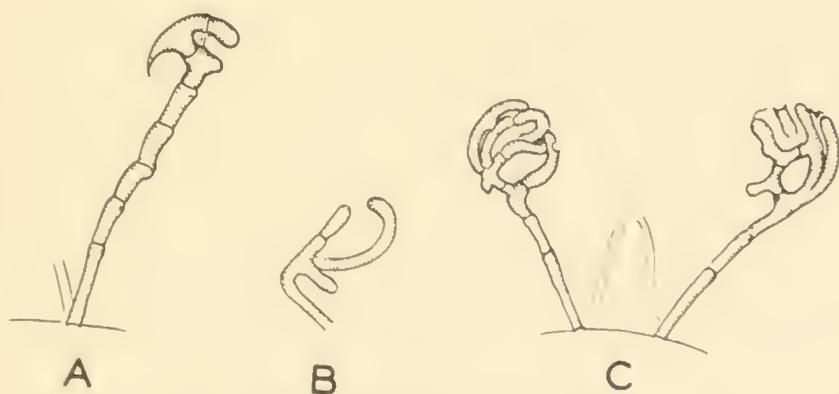


Fig. 25. *Hystrichonychus gracilipes*, peritremes: A.) male, Texas; B.) female, type; C.) female, Texas.

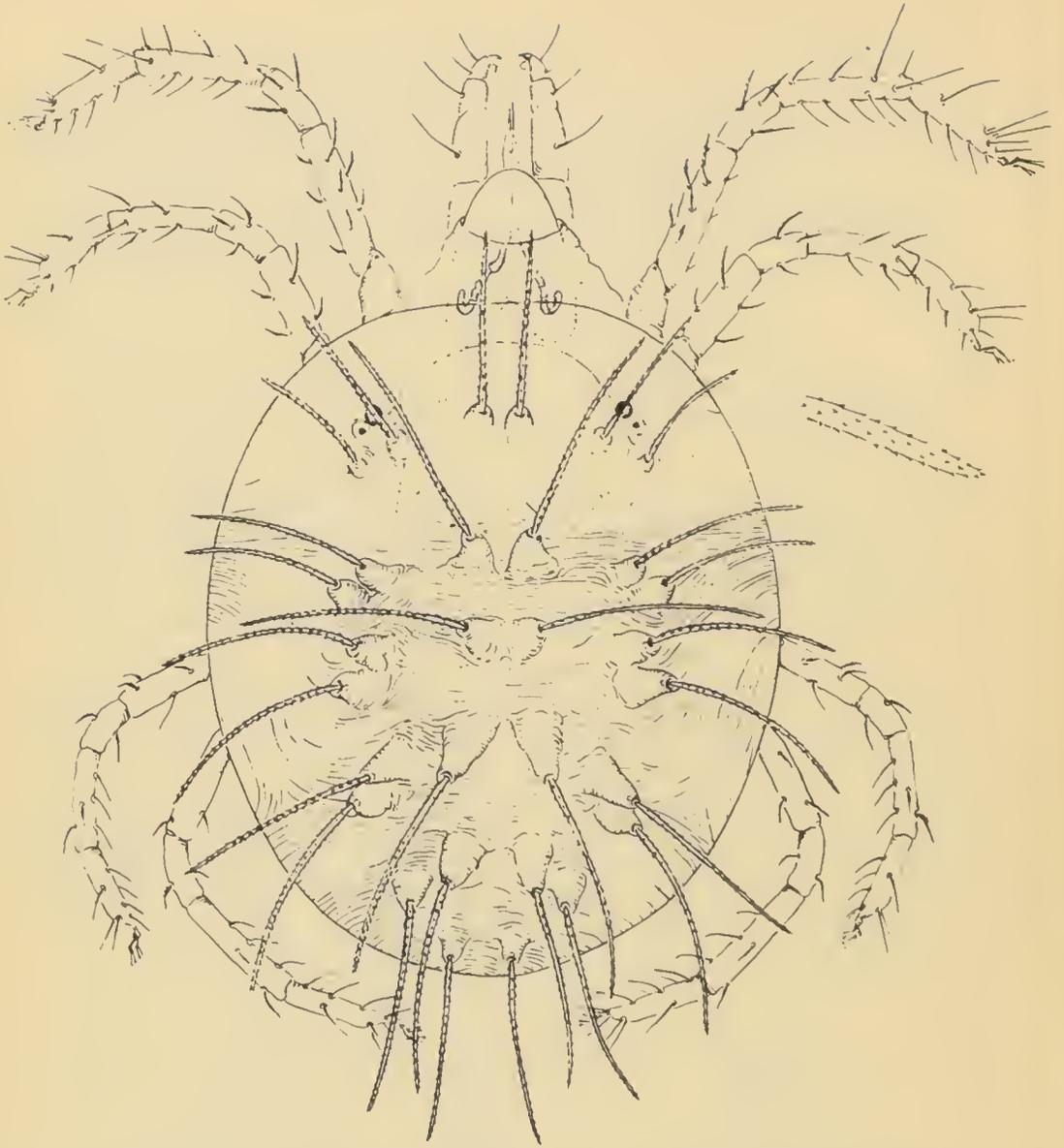


Fig. 26. *Hystrichonychus sidae*: dorsal aspect of female, holotype.

Hystrichonychus sidae Pritchard and Baker, new species
(Figures 26, 27)

Hystrichonychus sidae is very closely allied to *H. gracilipes*. It differs by having the body with comparatively slender and more tapering dorsal setae, and the distal end of the peritreme is comparatively simple. Moreover, *H. sidae* occurs only on alkali mallow, *Sida hederacea*.

Female.—Rostrum very slender, reaching middle of genu I. Palpus slender, the claw of the fourth segment surpassing the fifth segment;

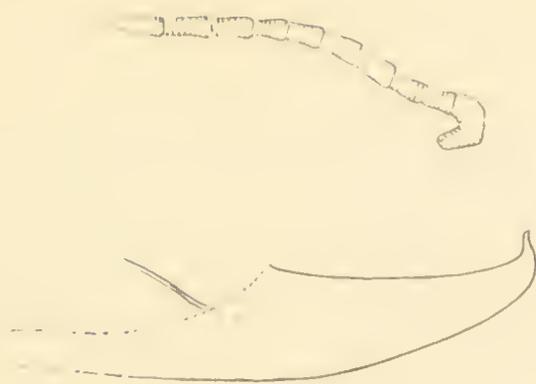


Fig. 27. *Hystrichonychus sidae*: peritreme of male and aedeagus.

terminal sensilla slender. Peritreme with several distal chambers forming a strong hook (sometimes with lobulate diverticula). Legs with slender, tapering, pubescent, tactile setae. Anterior legs about as long as body; tarsus I with one dorsal pair and three ventral pairs of tactile setae proximad of duplex setae and with a pair of medioventral sensory setae. Empodium a single pair of divergent tenent hairs, about one half as long as the pair of tenent hairs on the true claw. Body with fine, mostly transverse striae on integument; propodosoma with the three pairs of dorsal setae similar to the twelve pairs of dorsal hysterosomals, all very long, slender, tapering from near the base, sparsely serrate, and set on strong tubercles. Length of body, 353μ ; with rostrum, 500μ .

Male.—Similar to female except tarsus I with three pairs of sensory setae proximad of the duplex setae, and the dorsum of the body with all of the setae shorter than the first three pairs of dorsocentral hysterosomals. Aedeagus slender but stout and curved dorsad to the dorsally directed, tiny, distal angulation. Length of body 300μ ; with rostrum, 366μ .

Holotype.—Female, Modesto, California, August 8, 1949 (A. E. Pritchard), on alkali mallow, *Sida hederacea*; type no. 2075 in the U. S. National Museum. *Paratypes*.—Six males, 2 females, Corcoran, California, August 6, 1951 (A. E. Pritchard), on *Sida hederacea*; 1 male, 4 females, 5 nymphs, August 31, 1948, August 31, 1948 and 8 males, 25 females, 2 nymphs, Modesto, California August 8, 1949 (A. E. Pritchard), on *Sida hederacea*; and 7 males, 9 females, Tracy, California, May 26, 1949 (J. W. MacSwain), on *Sida hederacea*.

TRIBE **PETROBIINI** RECK

Petrobiinae Reck, 1952, Soobsh. Akad. Nauk Gruz. S.S.R., 13(7): 423.

The tribe Petrobiini differs from other tribes of the Bryobiinae in that the hysterosoma possesses only five pairs of dorsolateral and dorsosublateral setae. In other words, the second and third dorsolaterals are single, rather than paired. In many of the species, the inner sacrals are placed medially to resemble a fourth pair of dorsocentral hysterosomals; but in other cases they are marginal so that the mite has three pairs of caudal setae.

The true claw resembles that of the tribe Hystrichonychini. It consists of a small, slender pad that bears a pair of tenent hairs distally. The empodium may consist of a slender pad bearing many pairs of tenent hairs; but it may be only a small pad or even reduced to just a single pair of tenent hairs.

Key to the genera of Petrobiini

1. Empodium uncinatè 2
1. Empodium without a terminal hook, being padlike or else consisting of a pair of tenent hairs 3
2. Empodium with two rows of ventrally directed tenent hairs *Petrobia* (p. 42)
2. Empodium with one pair of mediolateral, distally directed tenent hairs *Schizonobia* (p. 56)
3. Hysterosoma with inner sacrals approximate and resembling a fourth pair of dorsocentrals *Aplonobia* (p. 58)
3. Hysterosoma with inner sacrals more widely spaced than dorsocentrals and more removed from them than the dorsocentrals are from each other *Monoceronychus* (p. 74)

GENUS **PETROBIA** MURRAY

Petrobia Murray, 1877, Econ. Ent., Apt., p. 118; Oudemans, 1915, Ent. Ber., 4(83): 193; Oudemans, 1915, Arch. Naturg. 81(A,5): 48; Vitzthum, 1929, Tierw. Mitteilg., 3(7): 49; Geijskes, 1939, Med. ed. Landbouwh. Wageningen, 42(4): 27; Womersley, 1940, Trans.

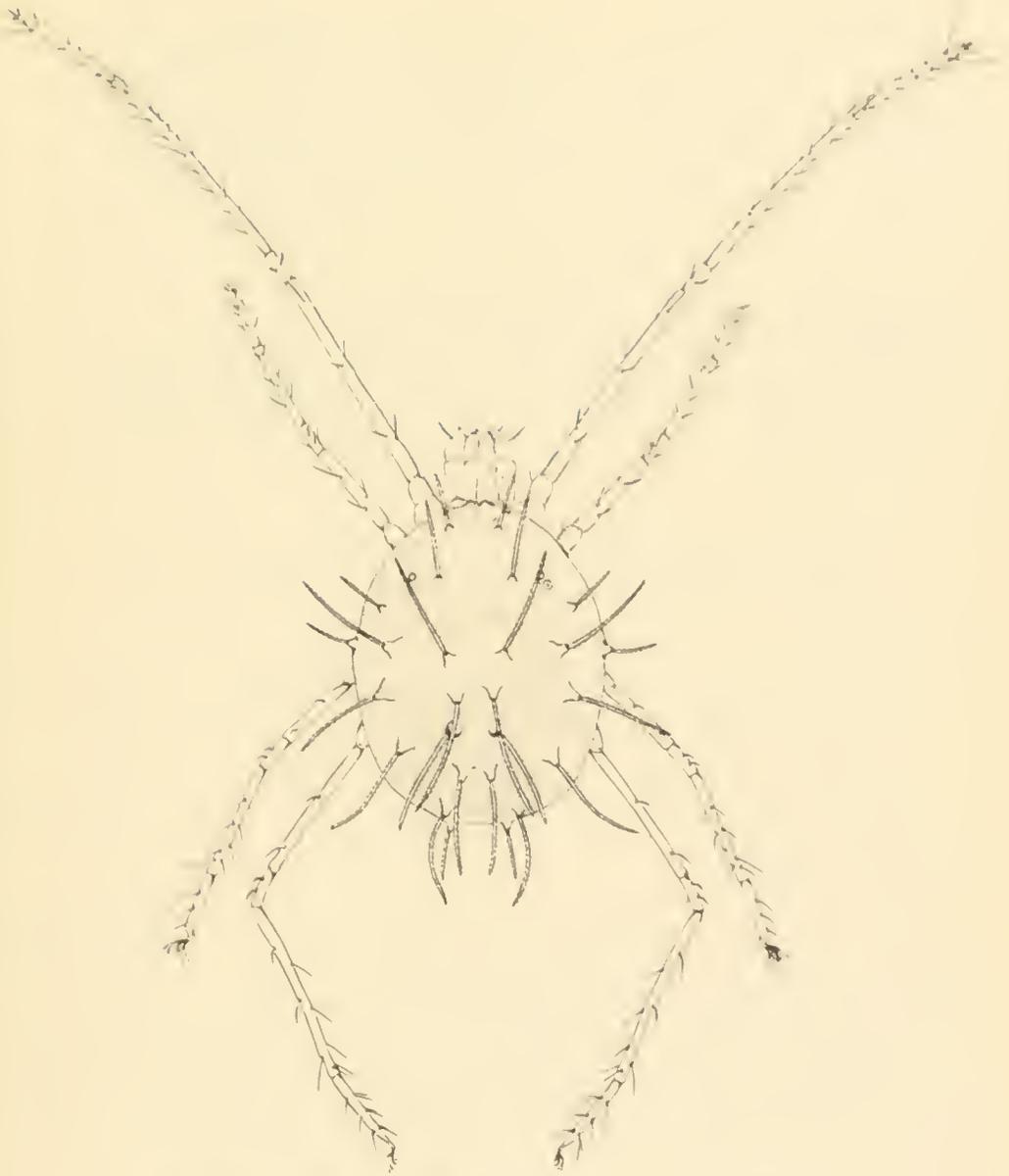


Fig. 28. *Petrobia harti*: dorsal aspect of female.

Roy. Soc. S. Australia, 64(2): 254; McGregor, 1950, Amer. Midl. Nat., 44(2): 363. Baker and Wharton, 1952, Introd. Acarol., p. 213; Baker and Pritchard, 1953, Hilgardia, 22(7): 206. *Type of genus*: (*Trombidium lapidum* Hammer) = *Petrobia latens* (Müller), by original designation and monobasic.

Tetranobia Banks, 1917, Ent. News, 28: 194. *Type of genus*: (*Tetranobia decepta* (Banks)) = *Petrobia latens* (Müller); monobasic.

Tetranychina Banks, 1917, Ent. News, 28: 195; McGregor, 1950, Amer. Midl. Nat., 44(2): 360. *Type of genus*: *Tetranychina apicalis* Banks; monobasic. *New synonymy*.

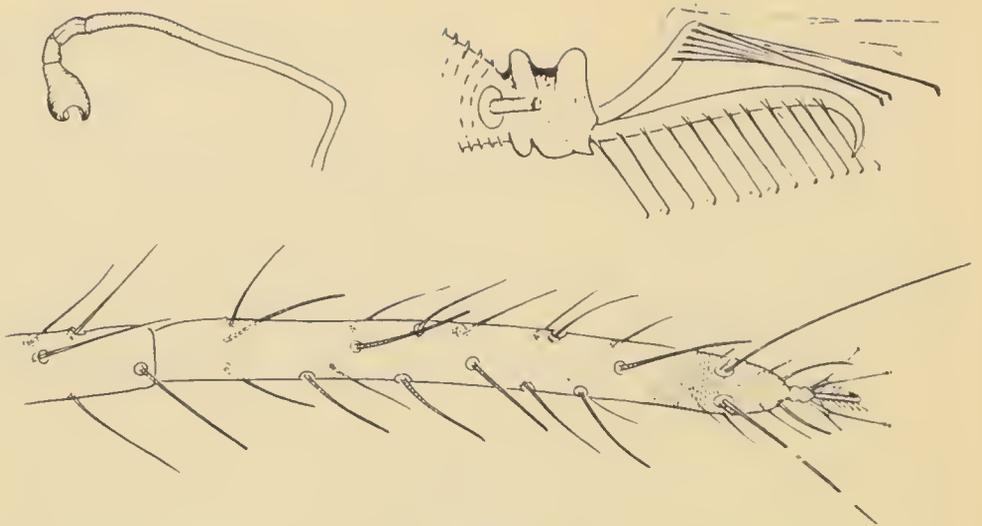


Fig. 29. *Petrobia harti*: peritreme and tarsus I of female, with enlargement of tarsal appendages.

Tenuicrus Womersley, 1940, Trans. Roy. Soc. S. Australia, 64(2): 250.

Type of genus: (*Tenuicrus errabundus* Womersley) = *Petrobia harti* (Ewing); monobasic. New synonymy.

Neobryobia Reck, 1941, Soobsh. Akad. Nauk Gruz. S.S.R., 2(8). Type of

genus: (*Neobryobia spectabilis* Reck) = *Petrobia harti* (Ewing).
New synonymy.

Petrobia may be recognized by having an uncinuate empodium bearing two rows of ventrally-directed tenent hairs.

The genus *Tetranychina* is here considered to be a synonym of *Petrobia*, because the only distinction that has been made between the two genera is in the termination of the peritreme: elongate and protruding when the stylophore is retracted in *Petrobia*, and more globular in *Tetranychina*. A study of the genus *Bryobia* showed that this single character is of no value for generic consideration in that group, and in the absence of supplementary characters, the termination of the peritreme is similarly considered to be of no generic value in this related group of mites. *Neobryobia* was considered by Reck (1950) to be a synonym of *Tetranychina*.

Petrobia drummondi Ewing is now known to belong to the genus *Bryobia*.

Key to the species of PETROBIA

Females

1. Body with dorsal setae much longer than intervals between them and set on tubercles 2
1. Body with dorsal setae shorter than intervals between them and and not set on tubercles 3
2. Clunal setae shorter than other dorsal hysterosomals; anterior legs much longer than body *harti* (p. 45)
2. Clunal setae similar in length to other dorsal hysterosomals; anterior legs about as long as body *lupini* (p. 47)
3. Sacrals distinctly longer than other dorsal hysterosomals *apicalis* (p. 49)
3. Sacrals similar in length to other dorsal hysterosomals *latens* (p. 51)

Petrobia harti (Ewing), new combination

(Figures 28, 29, 30)

Neophyllobius harti Ewing, 1909, Trans. Amer. Ent. Soc., 35: 405. Type: female, Carbondale, Illinois, on moss; in the U. S. National Museum.

Tetranychina harti, Banks, 1917, Ent. News, 28: 195; Garman, 1940, Bul. Conn. Agr. Exp. Sta., 431: 73; McGregor, 1950, Amer. Midl. Nat., 44(2): 363.

Tetranychina macdonoughi McGregor, 1917, Proc. U. S. Nat. Mus., 51 (2167): 588; McGregor, 1950, Amer. Midl. Nat., 44(2): 361. Types: males and females, Quincy, Florida, on *Oxalis stricta*; in the U. S. National Museum. *New synonymy*.

Tetranychina tuberculata Kishida, 1921, Dobutsugaku Zasshi, 33: 449. Described from a female. Tokyo, Japan, from human urine. *New synonymy*.

Tenuicrus errabundus Womersley, 1940, Trans. Roy. Soc. S. Australia, 64(2): 251. Type: female, Concord West, New South Wales, on ground; probably in the South Australian Museum. *New synonymy*.

Neobryobia spectabilis Reck, 1941, Soobsh. Akad. Nauk Gruz. S.S.R., 2(8); Reck, 1948, Trudy Zool. Inst. Akad. Nauk Gruz. S.S.R., 8. Described from specimens from Suchumi, Georgia, S.S.R., on *Oxalis corniculata*.

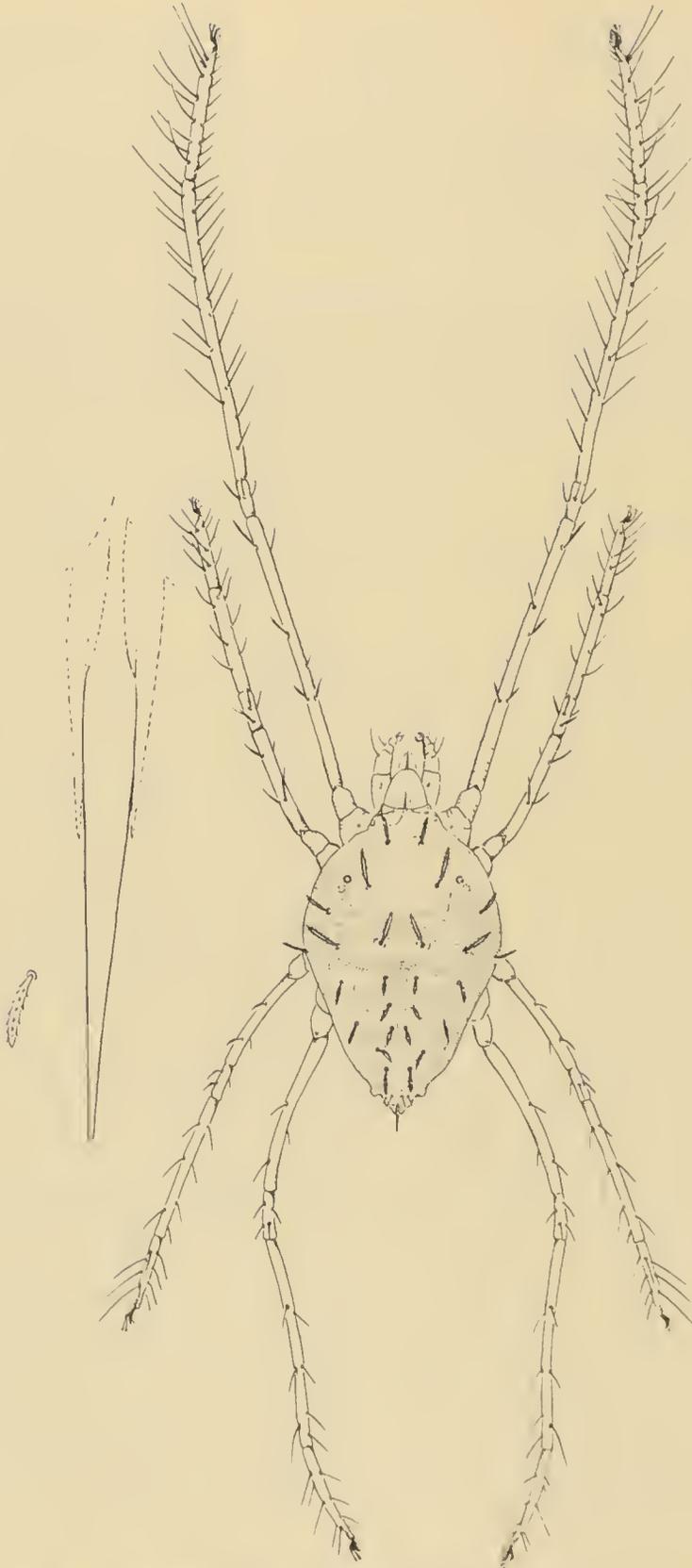


Fig. 30. *Petrobia harti*: dorsal aspect of male, with dorsal enlargement of aedeagus.

Tetranychina agerati Sayed, 1946, Bul. Soc. Fouad 1^{er} Ent., 30: 83.
Types: females, Dokki, near Cairo, Egypt, from *Ageratum conyzoides* and *Petunia hybrida*; probably in the collection of M. T. Sayed. New synonymy.

Females of *Petrobia harti* may be recognized by having the body with long dorsal setae that are set on strong tubercles, the clunal setae being obviously shorter than the others. The male is distinctive in having the first pair of dorsocentral hysterosomes comparatively long and slender and the second to "fourth" (the inner sacra) pairs short and lanceolate. The anterior legs are very long in adults of both sexes, about twice as long as the body in the female and about three times as long as the body in the male.

Tenuicrus errabundus (Australia), *Tetranychina agerati* (Egypt), and *Tetranychina tuberculata* (Japan) are considered by us to be synonyms of *Petrobia harti*. There is nothing in the illustrations accompanying the original descriptions of these species to indicate a difference from specimens that are found commonly on *Oxalis* in scattered parts of the United States. *T. macdonoughi* is also considered to be a synonym of *P. harti* inasmuch as no reliable difference has been found between Ewing's type of *harti* and other specimens studied. The synonymy of *Tetranychina spectabilis* is based on the host.

In view of the fact that *Petrobia harti* feeds primarily on members of the genus *Oxalis*, there has been a question as to whether specimens recorded from other hosts, such as clover, ageratum, and petunia, may not represent other species that form a complex with *P. harti*. However, it has been noted in greenhouses and nurseries in the San Francisco Bay area that specimens may be found on many other hosts when *Oxalis* is present as a weed.

Collections of this species have been studied from Maryland, Florida, Alabama, Mississippi, Illinois, and California.

Petrobia lupini (McGregor), new combination
(Figures 31, 32, 33)

Tetranychina lupini McGregor, 1950, Amer. Midl. Nat., 44(2): 362. Types: males and females, Oxnard, California, on *Lupinus arboreus*; in the U. S. National Museum.

Petrobia lupini is closely allied to *P. harti* and resembles that species in having the body with long dorsal setae that are set on strong tubercles. However, the anterior legs are shorter, about as long as the

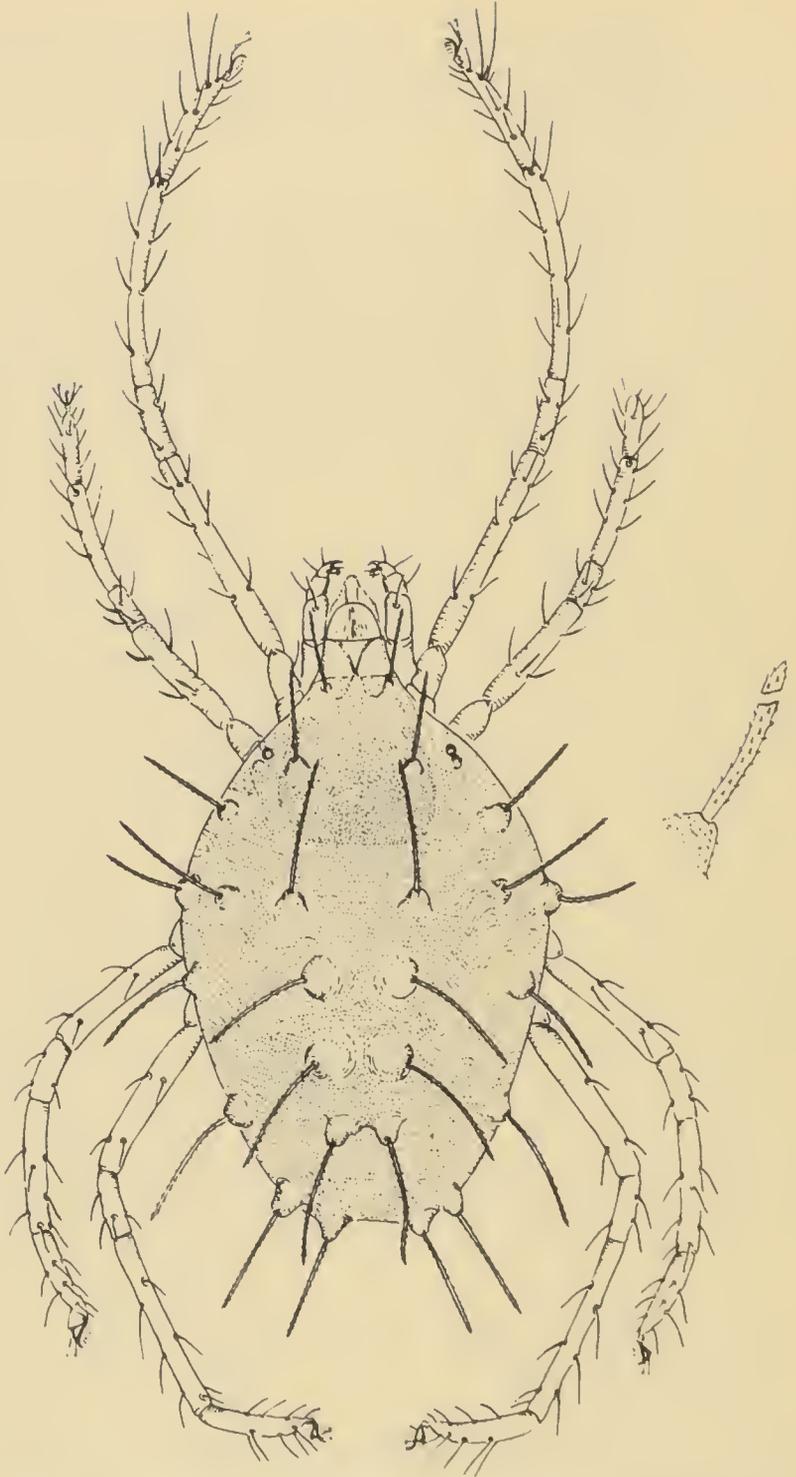


Fig. 31. *Petrobia lupini*: dorsal aspect of female, type.

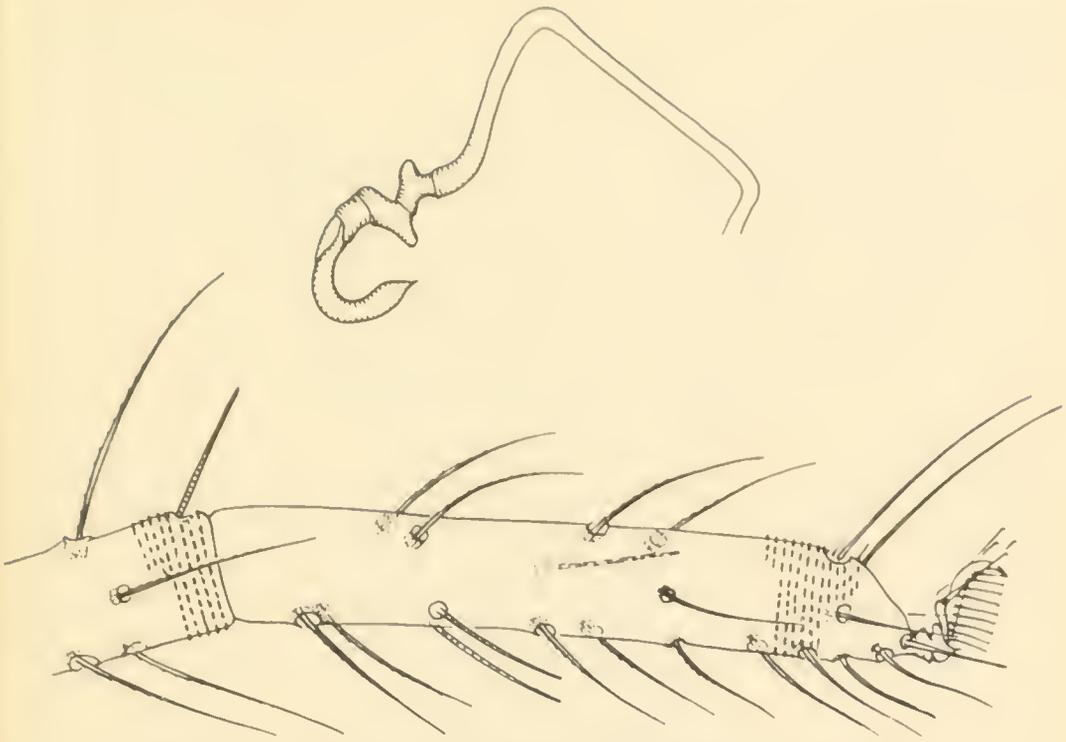


Fig. 32. *Petrobia lupini*: peritreme and tarsus I of female.

body in the female and about twice as long as the body in the male. Moreover, the clunal setae are as long as the other dorsal hysterosomals.

This spider mite is known only from lupines on the California coast. The types were collected on *Lupinus arboreus* in southern California. Other material has been collected near Montara on the San Francisco peninsula (A. E. Pritchard), on *Lupinus varicolor*.

Petrobia apicalis (Banks), new combination

(Figures 34, 35, 36)

Tetranychina apicalis Banks, 1917, Ent. News, 28: 195; McGregor, 1950, Amer. Midl. Nat., 44(2): 360. Types: females, St. Bernard, Louisiana, on white clover; in the U. S. National Museum.

Adults of *Petrobia apicalis* may be readily recognized and distinguished from *Petrobia latens*, which they resemble, by having very short, slender setae on the body except that the sacralis are obviously longer. The anterior legs are about as long as the body in the female, about twice as long as the body in the male.

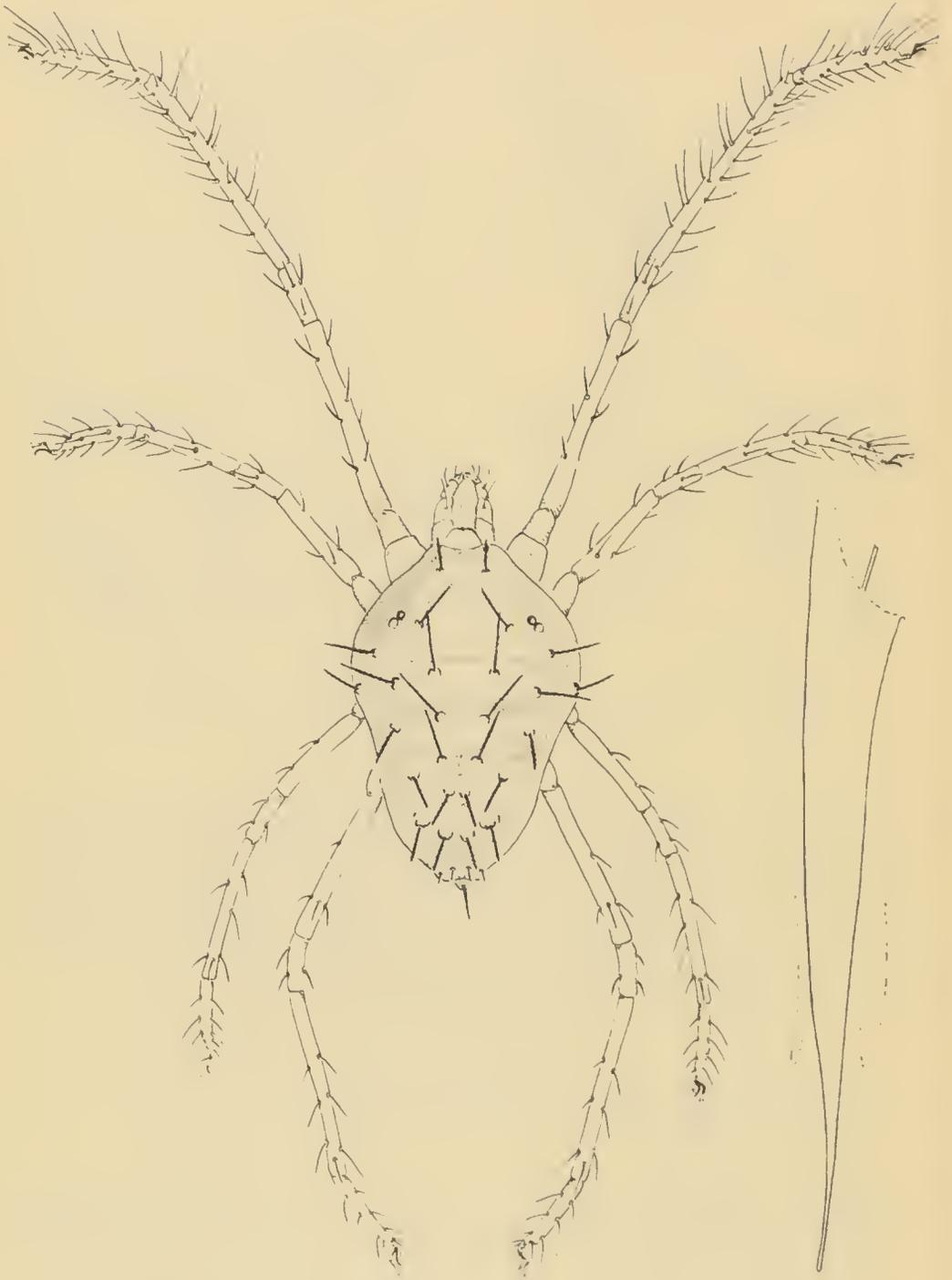


Fig. 33. *Petrobia lupini*: dorsal aspect of male, with lateral enlargement of aedeagus.

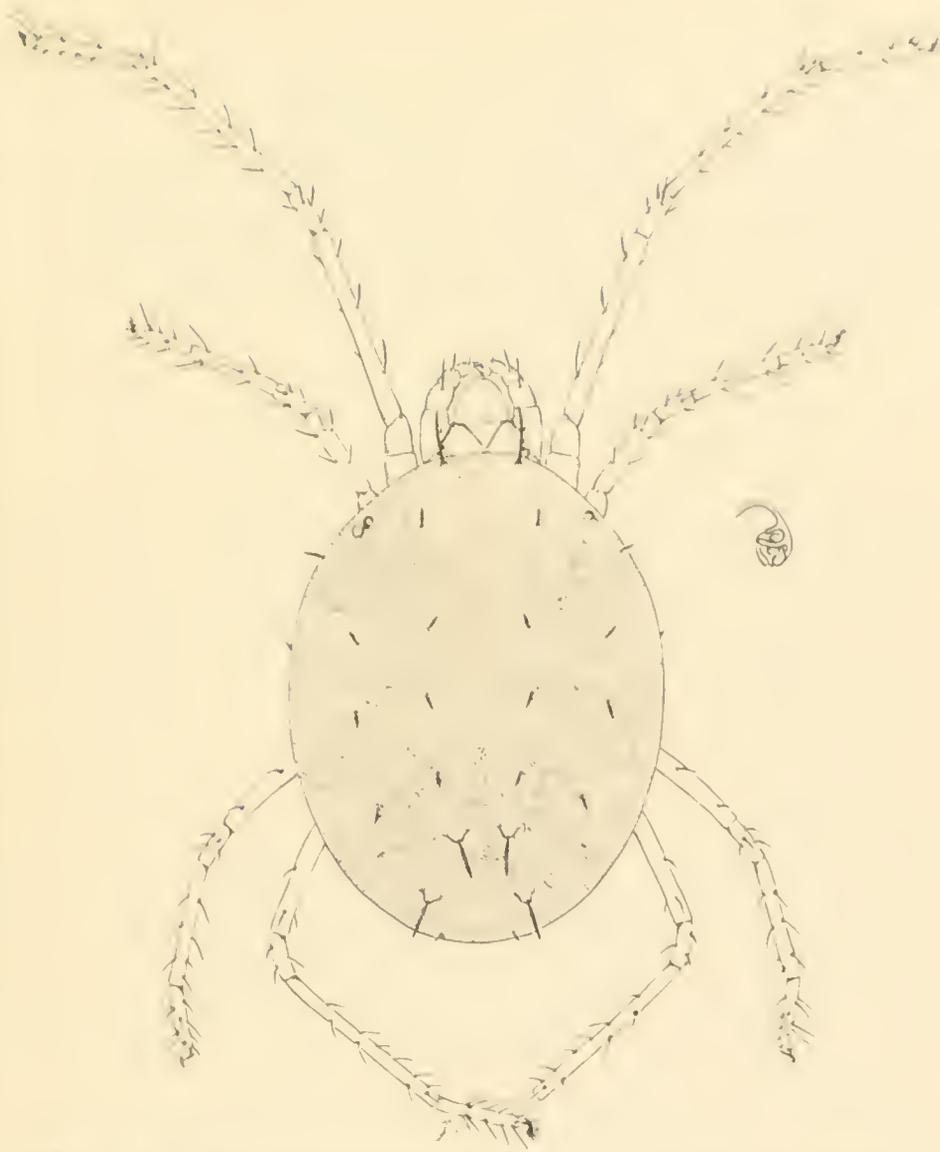


Fig. 34. *Petrobia apicalis*: dorsal aspect of female, Louisiana.

Petrobia apicalis is found on legumes in the southeastern United States. Specimens have been studied from Louisiana, Mississippi, and Georgia, on clover, peas, and vetch.

Petrobia latens (Müller)

(Figures 37, 38)

Acarus latens Müller, 1776, Zool. Dan. Prodr., p. 187. Described from specimens from Denmark, under stones.

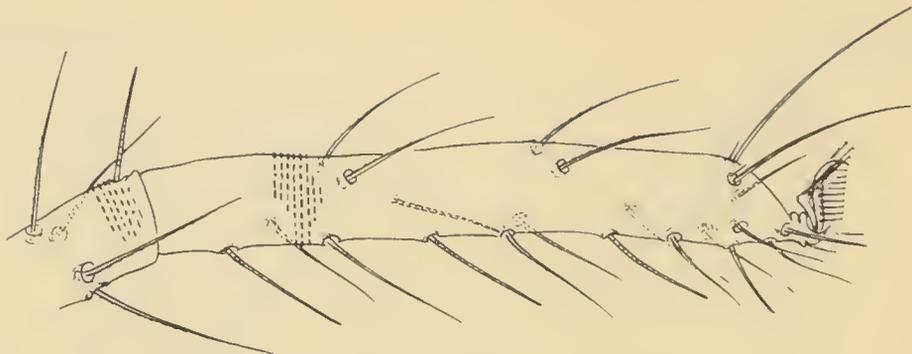


Fig. 35. *Petrobia apicalis*: tarsus I of female.

- Petrobia latens*, Oudemans, 1915, Arch. Naturg., 81(A, 5): 44; Oudemans, 1929, Krit. Hist. Overz. Acar., 2: 285; Womersley, 1940, Trans. Roy. Soc. S. Australia, 64(2): 254; McGregor, 1950, Amer. Midl. Nat., 44(2): 364; Baker and Pritchard, 1953, Hilgardia, 22(7): 206.
- Acarus praegnans* Schrank, 1781, Ins. Austr., p. 520. Described from specimens from Austria, on soil.
- Acarus petrarum* Fourcroy, 1785, Ent. Paris, 2: 529. Described from specimens from France, on soil.
- Trombidium lapidum* Hammer, 1804, in Hermann, Mém. Apt., p. 49. Described from specimens from Germany, on stones.
- Petrobia lapidum*, Oudemans, 1915, Arch. Naturg., 81: (A, 5): 49; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 27.
- Tetranychus anauniensis* Canestrini, 1889, Atti Reale Ist. Veneto Let. Sci. Arti (ser 6), 7: 503. Described from specimens from Italy, under stones.
- Tetranychopsis simplex* Trägårdh, 1904, Zool. Exp. Egypt White Nile 1901, 20(1): 8. Types: females from Egypt, under stones; probably in the Trägårdh collection.
- Tetranychopsis paupera* Berlese, 1910, Redia, 6: 346. Types: female and several nymphs, Cansiglio, Italy, under wood. *New synonymy*.
- Tetranychus longipes* Banks, 1912, Proc. Ent. Soc. Wash., 14: 97; Ewing, 1913, Ann. Ent. Soc. Amer., 6: 460. Types: females, Springer, New Mexico, on *Agropyron* sp., as well as California; in the U. S. National Museum.
- Tetranobia decepta* Banks, 1917, Ent. News, 28: 194. Types: females, Mesa, Arizona, on barley; in the U. S. National Museum.
- Tetranychina tritici* Ewing, 1921, Proc. U. S. Natl. Mus., 59(2394): 665. Types: females, Idaho, on wheat; in the U. S. National Museum.

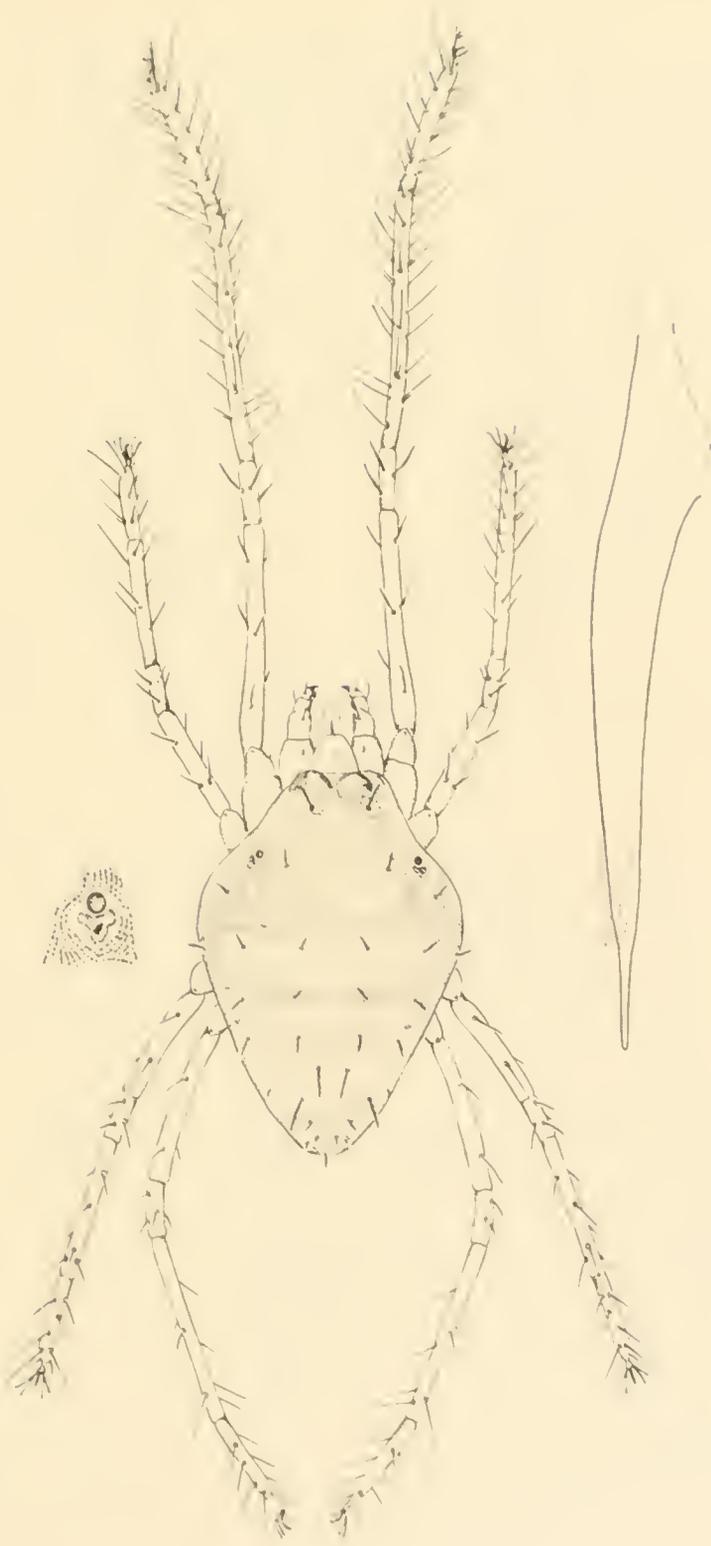


Fig. 36. *Petrobia apicalis*: dorsal aspect of male, Louisiana, with lateral enlargement of aedeagus.



Fig. 37. *Petrobia latens*: dorsal aspect of female.

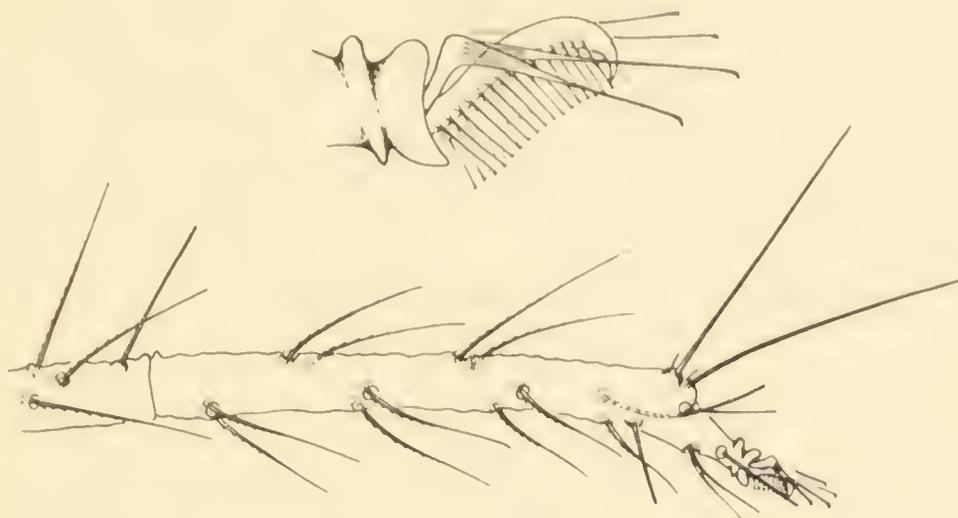


Fig. 38. *Petrobia latens*: tarsus I of female, with enlargement of appendages.

Petrobia cephae Sayed, 1946, Bul. Soc. Fouad 1^{er} Ent., 30: 79. *Types*: females, Upper Egypt, on onions; probably in the collection of M. T. Sayed.

Petrobia latens may be readily recognized by having a clawlike empodium and the dorsal setae of the body all short, slender, and similar in length. The anterior pair of legs is much longer than the body. It further differs from other members of the genus by having the peritremal enlargement slender, and by having the dorsum of the body with continuous but minutely crenulate striae rather than with dotted striae.

This species reproduces parthenogenetically, and males are unknown. Eggs that are destined to hatch quickly are red and spherical, radially striate dorsally and with a short dorsal stipe. However, eggs that serve for dormancy are coated with a white material, including a circular, radially striate cap (as first illustrated by Hammer, 1804). The dormant eggs are laid on stones and other debris, and do not hatch until conditions are favorable for the growth of new annual grasses. An individual female lays only one type of egg (Fenton, 1951).

Petrobia latens feeds primarily on monocotyledonous plants such as grasses, wheat, barley, sorghum, onions, gladiolus, and iris. When large populations build up on grasses, the mites migrate and may feed on other hosts. Damage has been reported to cotton, carrots, lettuce, and melons. Alfalfa, bur clover, and apple are other recorded hosts.

Homes are sometimes invaded when large populations build up in the yard.

Spider Mites

Petrobia latens is almost worldwide in distribution. It is known from Europe, North Africa, Australia, and North America. This species was not recorded from the United States until 1917, but it has since been recognized as an important pest of agriculture in the southwestern and western states. Collections also have been made in several eastern states. Specimens studied are from England, as well as from Oregon, Idaho, California, Arizona, New Mexico, Utah, Colorado, Kansas, Oklahoma, Texas, North Carolina, and New Jersey.

Petrobia brevipes Reck and Bagdasarian

Petrobia brevipes Reck and Bagdasarian, 1949, Doklady Akad. Nauk Armenia S.S.R., (10)4: 189. *Types*. Male and female, Erevan, Armenia, on *Kochia prostrata*.

This species belongs to the *latens* group in possessing short dorsal setae.

Petrobia erevanica Reck and Bagdasarian

Petrobia erevanica Reck and Bagdasarian, 1949, Doklady Akad. Nauk Armenia S.S.R., (10)4: 190. *Type*. Females, Niuvad and Erevan, Armenia, on *Artemisia* and other plants.

This species belongs to the *latens* group in possessing short dorsal setae.

Petrobia zachvatkini (Reck and Bagdasarian), new combination

Tetranychina zachvatkini Reck and Bagdasarian, 1949, Doklady Akad. Nauk Armenia S.S.R., (10)4: 191. *Type*. Females, Erevan, Armenia on *Salsola ericoides* and *Kochia prostrata*.

This species belongs to the *harti* group in possessing long dorsal setae set on tubercles.

GENUS **SCHIZONOBIA** WOMERSLEY

Schizonobia Womersley, 1940, Trans. Roy. Ent. Soc. S. Australia, 64(2): 251. *Type of genus*: *Schizonobia sycophanta* Womersley; monobasic.

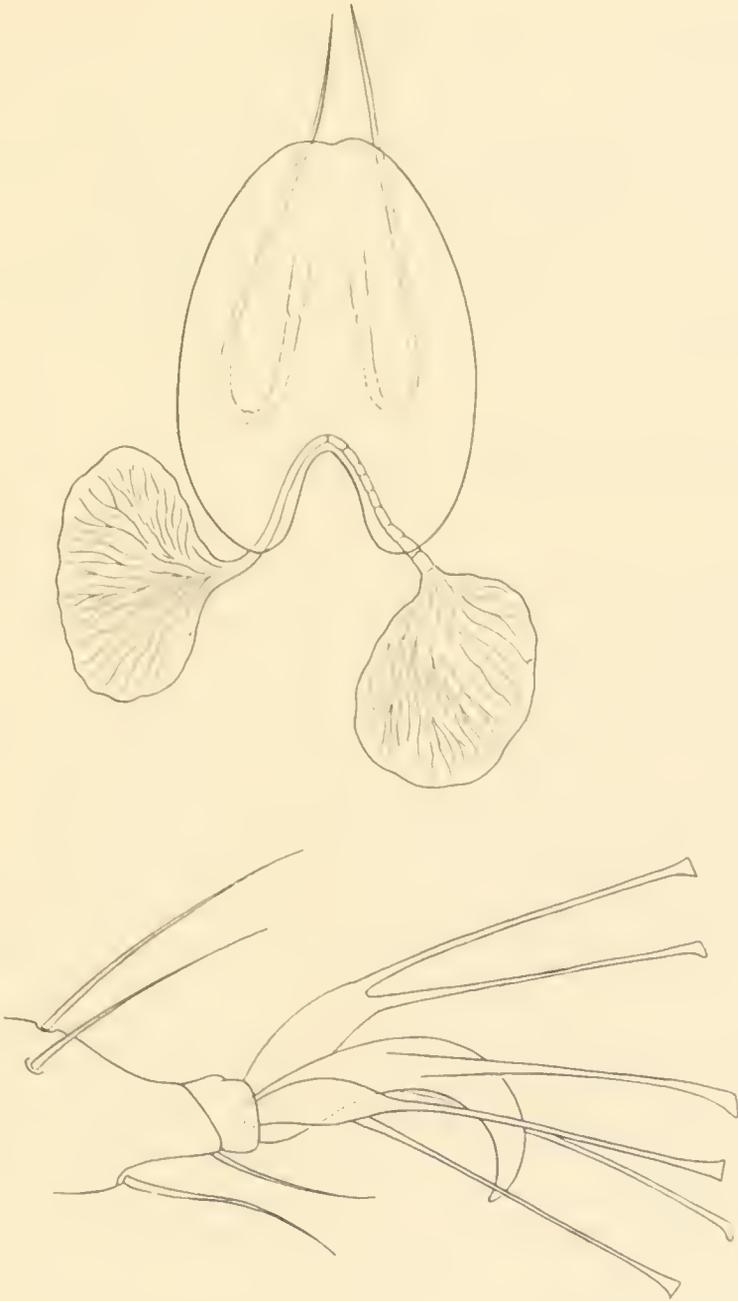


Fig. 39. *Schizonobia sycophanta*: peritremes and tarsal appendages (after Womersley).

The genus *Schizonobia*, as described by Womersley, is closely allied to *Petrobia*. It may be distinguished from *Petrobia* in that a single pair of distally directed tenent hairs are borne medially on the unciniate empodium. The distal end of the peritreme, as figured by Womersley, is also distinctive in that the branches originate together and fan out to form a broadly rounded enlargement. The fore legs of the female are not lengthened.

Schizonobia sycophanta Womersley
(Figure 39)

Schizonobia sycophanta Womersley, 1940, Trans. Roy. Ent. Soc. S. Australia, 64(2): 251. Type: female, Hobart, Tasmania, on couch grass; probably in the South Australian Museum.

This species is known only from the type female(s). We have not seen this species.

GENUS **APLONOBIA** WOMERSLEY

Aplonobia Womersley, 1940, Trans. Roy. Soc. S. Australia, 64(2): 252.
Type of genus: (*Aplonobia oxalis* Womersley) = *A. histricina* (Berlese); monobasic.

The genus *Aplonobia* may be recognized by having the empodium consisting of a pad bearing two rows of ventrally directed tenent hairs or else a pair of tenent hairs, together with a rounded body bearing only three pairs of dorsal propodosomals and with the inner sacrals resembling dorsocentrals.

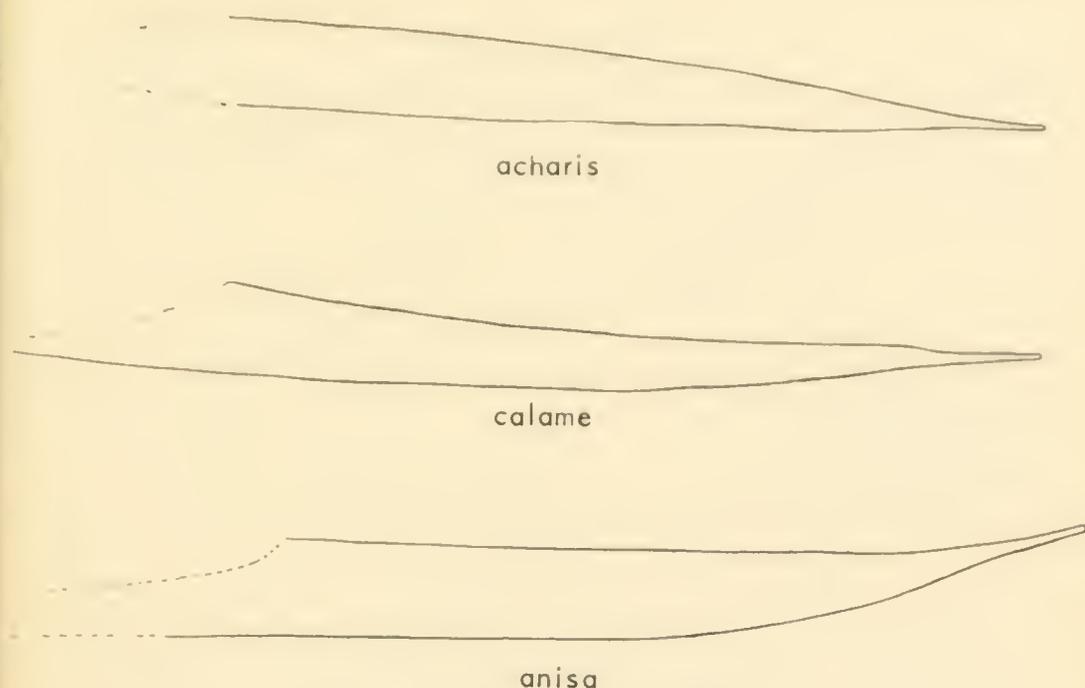
Aplonobia has been previously known from a single species in Australia. Five new species from the Pacific coast of the United States are here referred to the genus.

The distal enlargement of the peritreme varies from being a complex anastomosing chamber to having a simple enlargement in otherwise similar species. There may be many fine dorsal striac, or the striae may be comparatively few in number. The aedeagus forms a slender stylet (fig. 40).

Key to the species of **APLONOBIA**

Females

1. Empodial pad twice as long as pad of true claw 2
1. Empodial pad not longer than pad of true claw 3
- 2.(1). Body with dorsal setae stout, as long as intervals between them, and set on strong tubercles *histricina* (p. 59)
- 2.(1). Body with dorsal setae very slender; much shorter than intervals between them, and not set on tubercles *myops* (p. 63)

Fig. 40. *Aplonobia*, aedeagi.

- 3.(1). Dorsal setae long and stout, arising from strong tubercles; empodial pad with rows of ventrally directed tenent hairs . . . 4
- 3.(1). Dorsal setae slender or very short, not arising from strong tubercles; empodial pad with tenent hairs on either side united distally 5
- 4.(3). Hysterosoma with second and third pairs of dorsocentrals minute *anisa* (p. 64)
- 4.(3). Hysterosoma with second and third pairs of dorsocentrals as long as first pair of dorsocentrals *deina* (p. 67)
- 5.(3). Body with dorsal setae very short, not on tubercles; empodial pad about as long as pad of true claw *acharis* (p. 69)
- 5.(3). Body with dorsal setae slender and tapering, set on small tubercles; empodial pad much shorter than pad of true claw *calame* (p. 70)

Aplonobia histricina (Berlese), new combination

(Figures 41, 42)

Tetranychopsis histricina Berlese, 1910, Redia, 6: 243. Types: females, New South Wales, on fruit trees; in the Berlese collection at Florence, Italy.



P.60 Fig. 41. *Aplonobia histicina*: dorsal aspect of female, Australia.

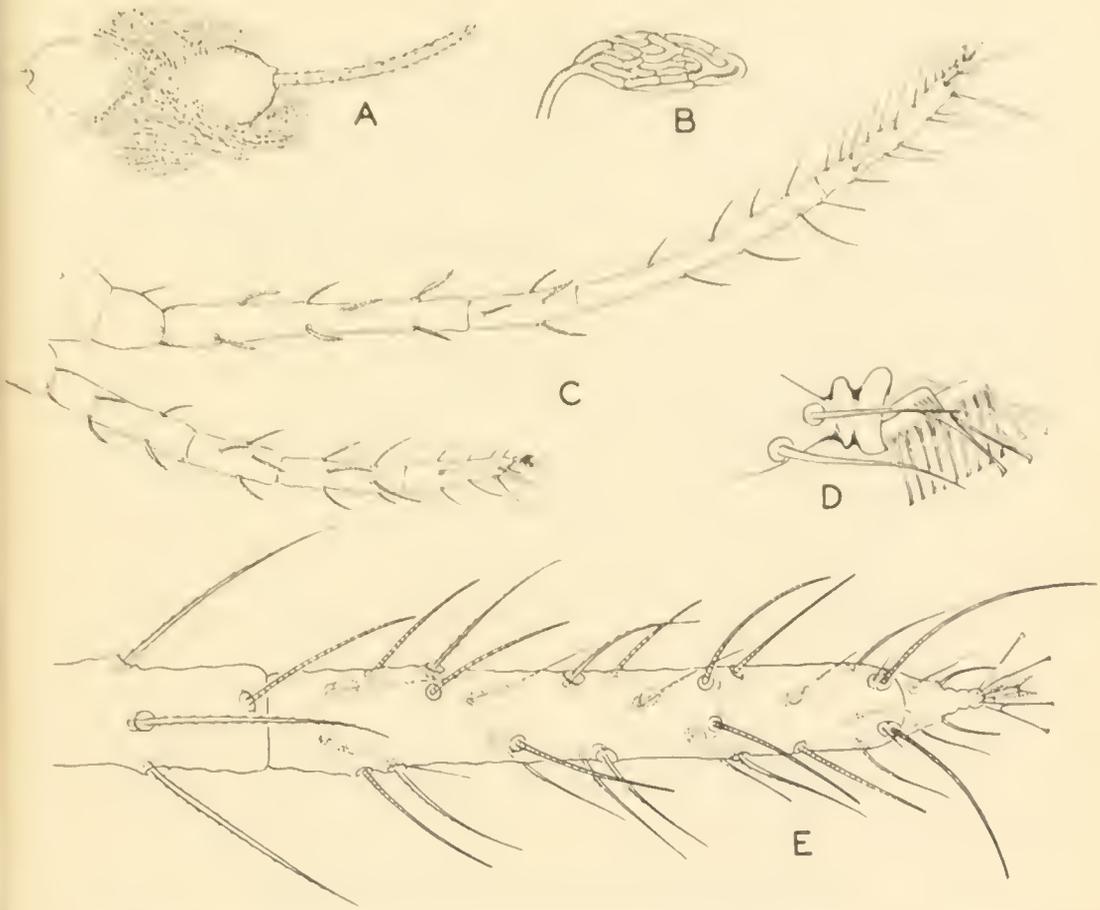


Fig. 42. *Aplonobia histricina*: A.) dorsocentral hysterosomal; B.) termination of peritreme; C.) legs I and II of female; D.) tarsal appendages; E.) tarsus I of female.

Aplonobia oxalis Womersley, 1940, Trans. Roy. Soc. S. Australia, 64(2): 253. Types: females, South Australia and New South Wales, on *Oxalis* primarily; probably in the South Australian Museum. *New synonymy*.

Aplonobia histricina may be readily recognized by the empodial pad that is much longer than the pad of the true claw, together with the stout setae on the dorsum of the body that arise from strong tubercles and reach about as far as the distances between their bases. The end of the peritreme bears a rounded enlargement that is composed primarily of branches arising from the base of the expansion. There are numerous, closely set striae on the dorsum of the body.

Aplonobia histricina is known only from Australia where it is found commonly on *Oxalis* weeds in orchards. Womersley reports that fruit trees may become infested, and that eggs are laid in clusters under

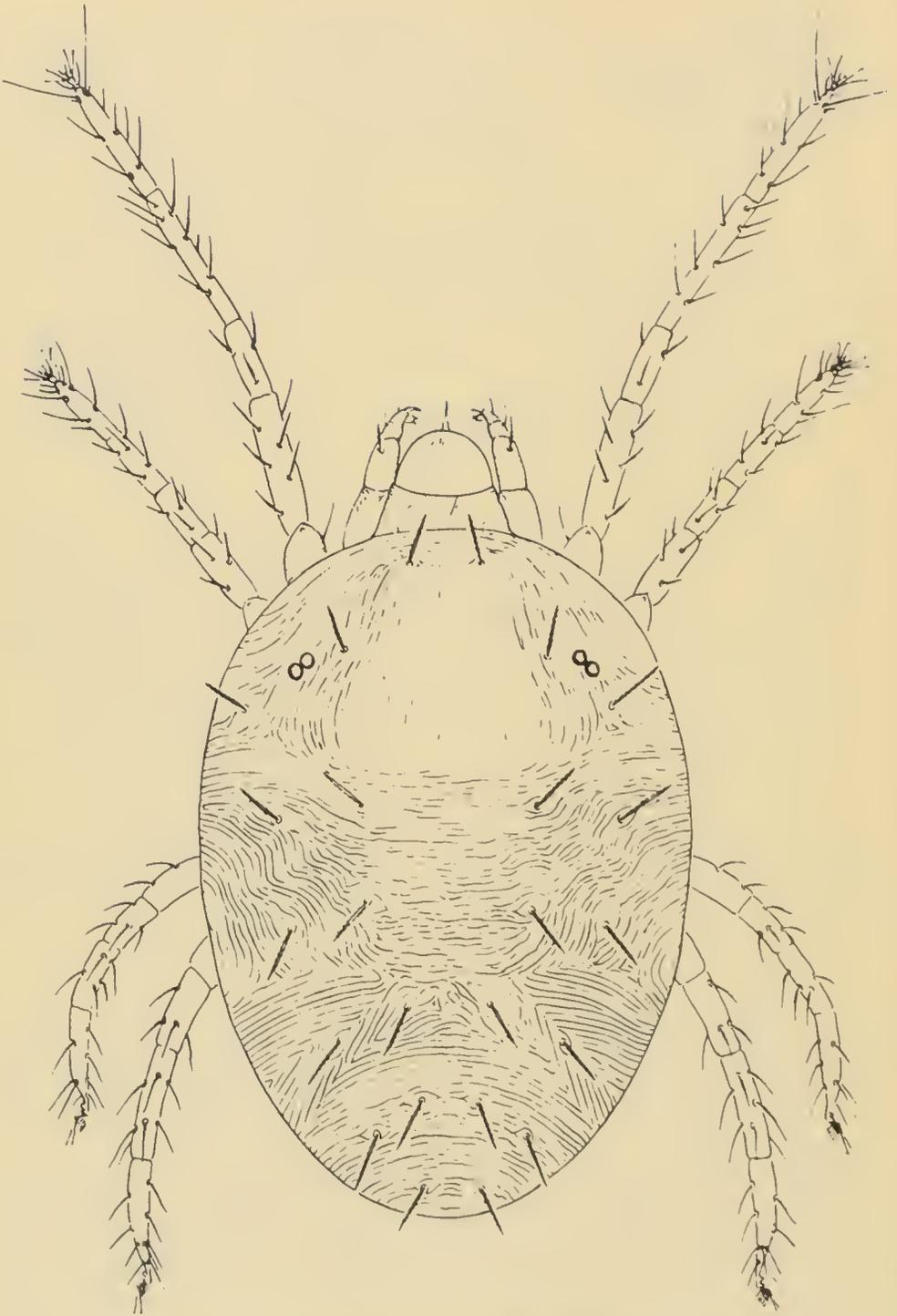


Fig. 43. *Aponobia myops*: dorsal aspect of female.

bark and on twigs lying on the ground. Specimens studied by us, other than Berlese's types, were kindly forwarded by D. G. Swan.

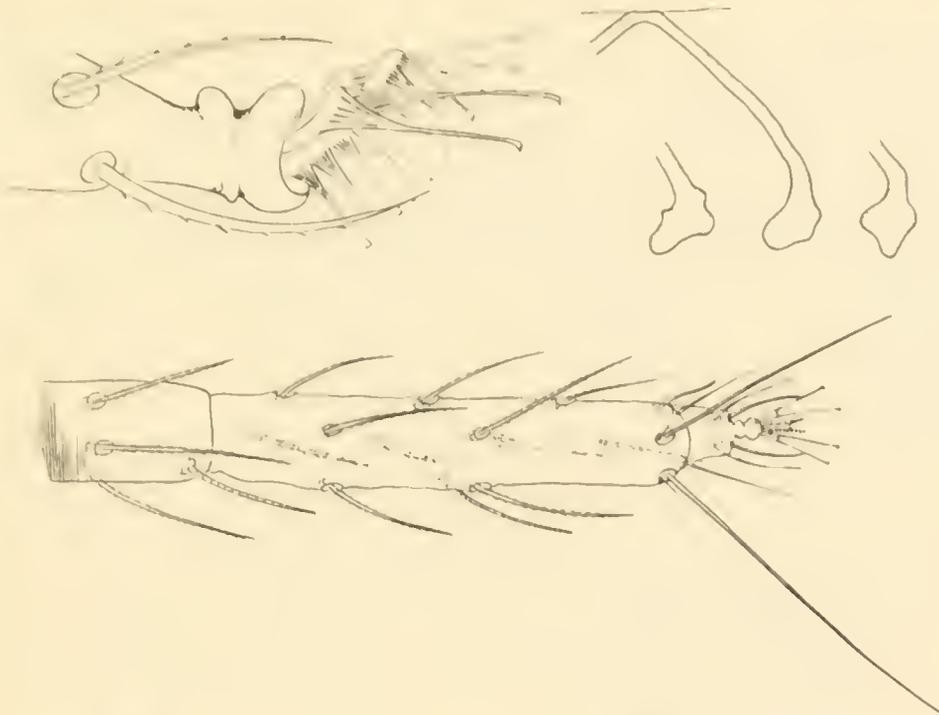


Fig. 44. *Aplonobia myops*: peritremes and tarsus I of female, with enlargement of tarsal appendages.

Aplonobia myops Pritchard and Baker, new species
(Figures 43, 44)

Females of *Aplonobia myops* may be readily recognized by having the empodial pad much longer than the pad of the true claw, together with having the dorsal setae of the body slender, much shorter than the intervals between them, and not set on tubercles. The peritreme is simple distally, and there are numerous, closely set striae on the body.

Female.—Rostrum short, reaching middle of femur I. Palpus with "claw" reaching end of fifth segment. Peritreme ending distally in a simple enlargement. Legs with tactile setae similar, slender and finely pubescent, tapering. Anterior legs about as long as body; tarsus I with two pairs of dorsal and seven ventral, tactile setae proximal to the duplex setae; and one mediolateral and one distoventral sensory setae proximal to the duplex setae. Empodium somewhat tapering, twice as long as pad of true claw, and with two rows of ventrally directed tenent hairs. Body with dorsal integument finely striate; dorsal setae all similar in size, very slender, finely pubescent, much shorter than intervals

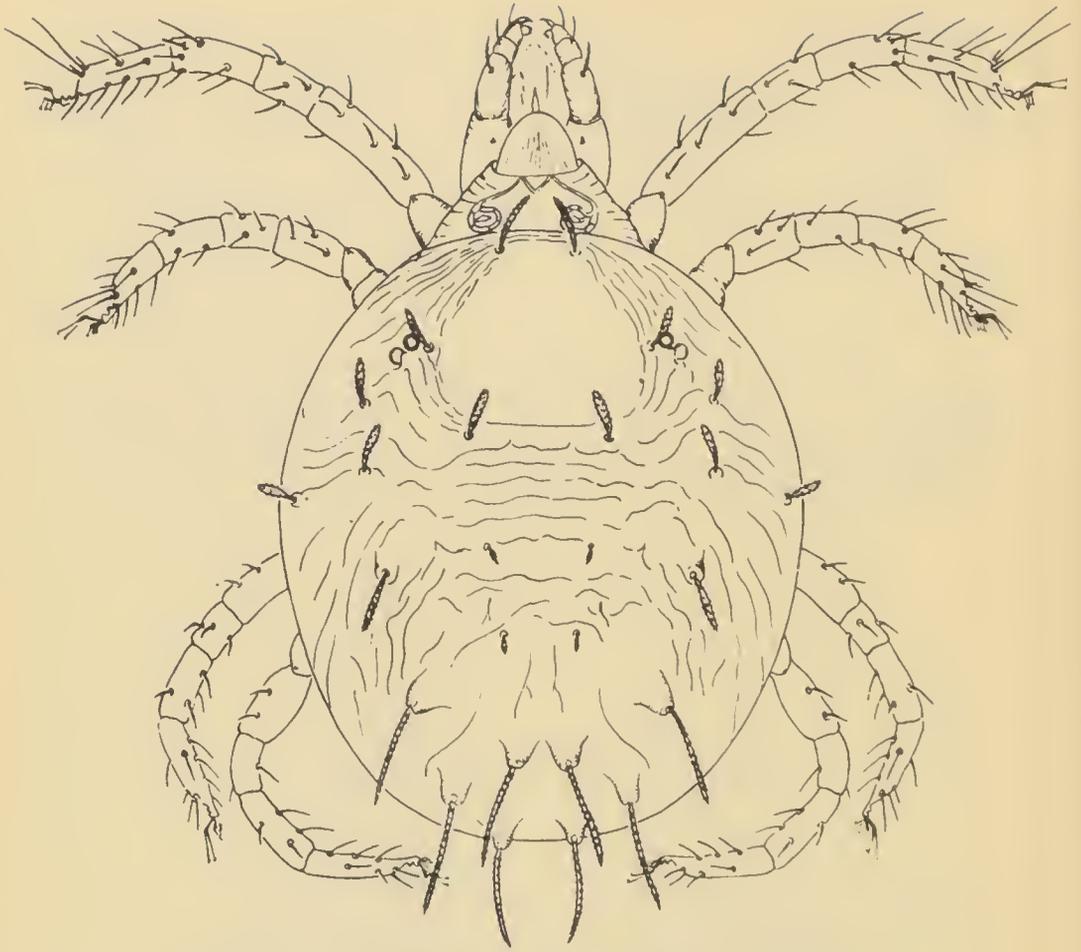


Fig. 45. *Aplonobia anisa*: dorsal aspect of female.

between their bases, and not set on tubercles. Length of body, 533μ ; including rostrum, 666μ .

Male.—Unknown.

Holotype.—Female, Holt, San Joaquin County, California, July 14, 1950 (W. W. Middlekauff) on asparagus; type no. 2076, in the U. S. National Museum. *Paratypes*.—Fifteen females, Holt, California, July 14, 1950 (W. W. Middlekauff), on asparagus.

Dr. Middlekauff reported that this species was causing considerable damage to a commercial field of asparagus.

Aplonobia anisa Pritchard and Baker, new species
(Figures 45, 46)

Females of *Aplonobia anisa* may be readily differentiated from other members of the genus by having the second and third pair of dorsocentral

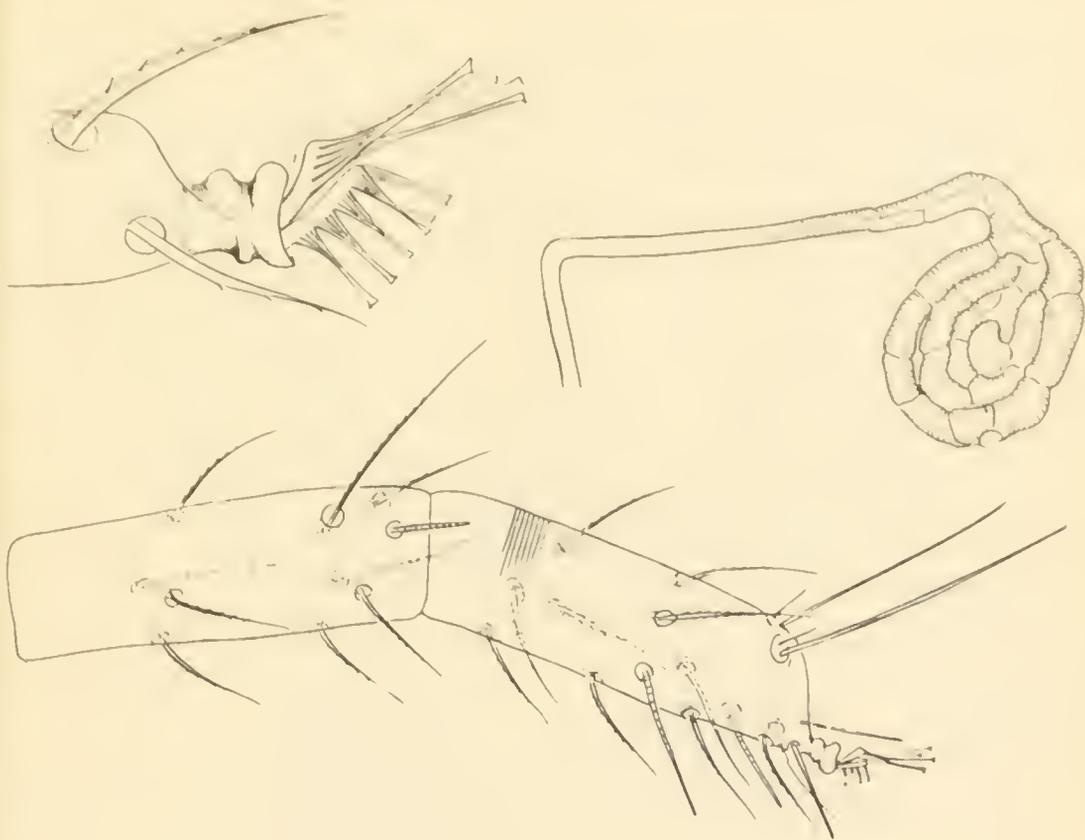


Fig. 46. *Aplonobia unisa*: peritreme, tibia and tarsus I of female, with enlargement of tarsal appendages.

hysterosomals minute. Setae on the anterior part of the dorsum of the body are short and subspatulate, whereas the caudal setae are long and slender.

Female.—Rostrum reaching end of genu I. Palpus with “claw” of fourth segment approximate to end of segment five. Peritreme ending in a distal, anastomosing, circular enlargement. Legs with tactile setae tapering, minutely pubescent, all of the same length; anterior legs shorter than body. Empodia very slightly longer than pads of true claws and each with two ventral rows of tenent hairs. Dorsum of body with widely spaced striae. Propodosoma with dorsal setae stout, pubescent; first pair slightly longer than second pair and first two pairs of setae more acuminate than the subspatulate third pair. Hysterosoma with second and third pair of dorsocentrals minute, the other setae anteriorly being long and subspatulate but posteriorly stout and tapering. Length of body, 353μ ; including rostrum, 480μ .

Male.—Body with dorsal setae all slender and tapering, slightly shorter than distances between their bases. Aedeagus with internal

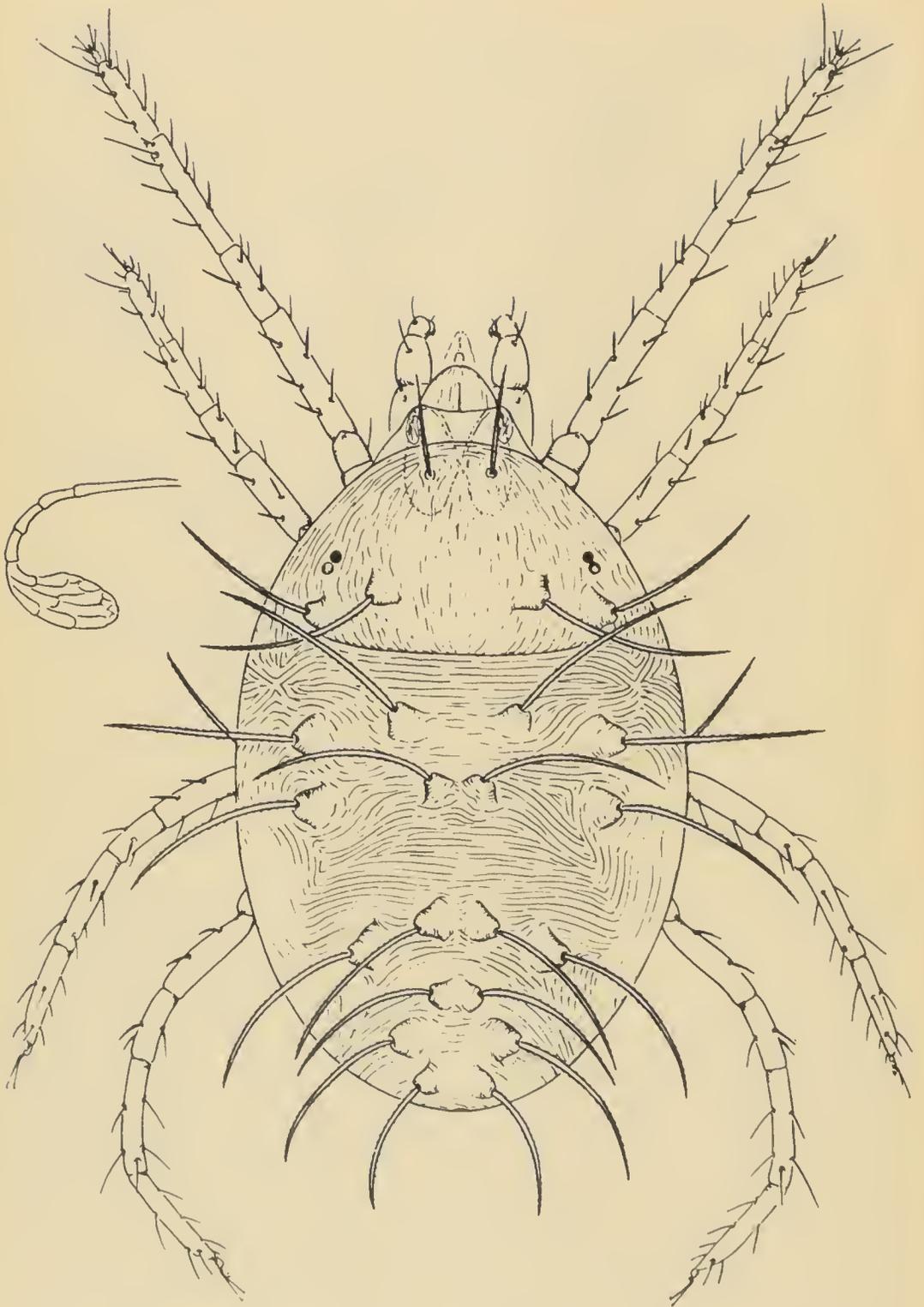


Fig. 17. *Aponobia deina*: dorsal aspect of female, with enlargement of peritreme.

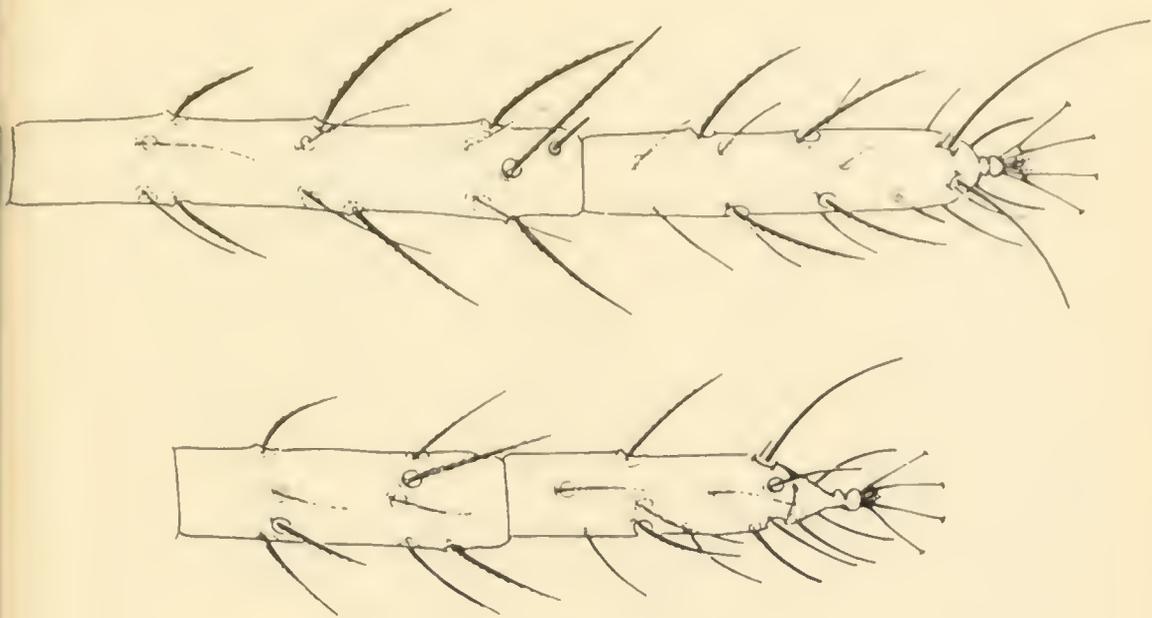


Fig. 48. *Aplonobia deina*: above, tibia and tarsus I of female;
below, tibia and tarsus II of female.

portion very long and slender, the external portion consisting of a nearly straight, slender and pointing sclerotization. Length of body, 335μ ; including rostrum, 406μ .

Holotype.—Female, Bakersfield, California, August 11, 1949 (A. E. Pritchard), on *Artemisia*; type no. 2077, in the U. S. National Museum.

Paratypes.—Three males, 4 females, Bakersfield, California, August 11, 1949 (A. E. Pritchard), on *Artemisia* sp.

Aplonobia deina Pritchard and Baker, new species

(Figures 47, 48)

The females of *Aplonobia deina* closely resemble those of *A. histricina*, the type of the genus, in that the dorsum of the body bears very long setae that are set on strong tubercles. However, the empodium is not more than approximately as long as the pad of the true claw. The dorsal integument of the body bears numerous striae as in *A. histricina*.

Female.—Rostrum short, reaching middle of femur I. Palpus with "claw" reaching end of fifth segment. Peritreme with the distal enlargement a slender sac of branches originating together. Legs with tactile setae slender and strongly pubescent. Leg I about as long as body; tarsus I with two pairs of dorsal and three pairs of ventral tactile setae

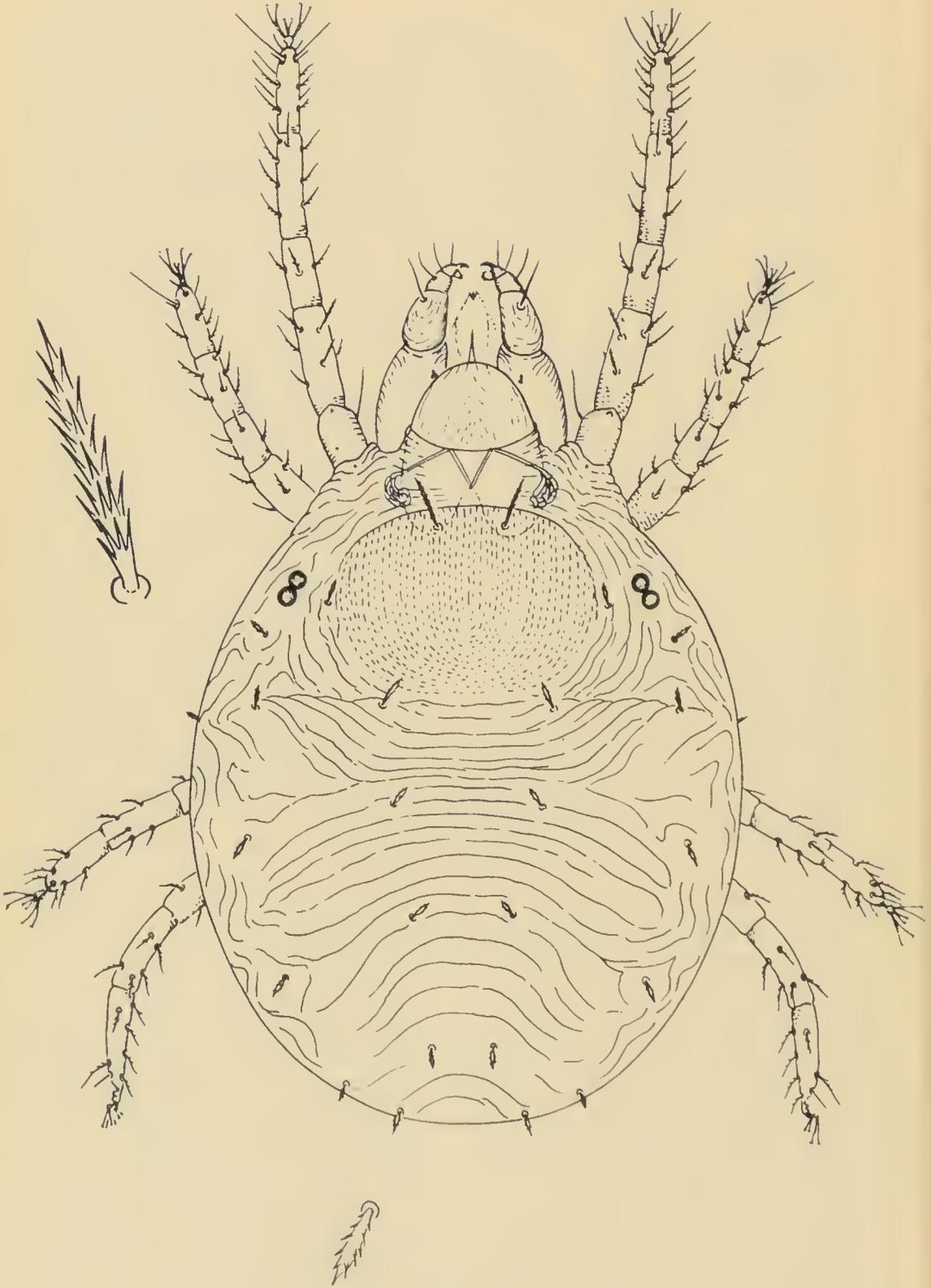


Fig. 49. *Aplonobia acharis*: dorsal aspect of female.

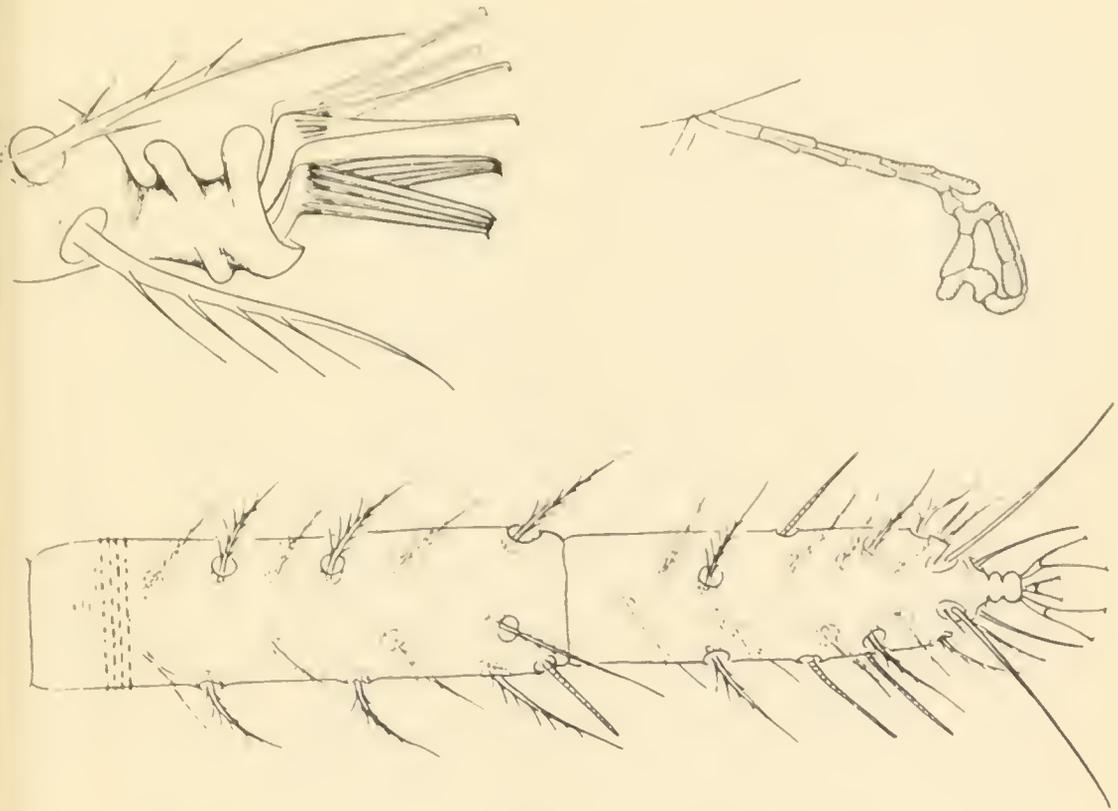


Fig. 50. *Aplonobia acharis*: peritreme and tibia and tarsus I of female, with enlargement of tarsal appendages.

proximal to the duplex setae; and one mediolateral and one distoventral sensory setae proximal to the duplex setae. Empodium a short pad about as long as the pad of the true claw, with two rows of ventrally directed tenent hairs. Body with dorsal integument mostly with fine striae; dorsal setae long, slender, tapering and set on strong tubercles, except for the somewhat shorter marginal setae. Length of body, 533μ ; including rostrum, 613μ .

Male.—Unknown.

Holotype.—Female, Wenatchee, Washington, May 1952 (W. M. Hantsbarger), on *Balsamorhiza sagittata*; type no. 2078, in the U. S. National Museum. *Paratypes*.—Five females, Wenatchee, Washington, May 1952 (W. M. Hantsbarger), on *Balsamorhiza sagittata*.

Aplonobia acharis Pritchard and Baker, new species
(Figures 49, 50)

The female of *acharis* may be differentiated from other species of *Aplonobia* by having all the dorsal setae of the body minute, except

Spider Mites

for the slender anterior propodosomals. The integument, except for the median area on the propodosoma, bears widely spaced striae. The empodium consists of a short pad on which each row of ventrally directed tenent hairs are more or less united distally.

The male may be recognized by having the dorsal setae long and slender but not as long as the intervals between their bases.

Female.—Rostrum reaching end of femur I. Palpus with "claw" reaching end of fifth segment. Peritreme with distal enlargement consisting of two irregular branches. Legs with tactile setae strongly tapering, finely pectinate. Leg I shorter than body; tarsus I with two pairs of dorsal and seven ventral setae proximad of the duplex setae; with a mediolateral, a distodorsal, and a distoventral setae proximal to the duplex setae. Empodial pad about as long as pad of true claw, with two rows of more or less distally united tenent hairs. Dorsum of body with rather broadly spaced integumentary striae except for median portion of propodosoma; dorsal setae slender, pubescent, fine except for longer pair of anterior propodosomals. Length of body, 466μ ; including rostrum, 580μ .

Male.—Similar to female except dorsal setae longer but not as long as intervals between their bases. Aedeagus with external portion short, straight, slender. Length of body, 400μ ; including rostrum, 486μ .

Holotype.—Female, Tesla, California, October 20, 1949 (J. W. MacSwain), on *Hemizonia virgata*; type no. 2079, in the U. S. National Museum. *Paratypes*.—Six females, Livermore, California, October 15, 1948 (J. W. MacSwain), on *Hemizonia* sp.; 5 males, 24 females, Tesla, California, October 20, 1949 (J. W. MacSwain), on *Hemizonia virgata*; 8 males, 8 females, Tesla, California, July 27, 1950 (A. E. Pritchard), on *Hemizonia virgata*; 2 males, 2 females, Tesla, California, September 19, 1950 (A. E. Pritchard), on *Hemizonia virgata*.

Aplonobia calame Pritchard and Baker, new species
(Figures 51, 52)

The female of *calame* differs from other species of *Aplonobia* in having the dorsal setae long and slender and set on small tubercles. The empodium is distinctive in possessing a single, long pair of tenent hairs.

The male is distinctive in having the dorsal setae long and slender, fully as long as the intervals between them, and set on small tubercles.

Female.—Rostrum reaching end of femur I. Palpus with "claw" reaching end of fifth segment. Peritreme with terminal enlargement

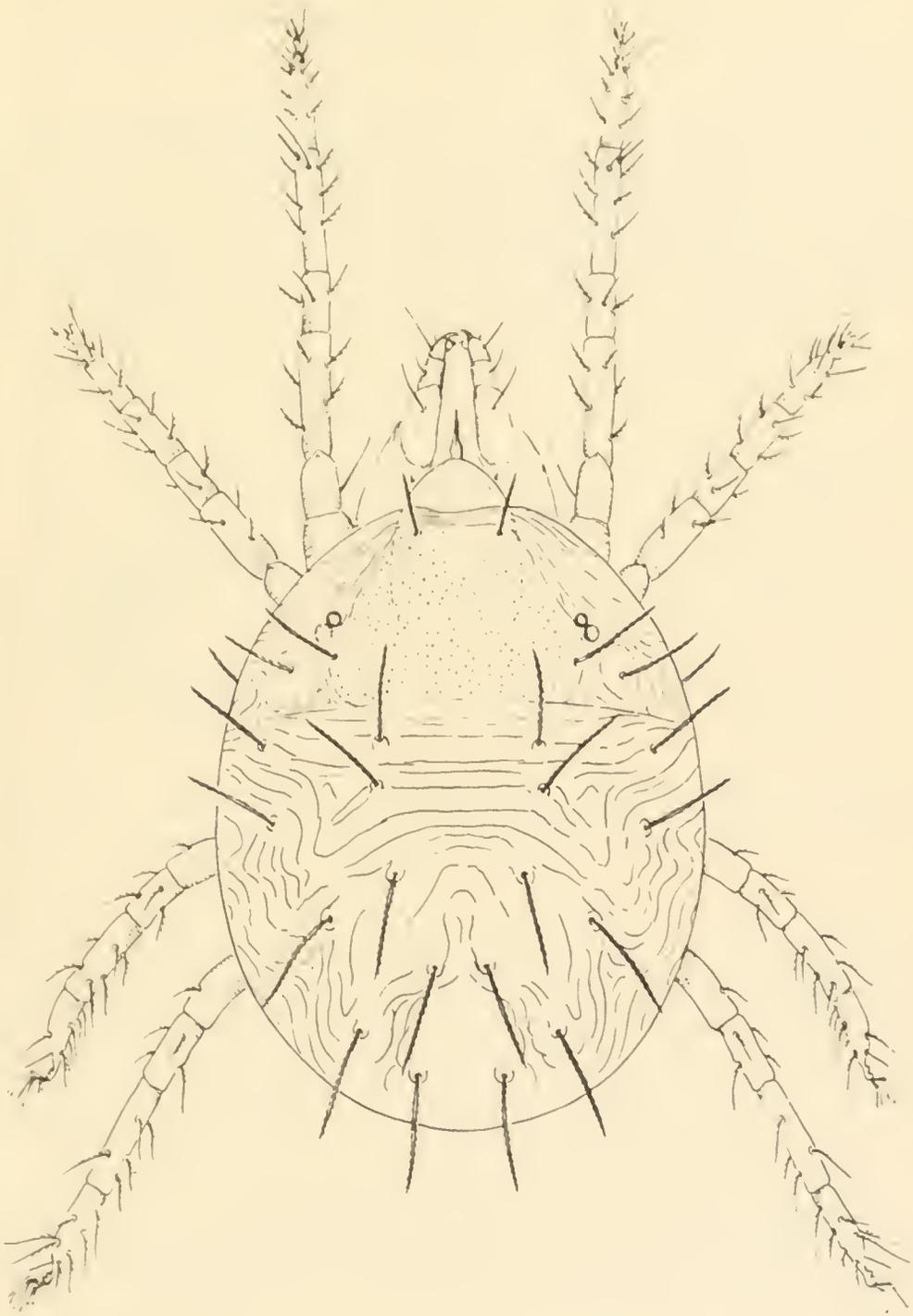


Fig. 51. *Aplonobia calame*: dorsal aspect of female.

made up of three chambered branches. Legs with tactile setae narrowly tapering, with long pectinations. Anterior legs about as long as body; tarsus I with four dorsal and seven ventral tactile setae proximal to

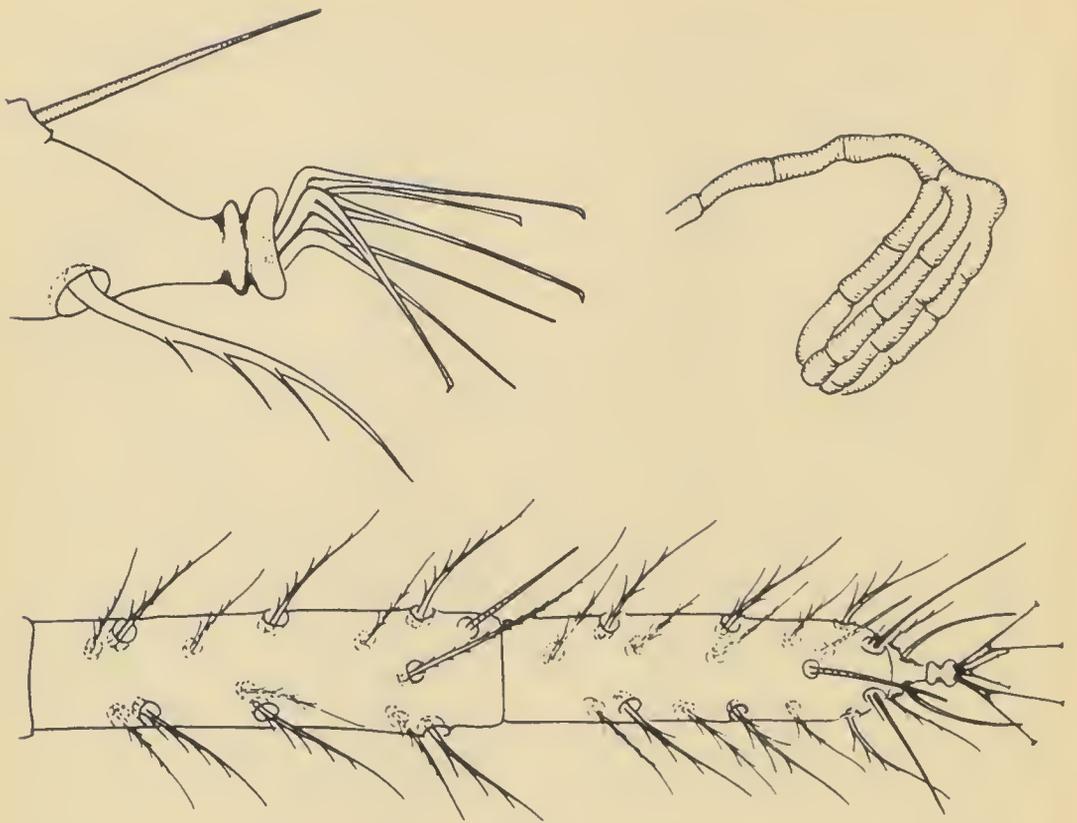


Fig. 52. *Aplonobia calame*: peritreme and tibia and tarsus of female, with enlargement of tarsal appendages.

the duplex setae; with a mediolateral, dorsodistal, and distoventral setae proximal to the duplex setae. Empodium a short pad bearing a pair of tenent hairs that are nearly as long as the tenent hairs of the true claws. Body with integumentary dorsum bearing rather widely spaced striae except for pebbled area on propodosoma; dorsal setae very slender, pubescent, about as long as intervals between their bases, set on small tubercles. Length of body, 466μ ; including rostrum, 566μ .

Male.—Similar to female except dorsal setae of body somewhat longer. Aedeagus with external portion very long, slender, nearly straight, and tapering. Length of body, 400μ ; including rostrum 466μ .

Holotype.—Female, Bakersfield, California, August 11, 1949 (A. E. Pritchard), on a composite plant; type no. 2080, in the U. S. National Museum. *Paratypes*.—Six males, 8 females, Bakersfield, California, August 11, 1949 (A. E. Pritchard), on a composite plant.

GENUS **MESOTETRANYCHUS** RECK

Mesotetranychus Reck, 1948, Trudy Zool. Inst. Akad. Nauk Gruz. S.S.R.,
8. Type of genus: *Mesotetranychus vachushtii* Reck; monobasic.

A description of the genus *Mesotetranychus* has not been seen by us, nor a description of the type of the genus. Reck's keys (1950, 1952a) indicate that his genus is similar to *Aplonobia* and *Monoceronychus*.

Mesotetranychus vachushtii Reck

Mesotetranychus vachushtii Reck, 1948, Trudy. Zool. Inst. Akad. Nauk Gruz. S.S.R., 8. Described from specimens from Georgia, S.S.R. on *Ephedra procera*.

The description of this species has not been seen by us.

Mesotetranychus samgoriensis Reck

Mesotetranychus samgoriensis Reck, 1949, Soobsh. Akad. Nauk Gruz. S.S.R., 10(6): 365. Described from females, Samgorien Desert, Georgia, S.S.R., on *Eryngium campestre*.

Reck's description and illustrations of *Mesotetranychus samgoriensis* indicate that this species belongs to the genus *Monoceronychus*, as here interpreted, inasmuch as the inner sacrales are placed laterally. However, the body is rounded; and the closest relationship is probably with *M. corynetes*, a species that may not properly belong in the genus *Monoceronychus*. A knowledge of the genital structures of the male of each species may contribute to a better understanding of their generic placement.

Mesotetranychus samgoriensis is distinctive in having the dorsal integument of the body mamillate. The dorsal setae are all short. The empodium is longer than the proximal pad of each true claw. This species is known only by the female from the Samgorien Desert of Georgia, S.S.R.

GENUS **MONOCERONYCHUS** MCGREGOR

Monoceronychus McGregor, 1945, Proc. Ent. Soc. Wash., 47(4): 100; McGregor, 1950, Amer. Midl. Nat., 44(2): 369. Type of genus: *Monoceronychus californicus* McGregor; by original designation and monobasic.

The genus *Monoceronychus* is very closely allied to *Aplonobia*. As here recognized, the only constant difference observed between the two genera consists in having the inner sacral setae more widely spaced than the dorsocentral hysterosomals and placed more remotely from them than the dorsocentrals are from each other.

Most of the species of *Monoceronychus* are readily differentiated from *Aplonobia* by having the body very slender rather than rotund, the propodosoma with a conspicuous, triangular projection mediocephalically (not found elsewhere in the Tetranychidae), and the dorsal integument of the body without striae in the area surrounding the third pair of dorsocentral hysterosomals. Moreover, monocotyledonous plants (and gymnosperms) are the only known hosts of *Monoceronychus*, whereas *Aplonobia* occurs on dicotyledonous plants.

One of the new species, *Monoceronychus corynetes*, swept from grasses, is very intermediate between its assigned genus and *Aplonobia*. It has a rather rounded body, no propodosomal projection, and possesses dotted striae across the dorsocentral hysterosomal area. The antero-median placement of the inner sacral setae represents an extreme of the *Monoceronychus* series.

In the only males known, *Monoceronychus californicus*, *M. aechmetes*, and *M. linki*, the distal portion of the aedeagus is very long and stylet-like, and ventrad of the aedeagus is a slightly wider, shorter, median projection.



Fig. 53. *Monoceronychus californicus*: dorsal view of aedeagus.

Key to the species of *Monoceronychus*
Females

1. Propodosoma without an anteromedian projection 2
1. Propodosoma with an anteromedian projection 3
- 2.(1). Anterior legs longer than the body; idiosoma rounded and with spatulate dorsal setae *corynetes* (p. 75)
- 2.(1). Anterior legs shorter than the body; idiosoma slender and with slender dorsal setae *mcgregori* (p. 77)
- 3.(1). Propodosoma with anteromedian projection much shorter than rostrum 4
- 3.(1). Propodosoma with anteromedian projection as long as or longer than rostrum 7
- 4.(3). Hysterosoma with caudal two pairs of setae very slender. 5
- 4.(3). Hysterosoma with caudal two pairs of setae obviously widened 6
- 5.(4). Anterior legs longer than body *machetes* (p. 81)
- 5.(4). Anterior legs much shorter than body *enoplus* (p. 90)
- 6.(4). Hysterosoma with caudal three pairs of setae broadly spatulate *californicus* (p. 83)
- 6.(4). Hysterosoma with caudal three pairs of setae lanceolate *aechmetes* (p. 86)
- 7.(3). Propodosomal projection covering only rostrum; hysterosoma with caudal three pairs of setae slender, tapering, and set on strong tubercles *scolus* (p. 90)
- 7.(3). Propodosomal projections covering entire gnathosoma; hysterosoma with caudal three pairs of setae differing in size and shape and set on small tubercles *linki* (p. 92)

Monoceronychus corynetes Pritchard and Baker, new species
(Figures 54, 55)

The female of *corynetes* may be differentiated from other members of *Monoceronychus*, as well as *Aplonobia*, by having the body rounded, the propodosomal projection absent, and the dorsal setae all short and broadly spatulate. The anterior legs are much longer than the body. The male is unknown.

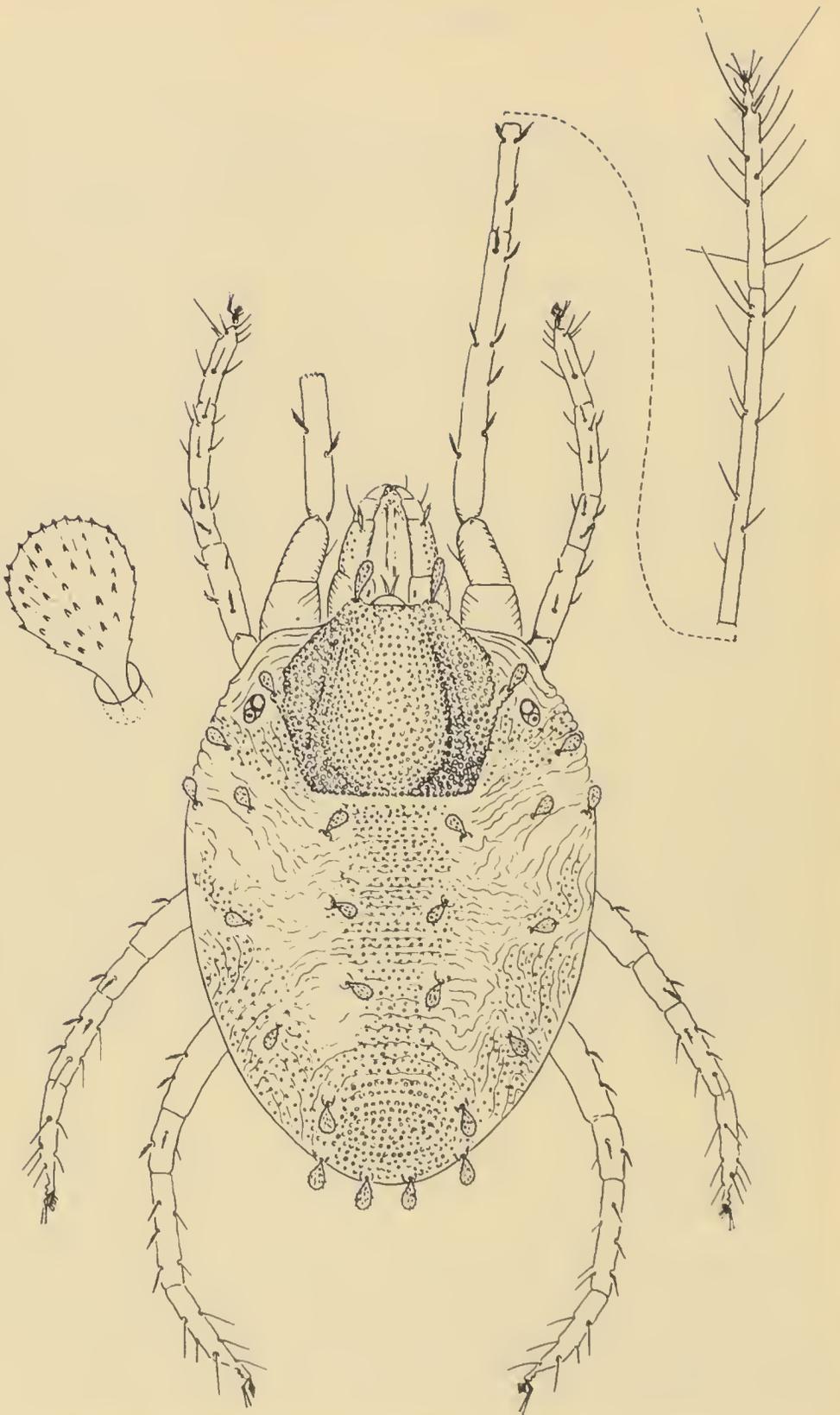


Fig. 54. *Monoceronychus corynetes*: dorsal aspect of female.

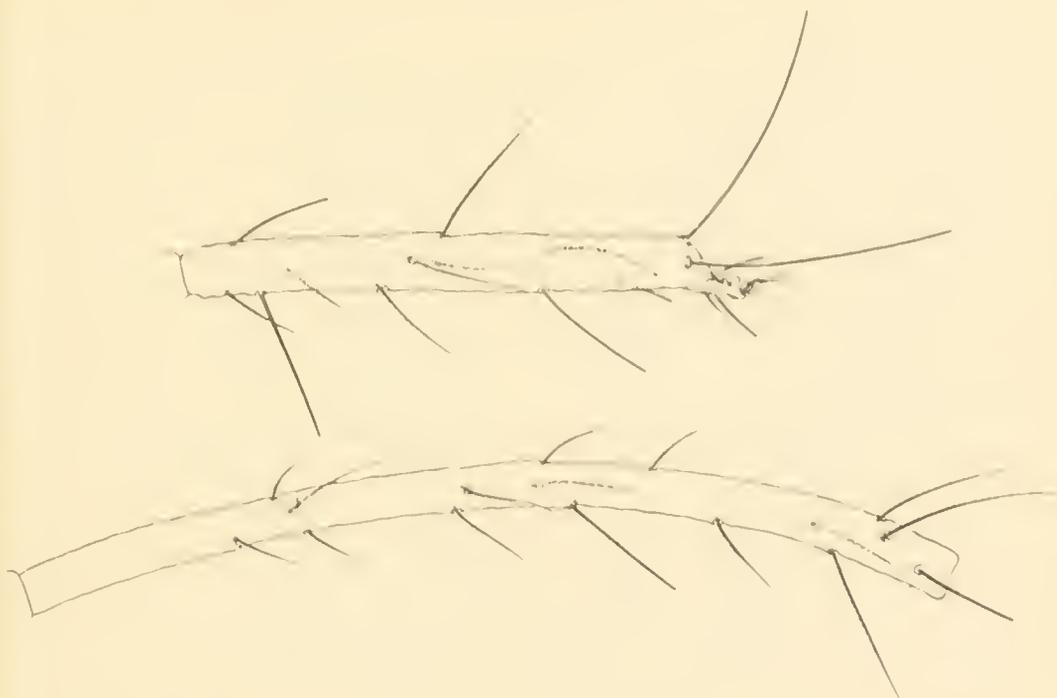


Fig. 55. *Monoceronychus corynetes*: tibia and tarsus I of female.

Female.—Rostrum reaching just past the end of trochanter I. Stylophore slender, broadly rounded anteriorly. Peritreme with distal enlargement slender. Anterior leg one and one-half times as long as body; dorsal setae on proximal segments slender and pubescent; tarsus I with ten tactile and two sensory setae proximad of duplex setae. Empodium somewhat longer than pad of true claw. Propodosoma without mediocephalic projection. Dorsum of body with crenulate and usually dotted integumentary striae except for pebbled area on propodosoma; dorsal setae all short and broadly spatulate. Length of body 413μ ; including rostrum 500μ .

Holotype.—Female, Tesla, California, September 21, 1951 (W. C. Bentinck), sweeping grass; type no. 2081 in the U. S. National Museum.
Paratype.—Female, Tesla, California, September 21, 1951 (W. C. Bentinck), sweeping grass.

Monoceronychus mcgregori Pritchard and Baker, new species
 (Figures 56, 57)

The female of *Monoceronychus mcgregori* may be recognized by having the propodosomal projection absent and the body slender. The anterior legs are shorter than the body. The male is unknown.

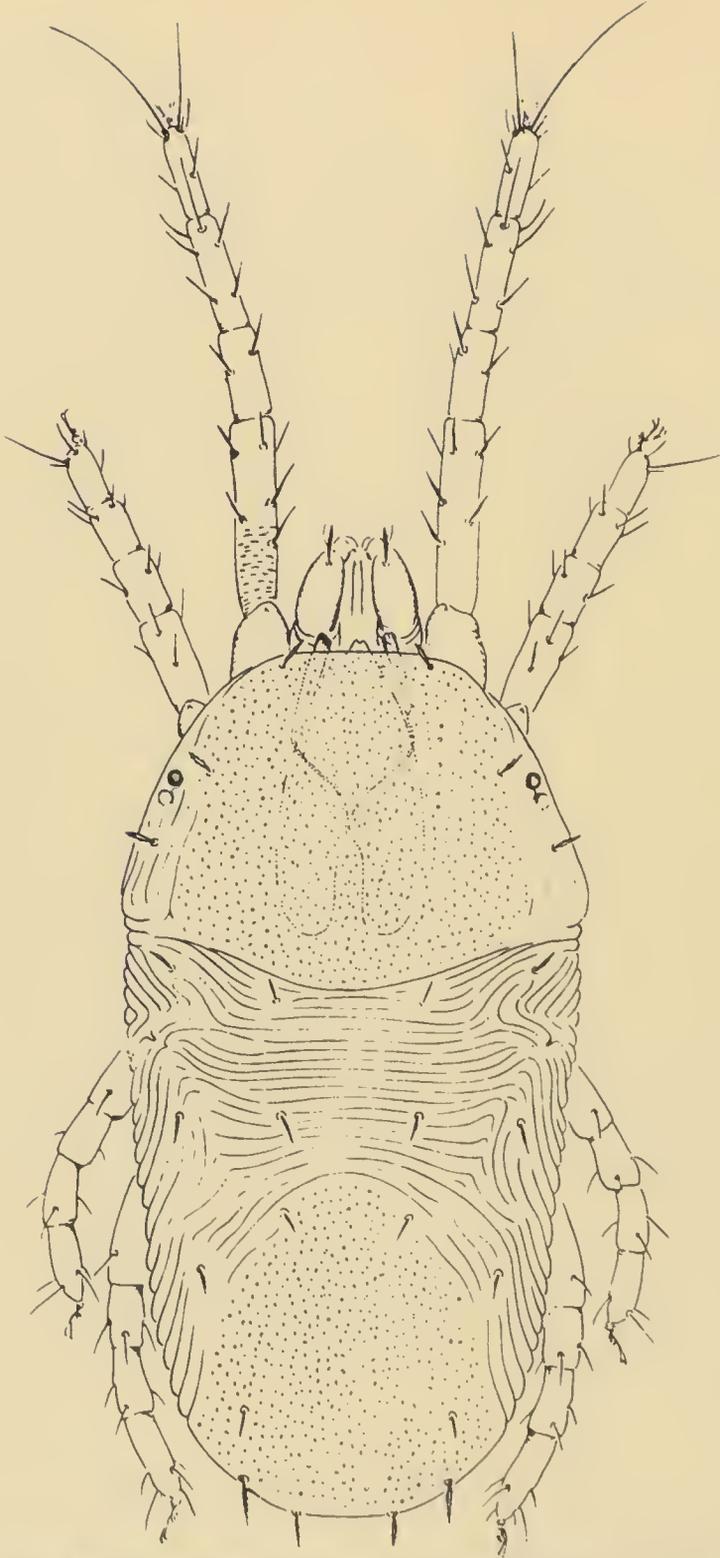


Fig. 56. *Monoceronychus mcgregori*: dorsal aspect of female.



Fig. 57. *Monoceronychus mcgregori*: above, tibia and tarsus I of female; below, tibia and tarsus II of female.

Female.—Rostrum nearly reaching middle of femur I. Stylophore slender, the sides angularly converging anteriorly and with a small mediocephalic emargination. Peritreme with distal enlargement slender.



Fig. 58. *Monoceronychus machetes*: dorsal aspect of female.

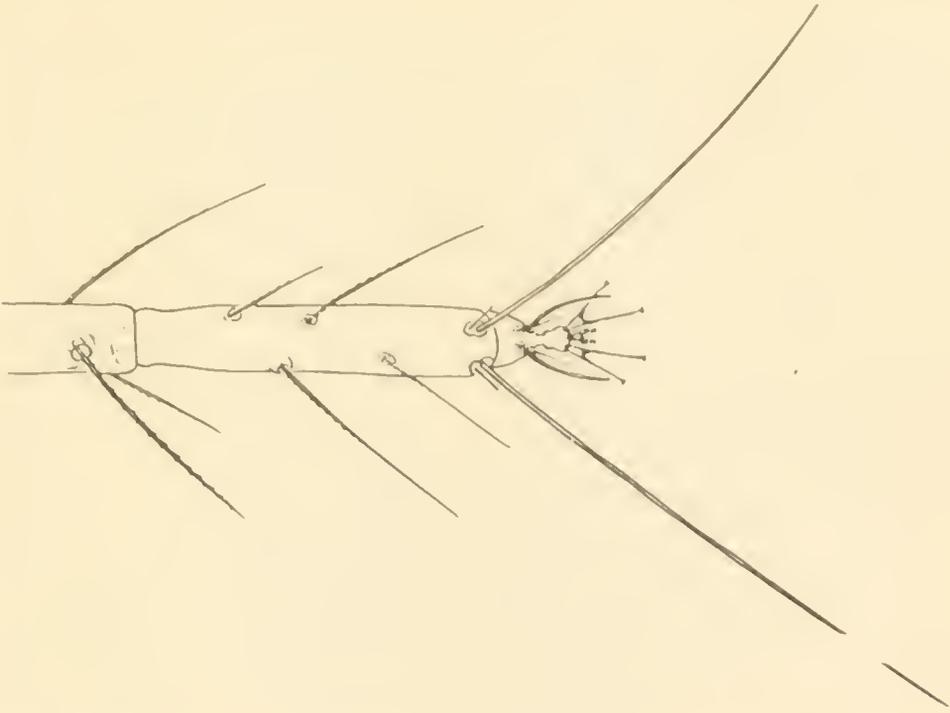


Fig. 59. *Monoceronychus machetes*: dorsal view of tarsus I of female.

Anterior leg distinctly shorter than body; dorsal setae on proximal segments setiform; tarsus I with three tactile setae proximal to duplex setae. Empodium distinctly longer than pad of true claw. Propodosoma without anterior projections. Dorsum of propodosoma and most of opisthosoma with nearly smooth integument, the metapodosomal dorsum with rather widely spaced, solid striae. Dorsal propodosomals and dorsal hysterosomals all minute and setiform except for somewhat longer outer sacrals and clunals. Length of body 380μ ; including rostrum 420μ .

Holotype.—Female, Miami Shores, Florida, May 5, 1952 (D. O. Wolfenbarger), on St. Augustine grass; type no. 2009 in the U. S. National Museum. *Paratypes*.—Five females, Miami Shores, Florida, May 5, 1952 (D. O. Wolfenbarger), on St. Augustine grass.

This species is named in honor of E. A. McGregor who forwarded to us the specimens for inclusion in this revision.

Monoceronychus machetes Pritchard and Baker, new species
(Figures 58, 59)

The female of *Monoceronychus machetes* may be readily recognized by having the anterior legs much longer than the body and the dorsal

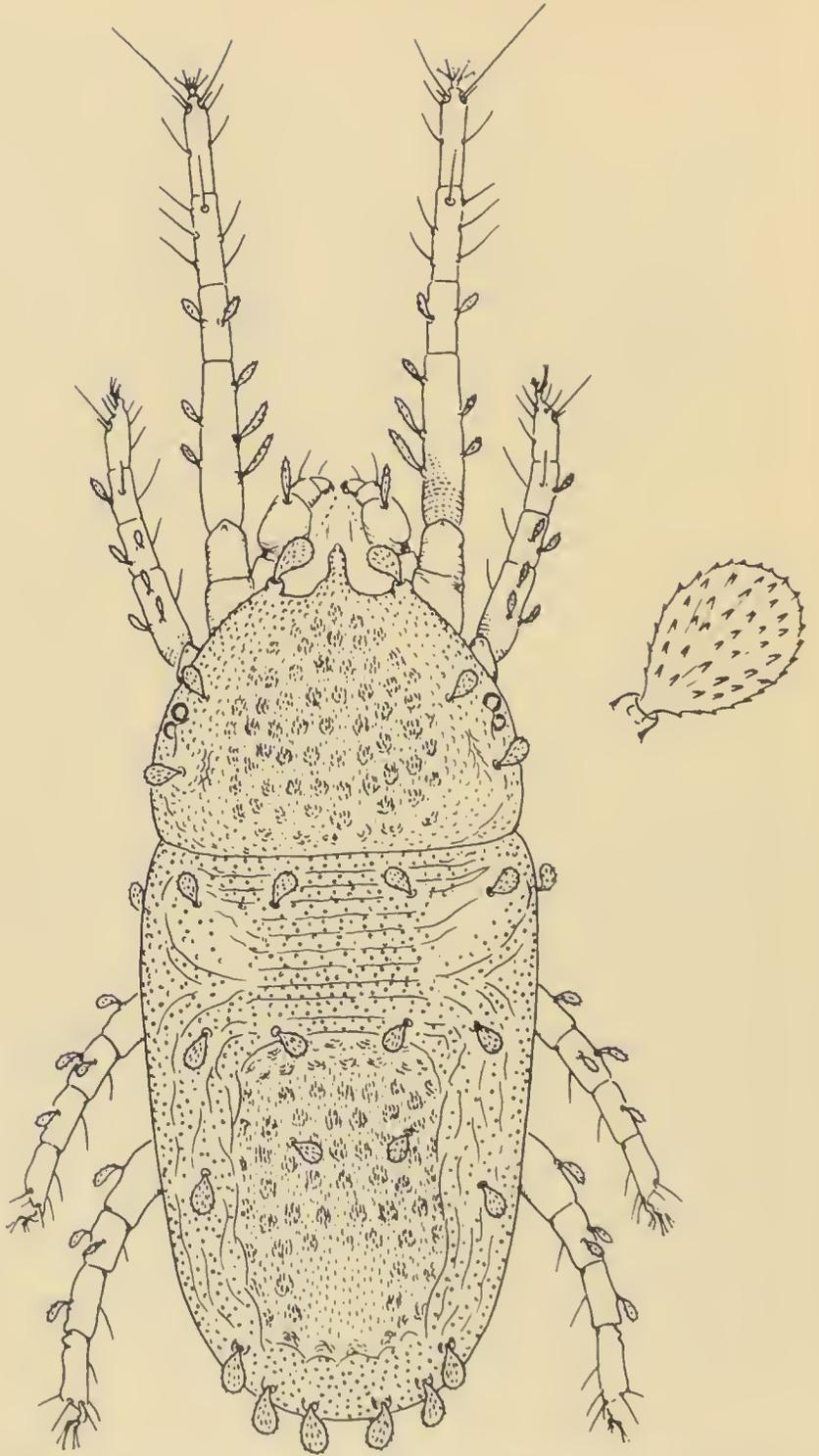


Fig. 60. *Monoceronychus californicus*: dorsal aspect of female, type.

setae of the body short and subspatulate except for slender setae caudally. The male is unknown.

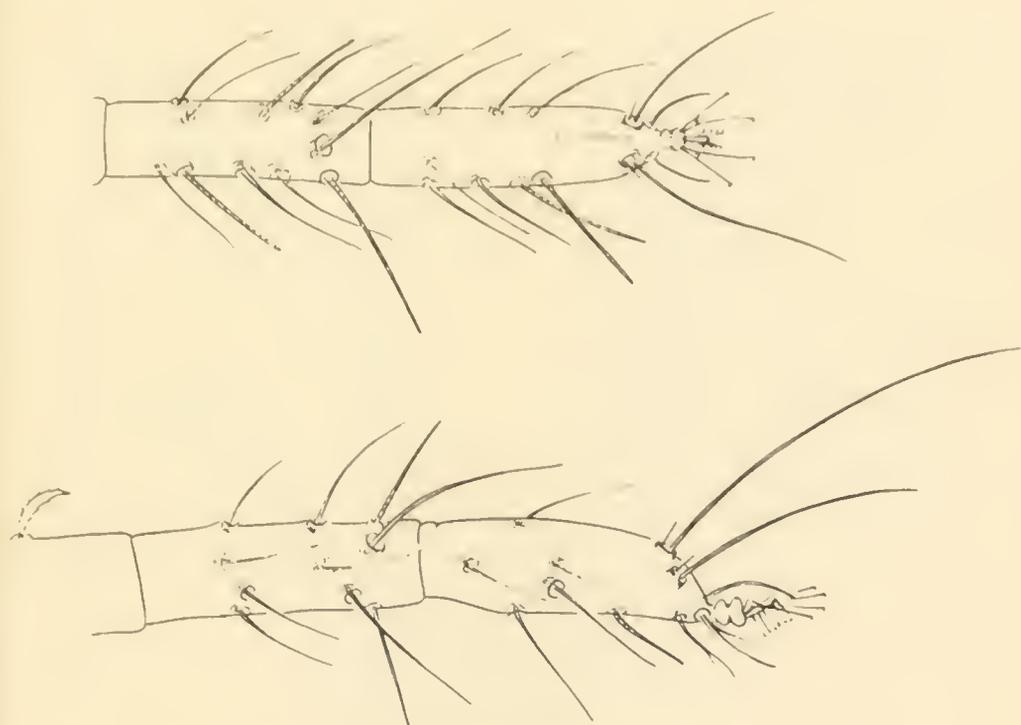


Fig. 61. *Monoceronychus californicus*: above, tibia and tarsus I of male; below, tibia and tarsus I of female.

Female.—Rostrum reaching to base of femur I. Stylophore slender, rounded anteriorly. Propodosoma with anteromedian projection well developed but shorter than rostrum, the anterior dorsal propodosomals set on long projections. Leg I slightly longer than body; dorsal setae on proximal segments slender and pubescent; tarsus I with four tactile setae proximal to duplex setae. Empodium much longer than pad of true claw. Body with broad dorsomedian area of propodosoma granulate, the metapodosoma with rather widely spaced, solid, transverse striae. Dorsal setae of body short and broadly lanceolate except for long and slender outer sacral and clunals. Length of body, 433 μ ; including rostrum, 500 μ .

Holotype.—Female, Jacumba, California, April 13, 1950 (A. E. Pritchard), on juniper; type no. 2082 in the U. S. National Museum.

Monoceronychus californicus McGregor

(Figures 53, 60, 61, 62)

Monoceronychus californicus McGregor, 1945, Proc. Ent. Soc. Wash., 47(4): 100; McGregor, 1950, Amer. Midl. Nat., 44(2): 370. Types:

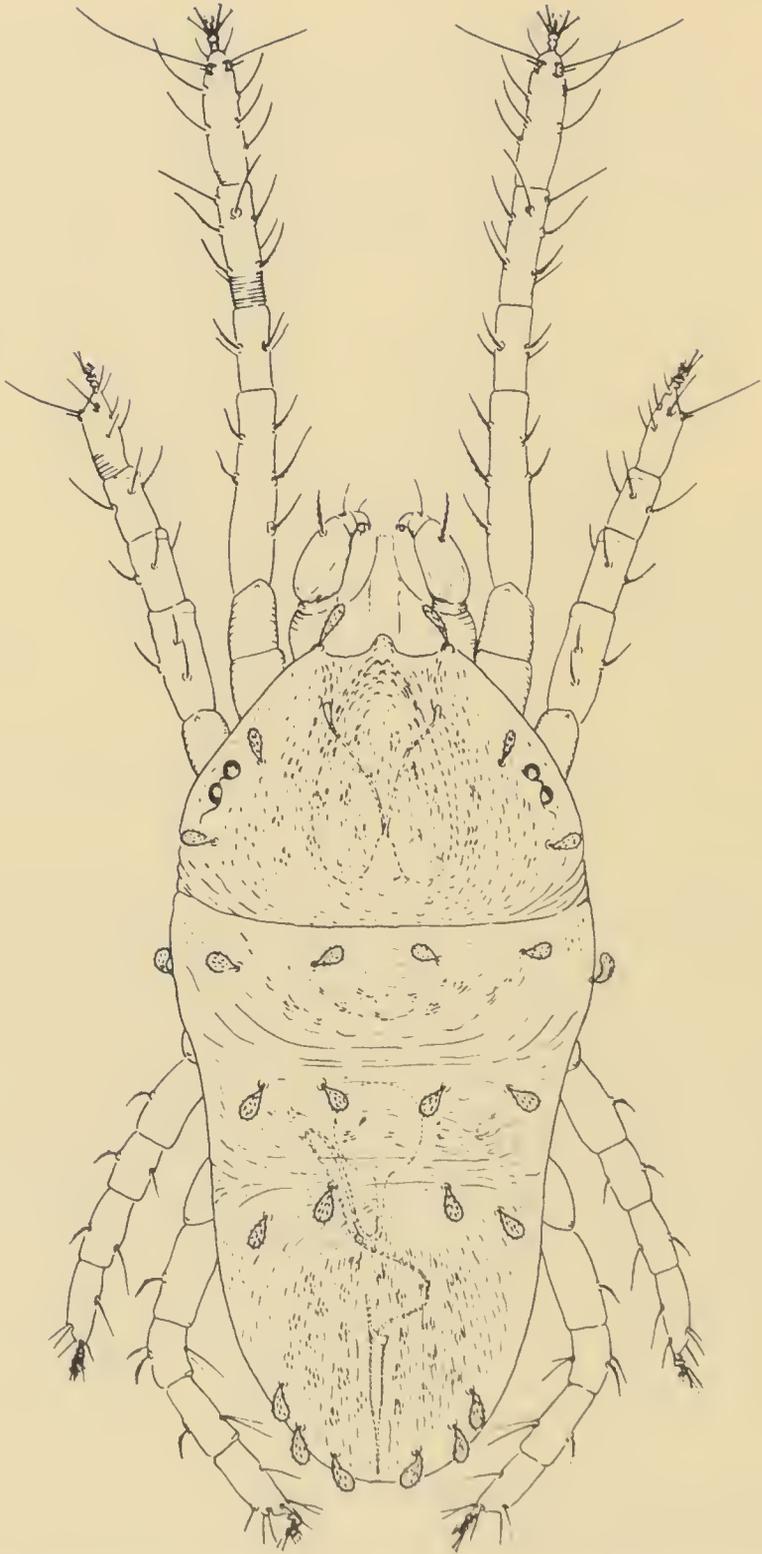


Fig. 62. *Monoceronychus californicus*: dorsal aspect of male, type.

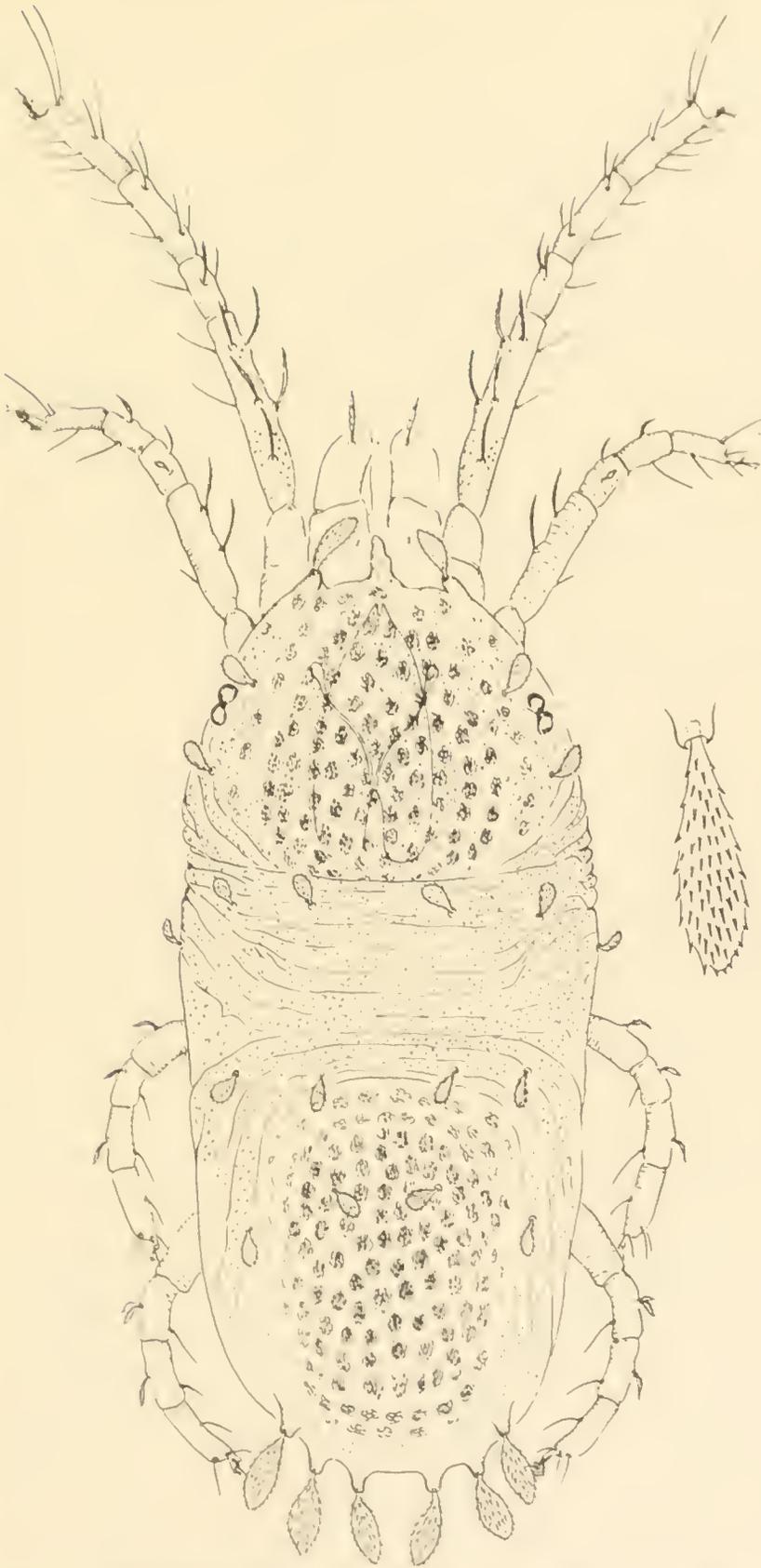


Fig. 63. *Monoceronychus aechmetes*: dorsal aspect of female.

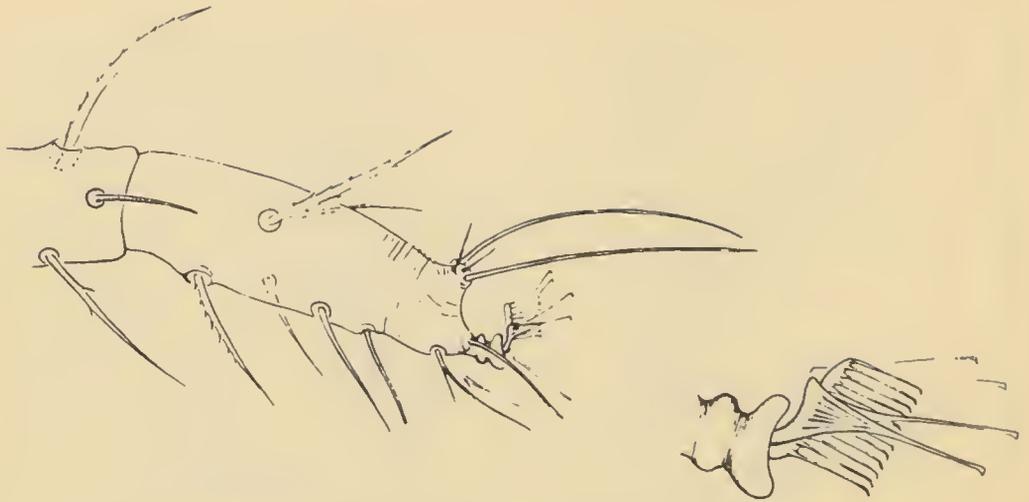


Fig. 64. *Monoceronychus aechmetes*: tarsus I of female, with enlargement of appendages.

males and females, Laguna Beach, California, on salt grass; in the U. S. National Museum.

The female of *Monoceronychus californicus* may be readily recognized by having broadly spatulate dorsal setae on a slender body that bears a small anterior propodosomal projection. As here limited, this species is known only from the coastal region of California, on salt grass.

In addition to the types from Laguna Beach, collections studied are from Larkspur, California (R. E. Beer and A. E. Pritchard), on salt grass; San Rafael, California (A. E. Pritchard), on salt grass; and Clayton, California (J. W. MacSwain), on salt grass.

Monoceronychus aechmetes Pritchard and Baker, new species
(Figures 63, 64)

Monoceronychus aechmetes is very closely related to *M. californicus*, and it may actually represent only a subspecies. Specimens of both forms have been studied, and *M. aechmetes* differs consistently in having the caudal setae of the body elongate—lanceolate rather than broadly spatulate, and in being found in the interior valleys of California rather than in the coastal area. McGregor (1950) noted the morphological differences.

Female.—Rostrum reaching proximal part of femur I. Stylophore acuminate anteriorly and with a terminal angulation. Anterior legs much

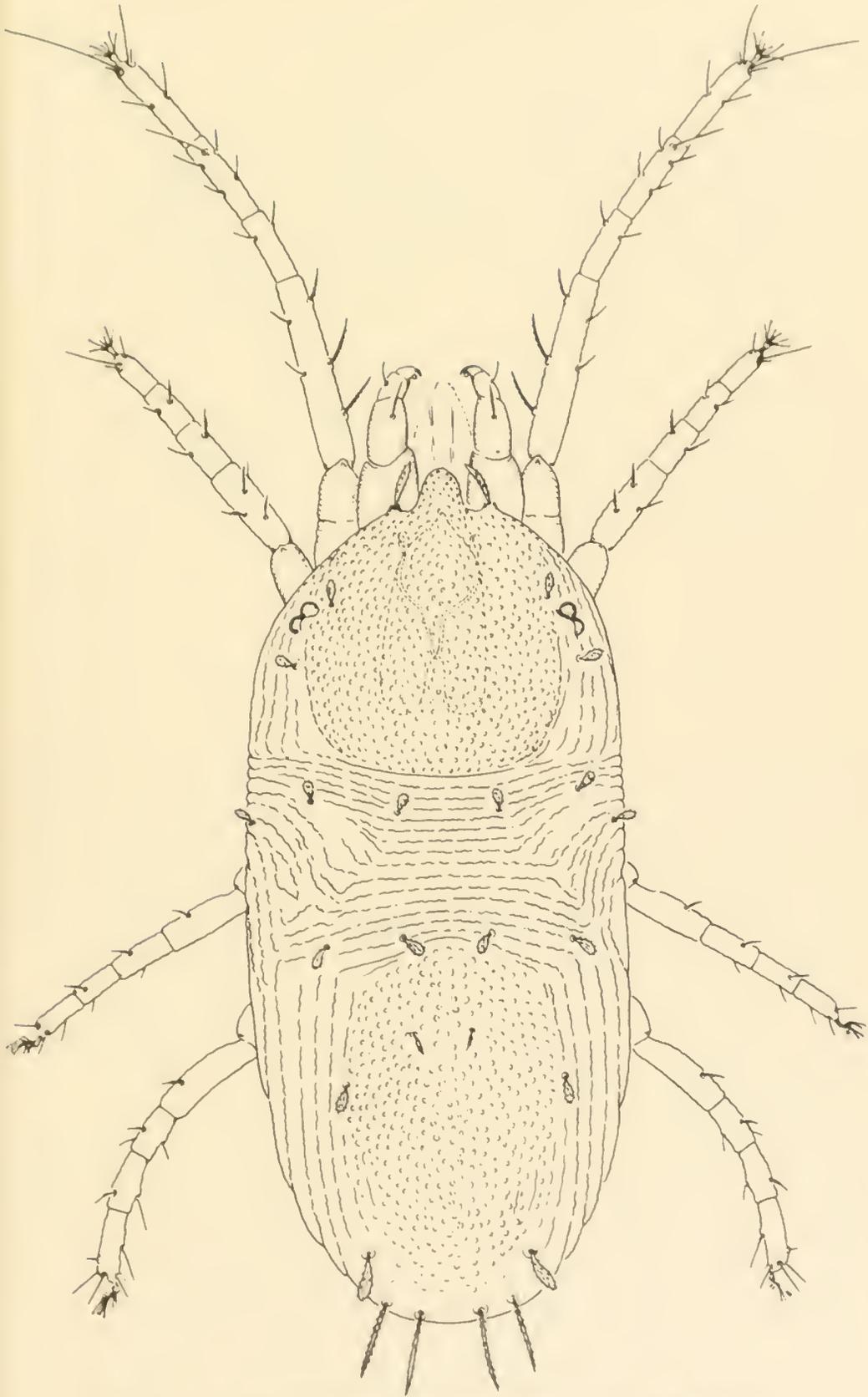


Fig. 65. *Monoceronychus enoplus*: dorsal aspect of female.

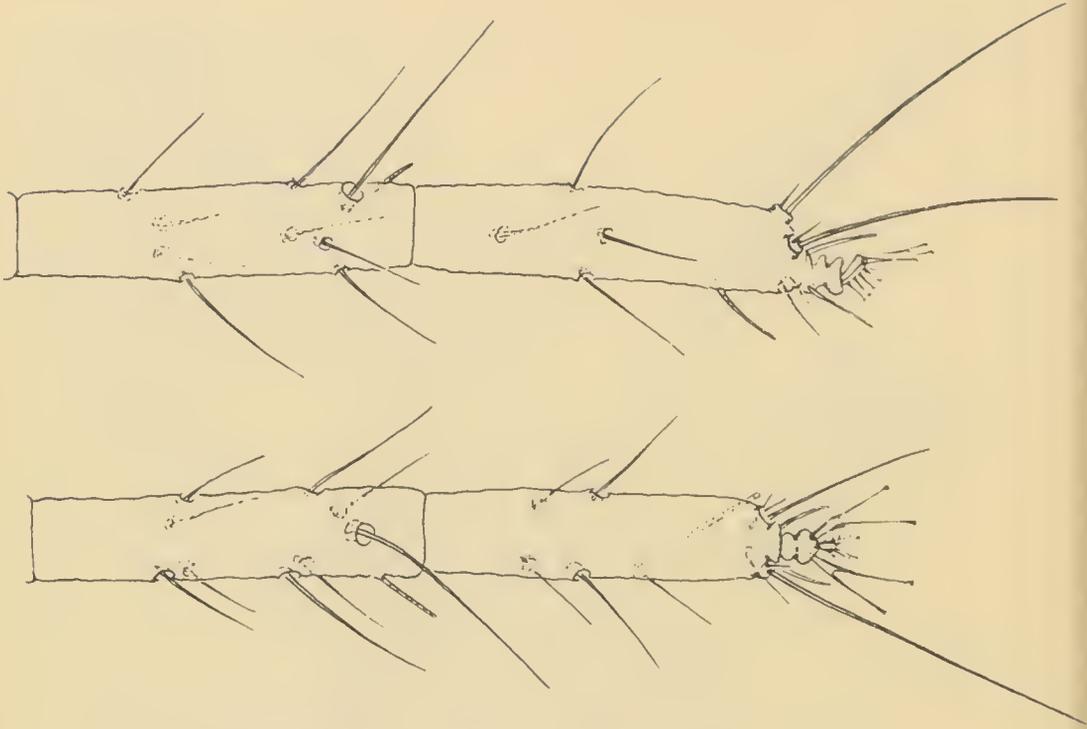


Fig. 66. *Monoceronychus enoplus*: dorsal and lateral views of tarsus I of female.

shorter than body; dorsal, tactile setae of proximal segments slender; tarsus I with five tactile and one sensory seta proximal to duplex setae. Propodosoma with anteromedian projection slender, reaching as far as ends of first propodosomal setae. Body with dorsum bearing transverse striae across median portion, the propodosoma and opisthosoma with strong areolets or globules; dorsal setae short and broadly spatulate except for caudal three pairs of lanceolate setae. Length of body, $513\ \mu$; including rostrum, $566\ \mu$.

Male.—Similar to female. Shaft of aedeagus abruptly narrowed to form a long and very slender terminal stylet. Length of body, $267\ \mu$; including rostrum, $300\ \mu$.

Holotype.—Female, Coalinga, California, May 10, 1952 (A. E. Pritchard), on *Agrostis* sp.; type no. 2085 in the U. S. National Museum. *Paratypes*.—One female, Sage, California, August 23, 1935, on Bermuda grass; 1 male, 1 female, 1 nymph, Yokohl Valley, Tulare County, California, November 3, 1935 (E. A. McGregor), on salt grass; 1 female, San Jacinto, California, May 26, 1951 (A. E. Pritchard), on salt grass; 1 female, Coalinga, California, May 10, 1952 (A. E. Pritchard), on *Agrostis* sp.; 3 males, 13 females, Palm Canyon, California, August 19, 1934 (E. A. McGregor), on salt grass; and 2 nymphs, 3 larvae, Huron, California, September 20, 1953 (A. E. Pritchard), on Bermuda grass.

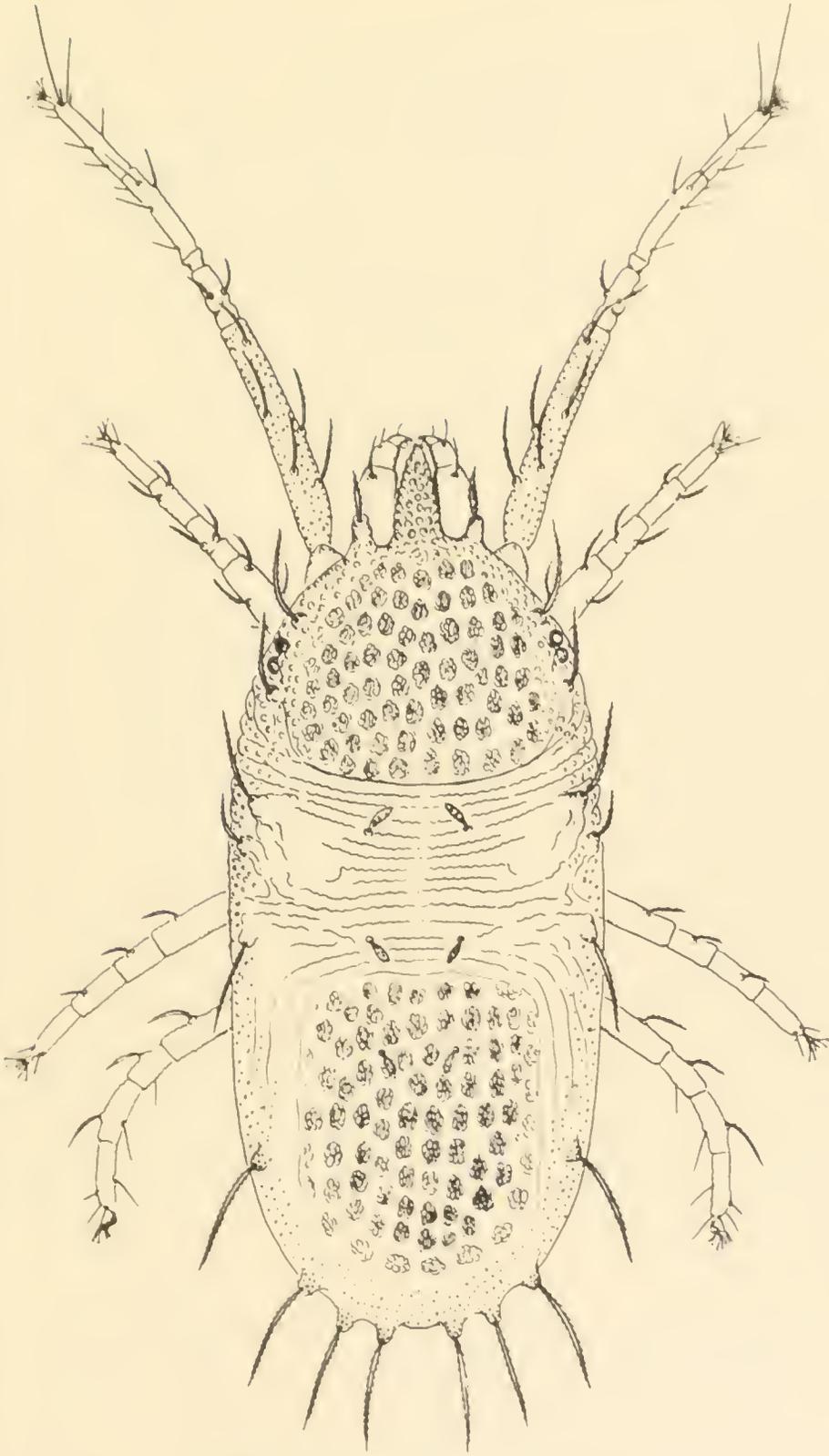


Fig. 67. *Monoceronychus scolus*: dorsal aspect of female.



Fig. 68. *Monoceronychus scolus*: tibia and tarsus I of female.

Monoceronychus enoplus Pritchard and Baker, new species
(Figures 65, 66)

The female of *Monoceronychus enoplus* may be readily recognized by having the dorsal setae of the body short and lanceolate or narrowly spatulate except for the slender two pairs of caudal setae.

Female.—Rostrum not reaching middle of femur I. Stylophore broadly angulate anteriorly. Propodosoma with anteromedian projection present, short and wide. Anterior leg much shorter than body; tactile setae on dorsum of proximal segments setiform; tarsus I with six tactile and no sensory setae proximal to duplex setae. Empodial pad similar in length to pad of true claw. Dorsum of body with crenulate striations medially, the propodosoma and opisthosoma largely pebbled. Length of body, 445 μ ; including rostrum, 533 μ .

Holotype.—Female, Hemet, California, May 26, 1951 (A. E. Pritchard), on grass; type no. 2084 in the U. S. National Museum. *Paratype*.—One female, Hemet, California, May 26, 1951 (A. E. Pritchard), on grass.

A protonymph, Tesla, California, October 4, 1951 (J. E. Gillasp), on grass, is also regarded as representing this species. The nymph resembles the adult except that the dorsal setae are very small and slender except for longer and more lanceolate anterior propodosomals and inner sacralis.

Monoceronychus scolus Pritchard and Baker, new species
(Figures 67, 68)

Females of *Monoceronychus scolus* are distinctive in having all of the lateral setae on the body long and slender, set on strong tubercles. The anteromedian projection of the propodosoma is very long, covering the rostrum. The male is unknown.

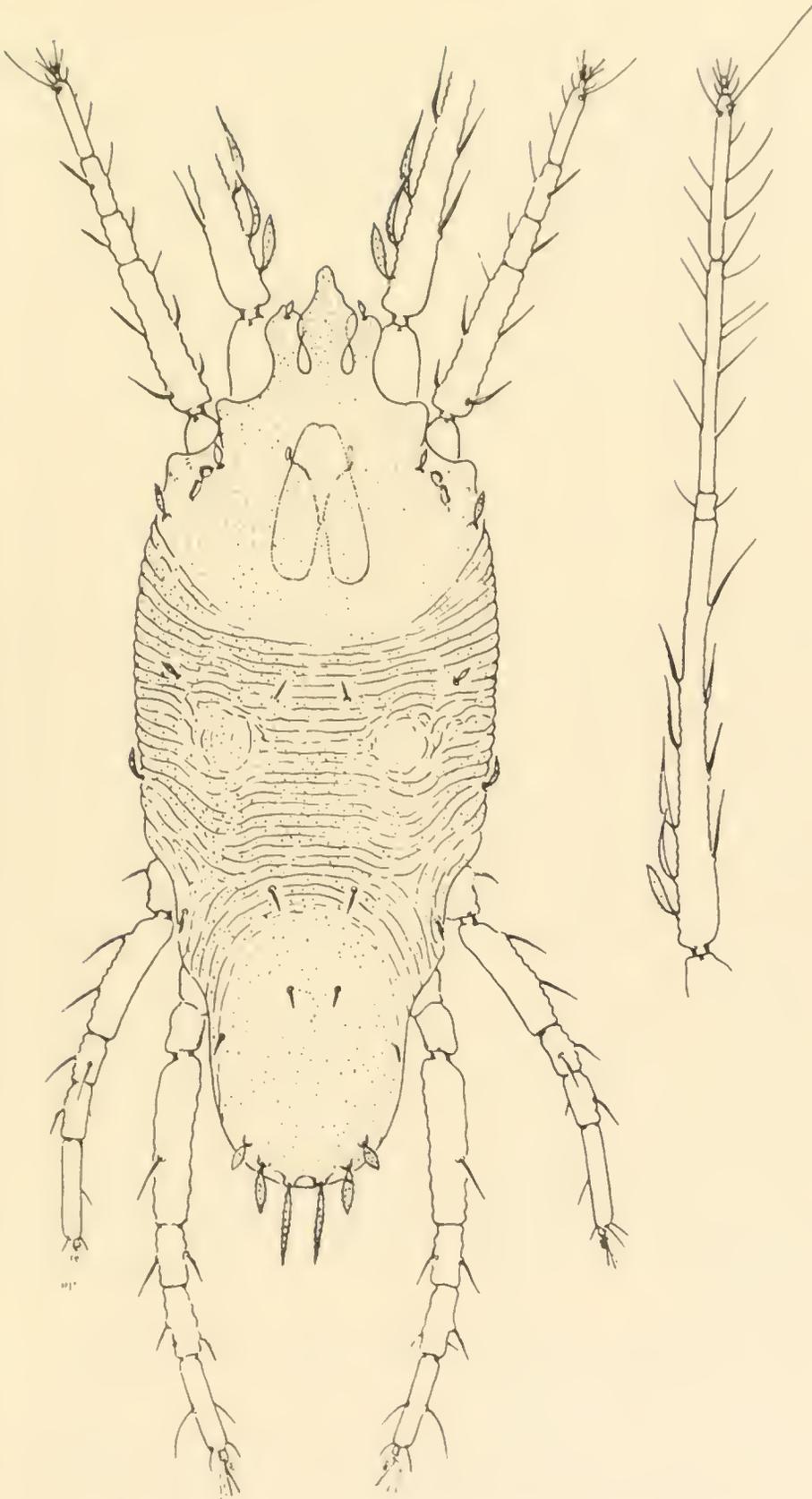


Fig. 69. *Monoceronychus linki*: dorsal aspect of female.

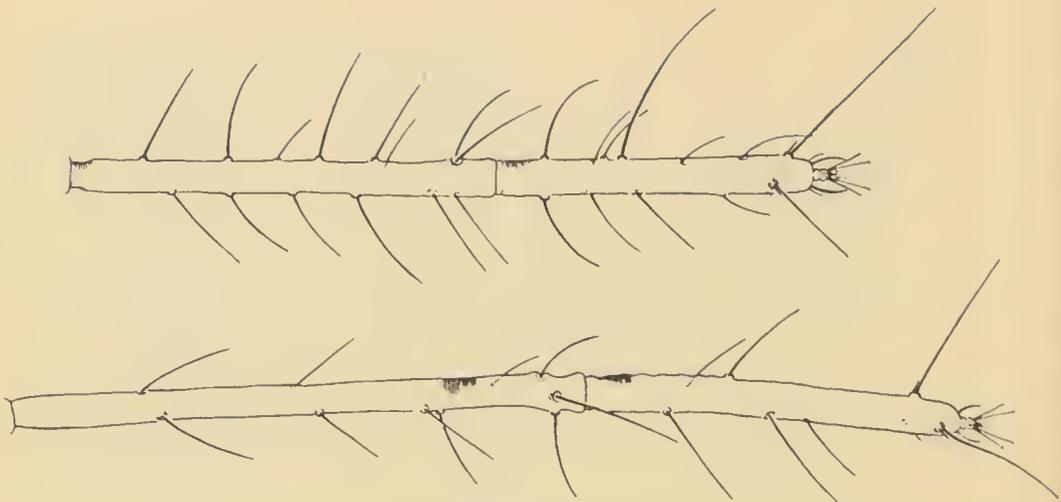


Fig. 70. *Monoceronychus linki*: above, tibia and tarsus I of male; below, tibia and tarsus I of female.

Female.—Rostrum reaching proximal third of femur I. Stylophore broadly angulate anteriorly. Propodosoma with median projection very long, covering rostrum. Anterior legs much shorter than body; dorsal setae on proximal segments very long and slender, pubescent; tarsus I with five tactile setae and a proximolateral sensory seta proximal to the duplex setae. Empodium longer than pad of true claws. Body with dorsal integument transversely striate medially and with clusters of globules over most of propodosoma and opisthosoma; dorsal setae all lateral, slender, set on obvious tubercles except for the three pairs of short and broadly lanceolate dorsocentral hysterosomals. Length of body, 533 μ .

Holotype.—Female, Hemet, California, May 26, 1951 (A. E. Pritchard), on grass; type no. 2083 in the U. S. National Museum. *Paratypes*.—Two females, Hemet, California, May 26, 1951 (A. E. Pritchard), on grass.

Five deutonymphs, Durham, North Carolina, June 18, 1953 (A. E. Pritchard), on Bermuda grass, appear to represent *Monoceronychus scolus*. The nymphs differ from the females mainly in having smaller dorsocentral hysterosomals and a smaller anteromedian projection of the propodosoma.

Monoceronychus linki Pritchard and Baker, new species

(Figures 69, 70, 71, 72)

Adults of *Monoceronychus linki* may be recognized by having three anterior projections of the propodosoma very strongly developed and covering the rostrum and palpi.

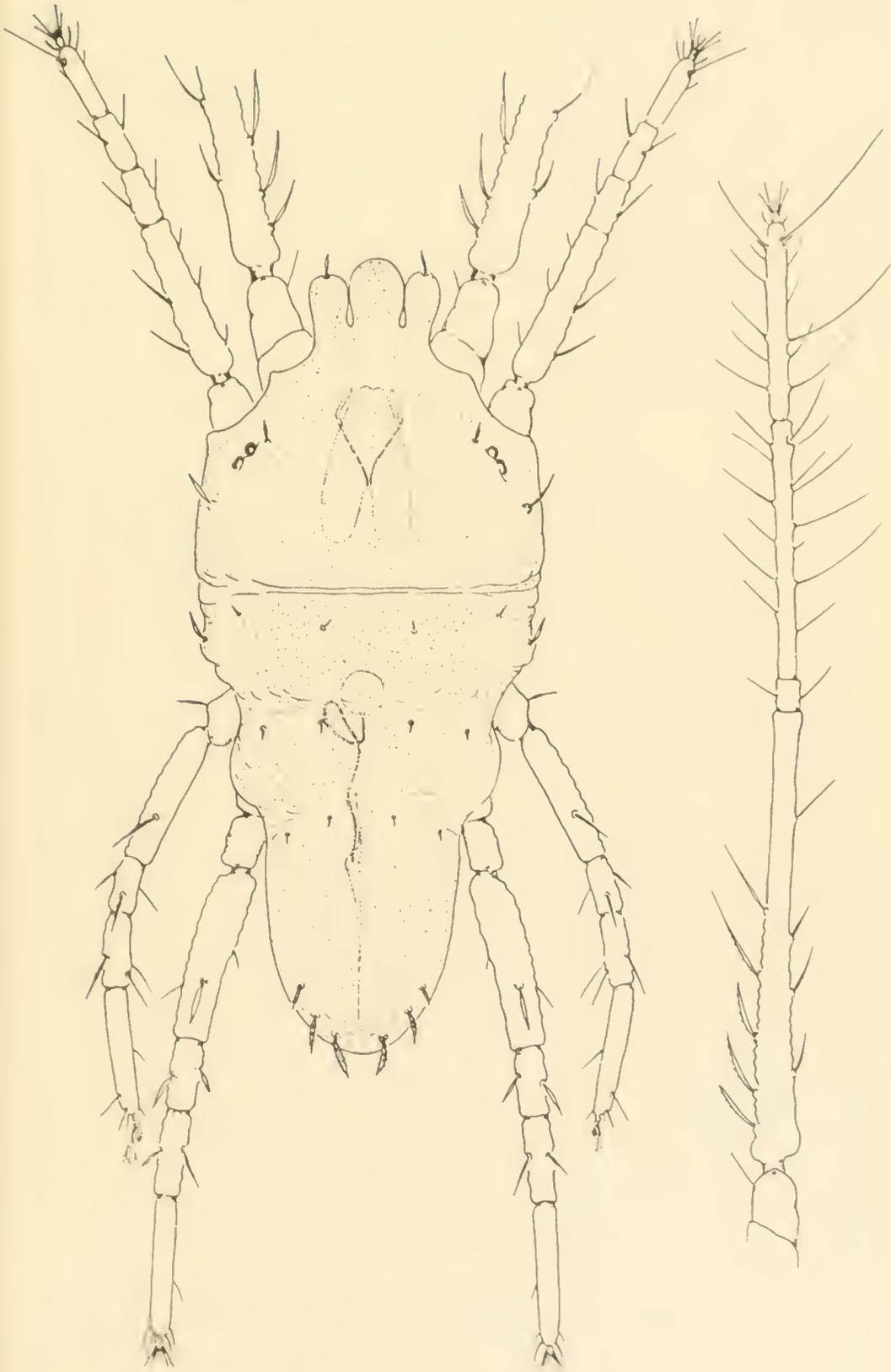


Fig. 71. *Monoceronychus linki*: dorsal aspect of male.

Spider Mites

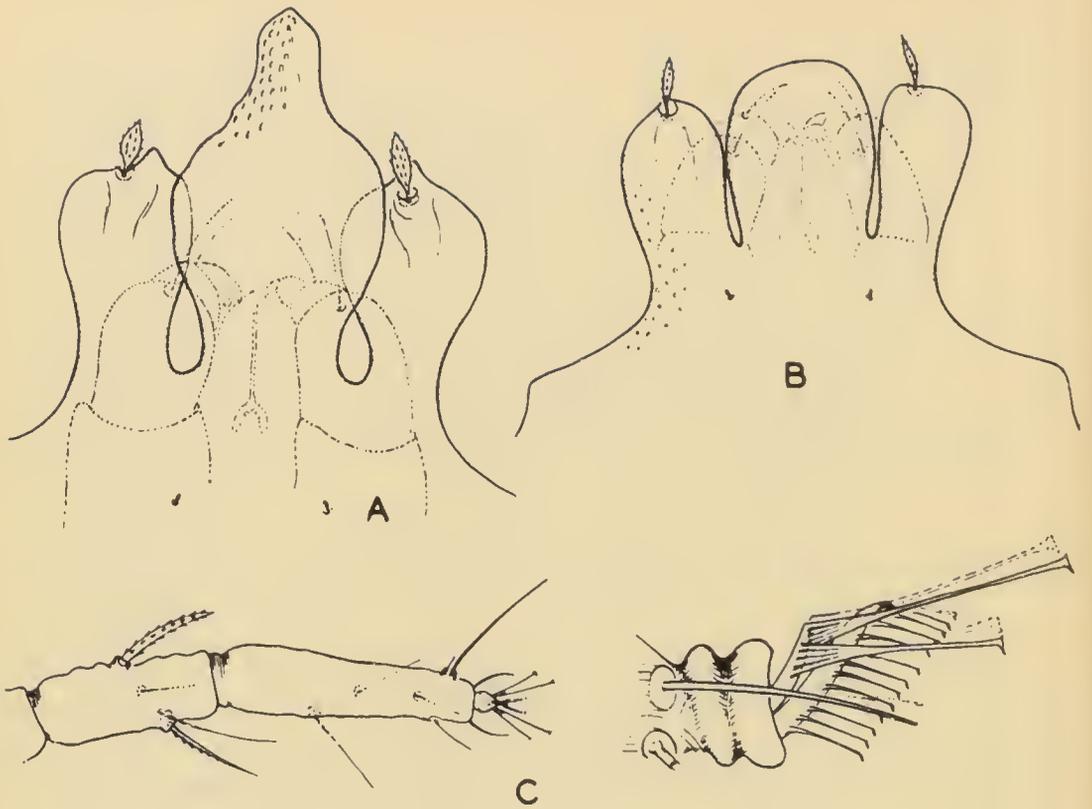


Fig. 72. *Monoceronychus linki*: A.) propodosomal projections of female; B.) propodosomal projections of male; C.) tarsus II of female with enlargement of appendages.

Female.—Rostrum not reaching end of trochanter I. Stylophore slender, slightly emarginate mediodistally. Leg I about as long as body; dorsal setae on proximal segments lanceolate; tarsus I with five tactile setae proximal to duplex setae. Empodium about as long as pad of true claw. Propodosoma anteriorly with mediolateral angulations and with three strong, medially widened projections covering gnathosoma. Dorsal integument punctate, the metapodosoma with transverse striae. Dorsal setae of body very short and mostly lanceolate, the clunals being long and slender. Length of body 725μ ; greatest width of body 292μ .

Male.—Similar to female except legs I much longer than body; tarsus I with ten tactile setae proximad of duplex setae; and clunal setae shorter and more lanceolate. Aedeagus abruptly constricted to form a long, stylet-like distal portion. Length of body 711μ ; greatest width of body, 285μ .

Holotype.—Female, Miami, Florida, April 15, 1953 (O. D. Link), on *Mariscus amcinensis*; type no. 2181 in the U. S. National Museum. *Paratypes*.—Five males, 4 females, 1 nymph, Miami, Florida, April 15, 1953 (O. D. Link), on saw grass.

Subfamily Bryobiinae Berlese

This species is named in honor of O. D. Link who collected this and many other interesting tetranychoids in Florida.

2

Subfamily TETRANYCHINAE Berlese

Tetranychini Berlese, 1913, *Acaroth. Ital.*, p. 17

Tetranychinae Reck, 1950, *Trudy Inst. Zool. Akad. Nauk Gruz. S.S.R.*,
9:123.

Tetranychidae Reck, 1952, *Soobsh. Akad. Nauk Gruz. S.S.R.*, 13(7): 423.

The subfamily Tetranychinae is distinctive in having only two pairs of anal setae in the female and four pairs of genito-anal setae in the male. The true claw is reduced to a very small pad bearing a long pair of tenent hairs. The empodium bears no tenent hairs, although paired hairs are often present proximoventrally.

The placement of the duplex setae varies considerably, and the proximal (tactile) member is nearly always more strongly developed than in the Bryobiinae. There are three pairs of dorsal propodosomals and only ten pairs of dorsal hysterosomals, the dorsosublaterals being absent.

Key to the tribes of Tetranychinae

1. Tarsus I dorsally with two pairs of duplex setae, the proximal member of each pair shorter than the distal member 2
1. Tarsus I dorsally with at most a single pair of usually loosely associated duplex setae, the proximal member usually as long as or longer than the distal member, or else duplex setae absent;

Subfamily Tetranychinae Berlese

empodium very small or absent . . . EURYTETRANYCHINI (p.100)

2. Hysterosoma with sacral setae all marginal; tarsus II with distal member of duplex setae a short sensory peg; propodosoma reticulate dorsally TENUIPALPOIDINI (p. 97)

2. Hysterosoma with inner sacrals mediodorsal; tarsus II with distal member of duplex setae long and tapering; propodosoma without reticulations TETRANYCHINI (p.124)

TENUIPALPOIDINI PRITCHARD AND BAKER, new tribe

The tribe Tenuipalpoideini is a rather anomalous or, perhaps, somewhat primitive member of the subfamily Tetranychinae. The strongly reduced pad of the true claw, as well as the presence of only two pairs of anal setae in the female and four pairs of genito-anal setae in the male, indicates a subfamilial relationship with the Tetranychinae. However, the character and placement of the setae on tarsus I, the complex distal enlargement of the peritreme, the integumentary sculpture, and the lateral position of the inner sacrals are all characteristic of the Bryobiinae.

TENUIPALPOIDES RECK AND BAGDASARIAN

Tenuipalpoides Reck and Bagdasarian, 1948, Doklady Akad. Nauk Armenia S.S.R., (9): 4: 183-186.

Type of genus.—*Tenuipalpoides zizyphus* Reck and Bagdasarian, monobasic and by original designation.

The genus *Tenuipalpoides* may be recognized by having the peritreme hooked or with an irregularly pectinate enlargement distally, tarsus I with two pairs of well-developed duplex setae placed on the dorsodistal declivity, tarsus II with the distal member of the duplex setae short and peglike, and the empodium simple, short and uncinat.

Tenuipalpoides zizyphus Reck and Bagdasarian

Tenuipalpoides zizyphus Reck and Bagdasarian, 1948, Doklady Akad. Nauk Armenia S.S.R., (9) 4: 183-186. Described from female, Erevan, Armenia on *Zizyphus vulgaris* (Lam.).

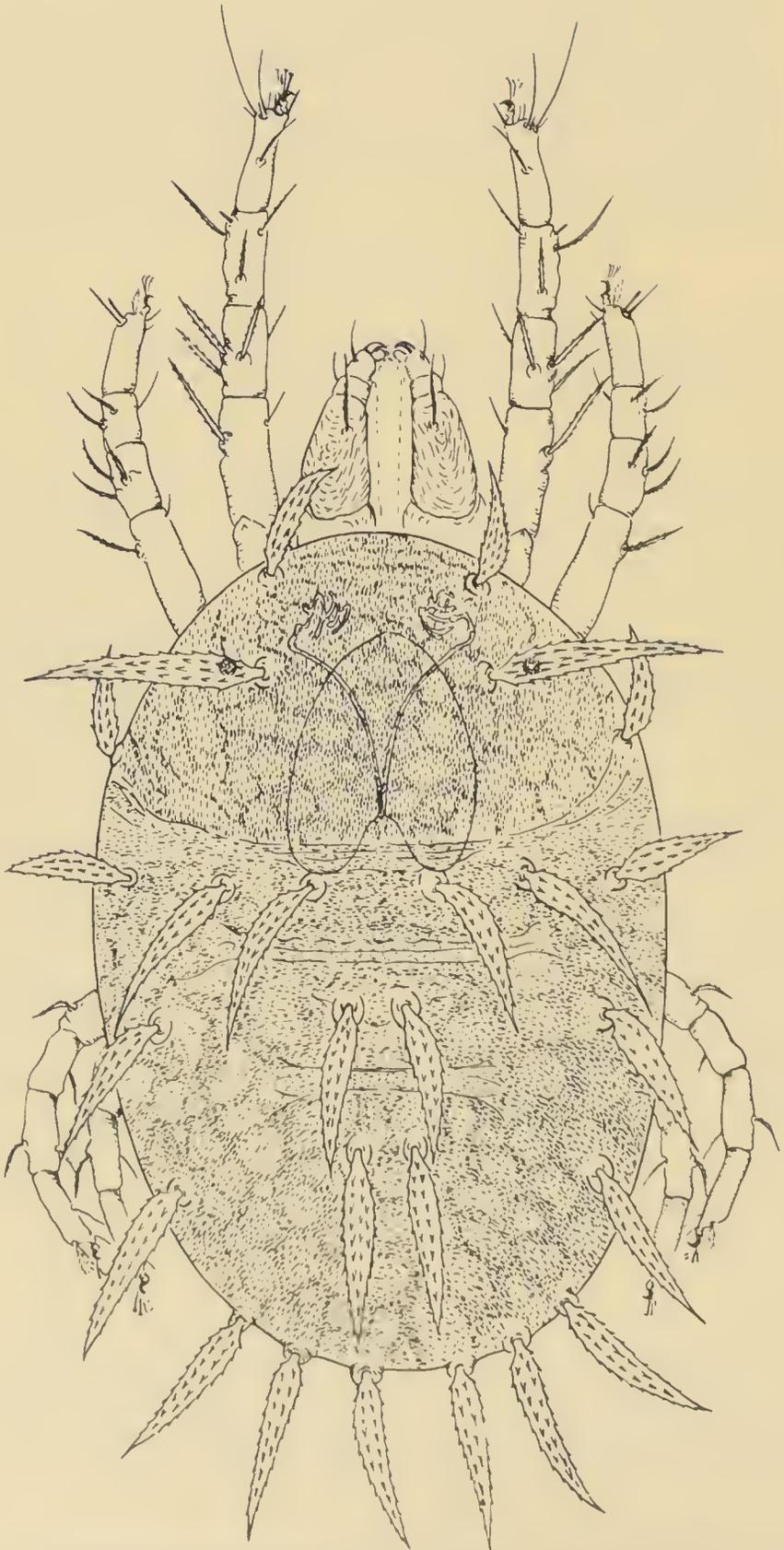


Fig. 73. *Tenuipalpoides dorychaeta*: dorsal aspect of paratype: female (Utah).

Subfamily Tetranychinae Berlese

Tenuipalpoides zizyphus may be recognized by having the distal ends of the peritremes hooked rather than with irregularly pectinate branches. The dorsal body setae as illustrated appear to be shorter than in *T. dorychaeta* from locust, and tibia I has two broadly lanceolate setae instead of a single one found in *T. dorychaeta*.

Tenuipalpoides dorychaeta Pritchard and Baker, new species
(Figures 73, 74)

The peritreme development separates this species from *T. zizyphus*.

Female.—Rostrum broadly obtuse anteriorly. Peritreme with distal end broadly enlarged because of irregularly pectinate branches. Tarsus I with an inner, tactile seta and an outer sensory seta proximal to duplex

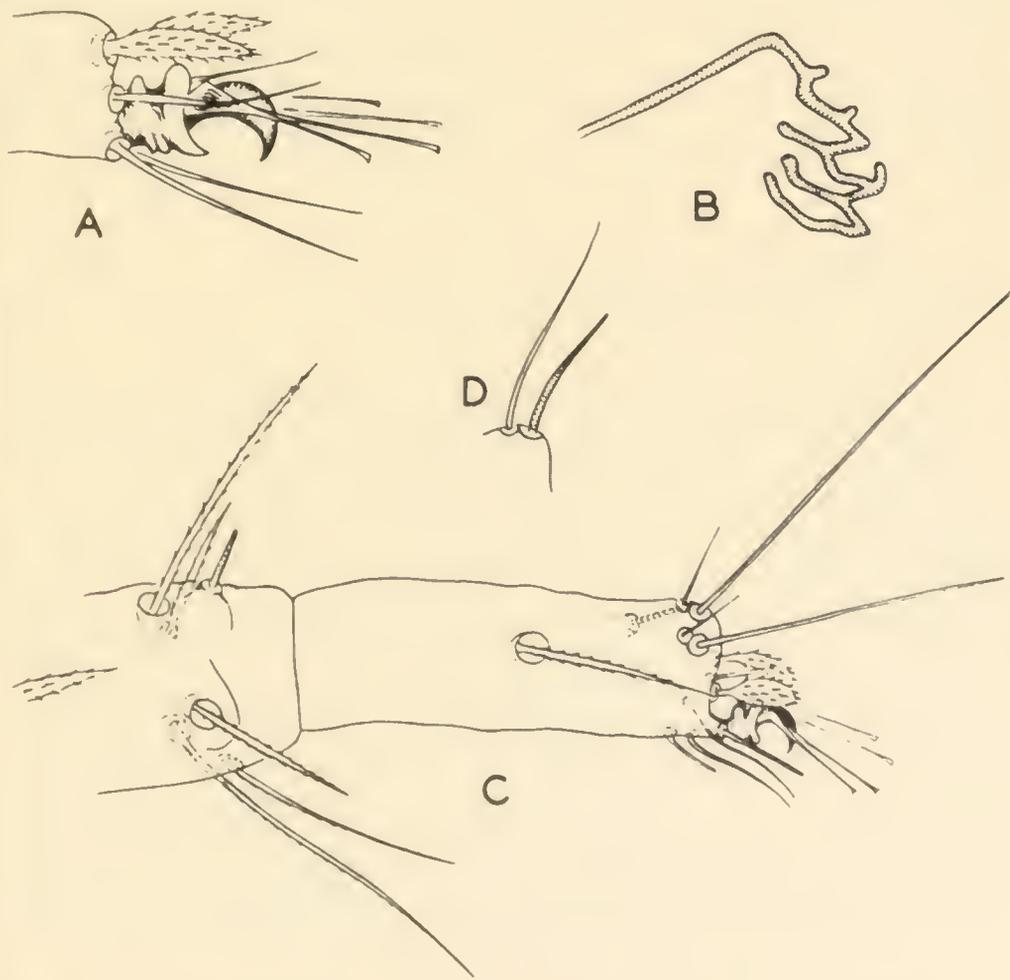


Fig. 74. *Tenuipalpoides dorychaeta*: A.) appendages of female tarsus IV; B.) peritreme; C.) tarsus I of female; D.) duplex setae of tarsus II of female.

Spider Mites

setae. Propodosoma with dorsum reticulate, the integument bearing fine dashes; hysterosomal dorsum with widely-spaced, irregular mostly transverse wrinkles and with dashed integumentary striae. Idiosoma with dorsal setae all long, mostly longer than intervals between them, and broadly lanceolate, the expansion beyond the median, sclerotized, setiform skeleton being thinner and serrate. Length of body, $400\ \mu$; including rostrum, $566\ \mu$; greatest width of body $330\ \mu$.

Male.—Similar to female. Tarsus I with two sensory setae proximad of duplex setae. Aedeagus with distal end turned dorsad, sigmoid and tapering. Length of body, $400\ \mu$; including rostrum $533\ \mu$.

Holotype.—Female, Natchez, Louisiana, August 22, 1953 (H. B. Boudreaux), on black locust; type no. 2175, in the U. S. National Museum. *Paratypes*.—Two males, five females, six nymphs, Natchez, Louisiana, August 22, 1953 (H. B. Boudreaux), on black locust; one male, 4 females, 2 nymphs, Durham, North Carolina, June 11, 1953 (A. E. Pritchard and H. B. Boudreaux), on honey locust; one male, four females, Logan, Utah (G. F. Knowlton and E. M. Kardo), on black locust; and one female, (Utah (G. F. Knowlton and Shi Chun Ma), on unknown host.

In life the mites are brilliant red with snow-white setae. They are rather inactive and are found on the bark of honey locust and black locust.

TRIBE EURYTETRANYCHINI RECK

Eurytetranychinae Reck, 1950, Trudy Inst. Akad. Nauk Gruz. S.S.R., 9: 123; Reck, 1952, Izd. Akad. Nauk S.S.R., 1952: 25; Reck, 1952, Soobsh. Akad. Nauk Gruz. S.S.R., 13(7): 423.

Members of the tribe Eurytetranychini are quite distinctive in that tarsi I and II both lack the duplex setae that are otherwise so characteristic of the family Tetranychidae. Tarsus I and tarsus II each may bear dorsally a single pair of setae that appears to be homologous with the duplex setae, but the proximal (tactile) member of the pair is more strongly developed than the distal (sensory) member, and their alveoli are adjacent but not coalescent. Tarsus I bears lateroventrally a pair of setae that resemble the second pair of duplexes. The body is rotund, and the legs are long and slender. There are ten pairs of dorsal hysterosomals and two pairs of para-anals. The dorsal integument of the body is striate. The termination of the peritreme is a simple distal bulb or hook.

Eurytetranychine mites feed primarily on the dorsal surface of leaves.

Subfamily Tetranychinae Berlese

Key to the genera of Eurytetranychini

1. Empodial claw present, small and hooked
 *Eurytetranychus* (p.101)
1. Empodium rudimentary and rounded, appearing absent
 *Eutetranychus* (p.111)

GENUS EURYTETRANYCHUS OUDEMANS

Eurytetranychus Oudemans, 1931, Ent. Ber., 8(178): 224, Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 30. Type of genus: (*Tetranychus latus*, Oudemans, not Canestrini and Fanzago) = *Eurytetranychus buxi* (Garman); monobasic and by original designation.

Simplinychus McGregor, 1950, Amer. Midl. Nat., 44(2): 274. Type of genus: *Neotetranychus buxi* Garman; monobasic and by original designation. New synonymy.

Eurytetranychoides Reck, 1950, Trudy Inst. Akad. Nauk Gruz. S.S.R., 9: 127. Type of genus: *Eurytetranychus thujae* Reck; monobasic and by original designation. New synonymy.

The empodium of *Eurytetranychus* consists of a rudimentary, uncinatate projection. The only other genus of tetranychids having a similar empodium is *Tenuipalpoides*, a dissimilar genus having the sacral setae all strongly widened and marginal, and having well-developed duplex setae. In *Eurytetranychus* the inner sacrals resemble dorsocentral hysterosomals, and duplex setae, as such, are absent.

Eurytetranychoides was differentiated from *Eurytetranychus* because the species on which the former name was based has a single pair of postanals, whereas two pairs of postanals are apparent in *Eurytetranychus*. A single pair of postanals is present in *E. admes*, a species closely allied to the type of *Eurytetranychoides*. However, the first pair of para-anals is present in *admes*, and it is probable that they were overlooked by Reck. A difference in the placement of the anterior para-anals is insufficient for generic recognition.

Zacher (1933) considered both *Paratetranychus nuptialis* Zacher and *P. brevipilosus* Zacher to belong to the genus *Eurytetranychus*. The original generic reference of (*Paratetranychus*) = *Oligonychus* for these species was correct. Ugarov and Nikolskii (1937) described *Eurytetranychus stenoperitrematus*, a species that is also properly referable to the genus (*Paratetranychus*) = *Oligonychus* (Baker and Pritchard, 1953).



Fig. 75. *Eurytetranychus buxi*: dorsal aspect of female, Florida.

Key to the species of EURYTETRANYCHUS *

- 1. Dorsal setae nearly as long as intervals between them; sensory setae absent on tibia III and IV *buxi* (p.103)
- 1. Dorsal setae less than one-fourth as long as intervals between them; proximal sensory seta present on tibia III and also tibia IV *admes* (p.110)

*We have not seen the descriptions of *E. thujae* and *E. recki*.

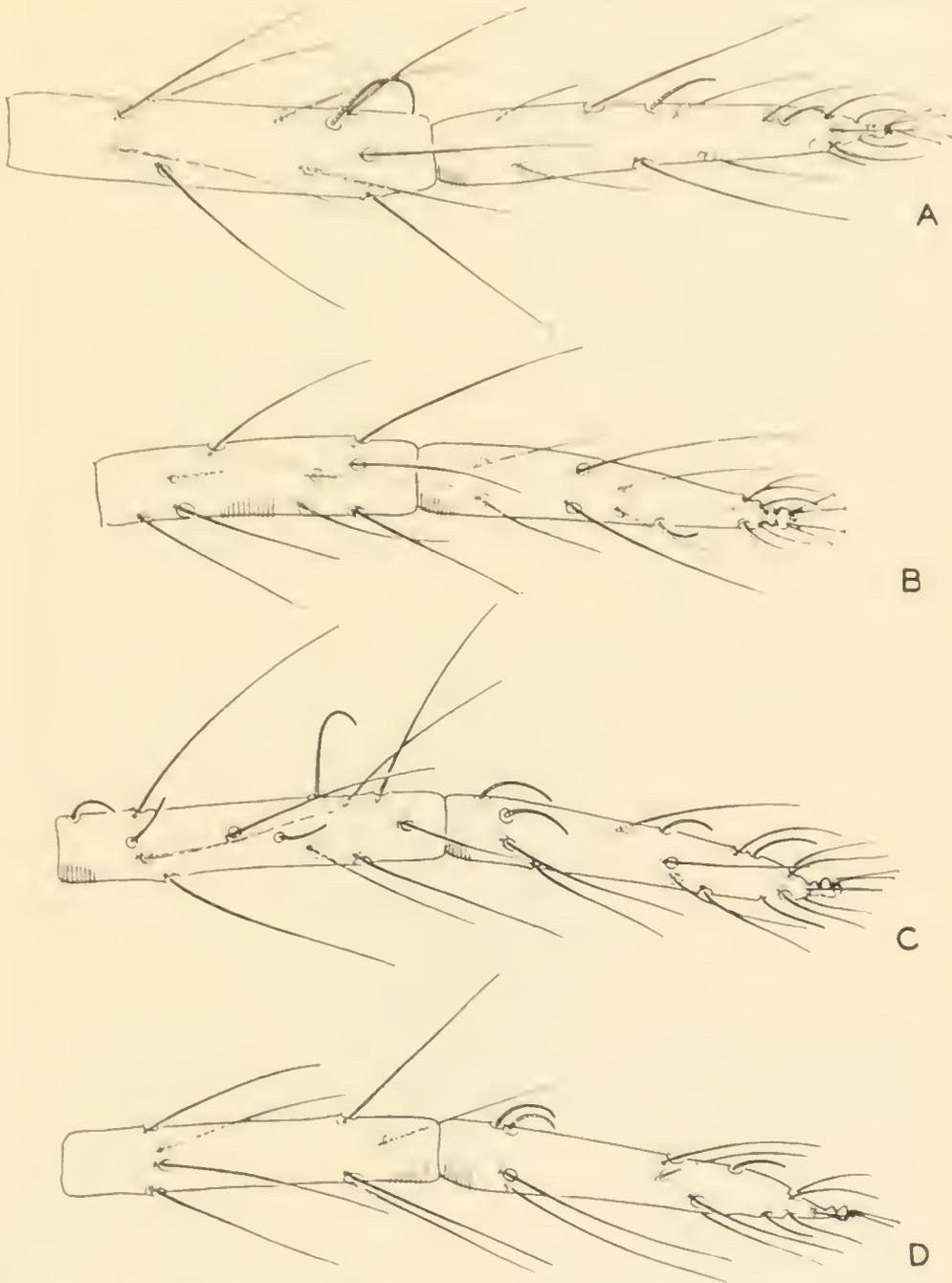


Fig. 76. *Eurytetranychus buxi*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

Eurytetranychus buxi (Garman), new combination
(Figures 75, 76, 77, 78)

Tetranychus latus, Berlese (not Canestrini, 1876), 1889, Acari Myr.
Scorp. Prostigmata, 46: 7. Misidentification.



Fig. 77. *Eurytetranychus buxi*: dorsal aspect of male.

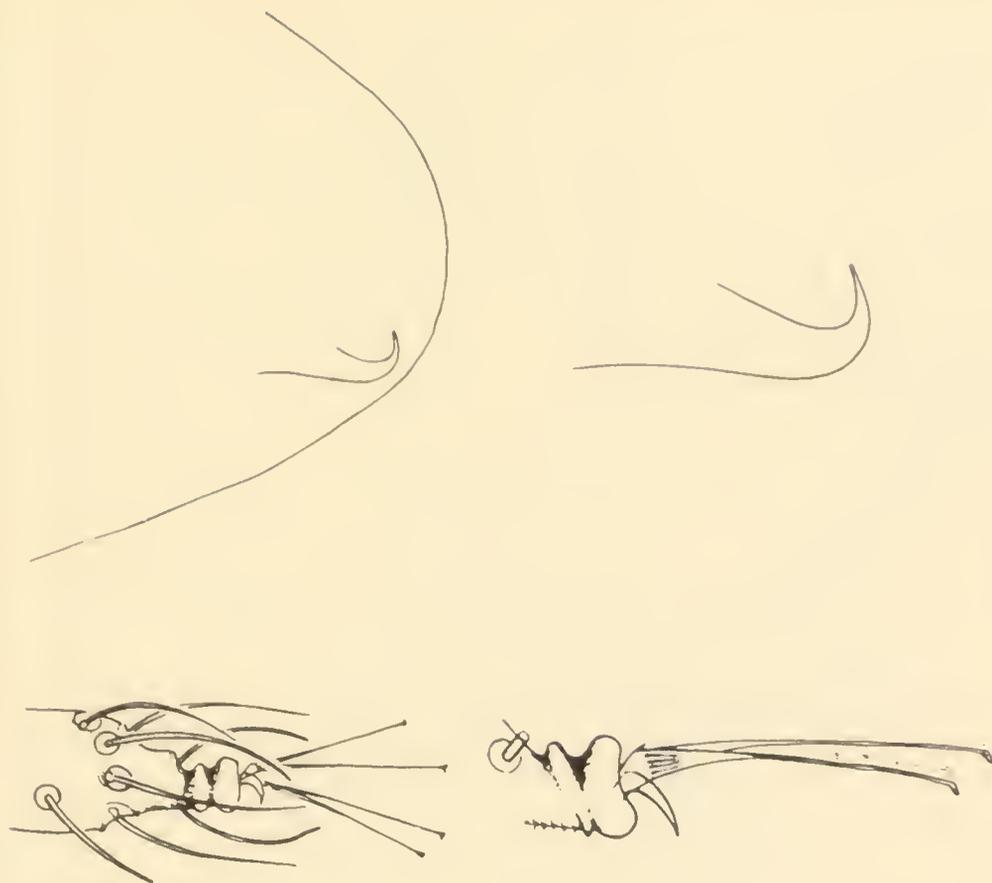


Fig. 78. *Eurytetranychus buxi*: aedeagus and appendages of tarsus I of female (left) and male (right).

Eurytetranychus latus, Oudemans, 1931, Ent. Ber., 8(178): 224; Geijskes, 1939, Meded. Landbouwh. Wageningen, 44(4): 30; Reck, 1948, Trudy Zool. Inst. Akad. Nauk Gruz. S.S.R., 9(4). *Misidentification.*

Eutetranychus latus, Ewing, 1932, Proc. Ent. Soc. Wash., 34: 14. *Misidentification.*

Neotetranychus buxi Garman, in Ries, 1935, Jour. Econ. Ent., 28: 57; Garman, 1940, Bul. Conn. Agr. Expt. Sta., 431: 73. *Types*: males and females, Michigan, on boxwood; probably in the collection of the Connecticut Agricultural Experiment Station.

Simplinychus buxi, McGregor, 1950, Amer. Midl. Nat., 44(2): 274.

Canestrini and Fanzago (1876, 1878) originally stated that *Tetranychus latus* occurs on conifers. The illustration in the latter article, inordinately diagnostic with regard to tarsal appendages for that period



Fig. 79. *Eurytetranychus admes*: dorsal aspect of female.

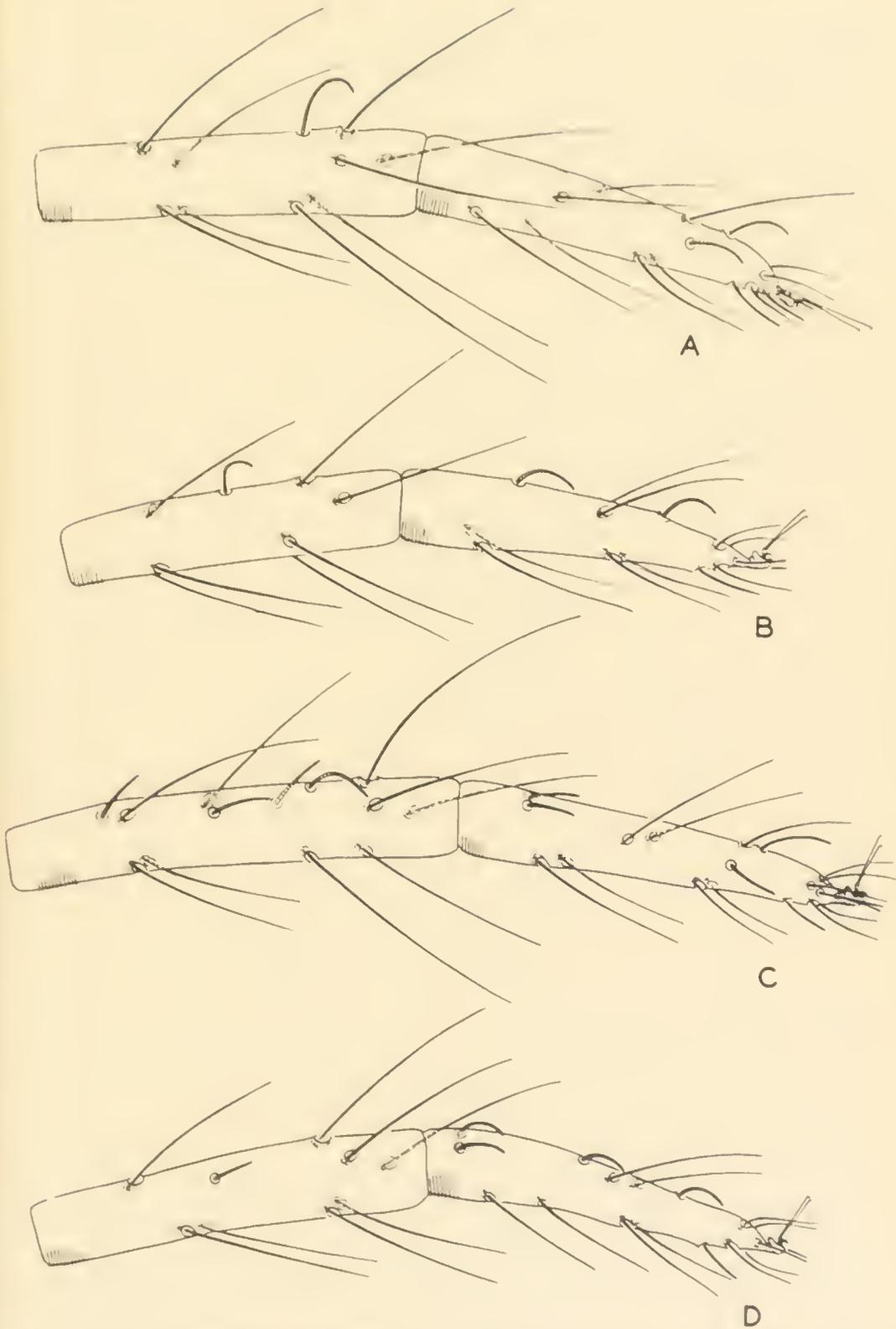


Fig. 80. *Eurytetranychus admes*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

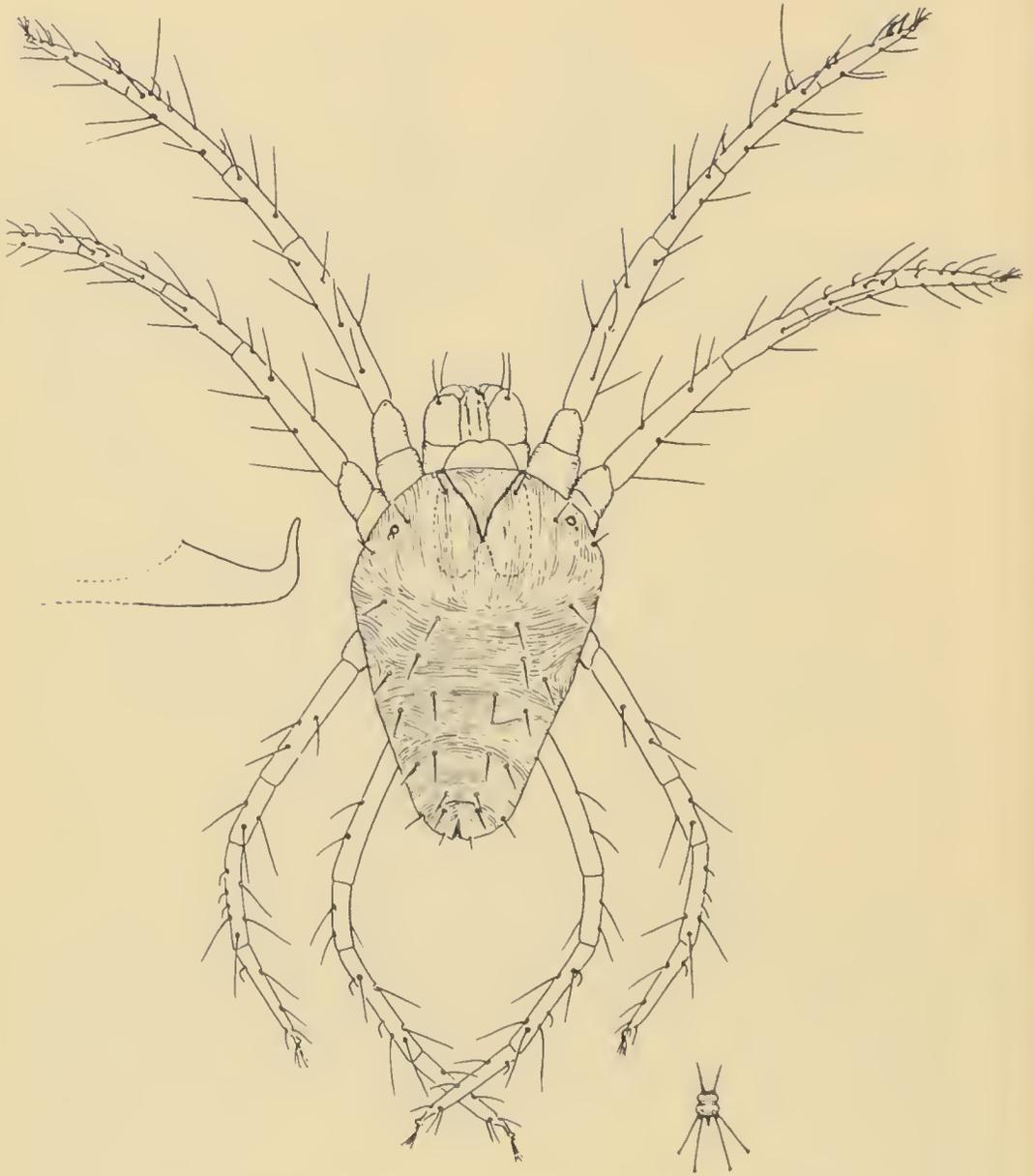


Fig. 81. *Eurytetranychus admes*: dorsal aspect of male, with enlargement of aedeagus.

of research, clearly shows two well-developed true claws. This indicates that *T. latus* cannot be a tetranychid. Moreover, the very strongly developed palpi and the very small rostrum figured are not in keeping with the tetranychid figures of these Italian workers. The shape of the specimen figured and the comparative development of the dorsal body setae are similar to those of certain species of the Eurytetranychini, but this is not sufficient for recognition of *T. latus* as a tetranychid.

We believe, therefore, that Berlese (1889) erred in his identification

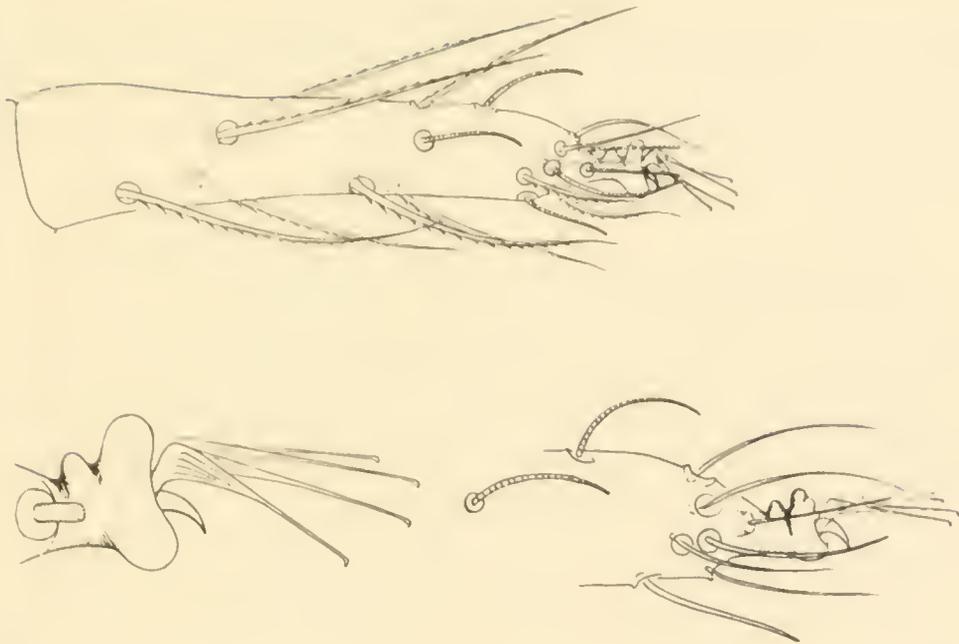


Fig. 82. *Eurytetranychus admes*: tarsus I of female with enlargements of appendages.

of *Tetranychus latus* Canestrini. He apparently illustrated the boxwood spider mite as this species, even though McGregor (1950) considered Berlese's figure of the foreshortened fifth palpal segment, the tibio-tarsal proportions, and the length of the leg vestiture to be an indication that a related species was under consideration.

Other workers have based their identifications of *latus* on Berlese's redescription and figures, but they have differed as to whether the name should apply to mites here considered under the name *Eurytetranychus buxi* or else *Eutetranychus banksi*.

Eurytetranychus buxi is credited to Garman alone (and not Garman and Ries), because the article by Ries (1935) indicates that Garman was responsible for the original description. This species may be readily recognized by possessing, in addition to the generic characters, slender dorsal setae of which many are nearly as long as the intervals between their bases.

This spider mite occurs primarily on the European boxwood, *Buxus sempervirens*, and it is often a serious pest of this ornamental plant. The Japanese boxwood, *Buxus microphylla*, is rarely infested.

In addition to the record of Berlese (1889) of collections from Italy, *Eurytetranychus buxi* is known to be widespread in the United States. Garman (1935, 1940) described specimens from Michigan and Connecticut, and Ewing (1932) reported collections from Virginia and Ohio.

Spider Mites

McGregor (1950) reported collections from California, Georgia, Michigan, Oregon, and Virginia. Specimens studied by us are mostly from Berkeley, San Rafael, and Niles, California (A. E. Pritchard), on *Buxus sempervirens*; Medford, Oregon (L. G. Gentner), on boxwood; and Durham, North Carolina (A. E. Pritchard), on *Buxus* spp.

Eurytetranychus admes Pritchard and Baker, new species
(Figures 79, 80, 81, 82)

Eurytetranychus admes differs from *E. buxi* in that the dorsal setae of the body are much shorter than in *E. buxi*, and tibiae III and IV each possesses a proximal sensory seta that is absent in that species. Moreover, it occurs only on cupressaceous conifers.

Female.—Stylophore slightly emarginate distally. Peritreme with distal end hooked. Palpus with terminal sensillum slender. Anterior legs about as long as body; tibia I with nine tactile and one sensory setae; tarsus I without paired setae resembling duplex setae; tibia II with eight tactile and one sensory setae; tarsus II without paired setae resembling duplex setae; tibiae III and IV each with a dorsomedian sensory seta in addition to the tactile setae. Idiosoma with dotted dorsal striae; dorsal setae slender, tapering, pubescent, greatly shorter than intervals between them. Length of body, 466 μ ; including rostrum, 606 μ .

Male.—Similar to female. Tibia I with eight tactile and five sensory setae. Aedeagus distally turned dorsad at right angle and tapering to a slightly sigmoid apex. Length of body, 320 μ ; including rostrum, 413 μ .

Holotype.—Female, Camp Nelson, California, September 7, 1947 (E. W. Baker), on incense cedar; type no. 2119 in the U. S. National Museum. *Paratypes*.—Four males, 19 females, Camp Nelson, California, September 7, 1947 (E. W. Baker), on incense cedar; 2 females, Keen Camp, California, May 26, 1951 (A. E. Pritchard), on juniper; 1 male, Placerville, California, July 19, 1950 (A. E. Pritchard), on incense cedar; and 6 females, Utah (G. F. Knowlton), on juniper.

Eurytetranychus thujae Reck

Eurytetranychus thujae Reck, 1947, Soobsh. Akad. Nauk Gruz. S.S.R., 8(7). Described from female, Georgia, S.S.R., on (*Biota*) = *Thuja orientalis*.

Eurytetranychoides thujae, Reck, 1950, Trudy Inst. Zool. Akad. Nauk Gruz., 9: 127.

Reck's 1950 description of this species indicates that it is closely allied to *Eurytetranychus admes*. The original description has not been seen.

Eurytetranychus recki Bagdall

Eurytetranychus recki Bagdall, 1948, Dokl. Akad. Nauk Armenia S.S.R., 9(3). Described from specimens from Armenia, on *Astragalus caucasicus* or *Medicago* spp., or both.

We have not seen the article in which this species was described.

GENUS **EUTETRANYCHUS** BANKS

Neotetranychus (*Eutetranychus*) Banks, 1917, Ent. News, 28: 197. Type of subgenus: *Tetranychus banksi* McGregor, by subsequent designation of McGregor, 1950.

Eutetranychus, McGregor, 1950, Amer. Midl. Nat., 44(2): 267.

Anychus McGregor, 1919, Proc. U. S. Natl. Mus., 56: 644; Sayed, 1942, Bul. Soc. Fouad 1^{er} Ent., 26: 125; Sayed, 1946, Bul. Soc. Fouad 1^{er} Ent., 30: 143. Type of genus: *Tetranychus banksi* McGregor; by original designation.

The genus *Eutetranychus* is distinctive in that the empodium is rudimentary and consists only of a rounded knob. Tarsus I bears on the dorsum a pair of associated setae that are probably homologous with one pair of the duplex setae. However, the alveoli are not coalesced, and the proximal, tactile member is longer than the more distal, sensory member.

Key to the species of **EUTETRANYCHUS**

1. Body with dorsal setae set on strong tubercles; dorsocentral hysterosomals as long as dorsolateral hysterosomals 2
1. Body with dorsal seta not set on tubercles; dorsocentral hysterosomals obviously shorter than dorsolateral hysterosomals *banksi* (p.115)

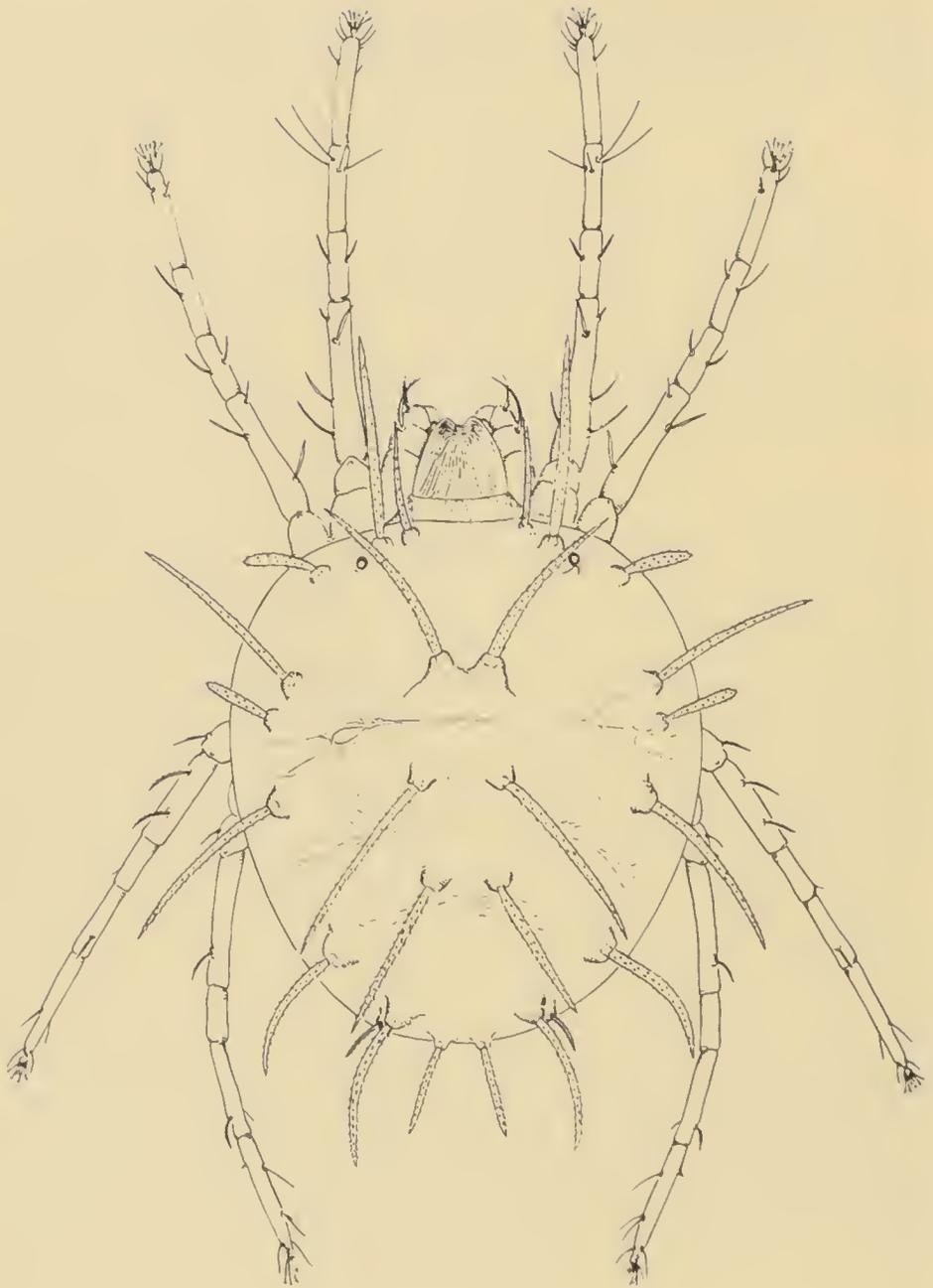


Fig. 83. *Eutetranychus spinosus*: dorsal aspect of female, Maryland.

- | | |
|----|---|
| 2. | Dorsocentral hysterosomals long and tapering; third dorsal propodosomal, humeral, outer sacral and clunals all slender and blunt
. <i>spinosus</i> (p.113) |
| 2. | Dorsocentral hysterosomals long and blunt; third dorsal propodosomal, humeral, outer sacral and clunals all short and spatulate
. <i>schultzi</i> (p.115) |

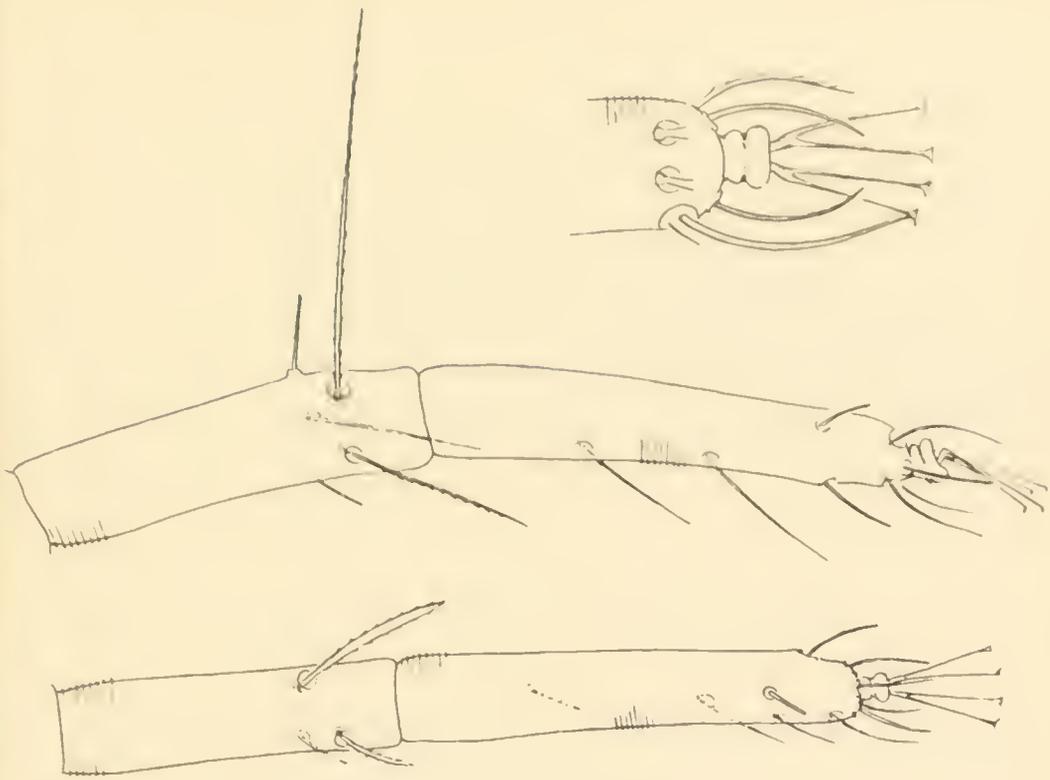


Fig. 84. *Eutetranychus spinosus*: above, tibia and tarsus I of female, with ventral enlargement of distal end of tarsus: below, tibia and tarsus II of female.

Eutetranychus spinosus (Banks)

(Figures 83, 84, 85, 86)

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

Type: female, Guelph, Ontario, Canada, on basswood; in the Museum of Comparative Zoology, Cambridge, Massachusetts.

Neotetranychus (*Eutetranychus*) *spinosa*, Banks, 1917, Ent. News, 28: 197.

Eutetranychus spinosa, McGregor, 1950, Amer. Midl. Nat., 44(2): 267.

The female of *Eutetranychus spinosus* may be readily differentiated from other species in the genus by having the dorsocentral hysterosomals very long and tapering, together with having the third propodosomal, humeral, and outer sacrals short, slender, and sometimes blunt. The dorsal setae of the body are set on strong tubercles. The dorsolateral hysterosomals are similar to the dorsocentral hysterosomals; but the outer sacrals are very short and slender, and the clunals are somewhat shorter than the inner sacrals.

The male, previously unknown, resembles the female. The aedeagus has the distal half of the external portion bent sharply dorsad, with the

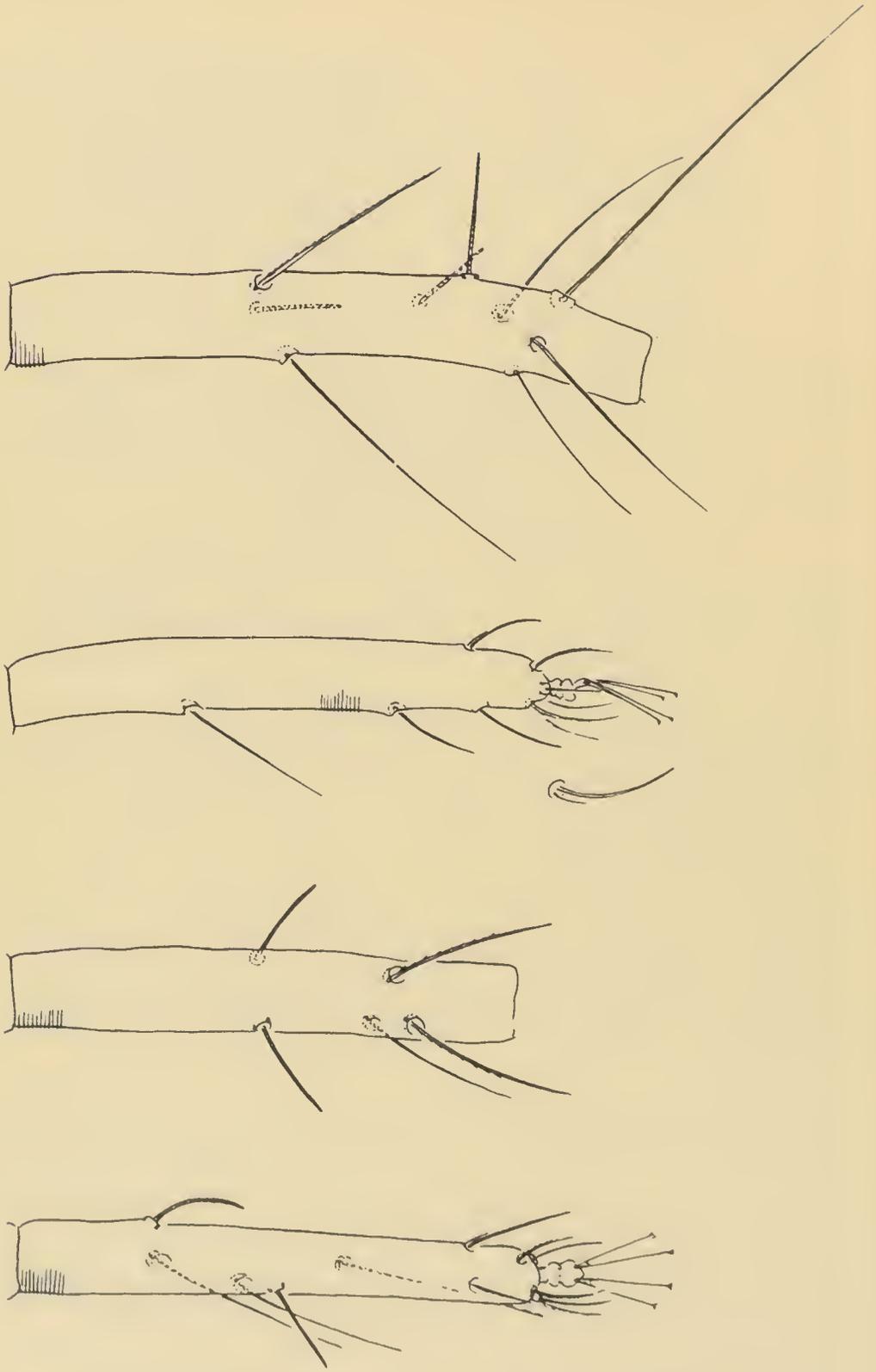


Fig. 85. *Eutetranychus spinosus*: above, tibia and tarsus I of male; below, tibia and tarsus II of male.



Fig. 86. *Eutetranychus spinosus*: nedeagus.

distal end curved somewhat caudad, and narrowing to a blunt tip.

In addition to the type female from Canada, on basswood, one female was examined from Cabin John, Maryland, September 17, 1944 (E. W. Baker), on grass; and a series was studied from Ithaca, New York (J. G. Matthyse), on linden.

Eutetranychus schultzi (Blanchard), new combination
(Figures 87, 88, 89)

Anychus schultzi Blanchard, 1940, Rev. Fac. Agron. La Plata, (3)2: 24 (1939). Types: females, Tucumán, Argentina, on *Ricinus communis*; of unknown disposition.

Eutetranychus schultzi is closely allied to *E. spinosus*. The female has long, slender, and nearly parallel-sided dorsocentral hysterosomals and they are blunt distally. They are also set on strong tubercles. However, the third dorsal propodosomals, the humeral, the outer pair of sacrals, and the clunals are all very short and broadly spatulate. The anterior pair of dorsal propodosomals are slender but shorter, as in *E. spinosus*. The male is unknown.

Our recognition of this species is based on specimens from Buenos Aires, Argentina, on *Ricinus* sp.; kindly forwarded by A. Ibarra Grasso.

Eutetranychus banksi (McGregor)
(Figures 90, 91, 92)

Tetranychus banksi McGregor, 1914, Ann. Ent. Soc. Amer., 7(4): 358. Types: females, Orlando, Florida, on castor bean and velvet bean; in the U. S. National Museum.

Neotetranychus (*Eutetranychus*) *banksi*, Banks, 1917, Ent. News, 28: 177.

Anychus banksi, McGregor, 1919, Proc. U. S. Natl. Mus., 56(2303): 644.

Eutetranychus banksi, McGregor, 1950, Amer. Midl. Nat., 44(2): 268;

Muma, Holtzberg, and Pratt, 1953, Fla. Ent., 36(4): 141.

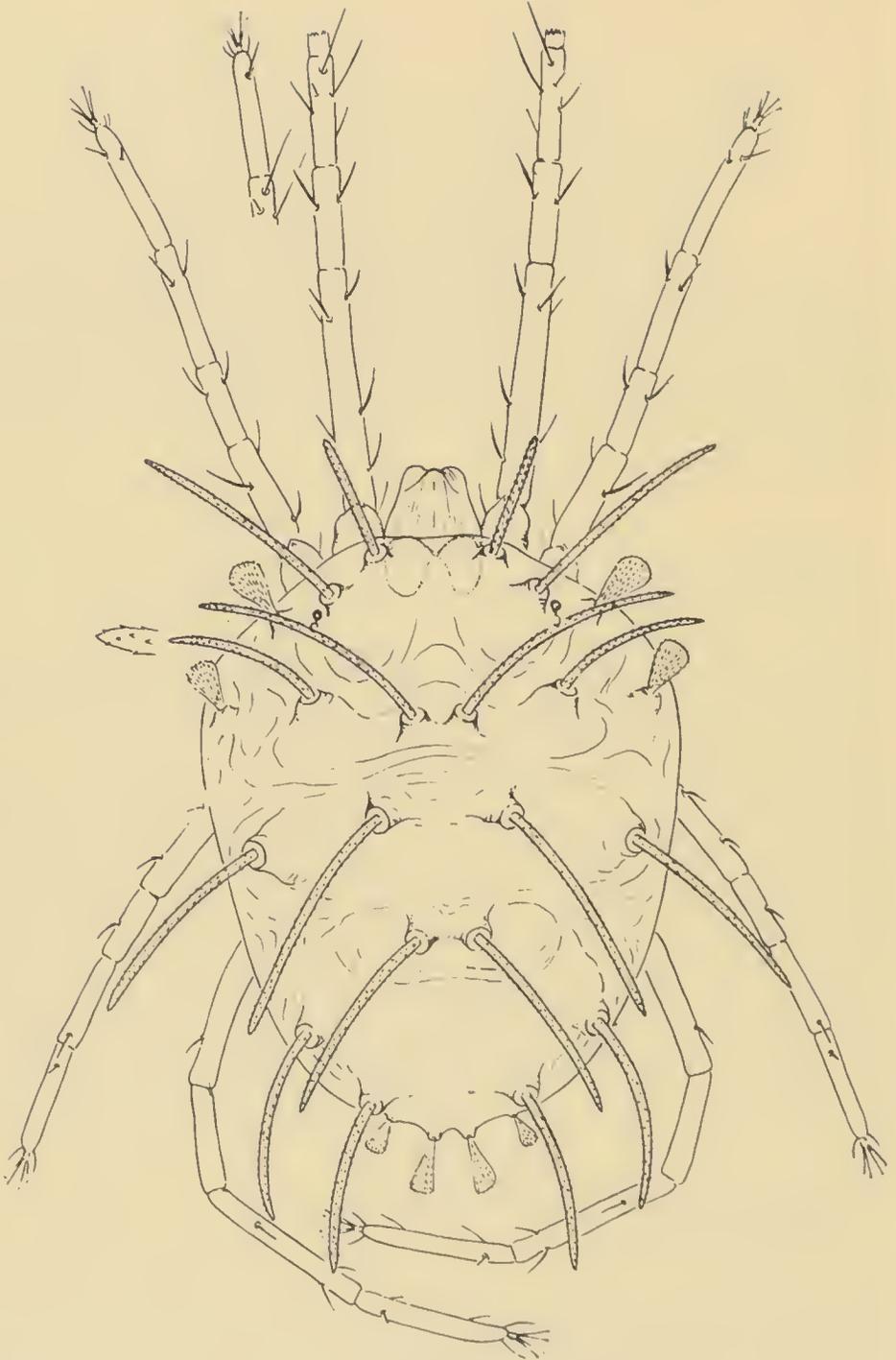


Fig. 87. *Eutetranychus schultzi*: dorsal aspect of female, Argentina.

Tetranychus rusti McGregor, 1917, Proc. U. S. Natl. Mus., 51(2677): 582. Types: males and females, Mira Flores Station, Dept. Piura, Hacienda "San Jacinto," Peru; in the U. S. National Museum. *New synonymy.*

Subfamily Tetranychinae Berlese

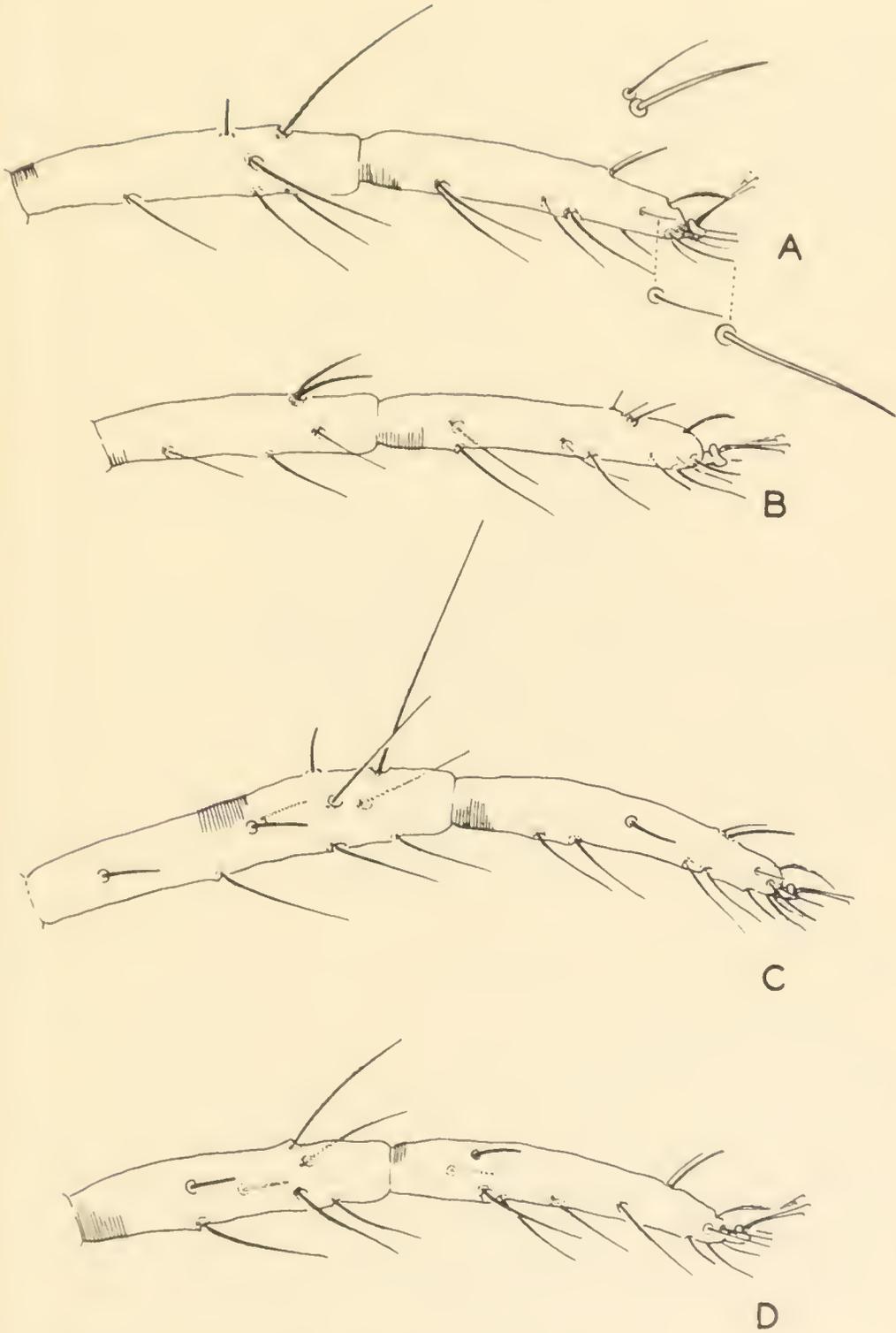


Fig. 88. *Eutetranychus schultzi*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.



Fig. 89. *Eutetranychus schultzi*: aedeagus.

Anychus rusti, McGregor, 1919, Proc. U. S. Natl. Mus., 56(2303): 645.

Eutetranychus rusti, McGregor, 1950, Amer. Midl. Nat., 44: 669.

Anychus ?latus, Hirst, 1923, Proc. Zool. Soc. Lond., 1923: 991. *Mis-identification.*

Anychus latus, Sayed, 1942, Bul. Soc. Fouad 1^{er} Ent., 26: 125. *Mis-identification.*

Anychus africanus Tucker, 1926, Union S. Afr. Dept. Agr., Div. Ent. Mem., 5: 5. *Types*: males and females, Durban, Natal, on oranges and lemons, and *Plumeria* (Frangipani); of unknown disposition. *New synonymy.*

Anychus clarki McGregor, 1935, Proc. Ent. Soc. Wash., 37: 161. *Types*: males and females, Weslaco, Texas, on citrus; in the U. S. National Museum.

Eutetranychus clarki, McGregor, 1950, Amer. Midl. Nat., 44: 270.

Anychus orientalis (Zacher) Klein, 1936, Bul. Agric. Res. Sta. Rehovoth, 21: 3; Sayed, 1946, Bul. Soc. Ent. Fouad 1^{er} Ent., 30: 143. (This species appears to be based on a manuscript name of Zacher.)

Anychus verganii Blanchard, 1940, Rev. Fac. Agron. La Plata, (3)2: 24 (1939). *Types*: females, Bella Vista, Corrientes, Argentina, on citrus; of unknown disposition. *New synonymy.*

Anychus ricini Rahman and Sapro, 1940, Proc. Ind. Acad. Sci., 11(sect. B): 194. *Types*: males and females, Lyallpur, India, on castor bean, almond, *Cassia fistula*, *Ziziphus jujuba*, and citrus; of unknown disposition. *New synonymy.*

Eutetranychus mexicanus McGregor, 1950, Amer. Midl. Nat., 44: 27.

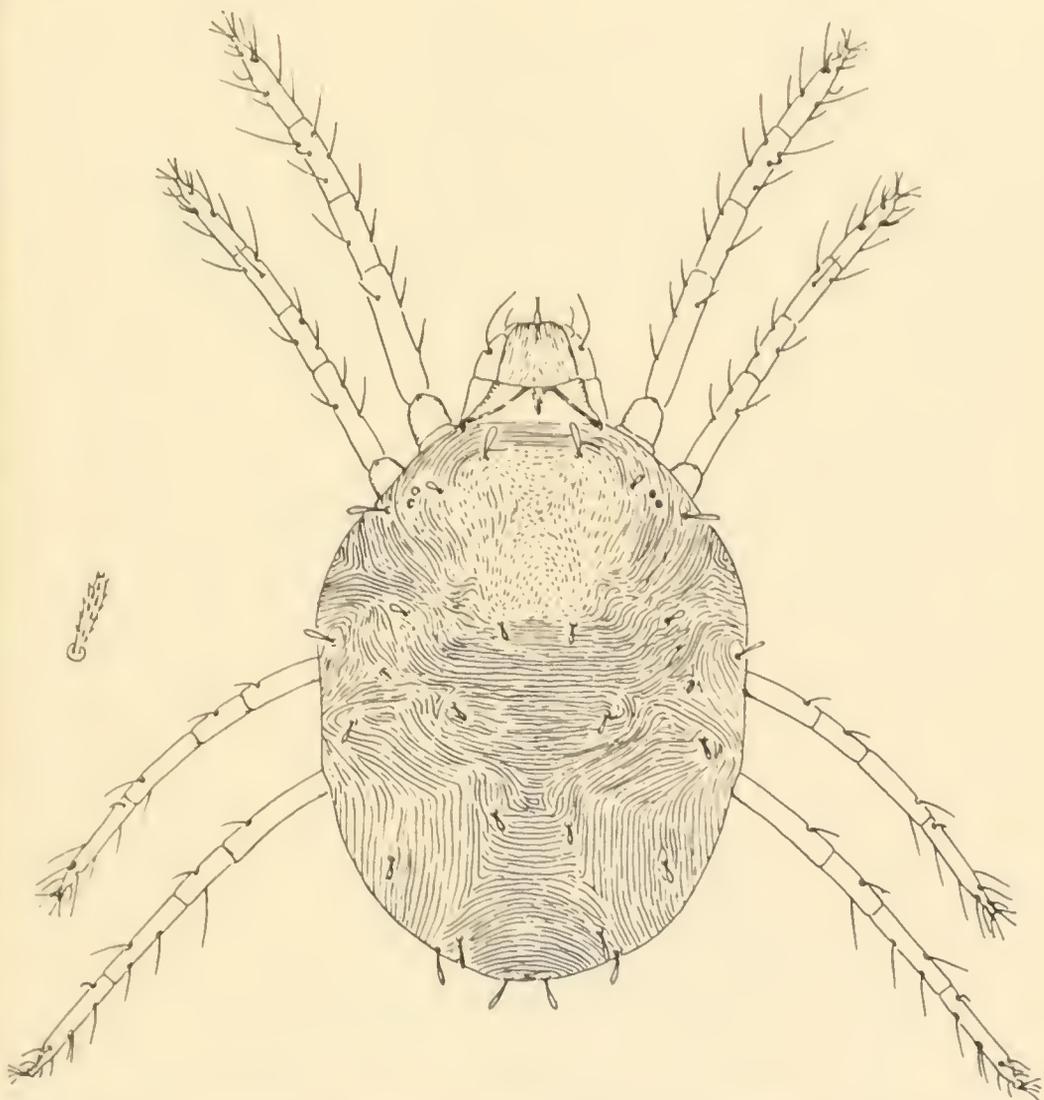


Fig. 90. *Eutetranychus banksi*: dorsal aspect of female, Florida, croton.

Types: female and two nymphs, Guadalajara, Mexico, on sapota; in the U. S. National Museum.

Our studies indicate that *Eutetranychus banksi* is a polytypic species. It appears that there are several different morphological forms as far as the development of dorsal body setae are concerned, and that intercontinental introduction of these forms on citrus and certain ornamental plants has created widespread opportunity for interbreeding and morphological intermediates.

The dorsal setae of the female body are all short and spatulate in the type series of *banksi* (Florida, citrus), with certain of the laterally situated setae somewhat longer than the more mediodorsally located setae. Specimens representing *verganii* (Argentina, citrus), are similar

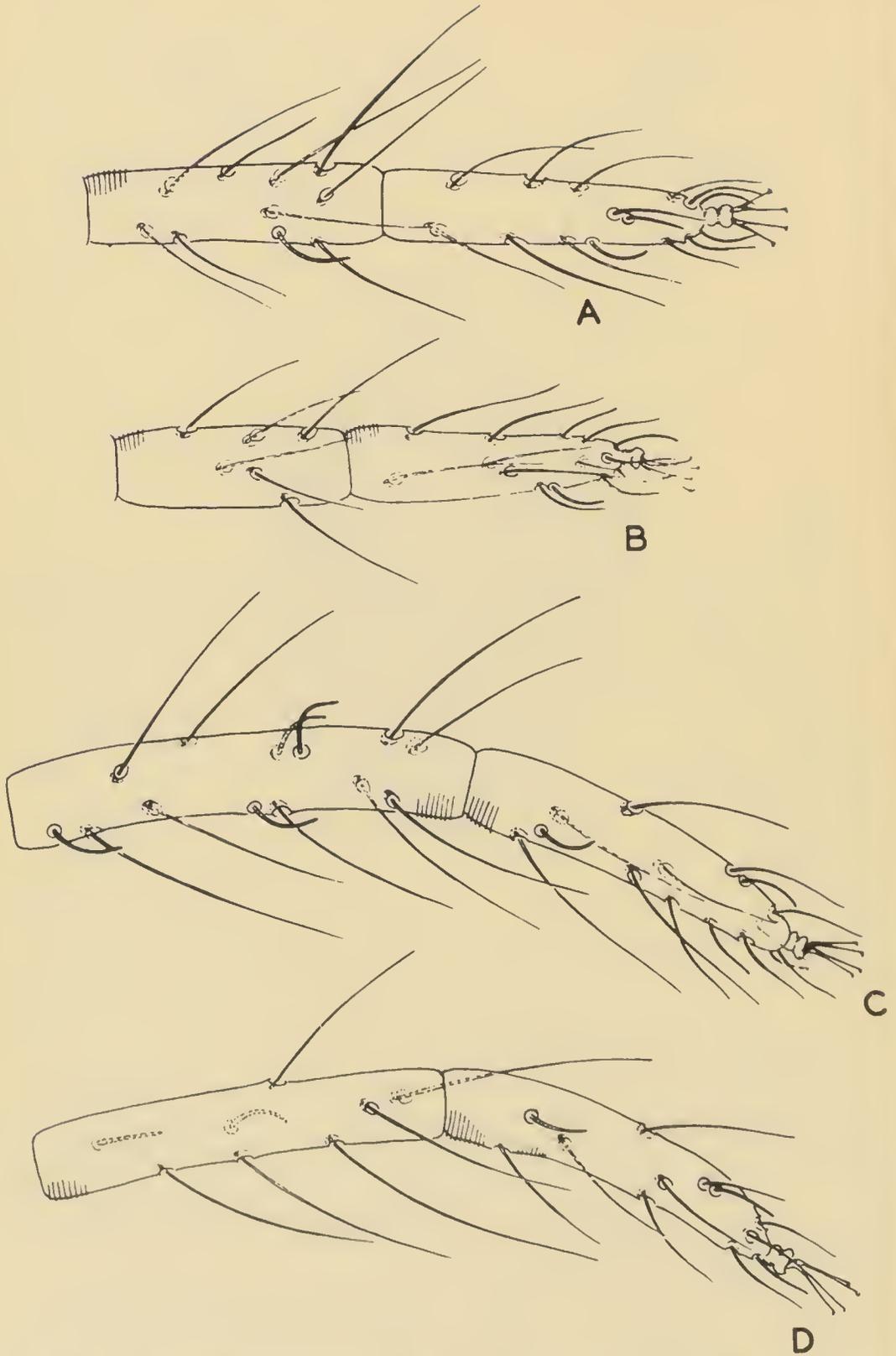


Fig. 91. *Eutetranychus banksi*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.



Fig. 92. *Eutetranychus banksi*: dorsal aspect of male, with enlargement of aedeagus.

except that there is more disparity between the length of the dorsolateral setae and the dorsomedian setae.

In correlation with an increased length of the dorsolateral setae of the body, there is a tendency for these setae to be less spatulate or merely slender and rather blunt, as in the types of *rusti* (Peru, papaya). Such variations are found on many individual specimens and within individual series studied from Florida, Texas, Mexico, and Argentina. The forms having the lateral setae slender and parallel-sided resemble the types of *clarki* (Texas, citrus) as figured and illustrated by McGregor (1935). However, the type series of *clarki* also consists of females that have the lateral setae of the body slender and subspatulate.

The dorsocentral hysterosomals are short and spatulate in females having subspatulate lateral setae. However, those specimens having slender lateral setae sometimes have slender dorsocentral hysterosomals (particularly in males and nymphs). The dorsocentral hysterosomals tend to be longer and more or less slender in the types of *mexicanus* (southern Mexico, citrus) and certain specimens from Florida, Texas, Mexico, and Argentina.

We are, therefore, unable to differentiate between *banksi*, *verganii*, *clarki*, *rusti*, and *mexicanus*, inasmuch as complete intergrades are found between the length and shape of the dorsal setae of the female body. No other differences such as the number and arrangement of dorsal setae referred to by McGregor (1919, 1950) have been verified. Muma, Holtzberg, and Pratt (1953) were also unable to differentiate *Eutetranychus banksi*, *E. clarki*, and *E. mexicanus*.

Still another form has been noted in specimens from Texas citrus wherein the females possess lateral setae on the body that are long, slender, and tapering. Specimens with dorsolateral body setae that are tapering have been observed also from Mexico and Florida. Again, there appears to be no sharp distinction from similar setae that are slender but comparatively blunt.

Hirst (1923) identified as ?*latus* (Canestrini) Berlese a spider mite found on citrus and other hosts in the Sudan. Hirst's description indicates a species belonging to the genus *Eutetranychus* as defined by us. Sayed (1942) accepted this identification of *latus* as being applicable to a species from Egypt having relatively slender and subspatulate setae on the dorsum of the female.

Later Sayed (1946) identified as *orientalis* Zacher (apparently a manuscript name) females with shorter and more spatulate dorsocentral hysterosomals. Sayed further remarked that the status of *latus* would remain in doubt until Berlese's specimens were examined. However, Sayed (1946) simultaneously recognized as *latus*, a similar form in

Subfamily *Tetranychinae* Berlese

which the lateral setae of the body are slender and tapering, and the dorsocentral hysterosomals were also figured as slender and tapering.

Specimens studied by us from Israel, on citrus, show some of the variations found in specimens from the New World. The lateral setae of the female are slender and subspatulate, or else slender and tapering; and the dorsocentral hysterosomals are short and spatulate, or else slender. Thus, they illustrate intermediates between the dorso-lateral setae of the two forms illustrated by Sayed (1946), but the tapering dorsocentral hysterosomals of the female of *latus*, as determined by Sayed, are different (see *pantopus*).

The descriptions of *africanus* (South Africa, citrus) and *ricinus* (India) indicate that type specimens resemble those determined by Sayed (1946) as *orientalis*.

A sensory seta is present at the proximal end of tibia III in the specimens from Israel. This sensory seta is absent in specimens studied from the Americas, and the significance of this sensillum is not known. No geographical isolation is particularly evident with citrus pests that appear to have been distributed throughout the world.

No differences have been observed among the aedeagi of males associated with females representing the various developments of dorsal setae. The aedeagus is simple, abruptly turned dorsad near the distal end. The development of the dorsal setae of the male body varies, but not as strongly as in the females with regard to differential length of the dorsocentral hysterosomals and the lateral setae. The same is true for the nymphs.

In summary, this species complex is known from Texas and Florida in the United States; Mexico, Argentina, and Peru in Central and South America; Italy, Palestine and Egypt in the Palaearctic region; South Africa, and India.

Hosts of *Eutetranychus banksi*, in addition to citrus, include croton, *Ficus* sp., *Oncoba spinosa*, and *Flacourtia indica* as far as our own studies are concerned. Published records are from citrus, castor bean, velvet bean, almond, sapota, *Cassia fistula*, and *Zizyphus jujuba*.

Eutetranychus pantopus (Berlese), new combination

Tetranychus pantopus Berlese, 1910, Redia, 6: 242. Types: two males.

Moreton Bay, Australia, on *Ficus* sp.: in the Berlese collection. *Anychus latus*, Sayed, 1946, Bul. Soc. Fouad 1^{er} Ent., 30: 143. Mis-identification.

Spider Mites

The type males of *pantopus* Berlese agree with the drawing of the male of *latus* as determined by Sayed (1946). These specimens as well as the female illustrated by Sayed differ from *banksi* by having all of the dorsal setae long, slender, and tapering. Similar mediodorsal setae have not been noted in the New World nor in Egypt. Sayed's material was apparently from the Sudan on Lebbek trees, and Berlese's is from Australia.

Eutetranychus pantopus may represent an extreme variation of the *banksi* complex or else a distinct species. Further studies are needed to determine its true status.

TRIBE TETRANYCHINI RECK

Tetranychinae Reck, 1950, Trudy Inst. Akad. Nauk Gruz. S.S.R., 9: 123; Reck, 1952, Izd. Akad. Nauk S.S.R. 1952: 25; Reck, 1952, Soobsh. Akad. Nauk Gruz. S.S.R., 13(7): 423.

The tribe Tetranychini contains most of the members of the family Tetranychidae, and particularly most of the species of economic importance. Their identification is often difficult without representatives of both sexes, or at least in many cases, males. The aedeagus must be mounted laterally to see the outline of this simple but often diagnostic structure.

Members of the Tetranychini may be differentiated from other tribes in the subfamily by having the empodium well developed - not a tiny hook or protuberance. The empodium in this tribe is usually represented by several pairs of ventrally directed, proximoventral hairs, and a dorso-medial clawlike appendage may or may not be developed. When the dorso-medial empodial claw is not prominent, the proximal pair of empodial hairs may be enlarged (with the others reduced or absent) to form a pair of clawlike appendages; or else the bases of the empodial hairs may unite to form a slender, more or less clawlike appendage.

At least for taxonomic purposes, if not for phylogenetic considerations, there are two major divisions of the tribe Tetranychini. The more primitive genera resemble the rest of the family in that two pairs of para-anal setae are present. The caudal pair of para-anals are widely spaced and laterad or somewhat caudad of the end of the anus in *Metatetranychus* and *Allonychus*, but they are approximate and resemble a terminal pair of dorsal opisthosomals in *Eotetranychus* and closely allied genera (*Schizotetranychus* and *Ncotetranychus*). In *Oligonychus* and *Tetranychus*, the caudal pair of para-anals are lacking.

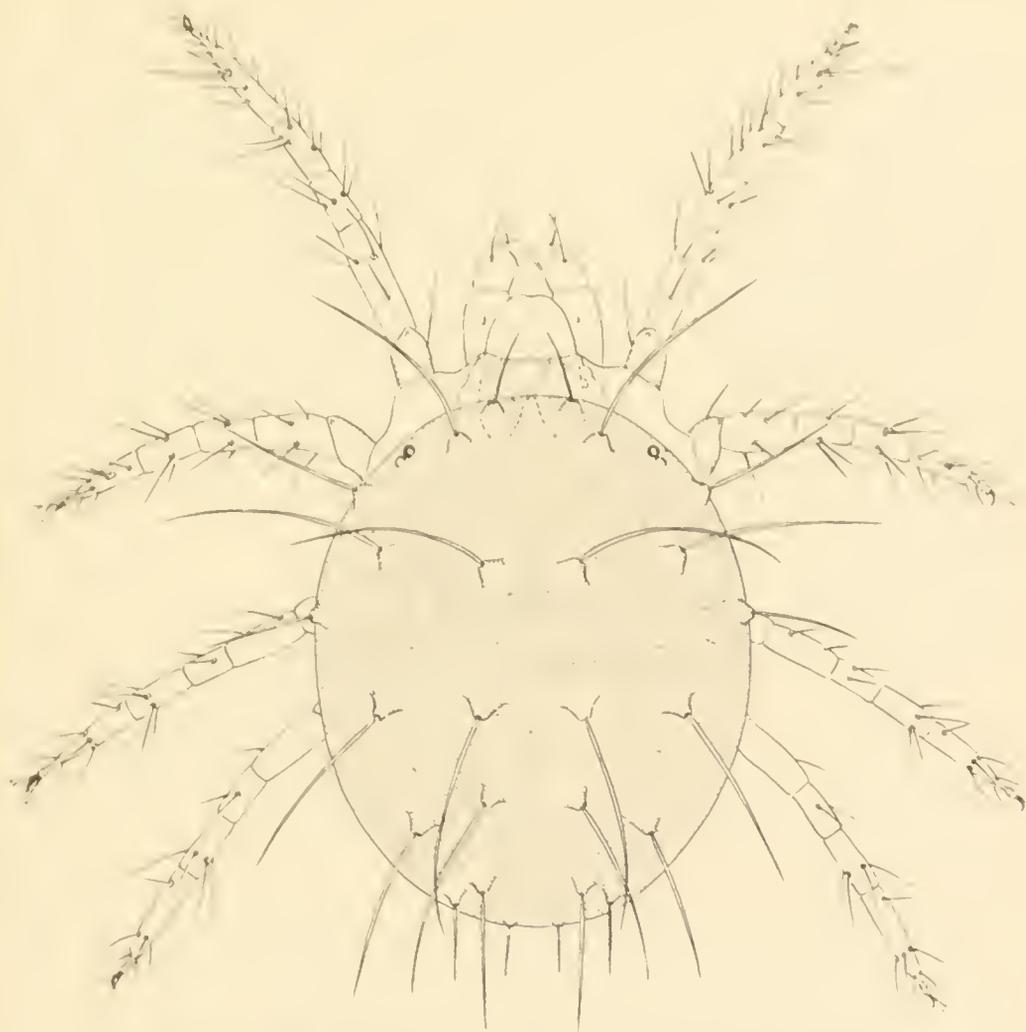


Fig. 93. *Metatetranychus ulmi*: dorsal aspect of female.

Oudemans (1930) first recognized the significance of the presence or absence of a pair of caudal setae for generic separation of this group of mites. He referred to this distinction in terms of whether the clunal setae are present or absent. This terminology was followed by Geijskes (1939), Womersley (1940), and Pritchard and Baker (1952).

We now believe that the presence of clunal setae is constant throughout the family Tetranychidae, and that a theory of the presence or absence of the caudal pair of para-anals not only provides an easier criterion for taxonomic purposes, but it also provides a more acceptable interpretation for phylogenetic considerations.

The duplex setae are characteristic of the tribe inasmuch as there are two pairs that are variously located on the dorsum of tarsus I and one pair on the dorsum of tarsus II. The proximal member of each duplex is comparatively well developed, long enough to cross the distal member.

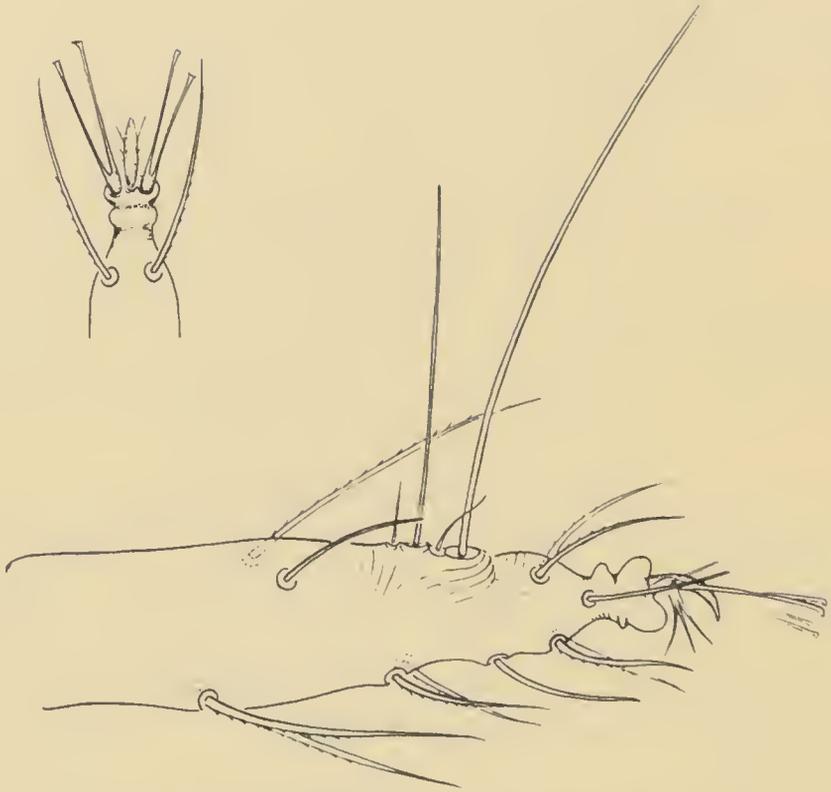


Fig. 94. *Metatetranychus ulmi*: tarsus I of female, with dorsal enlargement of appendages.

The peritreme is comparatively simple distally, often ending in a simple bulb. Sometimes the distal end is recurved, consisting of several compartments, and rarely the recurved end possesses irregular diverticula.

Members of the tribe Tetranychini have the ability to produce silken strands, and some spin copious webbing when colonies develop. Some early workers believed the silk to originate from near the anus, but later (Claparède, 1868) it was recognized that the silk glands are at the anterior end of the body. Blauvelt (1945) believed the silk to originate from two types of glands, one originating above the anterior coxae and the other above the base of the palpi. Grandjean (1948) considered the silk glands to be in the palpi.

Key to the genera of Tetranychini

1. Opisthosoma with two pairs of para-anal setae 2

Subfamily Tetranychinae Berlese

1. Opisthosoma with a single pair of para-anals 6
- 2.(1). Empodium with a simple, clawlike dorsal member and with paired proximoventral hairs 3
- 2.(1). Empodium not clawlike and with paired proximoventral hairs 4
- 3.(2). Empodium with a simple "claw" nearly as long as three pairs of similar, proximoventral hairs; tarsus I with duplex setae adjacent near distal end of segment *Metatetranychus* (p.127)
- 3.(2). Empodium with "claw" much shorter than the longest of the dissimilar proximoventral hairs; tarsus I with duplex setae separated along dorsal surface of segment *Allonychus* (p.137)
- 4.(2). Empodium with the two proximoventral hairs enlarged forming two clawlike appendages, the dorsal hairs very short if present *Schizotetranychus* (p.225)
- 4.(2). Empodium (excluding legs I and II of males) comprised of three pairs of hairs of similar length, the proximal member of which is slightly the stronger, or else with the hairs united proximally to form a single appendage 5
- 5.(4). Empodium forming a single, slender appendage on at least proximal one-half *Neotetranychus* (p.215)
- 5.(4). Empodium (excluding leg I and II of male) composed of three pairs of hairs *Eotetranychus* (p.138)
- 6.(1). Empodium clawlike and somewhat shorter than or about as long as proximoventral hairs; peritreme usually straight distally and ending in a simple bulb; tarsus I usually with duplex setae adjacent and placed near distal end *Oligonychus* (p.270)
- 6.(1). Empodium with clawlike dorsal member much shorter than proximoventral hairs or else rudimentary; peritreme recurved distally or rarely anastomosing; tarsus I with duplex setae widely spaced on dorsum of segment *Tetranychus* (p. 373)

GENUS METATETRANYCHUS OUDEMANS

Metatetranychus Oudemans, 1931, Ent. Ber., 8(177): 199; Oudemans, 1931, Ent. Ber., 8(178): 224; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 41; Zacher, 1933, Mitt. zool. Mus. Berl., 19: 586; Womersley, 1940, Trans. Roy. Soc. S. Australia, 64: 260; McGregor, 1950, Amer. Midl. Nat., 44: 329. *Type of genus: Tetranychus ulmi* Koch; by original designation.



Fig. 95. *Metatetranychus ulmi*:
aedeagus.

Members of the genus *Metatetranychus* have the dorsal setae of the body borne on strong tubercles. The empodial claw bears three pairs of proximoventral setae that are similar in length. There are two pairs of para-anal setae, and the caudal pair are spaced widely but similar to the anterior pair and located caudad of the anus. These characters will serve to identify the genus. The duplex setae of tarsus I are adjacent and placed near the distal end of the segment. The peritreme is straight distally, ending in a simple bulb.

Two species of *Metatetranychus* are definitely known to occur in North America. These species are similar morphologically, but differ considerably in color, biological habits, and geographical distribution. Both species are found in many parts of the world.

Key to North American Species of *Metatetranychus*

1. Hysterosoma with outer sacrales similar in length to clunals, each about one-third as long as inner sacrales . . . *citri* (p.133)
1. Hysterosoma with outer sacrales about two-thirds as long as inner sacrales and the clunals about one-third as long . . . *ulmi* (p.128)

Metatetranychus ulmi (Koch)

European Red Mite

(Figures 93, 94, 95)

Tetranychus ulmi Koch, 1836, Deut. Crust. Myr. Arach., 1: 11; Berlese, 1886, Acari dann. Pflanz. Colt., p. 22. Described from specimens from Regensburg, Germany, on elm.

Oligonychus ulmi, Hirst, 1920, Proc. Zool. Soc. Lond., 1920: 58.

Metatetranychus ulmi, Oudemans, 1921, Ent. Ber., 8(177): 198; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 43; Reck, 1941,

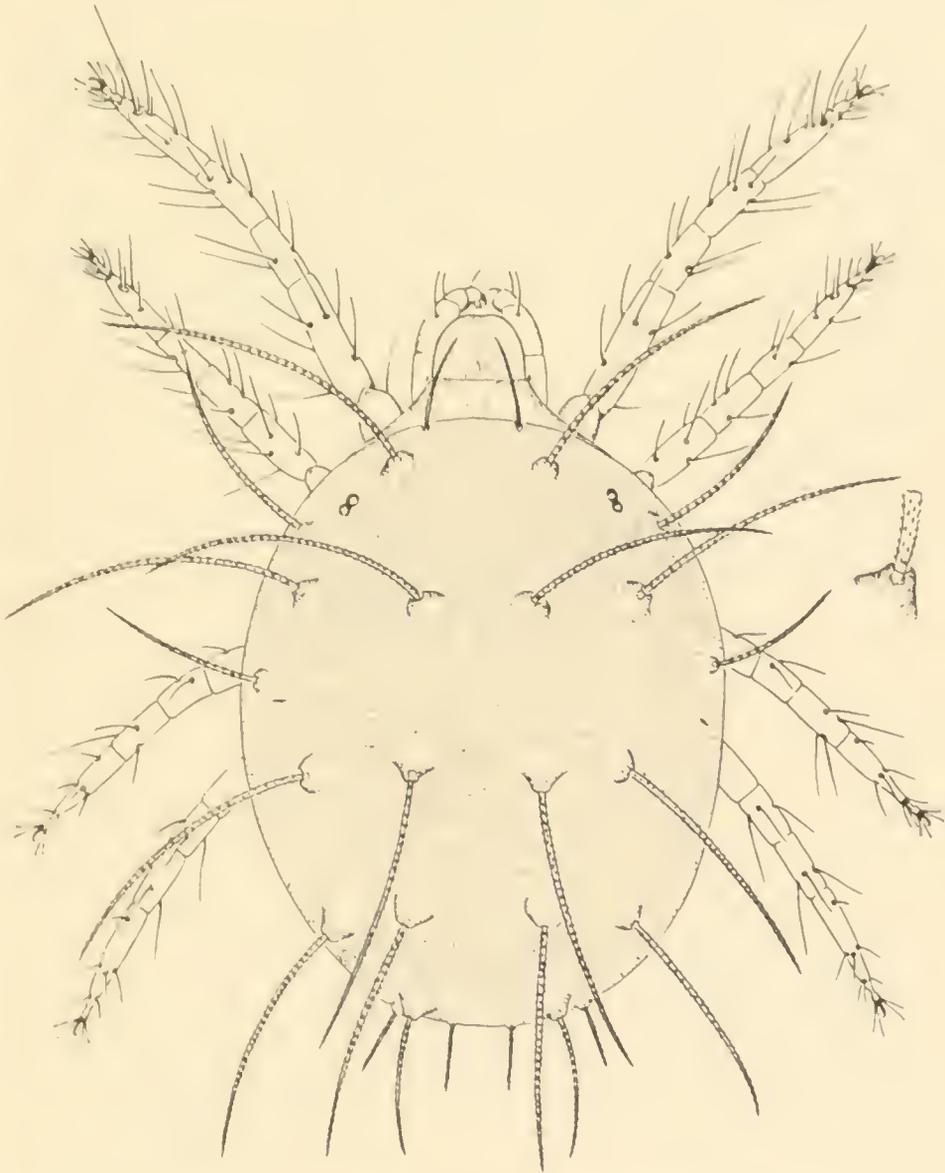


Fig. 96. *Metatetranychus citri*: dorsal aspect of female.

Soobsh. Akad. Nauk Gruz. S.S.R. (2)9; Günthart, 1945, Mitt. schweiz. ent. Ges. 9: 285; Womersley, 1940, Trans. Roy. Soc. S. Austr., 64: 261; Groves and Masee, 1951, Syn. World Lit. Fruit Tree Red Spider mite, p. 3; Pritchard and Baker, 1952, Hilgardia, 21(9): 260.

Paratetranychus ulmi, André, 1937, Util. Appl. Etud. Acar., p. 21.

Tetranychus pilosus Canestrini and Fanzago, not (*Distignatus*) = *Tetranychus pilosus* Donnadieu, 1875, 1876, Atti. Soc. Ven. Trent., 5: 133; Canestrini and Fanzago, 1878, Atti Reale Ist. Veneto Sci. Let. Arti (ser. 5), 4: 150; Canestrini, 1889, Atti Reale Ist.

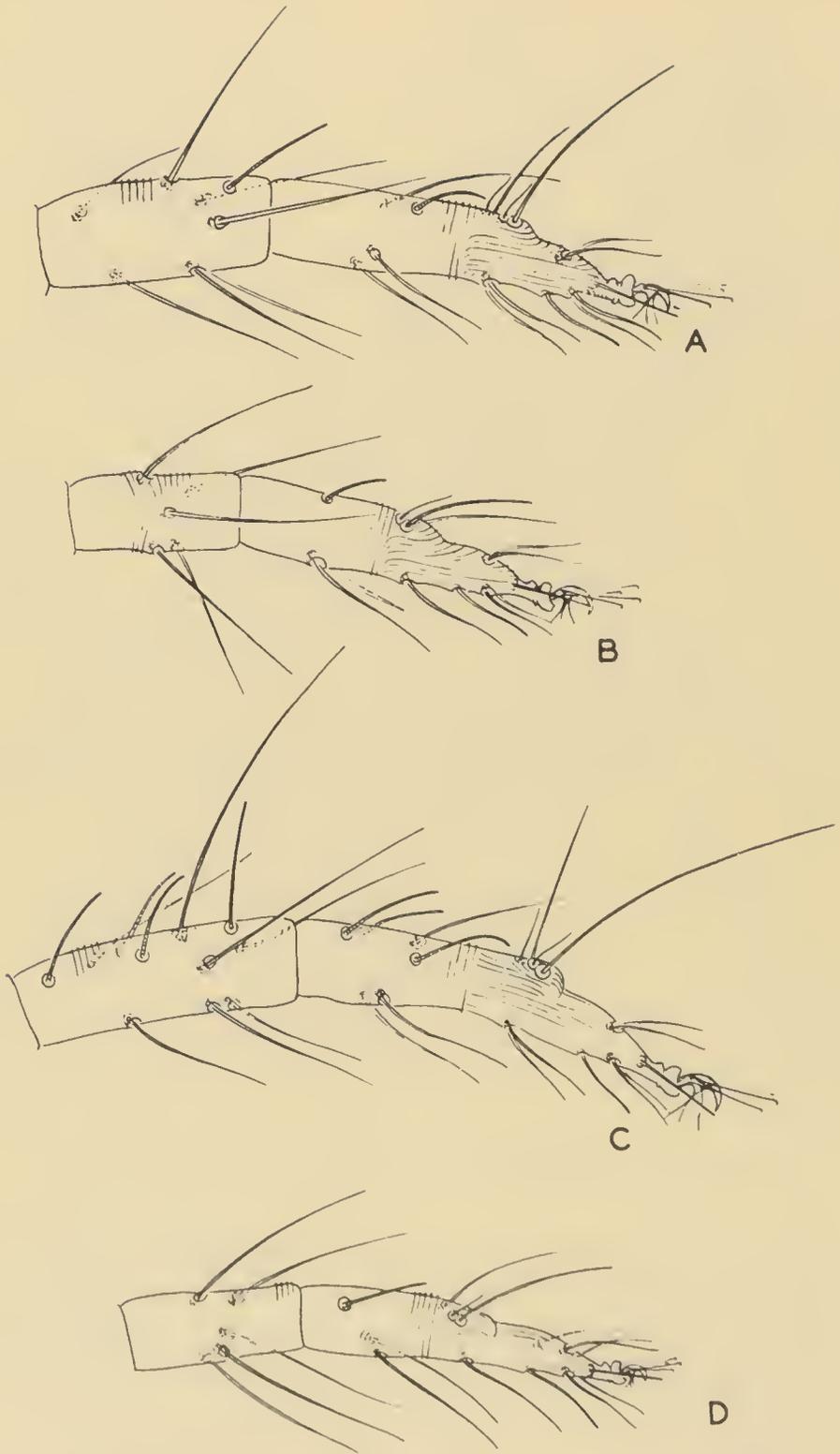


Fig. 97. *Metatetranychus citri*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

Subfamily Tetranychinae Berlese

Veneto Sci. Let. Arti (ser. 6), 7: 500; Berlese, 1889, Acari Myr. Scorp. Prostigmata, 46: 6. Described from specimens from Trevigiano, Italy, from fungus. *Secondary homonym.*

Paratetranychus pilosus Zacher, 1913, Mitt. Kais. biol. Land-Forst. Anst., 14: 39; Trägårdh, 1915, Centralanst. försök. jordbr. Ent. avdel., 20(109): 21; Trägårdh, 1915, Z. angew. Ent., 2: 161; McGregor, 1919, Proc. U. S. Natl. Mus., 56(2303): 671; Zacher, 1921, Zts. ang. Ent., 7: 184; Garman, 1921, Jour. Econ. Ent., 14: 355; Garman, 1923, Bul. Conn. Agr. Exp. Sta., 252: 103; Essig, 1922, Mo. Bul. Calif. Dept. Agr., 11: 409; Hamilton, 1924, Bul. Maryl. Agr. Exp. Sta., 264: 1; André, 1932, Bul. Mus. Natl. Hist. Nat. Paris (sér. 2), 3: 531; Garman, 1940, Bul. Conn. Agr. Expt. Sta., 431: 77; McGregor, 1950, Amer. Midl. Nat., 44: 348.

Metatetranychus pilosus, Zacher, 1933, Mitt. Zool. Mus. Berlin, 19: 587.

Paratetranychus pilosus alboguttatus Zacher, 1913, Mitt. kais. biol. Anst. Land-Forstw., 14: 39. Described from specimens from Zehlendorf, Germany, on gooseberry. *New synonymy.*

Metatetranychus alboguttatus, Oudemans, 1931, Ent. Ber., 8(177): 199.

Paratetranychus pilosus occidentalis McGregor and Newcomer, 1928, Jour. Agr. Res., 36: 180. Described from specimens from Yakima, Washington, on deciduous fruits. *New synonymy.*

Tetranychus mytilaspidis, Ewing (not Riley, 1885), 1912, Jour. Econ. Ent., 5: 414; Ewing, 1913, Ann. Ent. Soc. Amer., 6: 459. *Misidentification.*

Oligonychus muscorum Oudemans, 1929, Ent. Ber., 7(168): 484. Type female from Amsterdam, Holland, on moss. *New synonymy.*

Metatetranychus muscorum, Oudemans, 1931, Ent. Ber., 8(178): 232; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42: 42.

Oligonychus potentillae Oudemans, 1929, Ent. Ber., 7(168): 484. Type: female, Berlin, Germany, on *Potentilla fruticosa*: of unknown disposition. *New synonymy.*

Metatetranychus potentillae, Oudemans, 1931, Ent. Ber., 8(178): 233; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 43.

Oligonychus alni Oudemans, 1929, Ent. Ber., 8(169): 19. Described from specimens from Berlin, Germany, on *Alnus glutinosa*.

Metatetranychus alni, Oudemans, 1931, Ent. Ber., 8(178): 231.

Metatetranychus mali Oudemans, 1931, Ent. Ber., 8(181): 290; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42: 43. Type: female. Bremen, Germany, on *Pirus malus*; in the Rijksmuseum van Natuurlijke Historie, Leiden, Holland. *New synonymy.*

Metatetranychus canestrinii Oudemans, 1939, Zool. Anz., 127: 78. New name for *Tetranychus pilosus* Canestrini and Fanzago, not Donnadieu.

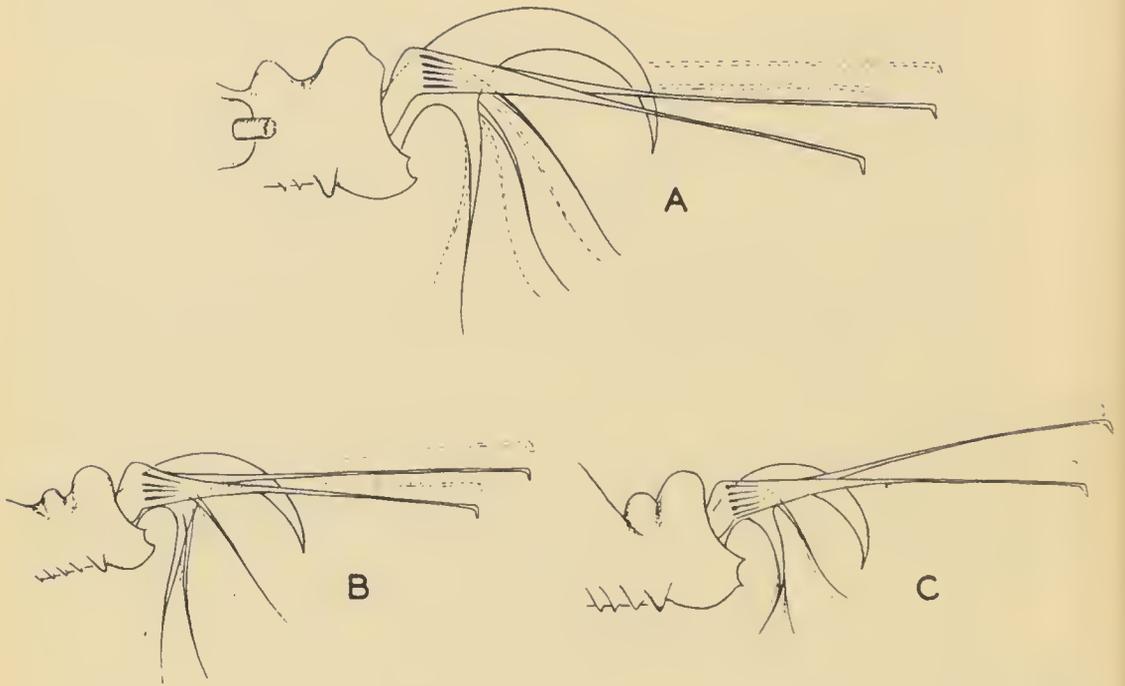


Fig. 98. *Metatetranychus citri*: A.) appendages of tarsus I of female; B.) appendages of tarsus III of male; C.) appendages of tarsus I of male.

Metatetranychus ulmi, long known in North America as *Paratetranychus pilosus*, is a well-known pest of deciduous fruit trees. The body of the adult female is brick red with whitish dorsal tubercles, and this coloration serves for ready determination in the field.

Slide preparations of both sexes of the adult may be differentiated from *Metatetranychus citri* by having the elunals distinctly shorter than the outer saerals.

The European red mite is known from Europe, Georgia, S.S.R., and throughout the United States, and southern Canada. It is also recorded from Tasmania and New Zealand, and specimens have been received from Japan.

Hosts are primarily deciduous trees and bushes belonging to the family Rosaceae. Fruit trees, namely apple, cherry, pear, peach, plum, and prune are common hosts, as well as berries and the ornamental shrubs cotoneaster and pyracantha. *Metatetranychus ulmi* also occurs commonly on elm. Other known hosts are almond, walnut, mountain ash, and black locust.

Metatetranychus ulmi overwinters in the egg stage on the twigs of trees. The egg is red, slightly flattened and radially striate dorsally, and with a dorsal stipe. Feeding injury occurs on the upper surface of the leaf, and very little or no webbing is spun. Groves and Massee (1951) present an extensive, annotated bibliography of this mite.

Subfamily Tetranychinae Berlese

Metatetranychus citri (McGregor)

Citrus Red Mite

(Figures 96, 97, 98, 99)

Tetranychus mytilaspidis, Banks, 1900 (not Riley, 1885), U. S. Dept. Agr. Div. Ent. Tech. Ser., 8: 71; Quayle, 1912, Calif. Agr. Exp. Sta. Bul., 234: 487; Ewing, 1913, Ann. Ent. Soc. Amer., 6: 459. Misidentification.

Paratetranychus mytilaspidus, Banks, 1915, U. S. Dept. Agr. Rep., 108: 37. Misidentification.

Tetranychus citri McGregor, 1916, Ann. Ent. Soc. Amer., 9: 28. Types: males and females, Orlando, Florida, on lemon; in the U. S. National Museum.

Paratetranychus citri, McGregor, 1919, Proc. U. S. Natl. Mus., 56(2303): 672; McGregor and Newcomer, 1928, Jour. Agr. Res., 36: 157; McGregor, 1950, Amer. Midl. Nat., 44: 335.

Metatetranychus citri, Reck, 1941, Soobsh. Akad. Nauk Gruz. S.S.R., 2(9); Baker and Wharton, 1952, Introd. Acar., p. 214.

Adults of *Metatetranychus citri* may be recognized in nature by having the entire body, including the strong tubercles, velvety reddish or purplish. Mounted specimens differ from those of *M. ulmi* by having the outer sacrals and the clunals all similar in length, about one-third as long as the inner sacrals.

McGregor (1916) first showed that *Tetranychus mytilaspidis* cannot refer to a tetranychid.

The citrus red mite is known from California (from Sacramento southward) and the southeastern United States. Specimens also have been received from South Africa; Canton, China, and southern Japan. It undoubtedly occurs in most citrus growing areas of the world.

Hosts are primarily broadleaved evergreen trees and shrubs. *Metatetranychus citri* is sometimes very abundant on citrus and broadleaved evergreen ornamentals such as *Choisya*, *Xylosma*, *Elaeagnus*,



Fig. 99. *Metatetranychus citri*:
aedeagus.



Fig. 100. *Allonychus braziliensis*: dorsal aspect of female, with enlargement of peritreme.

Umbellularia, and *Prunus laurocerasus*. Incidental hosts include rose, almond, pear, castor bean, and grasses.

Large populations that build up on favorite hosts such as citrus may

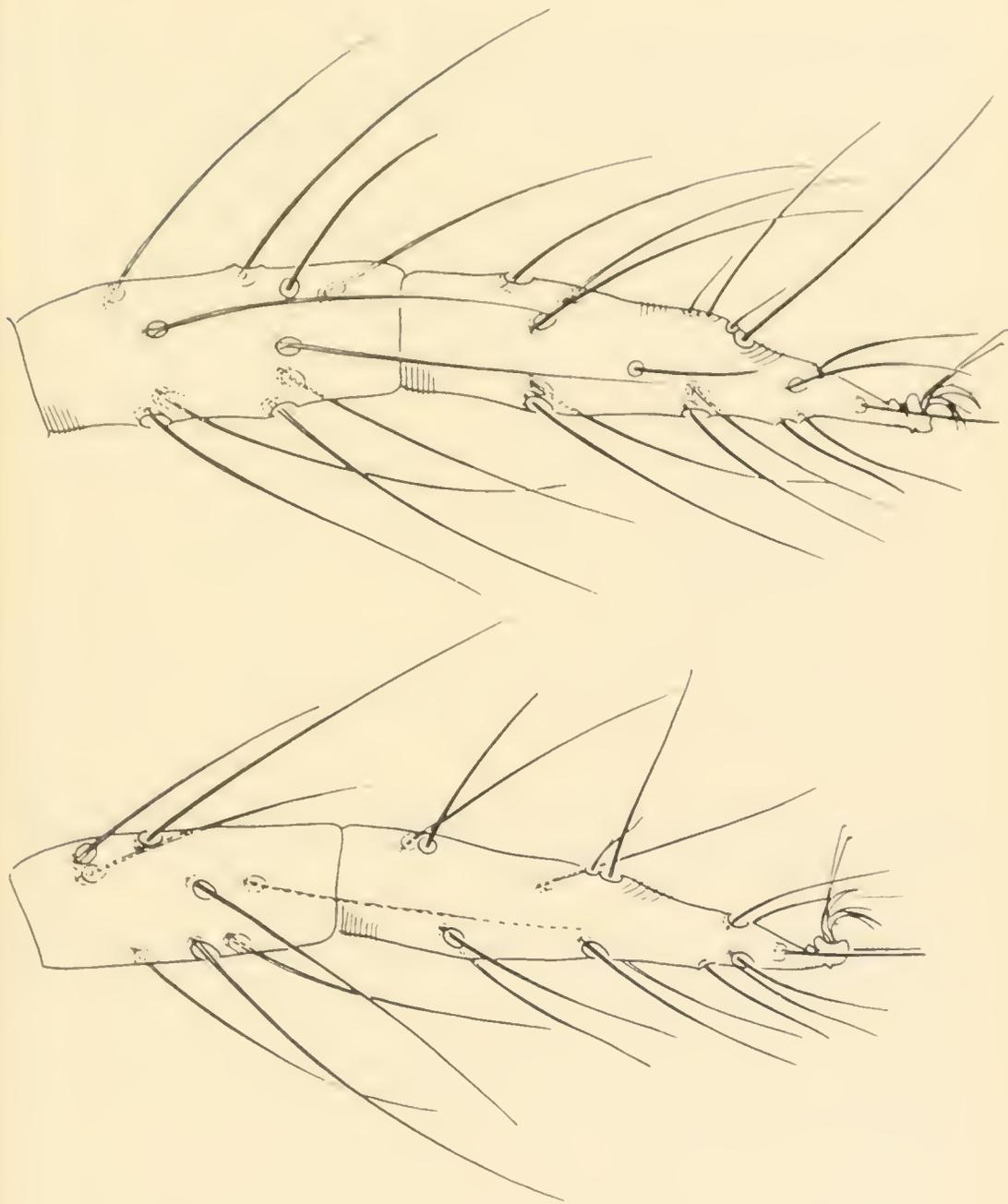


Fig. 101. *Allonychus braziliensis*: above, tibia and tarsus I of female; below, tibia and tarsus II of female.

give rise to infestations on neighboring plants such as roses. Our observations tend to show that such a secondary host is not favorable for continuation of the species.

Reproduction continues throughout the year, with the greatest populations being produced during the spring and fall under semi-tropical conditions (cool winters). The egg is red, slightly flattened and radially

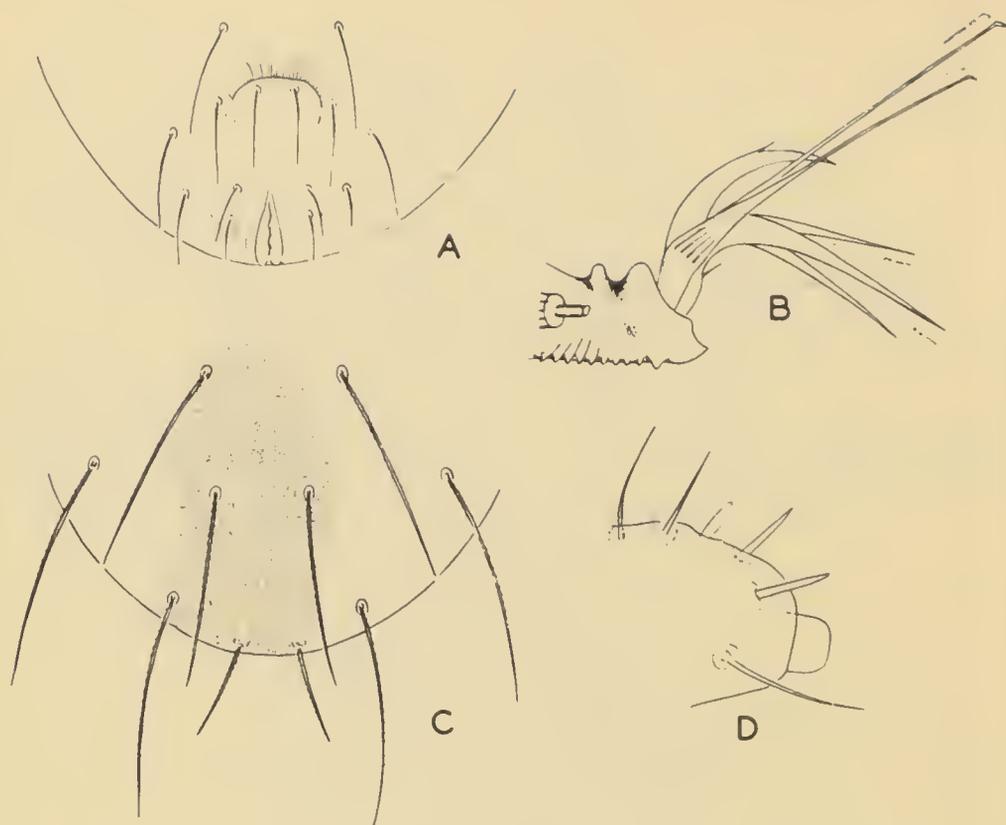


Fig. 102. *Allonychus braziliensis*: A.) ventrocaudal view of female opisthosoma; B.) appendages of tarsus I of female; C.) dorsocaudal view of female opisthosoma; D.) terminal segment of female palpus.

striate dorsally, and there are usually fine guy fibrils arising from the tip of the dorsal stipe. Feeding injury occurs on the upper surface of the leaves and on the fruit.

Boyce (1948) summarized our knowledge of the biology of the citrus red mite, and Debaeh *et al.* (1950) present studies on the effect of natural enemies on the mite.

Metatetranychus spinigerus (Lucas)

Tetranychus spinigerus Lucas, 1849, Hist. Nat. Anim. Art., in Explor. Sei. d'Algérie, Zool., 5(1): 309. Described from specimens from Constantine, Algeria, on *Antirrhinum orontium*.

Metatetranychus spinigerus, Oudemans, 1931, Ent. Ber., 8(177): 199; Oudemans, 1937, Krit. Hist. Overs. Aear., 3(C): 1058.

The original description and figures of *spinigerus* indicate that

Oudemans was correct in referring this species to the genus *Metatetranychus*. It is possible that this is an earlier name for *M. citri*, but the tetranychid fauna of the Mediterranean area should be better known before synonymy is made.

Metatetranychus hadzhibejliae Reck

Metatetranychus hadzhibejliae Reck, 1947, Soobsh. Akad. Nauk Gruz. S. S. R., 8(7). Described from specimens from Georgia, S. S. R., on *Ficus carica*.

We have not seen the description of this species.

ALLONYCHUS PRITCHARD AND BAKER, new genus

Type of genus.—*Tetranychus braziliensis* McGregor.

The genus *Allonychus* is proposed for a single species that is closely allied to *Metatetranychus*, but it appears to bear a relationship with the genus *Tetranychus* similar to the relationship that *Metatetranychus* bears with *Oligonychus*.

The most distinctive characteristic of *Allonychus* is in the composition of the empodium. This structure differs from that of all other tetranychids in consisting of a mediodorsal spur that bears a tiny pair of dorsal hairs, and in having four pairs of proximoventral hairs that are dissimilar in length.

Allonychus is considered by us to be closely allied to the genus *Metatetranychus* because there are two pairs of para-anals; the caudal pair is nearly as widely spaced as the anterior pair and is placed laterad of the anus. However, the duplex setae on tarsus I are separated lengthwise of the dorsal surface of the segment, the dorsal setae of the body are not set on tubercles, and the integumentary striae are longitudinal between the third dorsal hysterosomals and inner sacrals as in most species of *Tetranychus*.

Allonychus braziliensis (McGregor), new combination

(Figures 100, 101, 102)

Septanychus tumidus, Womersley, 1942, Trans. Roy. Soc. S. Australia, 66: 87. *Misidentification.*

Spider Mites

Septanychus braziliensis McGregor, 1950, Amer. Midl. Nat., 44: 318.

Types: Five females, Vicosá, Brazil, on quince; in the U. S. National Museum.

Our reference to Womersley's record of this species from Victoria, Australia, is not authenticated. Womersley presents an excellent photograph of copious webbing spun by the mite on buffalo grass.

Specimens studied by us are the types and a number of females from Boaca, Nicaragua, February 28, 1951 (E. J. Hambleton), on leaves of an unknown tree. McGregor recorded banana as a host.

GENUS **EOTETRANYCHUS** OUDEMANS

Eotetranychus Oudemans, 1931, Ent. Ber., 8(178): 224; Geijskes, 1939, Zacher, 1933, Mitt. Zool. Mus. Berlin, 19: 587; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 30. *Type of genus:* *Trombidium tiliarium* Hermann, referred to as *Acarus telarius* Linnaeus; by original designation.

Apotetranychus Oudemans, 1931, Eng. Ber., 8(178): 225; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 32. *Type of genus:* *Apotetranychus muscicola* Oudemans; monobasic and by original designation. *New synonymy.*

Platytetranychus Oudemans, 1931, Ent. Ber., 8(178): 224; Oudemans, 1931, Ent. Ber., 8(181): 293; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 45. *Type of genus:* *Tetranychus gibbosus* Canestrini; by original designation and monobasic. *New synonymy.*

Mites belonging to the genus *Eotetranychus* may be recognized by having the caudal pair of para-anals (the postanal setae) present, together with having the empodium (except for leg I, and sometimes II, of the male), consisting of three pairs of hairs.

The proximal pair of empodial hairs is typically stronger than the other two pairs, but the development is not as great as that of *Schizotetranychus*, a genus derived from *Eotetranychus*. The base of the empodial hairs may form a short stalk, but the base is not prolonged greatly as in *Neotetranychus*.

Empodium I of the male sometimes resembles that of the female by having three pairs of fine hairs. More often, however, the hairs are

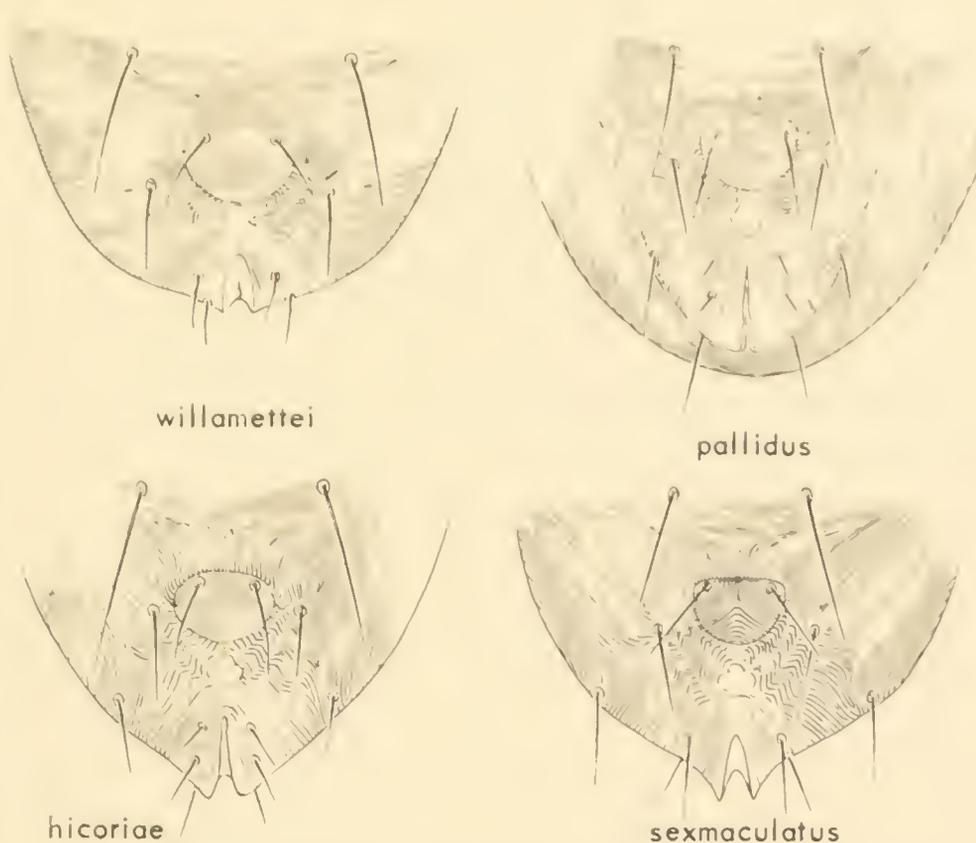


Fig. 103. *Eotetranychus*, caudoventral aspects of the female opisthosoma, showing types of striae.

reduced to slender or short teeth, so that the empodium appears as a pair of divergent, short and broad, trifid plates. The dorsal tooth is the smallest, and sometimes it is nearly absent. Empodia III and IV of the male resemble the female empodium.

The genus *Apotetranychus* is considered to be a synonym, because specimens that undoubtedly represent the type of the genus have been studied by us and they present no morphological differences of generic significance. Oudemans considered the comparative shortness of the dorsal setae of the body as well as the apparent shape of the alveoli in which they are inserted to be of generic value.

Platytetranychus is also considered to be a synonym of *Eotetranychus*. Oudemans (1931) regarded the type of the genus, *Tetranychus gibbosus* Canestrini, to be lacking a pair of caudal setae; but his description of the genus is obviously based on the poor drawing of Berlese. The Berlese drawing indicates that *gibbosus* is closely related to *E. libocedri* and *E. thujae*, both of which also occur on conifers. No other species with an empodium consisting of only three pairs of hairs are known from conifers.

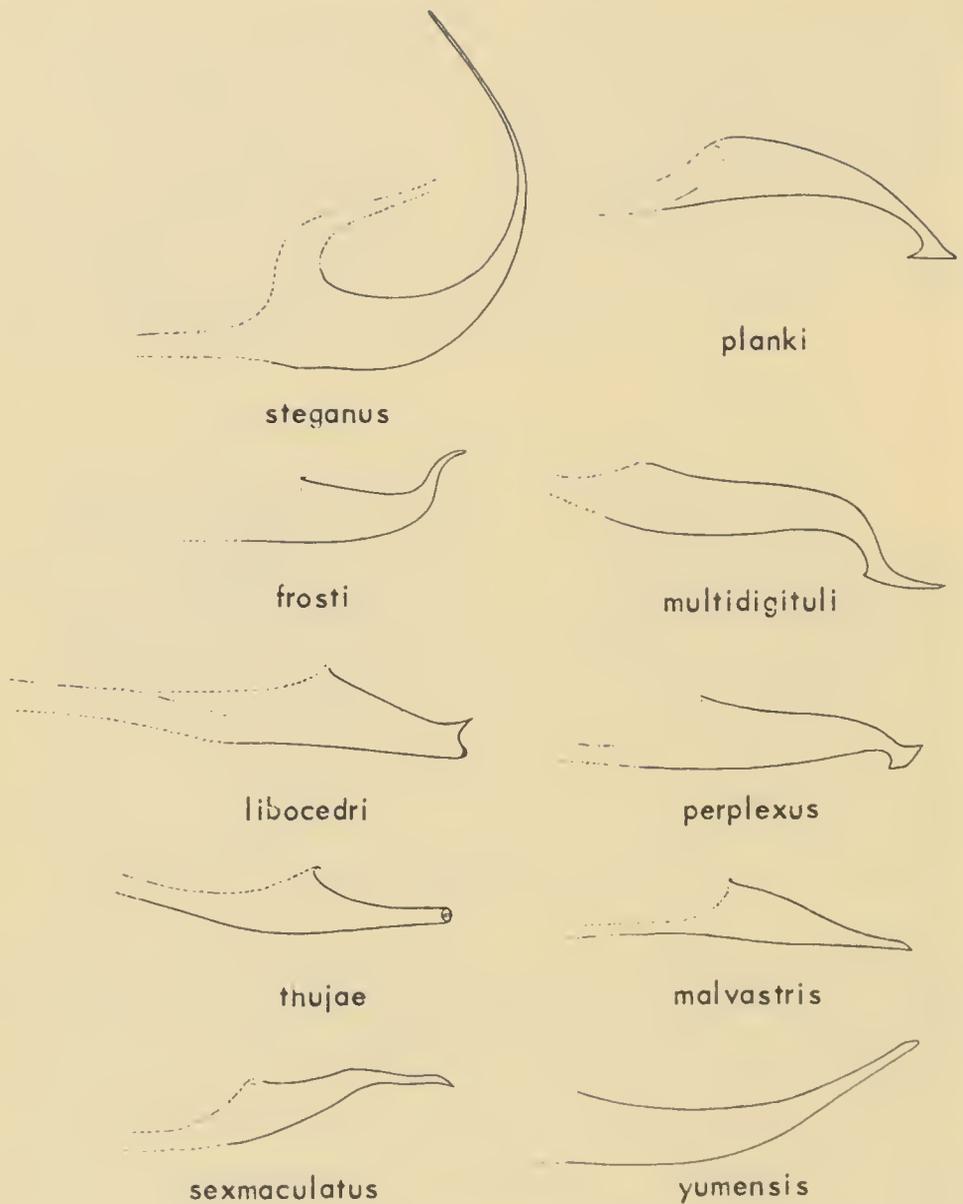
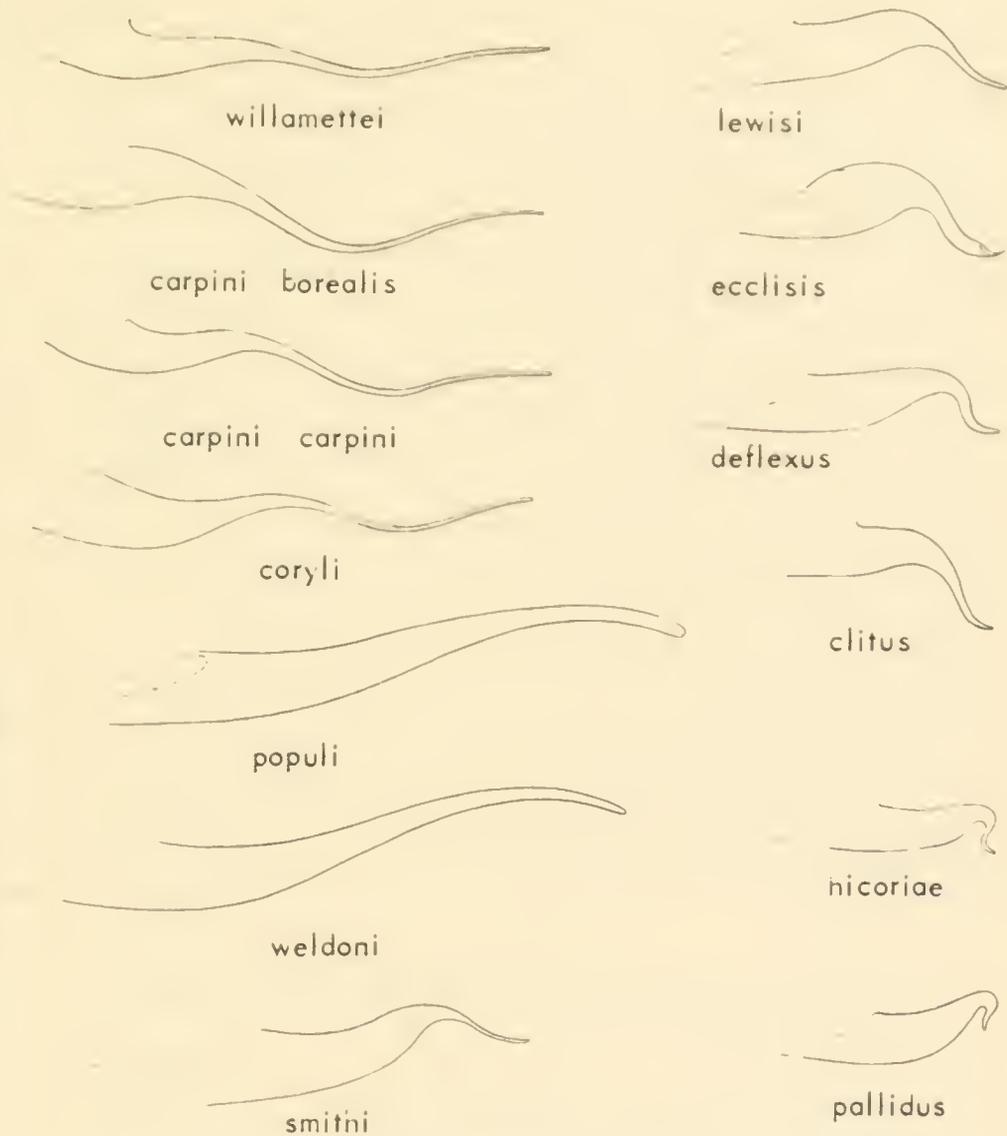


Fig. 104. *Eotetranychus*, aedeagi.

Eotetranychus resembles the genus *Tetranychus*, a more distant relative, in that the empodium consists of only three pairs of hairs. However, representatives of *Eotctranychus*, in addition to possessing two pairs of para-anals, have the duplex setae on tarsus I adjacent. The peritreme is variable with regard to its termination, but it often ends in a simple bulb.

The dorsal striae of the female (as well as the male) are usually, but not always, transverse between the third pair of dorsocentral hysterosomals and the sacrals.

Subfamily *Tetranychinae* BerleseFig. 105. *Eotetranychus*, aedeagi.

The characteristics of the integumental striae on the genital flap and just anterior to the flap were noted by C. A. Fleschner to be of value for species differentiation. Although this character appears to be variable in related genera, it has proved to be of considerable significance for determination of *Eotetranychus* females.

The number of tactile setae on tibia I, II, and III are here noted to be of value for species recognition or assignment to related groups of species. Similarly the number of tactile setae on the proximal portion of tarsus I, as well as the shape of empodium I of the male, is valuable for identification. These characters are delineated for the first time for most of the species.

Adult mites are usually tiny, with the body of the female slender. They are strawcolored or somewhat greenish with several spots of dark pigment along each side of the body. Species found in temperate regions hibernate as bright, lemon-yellow females. The eggs are typically pearly, globular, and with a tiny dorsal stipe.

Members of the genus *Eotetranychus* are found feeding on the under surface of leaves. They reside primarily along the veins, forming small colonies, and their webbing is usually sparse.

Several acarologists have misdetermined the genus *Eotetranychus* as defined by Oudemans and interpreted by us. McGregor (1950) used the character of the dorsal striae of the female hysterosoma (apparently as a subgeneric character) and, consequently, included erroneously several species of *Tetranychus*. Ugarov and Nikolskii (1937) plainly included only species properly belonging to *Tetranychus*. *E. inexpectatus* André and *E. cucurbitacearum* Sayed are other species of *Tetranychus* that were erroneously assigned to *Eotetranychus*.

In our systematic treatment of the genus *Eotetranychus*, species groups are recognized as an aid in presenting morphological characters and as a means for ready identification. We are not sure that the groups are discrete units phylogenetically. For instance, *E. steganus* and *E. clitus* both closely resemble members of the Tiliarium Group; but the leg chaetotaxy of each is distinct, and it is convenient to discuss them separately.

Key to North American species of EOTETRANYCHUS

Females

- | | | |
|--------|---|------------------------------|
| 1. | Tibia II with five to seven tactile setae | 2 |
| 1. | Tibia II with eight tactile setae (Tiliarium Group) | 8 |
| 2.(1). | Second tibia with five tactile setae | 3 |
| 2.(1). | Second tibia with six or seven tactile setae | 6 |
| 3.(2). | Peritreme with a distal hook bearing irregular projections; on honey locust (Multidigituli Group). | <i>multidigituli</i> (p.163) |
| 3.(2). | Peritreme ending in a simple bulb | 4 |
| 4.(3). | Dorsocentral hysterosomals longer than longitudinal intervals between them; on palmetto (Steganus Group) | <i>steganus</i> (p.167) |
| 4.(3). | Dorsocentral hysterosomals shorter than longitudinal intervals between them; on cupressaceous conifers (Libocedri Group). | 5 |
| 5.(4). | Tibia I with nine tactile (and one sensory) setae; tibia III with five tactile setae | <i>libocedri</i> (p.154) |

Subfamily Tetranychinae Berlese

- 5.(4). Tibia I with seven tactile (and one sensory) setae; tibia III with four (or three) tactile setae *thujae* (p.159)
- 6.(2). Body with dorsal setae slender and tapering, much longer than longitudinal intervals between them; tibia II with six setae (Clitus Group) *clitus* (p.170)
- 6.(2). Body with dorsal setae subelavate, no longer than longitudinal intervals between them; tibia II typically with seven setae (Caribbeanae Group). 7
- 7.(6). Dorsocentral hysterosomals not over one-half as long as intervals between them; propodosomal integument with irregularly arranged dots or granulations mediodorsally, and usually around tubercles on the hysterosoma . . . *caribbeanae* (p.147)
- 7.(6). Dorsocentral hysterosomals about as long as intervals between them; propodosoma with anastomosing striae mediodorsally, as well as on lateral parts of the hysterosoma . . . *planki* (p.148)
- 8.(1). Tarsus I with four tactile setae proximal to duplex setae *perplexus* (p.175)
- 8.(1). Tarsus I with five tactile setae proximal to duplex setae . . . 9
- 9.(8). Area immediately anterior to genital flap with longitudinal or irregular striae 10
- 9.(8). Area immediately anterior to genital flap with transversely parallel striae 14
- 10.(9). Genital flap with only transverse striae 11
- 10.(9). Genital flap with longitudinal striae on anterior portion *sexmaculatus* (p.202)
- 11.(10). Area immediately anterior to genital flap with irregular striae *pallidus* (p.211)
- 11.(10). Area immediately anterior to genital flap with only parallel, longitudinal striae 12
- 12.(11). Peritreme straight distally *ecclisis* (p.210)
- 12.(11). Peritreme strongly hooked distally 13
- 13.(12). Palpus with terminal sensillum twice as long as broad at base *hicoriae* (p.211)
- 13.(12). Palpus with terminal sensillum one and one-half times as long as broad at base *smithi* (p.192)
- 14.(9). Tarsus II with duplex setae subequal in length *willamettci* (p.187)
- 14.(9). Tarsus II with proximal member of duplex much shorter than distal member 15

Spider Mites

- 15.(14). Peritreme anastomosing distally *populi* (p.189)
 15.(14). Peritreme straight distally or with a simple bend or hook 16
 16.(15). Peritreme straight distally, rarely bent 17
 16.(15). Peritreme with a strong hook . . . *uncatus; weldoni; malvastris;*
frosti; yumensis; lewisi. (pp. 183, 191, 192, 199, 205)
 17.(16). Palpus with terminal sensillum twice as long as wide at base
 *deflexus* (p.206)
 17.(16). Palpus with terminal sensillum more than two times as long
 as wide at base 18
 18.(17). Palpus with terminal sensillum two and one-half times as long
 as wide at base *carpini* (p.179)
 18.(17). Palpus with terminal sensillum three times as long as wide
 at base *coryli* (p.183)

Males*

The male of *caribbeanae* is unknown.

1. Tibia II with five to seven tactile setae 2
 1. Tibia II with eight tactile setae (Tiliarium Group) 7
 2.(1). Second tibia with two sensory setae; on cupressaceous conifers
 (Libocedri Group) 3
 2.(1). Second tibia without sensory setae; (rarely with a single
 sensory seta); on other hosts 4
 3.(2). Aedeagus with distal portion slender and parallel sided, the
 caudal end rounded *thujae* (p.159)
 3.(2). Aedeagus narrowing only slightly and with the caudal end
 emarginate *libocedri* (p.154)
 4.(2). Aedeagus bent ventrad 5
 4.(2). Aedeagus curved strongly dorsad and tapering to an acute tip
 (Steganus Group) *steganus* (p.167)
 5.(4). Aedeagus with distal portion sigmoid and tapering (Clitus
 Group) *clitus* (p.170)
 5.(4). Aedeagus with a terminal knob 6
 6.(5). Peritreme anastomosing distally; knob of aedeagus with a long
 caudally directed angulation; dorsal setae of body not on
 tubercles (Multidigituli Group) *multidigituli* (p.163)
 6.(5). Peritreme straight distally, ending in a simple bulb; knob of
 aedeagus with both angulations very short; dorsal setae of

Subfamily Tetranychinae Berlese

body borne on strong tubercles (Caribbeanae Group) . . .
 *planki* (p.148)

- 7.(1). Aedeagus enlarged at distal end to form a terminal knob . . .
 *perplexus* (p.175)
- 7.(1). Aedeagus tapering distally, without a terminal enlargement . . . 8
- 8.(7). Aedeagus linear, long, slender, and caudally directed . . . 9
- 8.(7). Aedeagus not forming a linear shaft 14
- 9.(8). Aedeagus with a strong wave near the middle and tapering to
 a point 10
- 9.(8). Aedeagus with a broad curve medially and with the distal end
 rounded 13
- 10.(9). Tarsus II with both members of the duplex setae about equal
 in length *willamettei* (p.187)
- 10.(9). Tarsus II with the proximal member of the duplex much shorter
 than the distal member 11
- 11.(10). Peritreme strongly hooked distally *uncatus* (p.183)
- 11.(10). Peritreme straight distally or bent 12
- 12.(11). Peritreme straight distally, ending in a simple bulb
 *carpini* (p.179)
- 12.(11). Peritreme bent at distal end *coryli* (p.183)
- 13.(9). Peritreme anastomosing distally *populi* (p.189)
- 13.(9). Peritreme with a simple hook distally *weldoni* (p.191)
- 14.(8). Aedeagus forming a triangle, the lower margin straight or
 nearly so *malvastris* (p.192)
- 14.(8). Aedeagus obviously curved or bent dorsad or ventrad . . . 15
- 15.(14). Median portion of aedeagus curved or bent dorsad 16
- 15.(14). Median portion of aedeagus curved or bent ventrad 18
- 16.(15). Aedeagus shallowly bent dorsad 17
- 16.(15). Aedeagus abruptly bent dorsad. *frosti* (p.190)
- 17.(16). Aedeagus abruptly constricted at end of curvature to form a
 slender distal stylet *smithi* (p.192)
- 17.(16). Aedeagus gradually narrowing beyond bend *yumensis* (p.199)
- 18.(15). Aedeagus abruptly declivate, the bent portion forming an acute
 angle 19
- 18.(15). Aedeagus more shallowly bent, the distal end forming an obtuse
 angle 20
- 19.(18). Shaft of aedeagus abruptly constricted at bend: peritreme with
 distal end forming a weak angulation: dorsal setae of body

Spider Mites

- slightly longer than intervals between them. *pallidus* (p.211)
- 19.(18). Shaft of aedeagus gradually narrowing to bend; peritreme with distal end strongly hooked; dorsal setae of body much longer than intervals between them *hicoriae* (p.211)
- 20.(18). Aedeagus with bent portion sigmoid and evenly tapering, the tip directed caudally 21
- 20.(18). Aedeagus with bent portion not sigmoid, the tip abruptly narrowed and caudoventrally directed. . . *sexmaculatus* (p.202)
- 21.(20). Bend of aedeagus very gradual; palpus with well-developed terminal sensillum *lewisi* (p.205)
- 21.(20). Bend of aedeagus abrupt; palpus with terminal sensillum rudimentary 22
- 22.(21). Terminal segment of palpus with tapering sensilla subequal in length; aedeagus gradually tapering through bend *deflexus* (p.206)
- 22.(21). Terminal segment of palpus with tapering sensilla very dissimilar in development; aedeagus slightly widened at bend *ecclisis* (p.210)

Caribbeanae Group

Adults of the Caribbeanae Group may be recognized by the peculiar integument on the dorsum of the body. The mediodorsal portion of the propodosoma, and usually some of the hysterosoma bears broken, very irregular striae rather than the parallel striae found in other members of the genus. Moreover, the dorsal setae of the body are clavate or nearly so.

Tibia I of the female bears seven or nine tactile and one sensory setae; tarsus I bears four tactile and one sensory setae proximad of the duplex setae. Tibia II bears seven tactile setae, and tibia III bears six tactile setae. The empodium of the female has a moderately long base before division into six hairs. Tibia I of the male possesses nine tactile setae plus four sensory setae; and tibia II has seven tactile setae; and tibia III has six tactile setae. Tarsus I bears four tactile and three sensory setae proximal to the duplexes. Empodium I of the male consists of a slender, moderately elongate base, with three short teeth on each side distally.

Two species, both of tropical distribution, belong to this group.

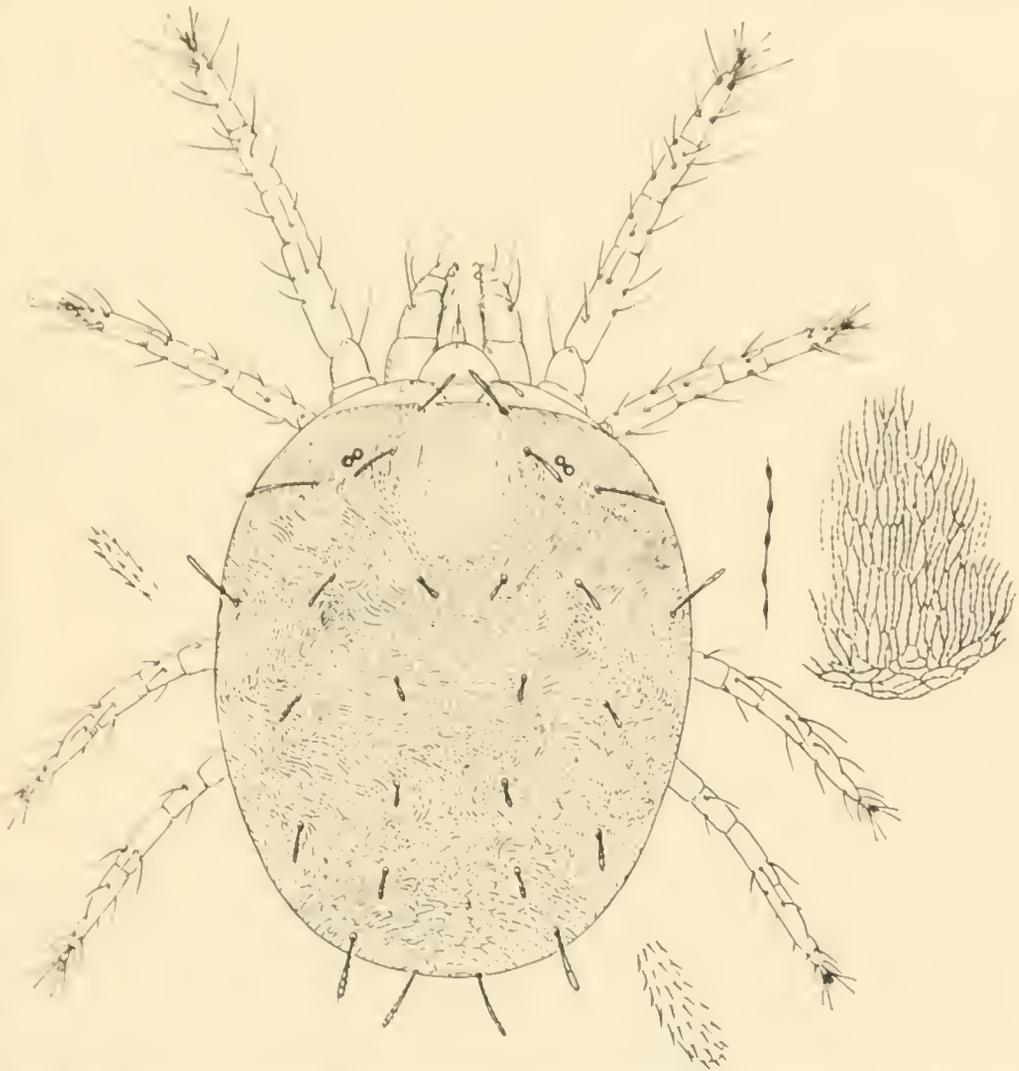


Fig. 106. *Eotetranychus caribbeanae*: dorsal aspect of female, with enlargement of integumental striations, Key West, Florida, Cassava.

Eotetranychus caribbeanae (McGregor), new combination
(Figures 106, 107)

Tetranychus caribbeanae McGregor, 1950, Amer. Midl. Nat., 44(2): 283.

Types: females, Loiza, Puerto Rico, on cassava; in the U. S. National Museum.

The female of *Eotetranychus caribbeanae* may be recognized readily by having many of the dorsal striae anastomosing; and the striae are composed of short dashes rather than dots. The dorsocentral setae of the hysterosoma are less than one-half as long as intervals between their bases, and they widen to near the tip. Other dorsal setae of the

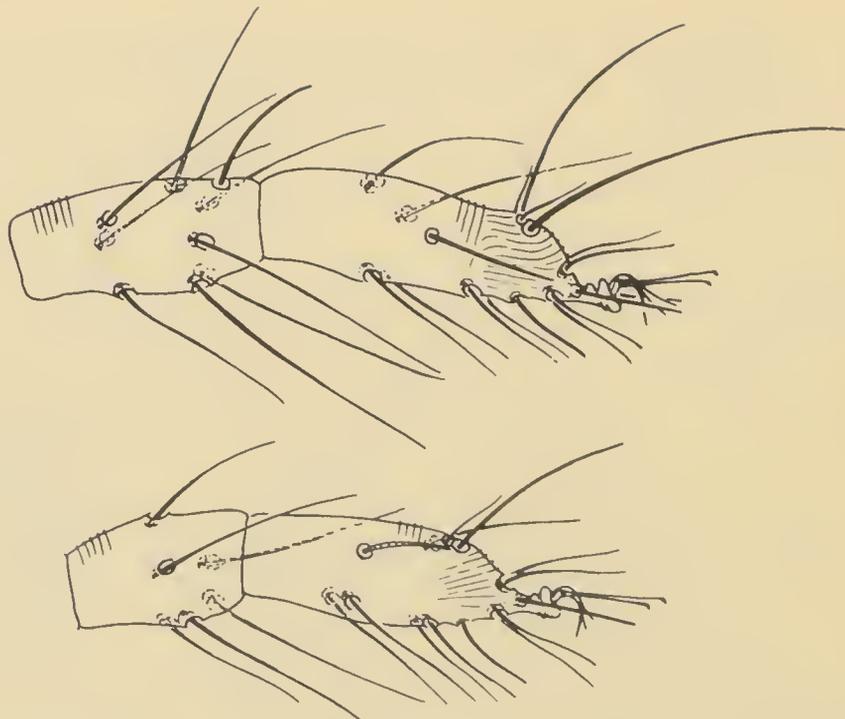


Fig. 107. *Eotetranychus caribbeanae*: above, tibia and tarsus I of female; below, tibia and tarsus II of female.

body are longer, spatulate and set on tubercles. In the female, tibia I bears seven tactile setae plus a sensory seta. The male is unknown.

In addition to the types, specimens have been studied from Coral Gables, Florida (O. D. Link), on Jamaica dogwood; Key West, Florida (L. W. Holley), on cassava; and South Miami, Florida (A. E. Pritchard), on *Dalbergia sisso*.

Eotetranychus planki (McGregor), new combination
(Figures 108, 109, 110, 111, 112, 113)

Tetranychus planki McGregor, 1950, Amer. Midl. Nat., 44(2): 300. Types: males and females, Mayagüez, Puerto Rico, on *Erythrina berte-roana*; in the U. S. National Museum.

The female of *Eotetranychus planki* may be readily differentiated from other species included in the genus by having the mediodorsal portion of the propodosoma, as well as broad areas around the dorsal hysterosomals all with the integument irregularly dotted. In some of the females from Argentina, however, the hysterosomal dotting is strongly reduced. The dorsal setae of the body are slender, each slightly

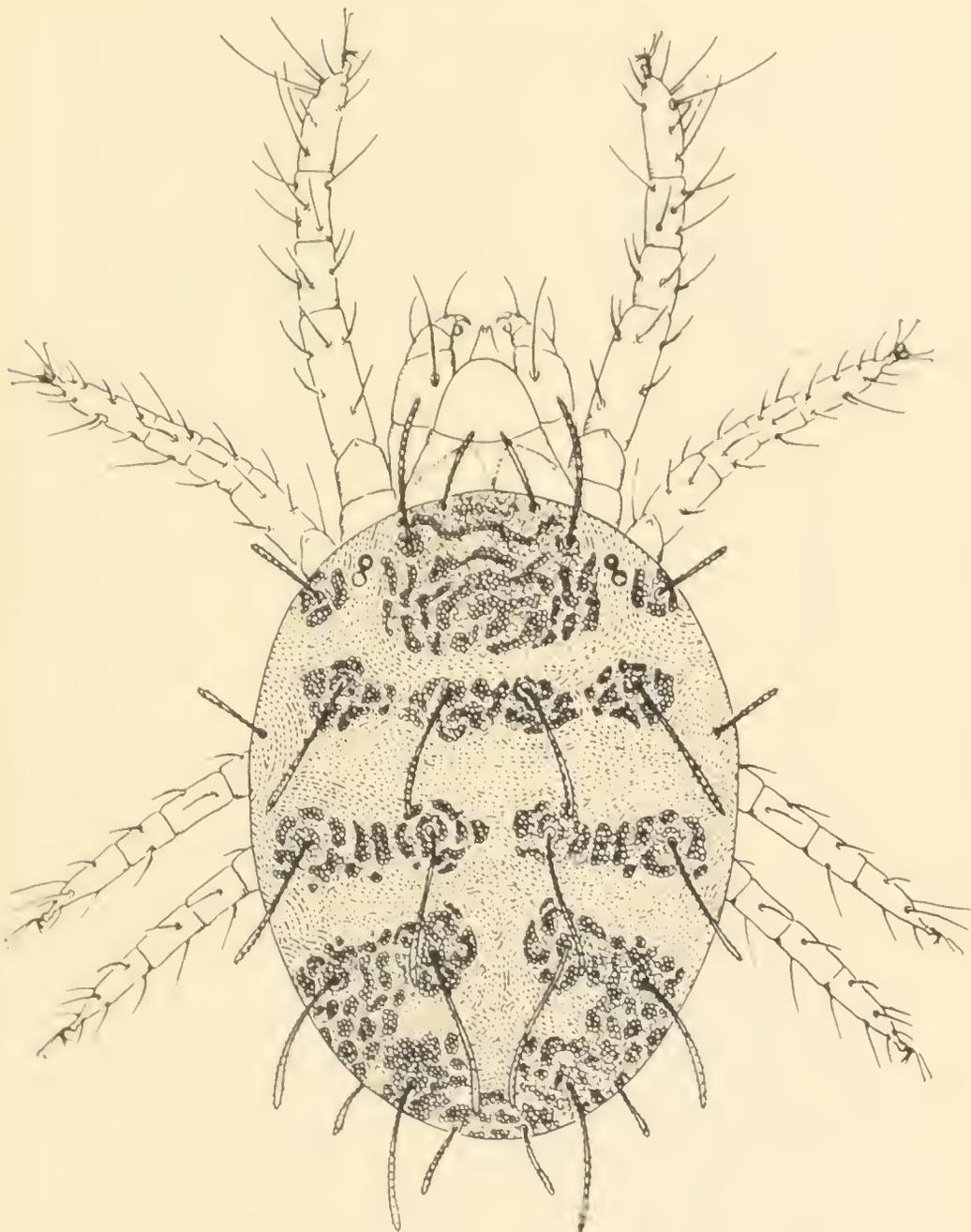


Fig. 108. *Eotetranychus planki*: dorsal aspect of female,
Trinidad, *Cajanus indicus*.

enlarged near the distal end. Dorsocentral hysterosomals are approximately as long as intervals between them and not differentiated from most other dorsal setae.

The female bears nine tactile and one sensory seta on tibia I.

Eotetranychus planki has been known only from specimens from western Puerto Rico, on *Erythrina*. Additional specimens have been

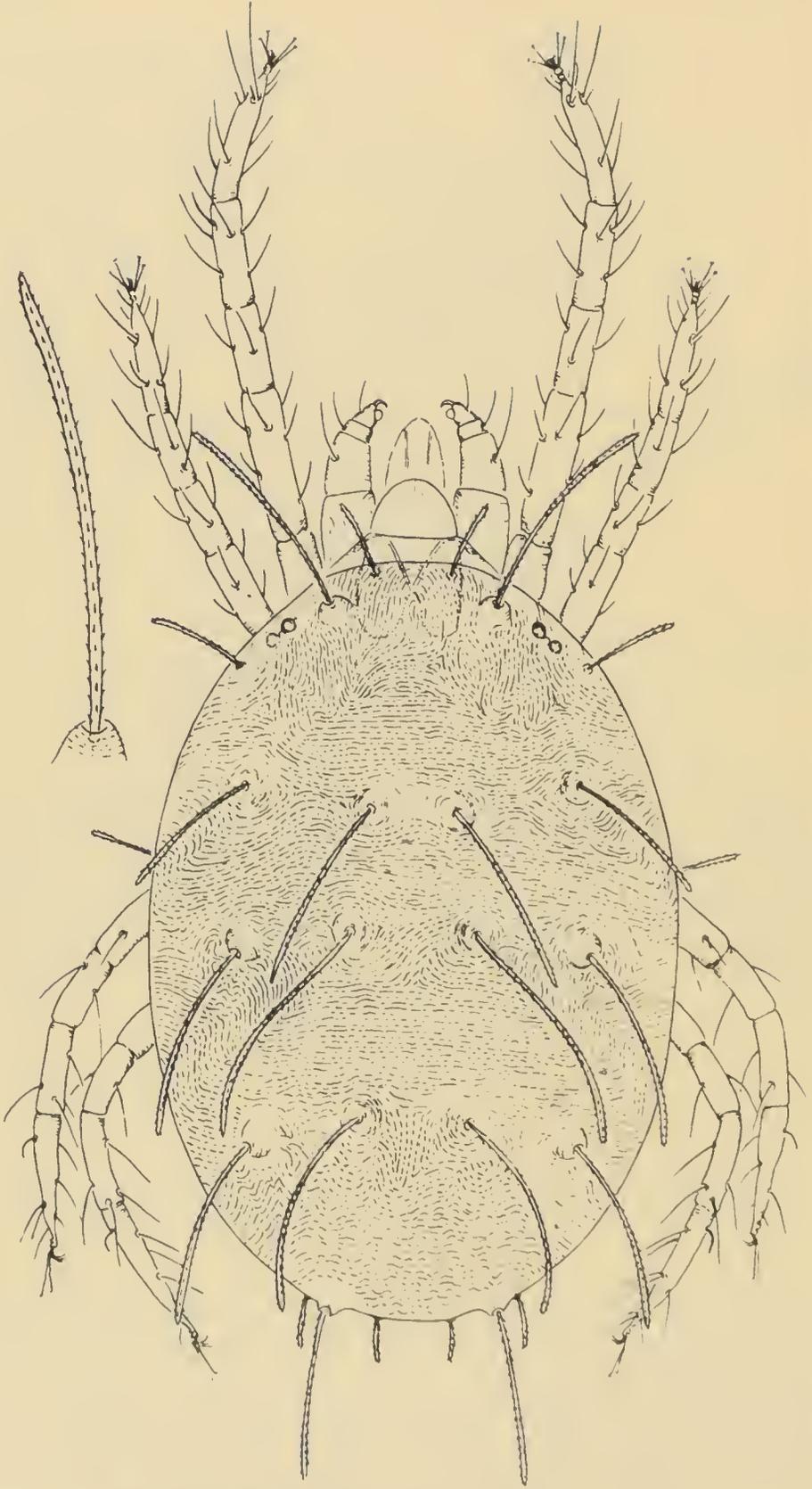


Fig. 109. *Eotetranychus planki*: dorsal aspect of female, Argentina, *Cassia* sp.

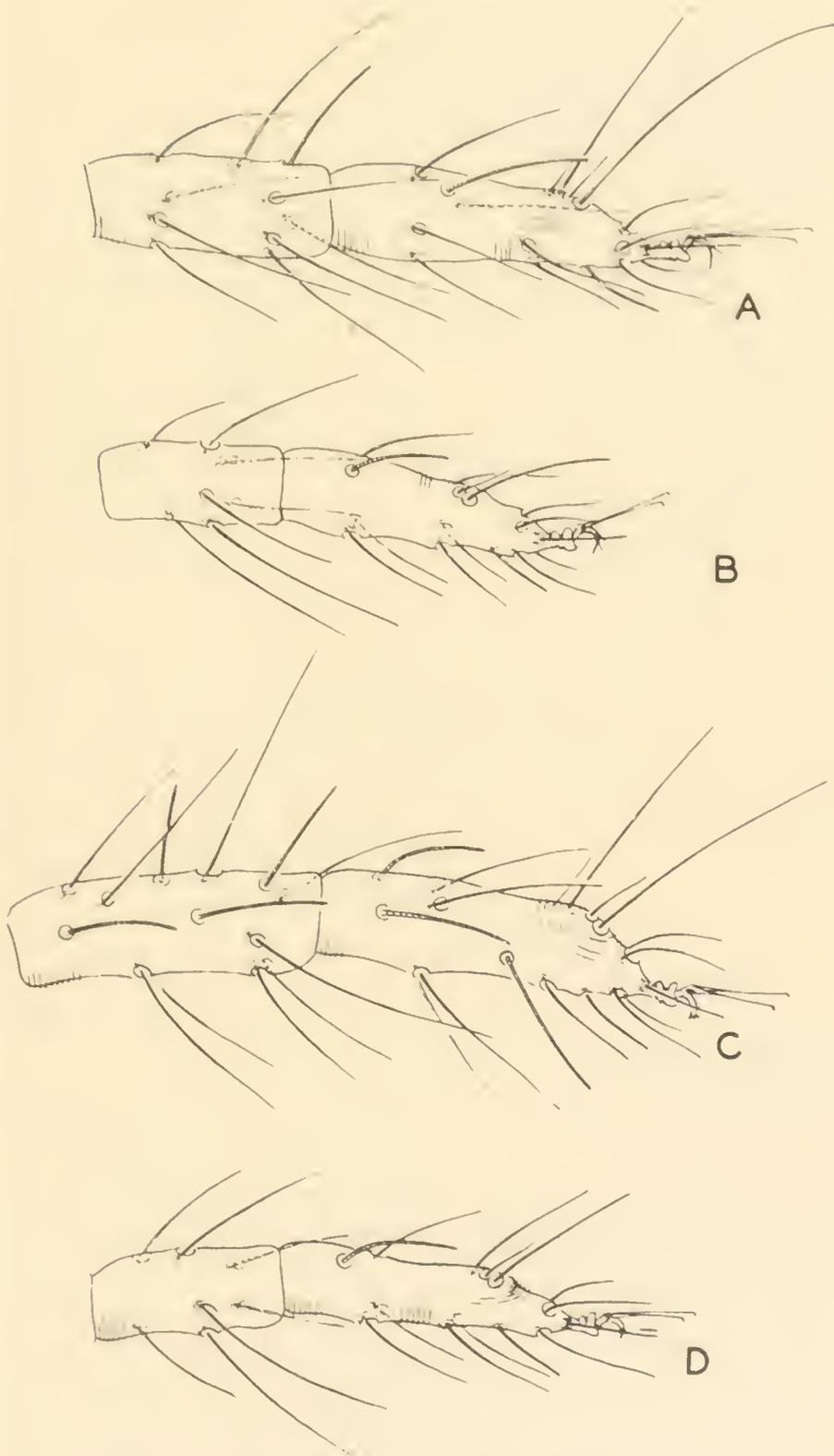


Fig. 110. *Eotetranychus planki*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male; all from Trinidad.

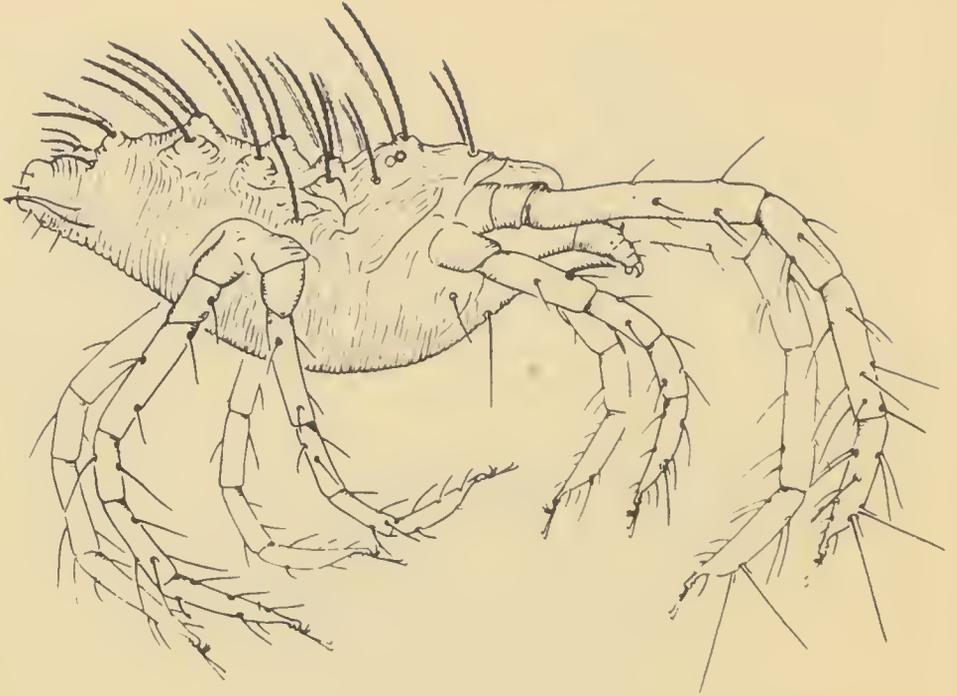


Fig. 111. *Eotetranychus planki*: lateral aspect of male, Argentina, *Cassia* sp.



Fig. 112. *Eotetranychus planki*: above, appendages of male tarsus I; below, appendages of female tarsus I (all from Trinidad).



Fig. 113. *Eotetranychus planki*: aedeagus,
Puerto Rico.

studied from the type locality, Mayagüez, Puerto Rico (H. K. Plank), on *Soya max*, *Puereria phaseoloides*, and "kudzu" leaves; Santa Maria, Trinidad (R. G. Fennah), on *Cajanus indicus*; and Concordia, Argentina (L. C. Knorr), on *Cassia occidentalis*.

Libocedri Group

Members of the Libocedri Group may be recognized by having the dorsal setae of the body, especially the dorsocentral hysterosomals, very short, together with having only five tactile setae on tibia II, and the peritreme ending in a simple bulb.

Tibia I of the female bears seven or nine tactile and one sensory setae; tibia II rarely may bear one or two sensory setae in addition to the five tactile setae; tibia III bears three to five tactile setae. The tibiae of the male resemble those of the female with regard to tactile setae, but there are five sensory setae on tibia I and two sensory setae on tibia II and one or two sensory setae on tibia III. Tarsus I bears three to five tactile and one or two setae proximal to the duplex setae.

Members of the Libocedri Group are found only on cupressaceous conifers. No other species of *Eotetranychus* are known from similar hosts.



Fig. 114. *Eotetranychus libocedri*: dorsal aspect of female, Texas, Arizona cypress.

Eotetranychus libocedri (McGregor), new combination
(Figures 114, 115, 116, 117,)

Tetranychus libocedri McGregor, 1936, Ann. Ent. Soc. Amer., 29(4): 771; McGregor, 1950, Amer. Midl. Nat., 44: 289. Types: males and females, Camp Nelson, California, on *Libocedrus decurrens*; in the U. S. National Museum.

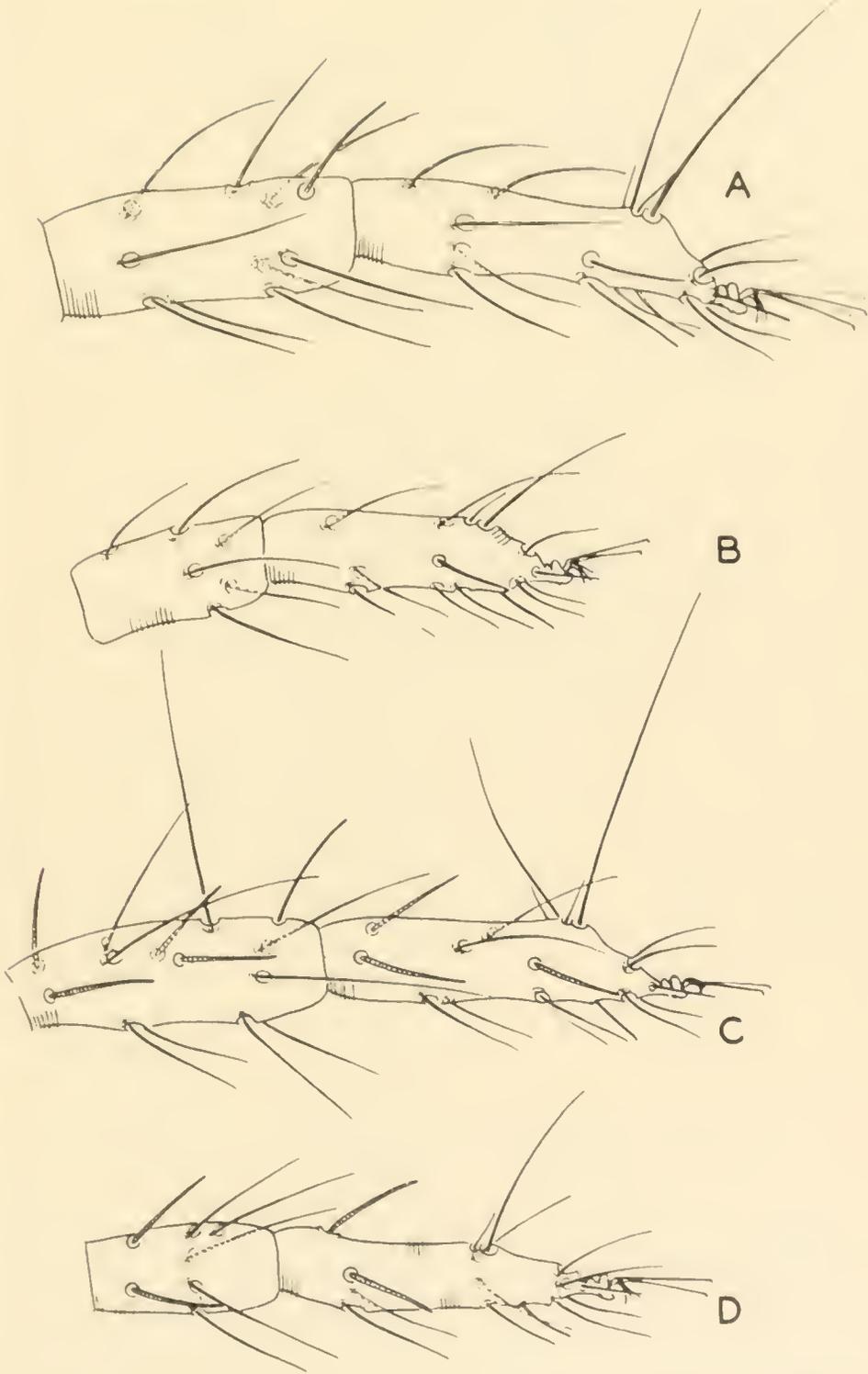


Fig. 115. *Eotetranychus libocedri*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

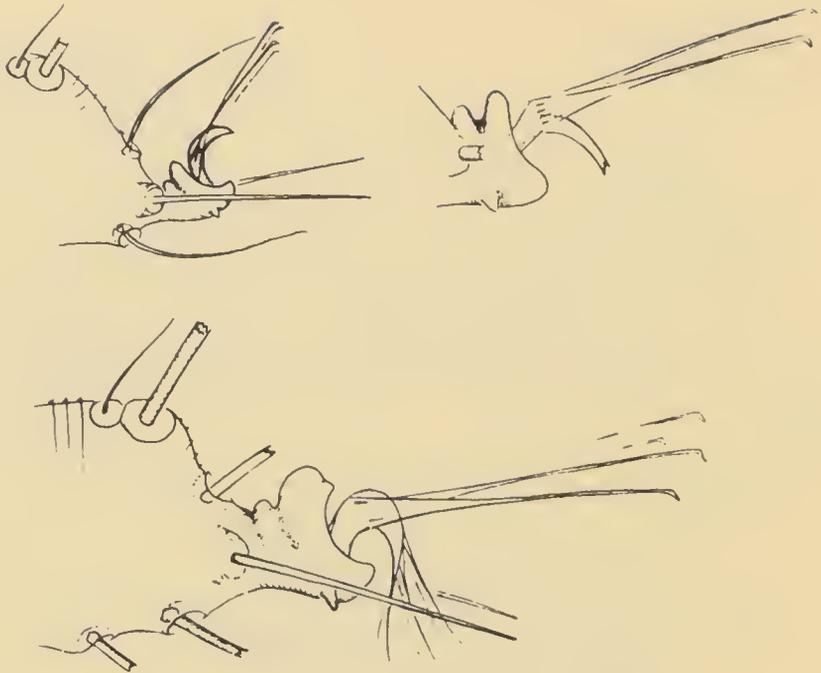


Fig. 116. *Eotetranychus libocedri*: above, appendages of tarsus I of male; below, appendages of tarsus I of female.



Fig. 117. *Eotetranychus libocedri*: aedeagus, Texas, Arizona cypress.

Adults of *Eotetranychus libocedri* may be recognized by having the dorsocentral hysterosomals very short and tapering (sometimes with a slight medial enlargement), together with the distinctive leg chaetotaxy.

The dorsal propodosomals vary considerably in length, and there is some variation in the humeral and dorsolateral hysterosomals. The dorsocaudal hysterosomals are often conspicuously longer than the dorsocentrals. Tibia I of the female bears nine tactile setae, and tarsus I bears five tactile (and sometimes one sensory) setae proximal to the duplex setae. Tarsus I of the male bears four tactile and two sensory setae proximal to the duplex setae. A tactile member of the two tactile and one sensory setae that are ventrad of the duplexes may appear to

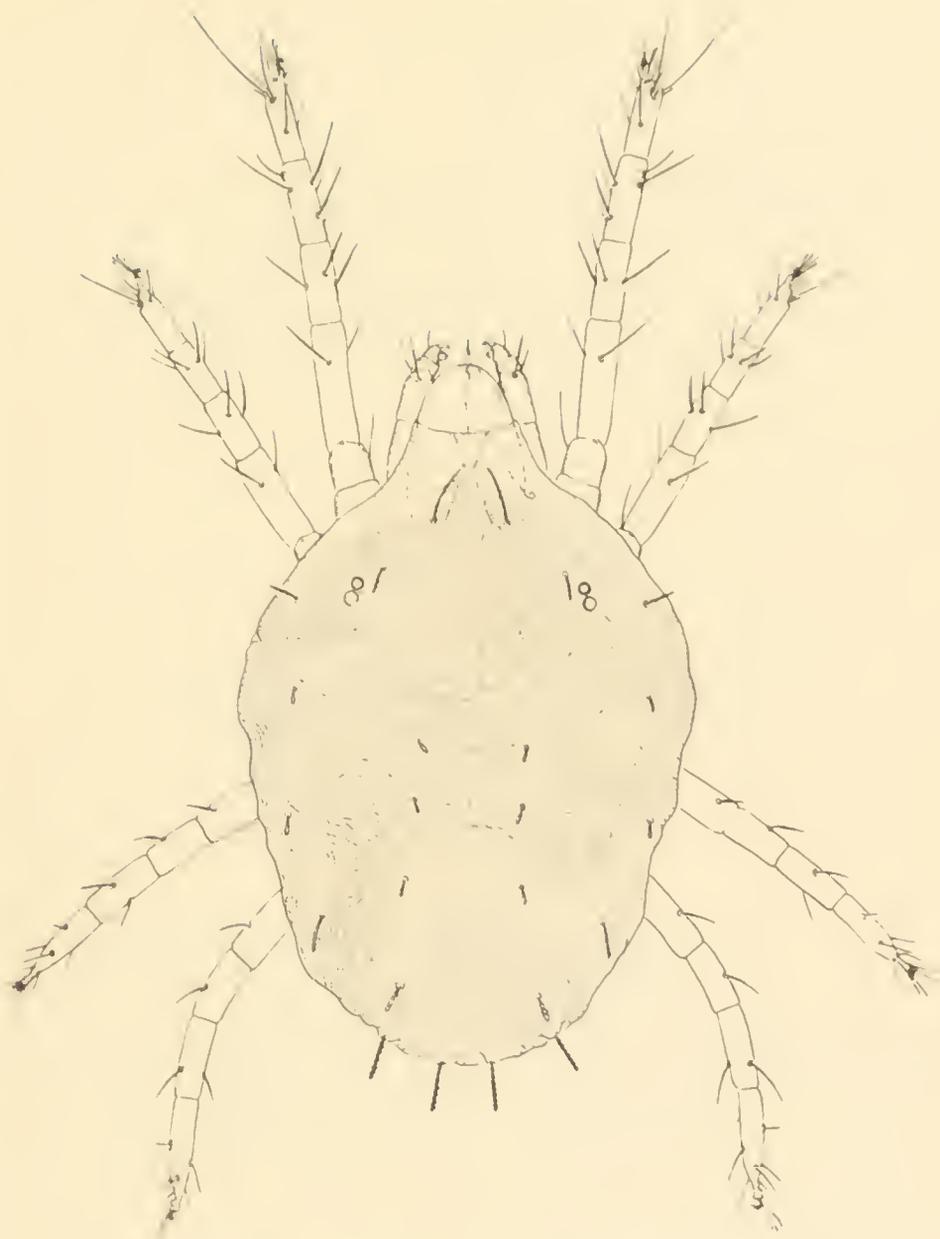


Fig. 118. *Eotetranychus thujae*: dorsal aspect of female, Maryland, arbor vitae.

be slightly proximal. The aedeagus of *Eotetranychus libocedri* is distinctive. It consists of a simple rod slightly narrowing distally and laterally emarginate at the tip.

This species is known from cupressaceous conifers in the western and southwestern United States. In addition to the types, specimens have been studied from Danville, California (A. E. Pritchard), on *Thuja* sp. and *Cupressus* sp.; Murietta, California (A. E. Pritchard), on Italian cypress; Camp Nelson, California (E. W. Baker), on incense cedar; San Diego, California (D. F. Palmer), on cypress; Yakima, Washington

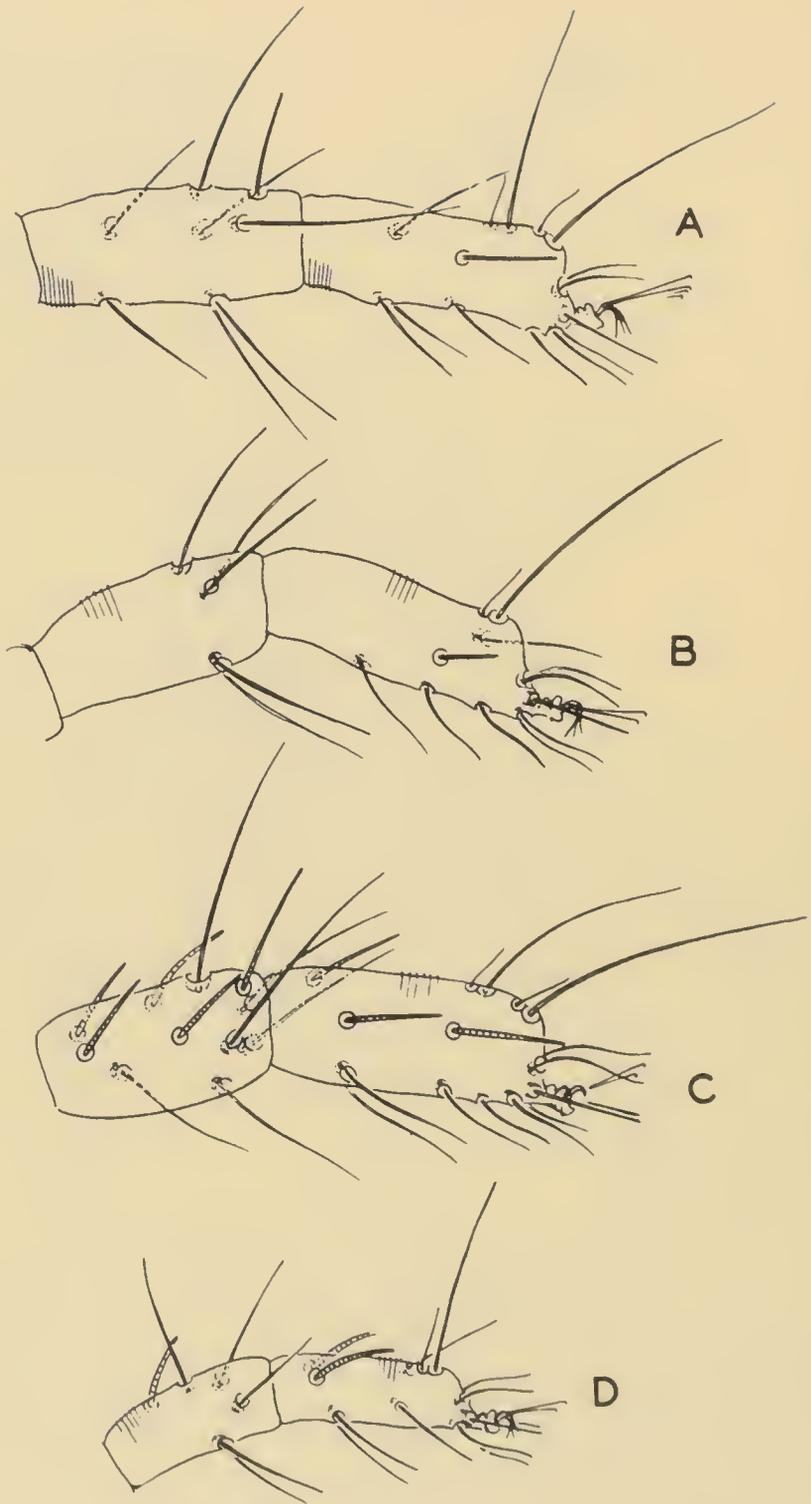


Fig. 119. *Eotetranychus thujae*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male; all from type material.



Fig. 120. *Eotetranychus thujae*: aedeagus.

(E. W. Baker), on arborvitae; Utah (G. F. Knowlton), on juniper; and Ysleta, Texas (P. Netterville), on Arizona cypress.

Eotetranychus thujae (McGregor), new combination
(Figures 118, 119, 120)

Tetranychus thujae McGregor, 1950, Amer. Midl. Nat., 44(2): 303. Types: males and females, Monticello, Florida, on arborvitae and "evergreens"; in the U. S. National Museum.

Eotetranychus thujae is closely allied to *E. libocedri*, and the adults similarly have very short dorsocentral hysterosomals. However, these setae are enlarged near the distal end, and the leg chaetotaxy and the aedeagus are considerably different. There is variation in the length of the second and third dorsal propodosomals. Tibia I of the female bears seven tactile and one sensory setae, and tarsus I bears three (or four) tactile setae that are definitely proximal to the duplex setae. Tarsus I of the male similarly bears three tactile and one sensory setae proximally. The tarsus is abruptly declivate just beyond the duplex setae, and the two ventral tactile and one lateral sensory setae accompanying the duplexes may appear to be placed slightly more proximally. The aedeagus is distinctive in that it consists of a sharply



Fig. 121. *Eotetranychus multidigituli*: dorsal aspect of female.



Fig. 122. *Eotetranychus multidigituli*: A.) tibia and tarsus I of female, with enlargement of appendages; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male, with enlargement of appendages of tarsus I.

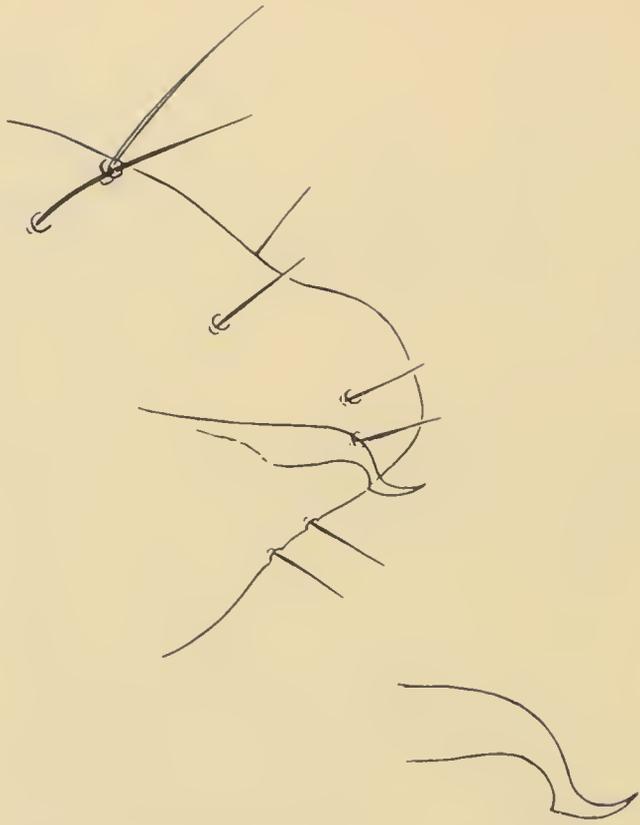


Fig. 123. *Eotetranychus multidigituli*: aedeagus.

narrowed rod, forming a fingerlike distal end that is broadly rounded at the tip.

This species is known from the eastern and southwestern United States on cupressaceous conifers. In addition to the types, specimens have been examined from Beltsville, Maryland (E. W. Baker), on arborvitae; St. Petersburg, Florida (E. W. Baker), on juniper; Williana, Louisiana (L. D. Newsom), on *Juniperus virginiana*; and Oklahoma City, Oklahoma (A. E. Pritchard), on juniper. McGregor also recorded specimens from Alabama.

Eotetranychus gibbosus (Canestrini), new combination

Tetranychus gibbosus Canestrini, 1889, Atti Reale Ist. Veneto Let. Sci. Arti (ser. 6), 7(2): 501; Berlese, 1886, Acari, Myr. Scorp., 72, no. 7. Described from specimens from Trentino and Padova, Italy, on conifers.

Subfamily Tetranychinae Berlese

Platytetranychus gibbosus, Oudemans, 1931, Ent. Ber., 8(178): 224;
Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 45.

The original description and Canestrini's illustration indicate that *gibbosus* is allied to *Eotetranychus thujae* and *E. libocedri*. Berlese's illustration also indicates that it may be a member of this group, even though his specimen could represent *Paratetranychus ununguis*.

Oudemans apparently based his description of the genus *Platytetranychus* on Berlese's poor figure, and he considered the postanals to be absent in his key (1931). Geijskes (1939) followed Oudemans in considering the absence of these setae to be a key character.

Definite identification of this species must be based on topotype material.

Multidigituli Group

Adults of the Multidigituli Group may be differentiated from other members of the genus by having the peritreme forming an anastomosing chamber distally, together with having the dorsocentral hysterosomals shorter than the longitudinal intervals between them.

Tibia I bears seven tactile plus one sensory setae in the female, seven tactile plus four or five sensory setae in the male; tibia II bears five tactile setae in the female and an additional two sensory setae in the male; tibia III bears five tactile setae in both sexes. Tarsus I is abruptly declivate distally, and it bears three tactile setae proximally, with one sensory seta in the female and three sensory setae in the male.

The aedeagus is distinctive in that it bends sharply ventrad and forms a distal knob the distal angulation of which is much longer than the anterior angulation.

The palpus bears three tactile and four sensory setae as is typical of the family.

The Group contains a single species.

Eotetranychus multidigituli (Ewing), new combination
(Figures 121, 122, 123)

Tetranychus multidigituli Ewing, 1917, Jour. Econ. Ent., 10(5): 497;
McGregor, 1919, Proc. U. S. Natl. Mus., 56(2303): 654; McGregor,
1950, Amer. Midl. Nat., 44(2): 306. Types: five females, Wooster,
Ohio, on *Gleditsia triacanthos*; in the U. S. National Museum.

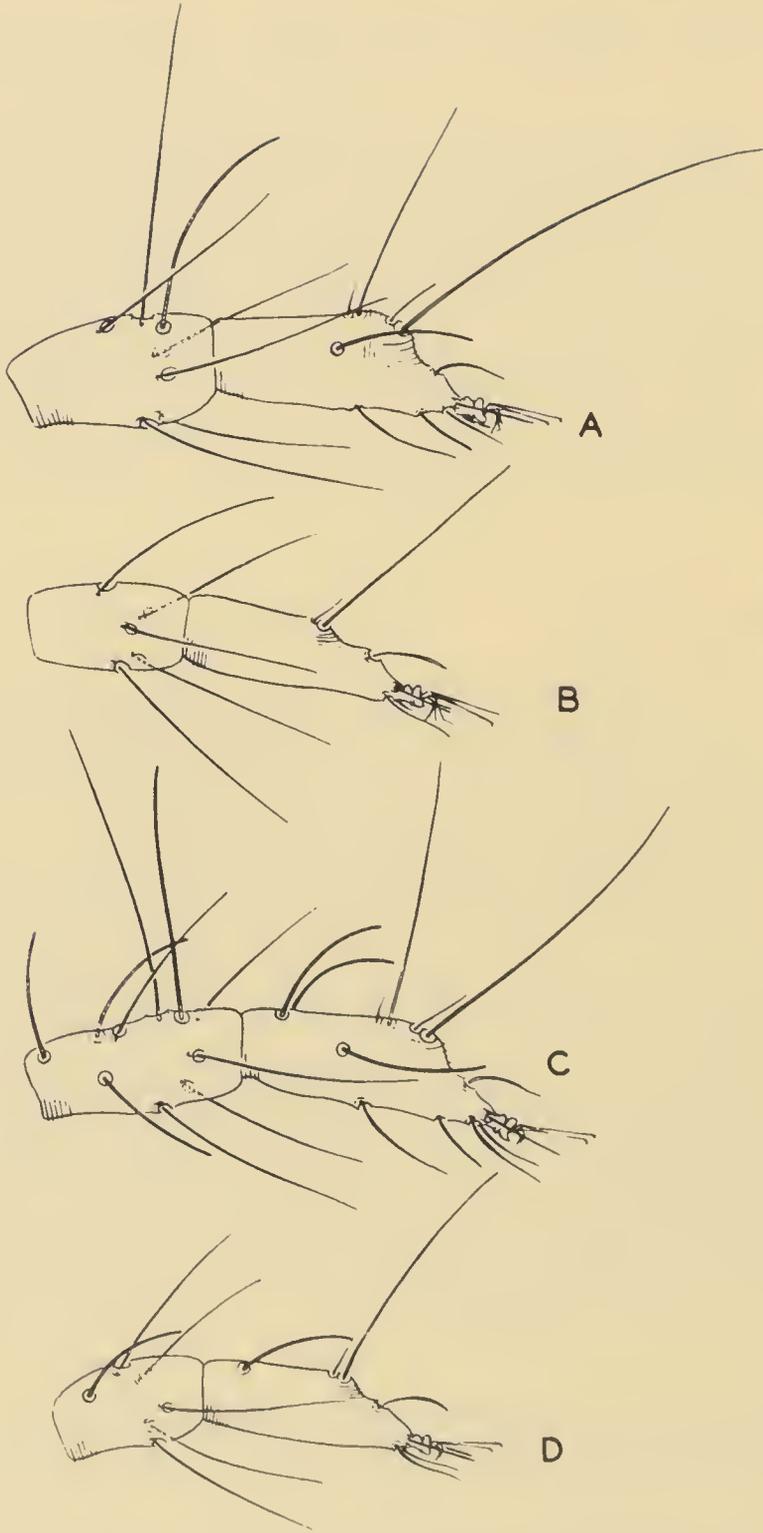


Fig. 124. *Eotetranychus steganus*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

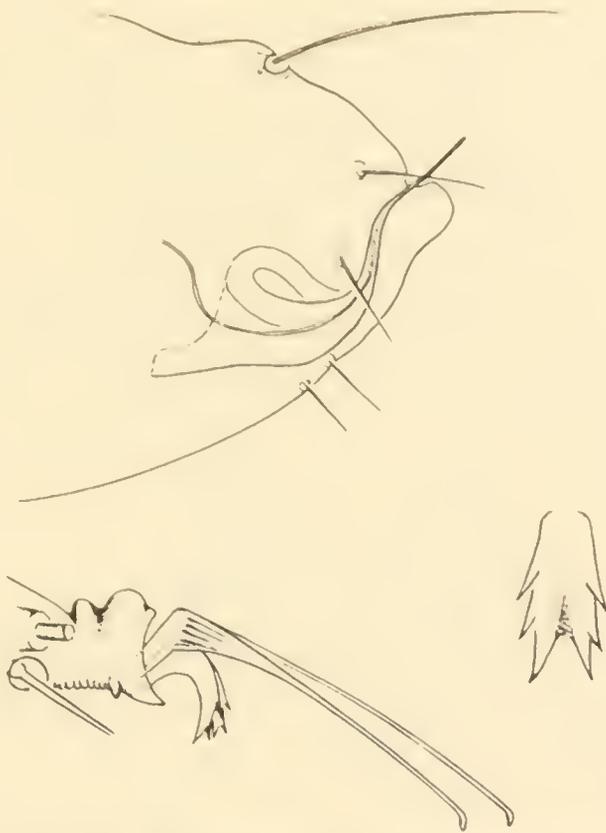


Fig. 125. *Eotetranychus steganus*: aedeagus; and appendages of tarsus I of male with dorsal view.

Tetranychus ellipticus Garman, 1940, Bul. Conn. Agr. Exp. Sta., 431: 83; McGregor, 1940, Amer. Midl. Nat., 44(2): 284. *Types*: males and females, New Haven and Glastonbury, Connecticut, on *Gleditsia triacanthos*; in the collection of the Connecticut Agricultural Experiment Station. *New synonymy*.

There is some variation in the length of the dorsal setae of the body of this species, and they are not widened proximally (as indicated in Garman's illustration). In specimens from the northeastern United States the dorsocentral hysterosomals are longer and possibly more pubescent than in specimens from the midwestern and southern states.

Eotetranychus multidigituli is known only from honey locust, *Gleditsia triacanthos*, occurring under the leaves.

The types of both *multidigituli* and *ellipticus* (kindly loaned by Dr. Garman) have been studied, as well as collections from Hamden, Connecticut (Philip Garman), on honey locust; Washington, D. C. (E. W. Baker),

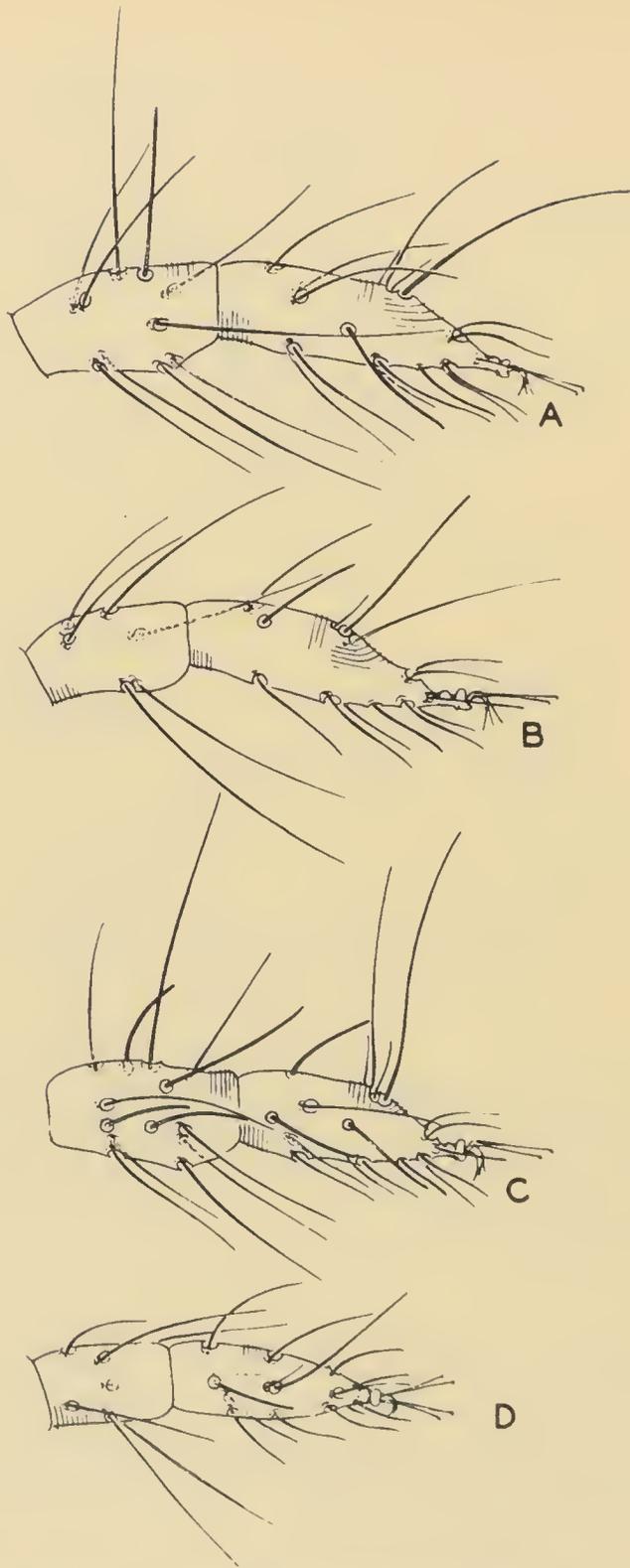


Fig. 126. *Eotetranychus clitus*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

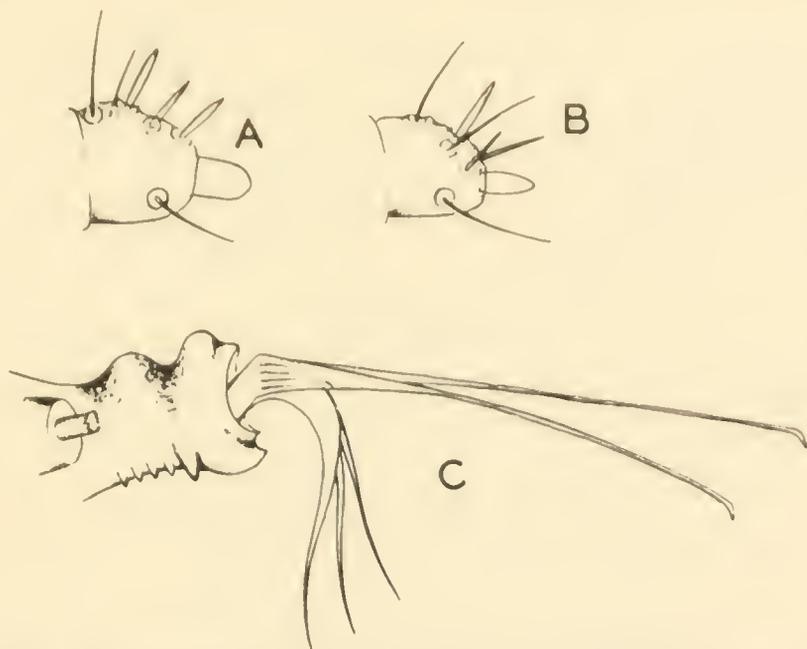


Fig. 127. *Eotetranychus clitus*: A.) terminal segment of palpus of female; B.) terminal segment of palpus of male; C.) appendages of tarsus I of female.

on thornless honey locust; Durham, North Carolina (Bruce Boudreaux), on honey locust; and Natchitoches, Louisiana (L. D. Newsom), on honey locust.

Steganus Group

The *Steganus* Group resembles the *Tiliarium* group in that the dorsal setae of the body are all long, slender, and tapering. However, tibia II possesses only five, rather than eight, tactile setae, and there are very few setae on tarsus I. The aedeagus is also distinctive in forming a long, dorsally bent stylet.

This group is recognized on the basis of a single species that occurs on palmetto in Florida.

Eotetranychus steganus Pritchard and Baker, new species

(Figures 124, 125)

Female.—Rostrum reaching beyond middle of femur I. Palpus with terminal sensillum small and slender. Stylophore emarginate anteromedially. Tibia I with six tactile and one sensory seta; tarsus I with a single sensory seta proximal to duplex setae and with a single, ventral



Fig. 128. *Eotetranychus clitus*: aedeagus.

tactile seta at the level of the duplex setae; tibia II with five tactile setae; tibia III with three tactile setae. Empodium with three pairs of hairs, divergent almost from base. Dorsal integument with regular, parallel, dotted striae. Dorsal setae of body much longer than intervals between bases, slender and acutely tapering from near base, very finely pubescent. Length of body, 330μ ; including rostrum, 410μ .

Male.—Similar to female. Tibia I with six tactile and three sensory setae; tarsus I with three sensory setae proximal of duplex setae; tibia II with a sensory seta in addition to the five tactile setae. Aedeagus with external portion of shaft curved abruptly dorsal, the curved portion longer than the shaft, needle-like, and tapering. Length of body, 266μ ; including rostrum, 333μ .

Holotype.—Male, St. Petersburg, Florida, July 1, 1952 (E. W. Baker), on palmetto; type no. 2176 in the U. S. National Museum. *Paratypes*.—Seventy-seven females, 59 males, St. Petersburg, Florida, July 1, 3,

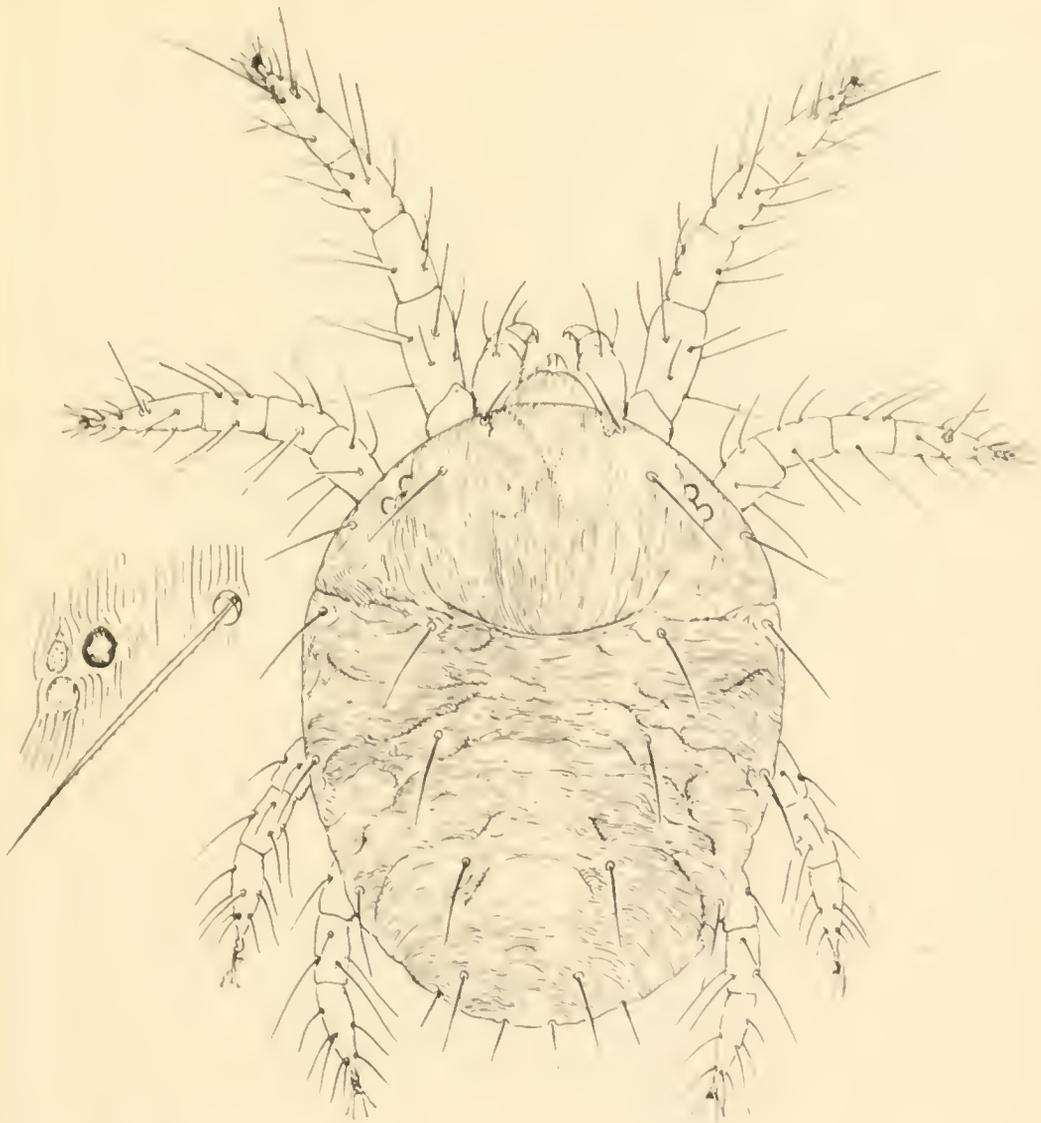


Fig. 129. *Eotetranychus muscicola*: dorsal aspect of female, Scotland.

and 11, 1952 (E. W. Baker), on palmetto; 2 females, 4 nymphs, Ponte Vedra, Florida, July 3, 1953 (A. E. Pritchard), on palmetto; 5 females, South Miami, Florida, July 9, 1953 (A. E. Pritchard), on palmetto; 3 males, 10 females, Miami, Florida, (E. W. Baker), on palmetto.

Clitus Group

The Clitus Group is based on a species that closely resembles *Eotetranychus deflexus*, and it is probable that the closest relationships are with that species. However, *E. clitus* is distinctive in having six tactile setae on tibia II.

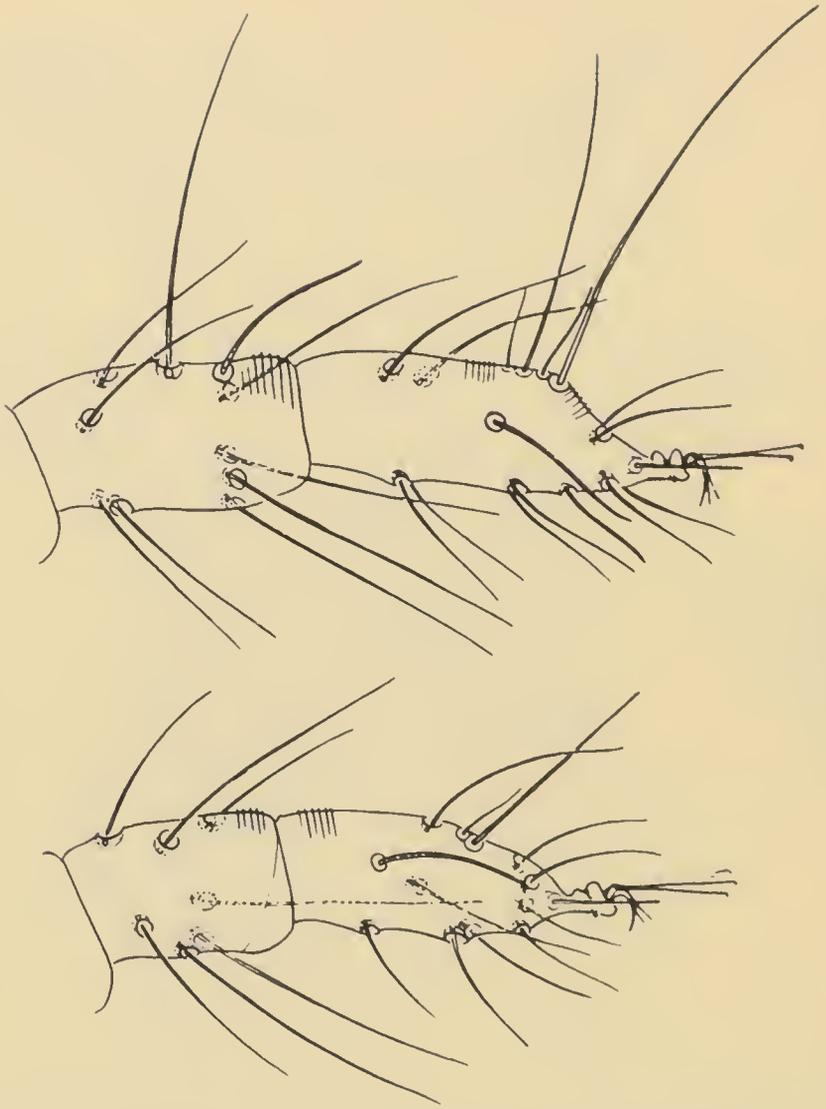


Fig. 130. *Eotetranychus muscicola*: above, tibia and tarsus I of female; below, tibia and tarsus II of female.

Eotetranychus clitus Pritchard and Baker, new species
(Figures 126, 127, 128)

The male of *Eotetranychus clitus* closely resembles that of *E. deflexus* in having the aedeagus tapering and abruptly declivate in a sigmoid curve. However, the distal segment of the palpus of this sex bears four sensory sensilla, the terminal sensillum being very long and slender.

The peritreme forms a strong hook distally, and the clunals of the female are much shorter than the inner sacrales.

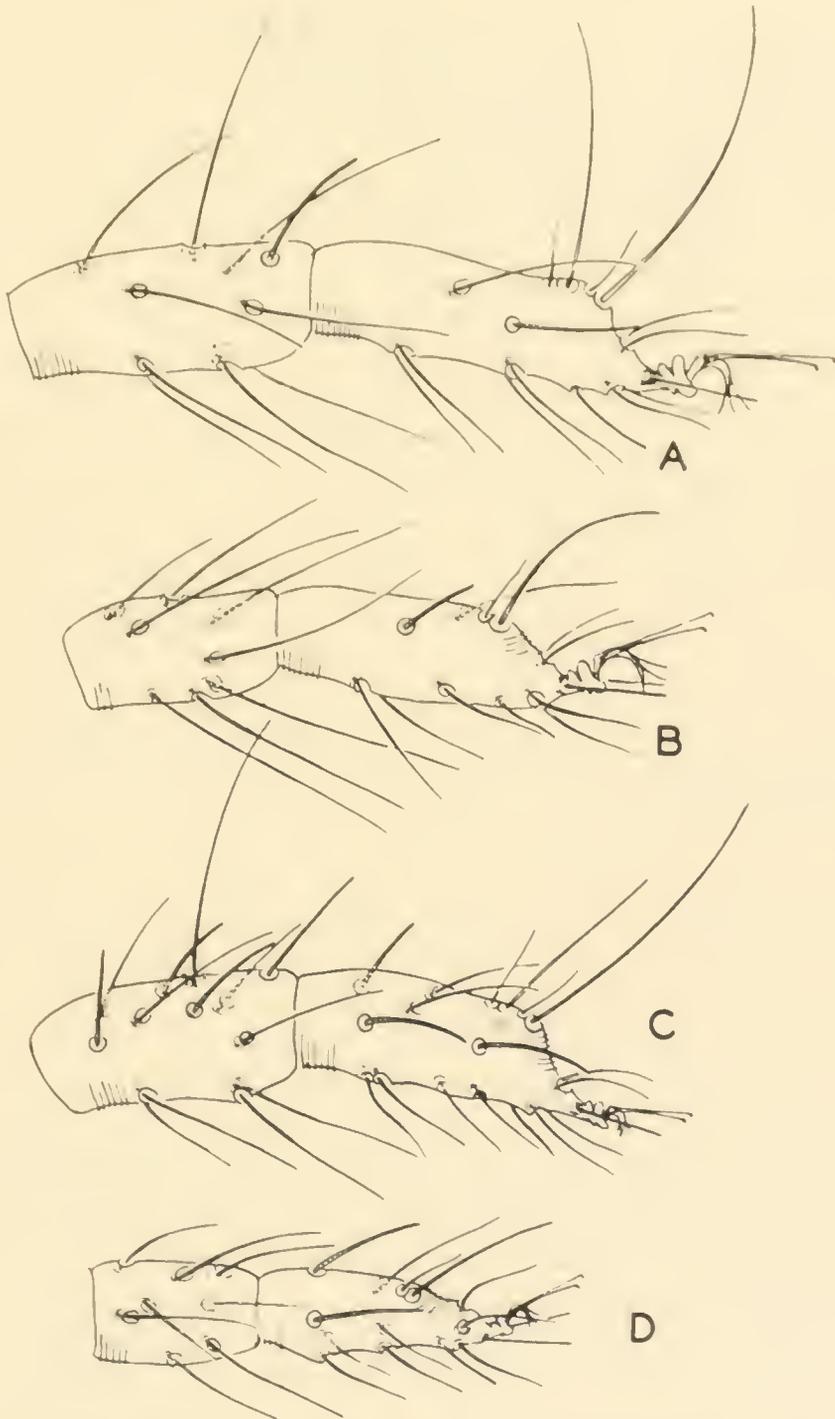


Fig. 131. *Eotetranychus perplexus*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

This species is known only from the southeastern United States, on low-growing hosts.

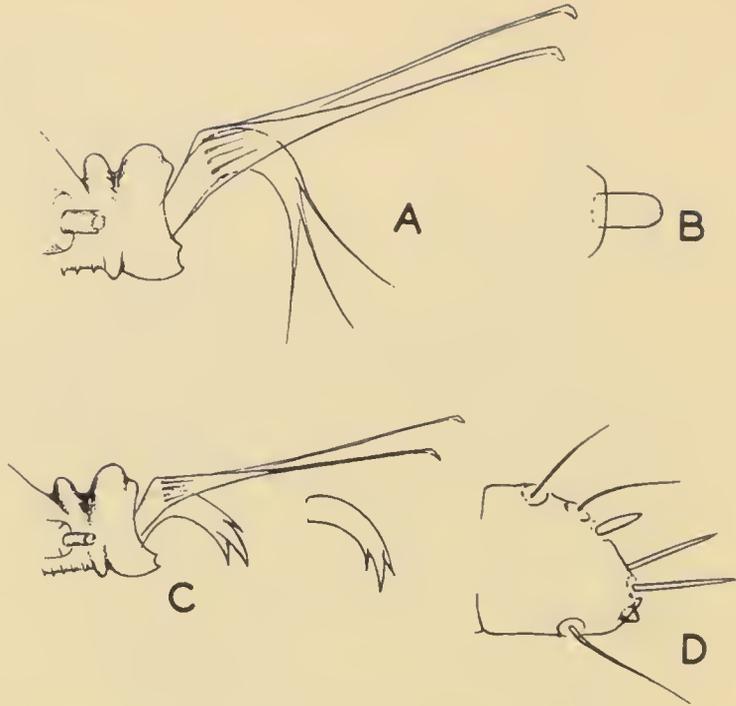


Fig. 132. *Eotetranychus perplexus*: A.) appendages of tarsus I of female; B.) terminal segment of palpus of female; C.) appendages of tarsus I of male; D.) terminal segment of palpus of male.

Male.—Palpus with terminal sensillum obconical, about three times as long as broad at base; proximal sensillum of last palpal segment slender, somewhat longer than the mediodorsal, tapering sensilla. Peritreme strongly retrorse distally. Tibia I with nine tactile and four (or three) sensory setae; tarsus I with four tactile and three sensory setae proximal to duplexes; empodium I with three pairs of short teeth. Tibia II with six tactile setae; tibia III with six tactile setae. Dorsal setae of body slender and tapering, considerably longer than longitudinal intervals between bases. Aedeagus bent ventrad near middle of shaft, the distal portion tapering and sigmoid. Length of body 280μ ; including rostrum 360μ .

Female.—Similar to male. Terminal sensillum on palpus twice as long as broad. Tibia I with nine tactile and one sensory setae; tarsus I with five tactile and one sensory setae proximal to duplexes. Clunal setae about two-thirds as long as outer sacral. Genital flap and area immediately anterior with transverse striae. Length of body 366μ ; including rostrum 433μ ; greatest width of body 253μ .

Holotype.—Male, Leesburg, Florida, June 29, 1948 (R. A. Lafler), on azalea; type no. 2177 in the U. S. National Museum. *Paratypes*.—Sixty-one females, 2 nymphs, Winter Garden, Florida, March 29, 1948



Fig. 133. *Eotetranychus perplexus*: aedeagi.

(O. D. Link), on blackberry; 3 males, 11 females, Leesburg, Florida, June 29, 1948 (R. A. Lafler), on azalea; 13 females, Raleigh, North Carolina, May 28, 1950 (C. F. Smith), on azalea; 19 females, Frost Proof, Florida, April 20, 1951 (A. C. Baker), on passion flower; 8 females, Baton Rouge, Louisiana, May 22, 1951 (L. D. Newsom), on blackberry; 3 females, 1 larva, Corey, Louisiana, July 8, 1952 (J. S. Roussel), on *Rubus* sp.

Tiliarium Group

Members of the Tiliarium Group may be recognized by having eight tactile setae on tibia II.

The species are, for the most part, very closely allied, and a lateral

view of the aedeagus is usually necessary for identification. Differences in the length of the dorsal setae, the terminal sensillum of the palpus, the termination of the peritreme, the comparative length of components of the duplex setae, and ventral striations of the opisthosoma are characters sometimes useful for separation of the females on a local basis.

Eotetranychus muscicola (Oudemans), new combination
(Figures 129, 130)

Apotetranychus muscicola Oudemans, 1931, Ent. Ber., 8(178): 234; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 33.
Type: female, Arnhem, Holland, from moss; in the Rijksmuseum van Natuurlijke, Leiden, Holland.

The female of *muscicola* differs from other members of the genus *Eotetranychus* that have nine tactile and one sensory setae on tibia I and eight tactile setae on tibia II by having only four tactile (and one sensory) setae proximal to the duplexes on tarsus I, together with having the body broadly rounded with the dorsal setae somewhat shorter than longitudinal intervals between them. The male is unknown.

This species has been known from a single female collected in Holland, on moss. A number of females from Scotland (at Hoboken, New Jersey quarantine, Perlmutter) were intercepted on *Calluna* sp.

Eotetranychus georgicus (Reck), new combination

Apotetranychus georgicus Reck, 1948, Trudy Zool. Inst. Akad. Nauk Gruz. S.S.R., 8. Described from specimens from Georgia, S.S.R., on *Rhamnus pallasii*.

We have not seen the original description of *Apotetranychus georgicus*. However, the outstanding conception of tetranychid phylogeny, which is expressed in the articles by Reck that we have been able to see, indicates that he understands the basic principles of relationships within the family. Reck's keys (1950, 1952), indicate that his conception of *Apotetranychus* is similar to that of *Eotetranychus*, and we, therefore, make the new combination. Our own studies invalidate a distinction between these related genera on a basis of dorsal tubercles on the body, the shape of the dorsal setae, or the shape of the alveoli bearing the dorsal setae.

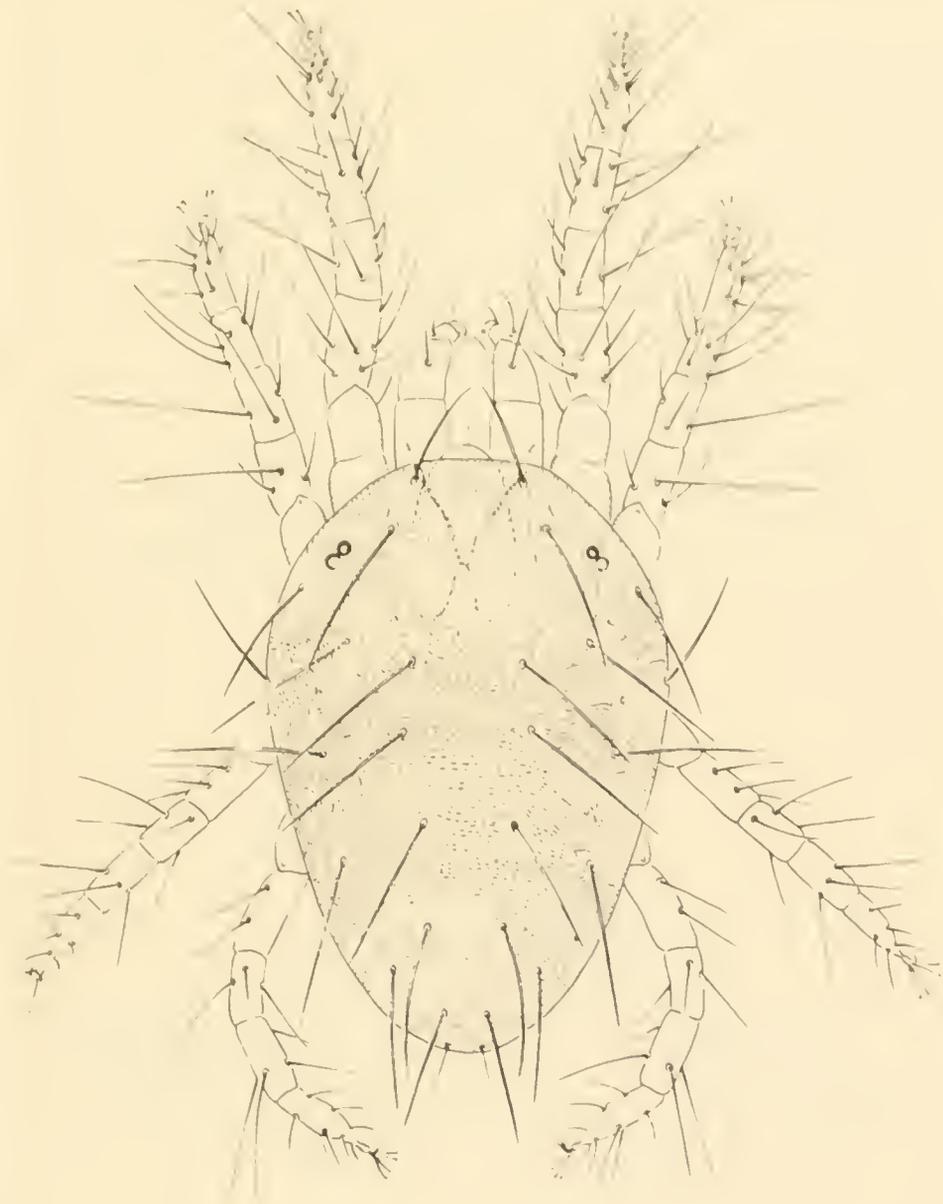


Fig. 134. *Eotetranychus carpini borealis*: dorsal aspect of female.

Eotetranychus perplexus (McGregor), new combination
(Figures 131, 132, 133)

Tetranychus perplexus McGregor, 1950, Amer. Midl. Nat., 44(2): 298.

Types: males and females, Lebec, California on *Salix* sp.; in the U. S. National Museum.

The female of *Eotetranychus perplexus* agrees with most members of the genus in that there are nine tactile and one sensory setae on tibia

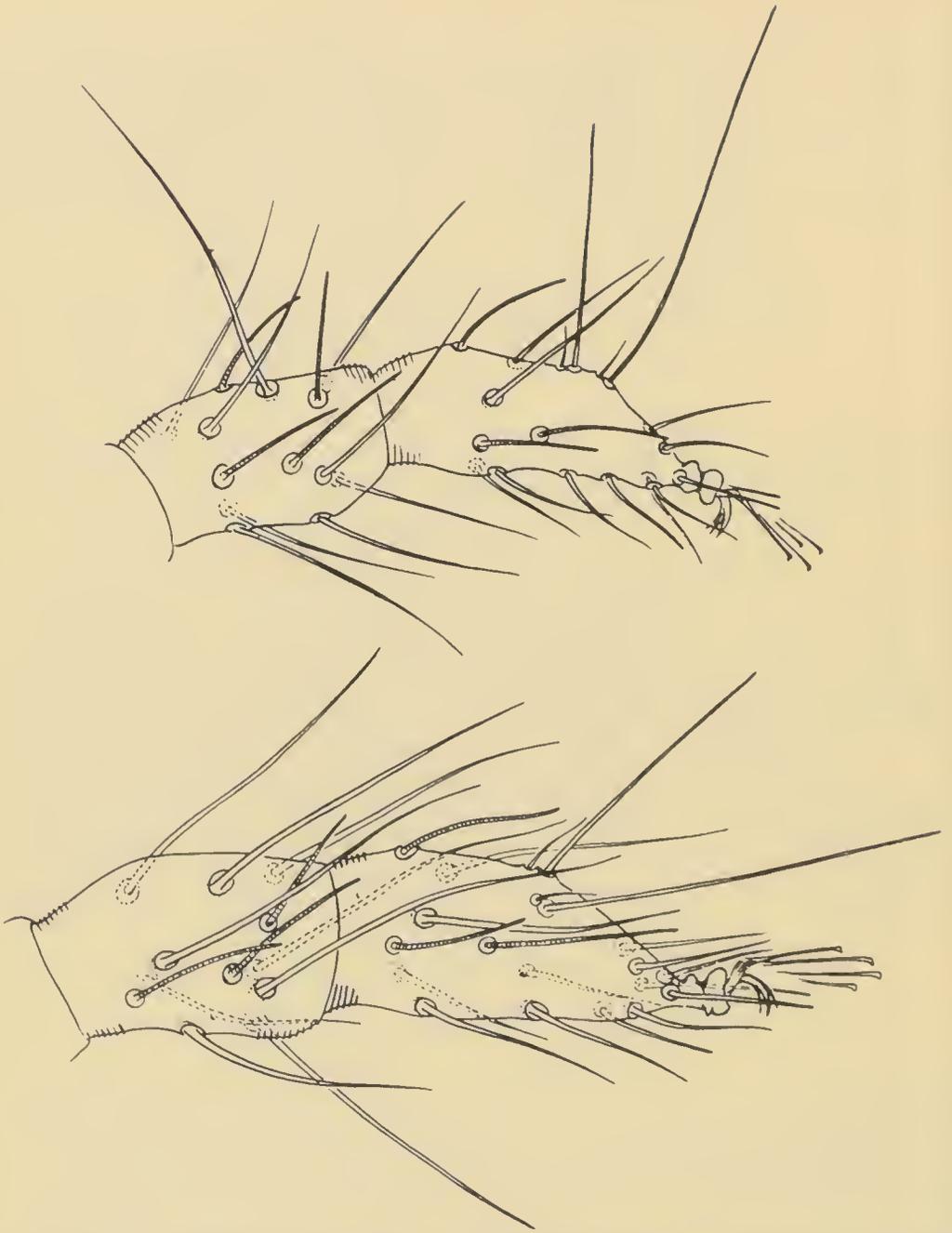


Fig. 135. *Eotetranychus carpini*: above, tibia and tarsus I of male *E. carpini borealis*; below, tibia and tarsus I of male, Hamden, Connecticut.

I and eight tactile setae on tibia II. However, it agrees with *E. muscicola* in that there are only four tactile (and one sensory) setae on tarsus I proximal to the duplexes. In contradistinction to *E. muscicola*, the body is slender, with the dorsal setae longer than the intervals between them, and thus resembling most of the Tiliarium Group. Females are sometimes found in association with *Eotetranychus willamettei* from

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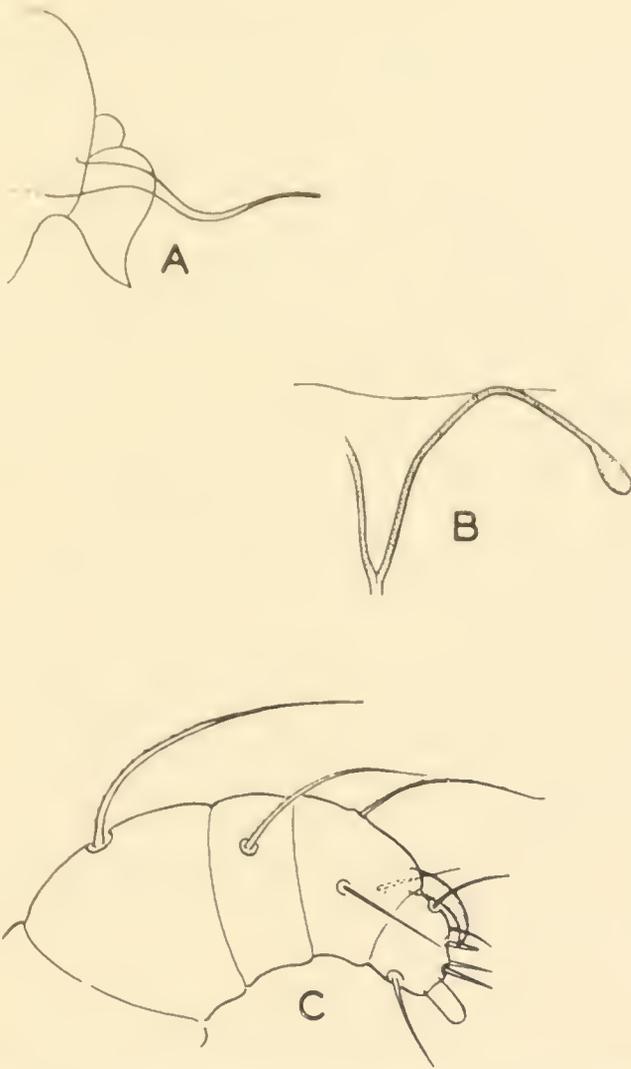


Fig. 136. *Eotetranychus carpini borealis*: A.) aedeagus; B.) peritreme; C.) palpus of female.

which they may be separated by having the peritreme bent or hooked, not straight, distally.

The male may be readily recognized by having the aedeagus flaring at the distal end to form a dorsal and a ventral angulation.

Collections, in addition to the types, that have been studied from California are labelled: Hatcreek (A. E. Pritchard), on *Purshia tridentata*; Modesto (A. E. Pritchard), on willow; Wasco and Bakersfield (G. L. Smith), on willow; Tulare County (Y. H. Schweers), on willow; Camp Nelson (E. W. Baker), on mountain mahogany; and Ridge Route, Frenchman Flat (E. W. Baker), on willow. Other specimens studied are from Satus Pass, Washington (E. J. Newcomer), on *Prunus emarginatus*; Blewelt Pass, Washington (E. W. Baker), on *Purshia* sp.; and Basseaux

Spider Mites

Lake, British Columbia (E. W. Baker), on *Purshia* sp. McGregor also recorded this species from Idaho, and he further noted *Cercocarpus* sp. as a host.

Eotetranychus tiliarium (Hermann)

Trombidium tiliarium Hermann, 1804, Mém. Apt., p. 42. Described from specimens from Straatsburg, France, on *Tilia* sp.

Tetranychus tiliarium, Koch, 1838, Deu. Crust. Myr. Arach., 17: 13; Hirst, 1920, Proc. Zool. Soc. Lond., 1920: 57; Hirst, 1924, Ann. Mag. Nat. Hist (ser. 9), 14: 622; Oudemans, 1931, Ent. Ber., 8(178): 235; Oudemans, 1937, Krit. Hist. Overz. Acar., 3(C): 1051.

Tetranychus minimus Targioni Tozzetti, 1878, Ann. Agric., 1: 247. Described from specimens from Italy, on *Tilia Europaea*. *New synonymy*.

Tetranychus telarius, Hirst, 1920, Proc. Zool. Soc. Lond., 1920: 57; Oudemans, 1930, Ent. Ber., 8(175): 166. Zacher, 1921, Z. ang. Ent., 7: 186. Oudemans, 1937, Krit. Hist. Overz. Acar., 3(C): 1045. *Misidentification*.

Eotetranychus telarius, Oudemans, 1931, Ent. Ber., 8(178): 225; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(3): 31; Reck, 1948, Soobsch, Akad, Nauk Gruz. S.S.R. 8(9-10): 373. *Misidentification*.

The male of *Eotetranychus tiliarium* may be recognized by having the aedeagus very long and slender, straight, and tapering to the tip.

The female bears nine tactile and one sensory setae on tibia I; eight tactile setae on tibia II; and five tactile and one sensory setae proximal to the duplexes on tarsus I. As in all other species having this count of leg setae, the body is small and slender with long and slender dorsal setae. As is usually the case with related species, the end of the peritreme is hooked or angulate at the distal end (however, Zacher describes a simple bulb).

Hermann (1804) may be considered the first reviser, inasmuch as he proposed the specific name *tiliarium* for the linden mite and used the specific name *telarius* for the common spinning mite of Europe. It is true that Hermann was not entirely clear on his separation of the two species. However, Koch (1838) restricted the specific name *tiliarium* to the linden mite, and there appears to be little justification for substitution of the Linnaean specific name *telarius* for this mite as proposed by Oudemans (1931) and used by certain of his followers.

Subfamily Tetranychinae Berlese

The synonymy of *minimus* with *tiliarium* is based primarily on the host and the figure of the leg and empodium that was presented by Targioni Tozzetti.

Specimens studied are from Germany, on *Tilia* sp., kindly submitted by F. Zacher. Other authentic records are all from Europe on trees such as maple, sycamore, horse-chestnut, hawthorne, hazel, and willow. A collection too recent to be included in the key was made from *Tilia* sp., July 9-19, Amherst, Massachusetts (W. B. Becker).

Eotetranychus carpini (Oudemans)

(Figures 134, 135, 136)

Tetranychus carpini Oudemans, 1905, Tijds. Ent., 48: LXXIX; Oudemans, 1910; Bul. Ent. Res., 1: 114; Oudemans, 1915, Arch. Naturg., 81 (5): 44; Hirst, 1920, Proc. Zool. Soc. Lond., 1920: 56; Zacher, 1921, Z. ang. Ent., 7: 185. *Type*: male, Beuel, near Bonn, Holland, on *Carpinus betulus*; represented only by a figure in the Rijksmuseum van Natuurlijke Historie, Leiden, Holland.

Eotetranychus carpini, Oudemans; 1931, Ent. Ber., 8(131): 290; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 32.

Tetranychus borealis Ewing, 1913, Ann. Ent. Soc. Amer., 6: 457; McGregor, 1919, Proc. U. S. Natl. Mus., 56(2303): 658; McGregor, 1950, Amer. Midl. Nat., 44(2): 306. *Types*: males and females, from the Coast Range Mountains, Benton County, Oregon; on *Spiraea* sp.; in the U. S. National Museum.

Eotetranychus carpini borealis, Pritchard and Baker, 1952, Hilgardia, 21(9): 261.

Tetranychus flavus Ewing, 1913, Ann. Ent. Soc. Amer., 6: 458; McGregor, 1909, Proc. U. S. Natl. Mus., 56(2303): 654; McGregor, 1950, Amer. Midl. Nat., 44(2): 286. *Types*: males and females, Hood River, Oregon, on apple; in the U. S. National Museum.

Tetranychus oregonensis McGregor, 1917, Proc. U. S. Natl. Mus., 51(2167): 585; McGregor, 1919, Proc. U. S. Natl. Mus., 56(2303): 661; McGregor, 1950, Amer. Midl. Nat., 44(2): 295. *Types*: males and females, Portland, Oregon, on wild cherry; in the U. S. National Museum.

Tetranychus monticolus McGregor, 1917, Proc. U. S. Natl. Mus., 51(2167): 584; McGregor, 1919, Proc. U. S. Natl. Mus., 56(2303): 662; McGregor, 1950, Amer. Midl. Nat., 44(2): 293. *Types*: males and females, Mount Hood, Oregon, on *Vaccinium* sp.

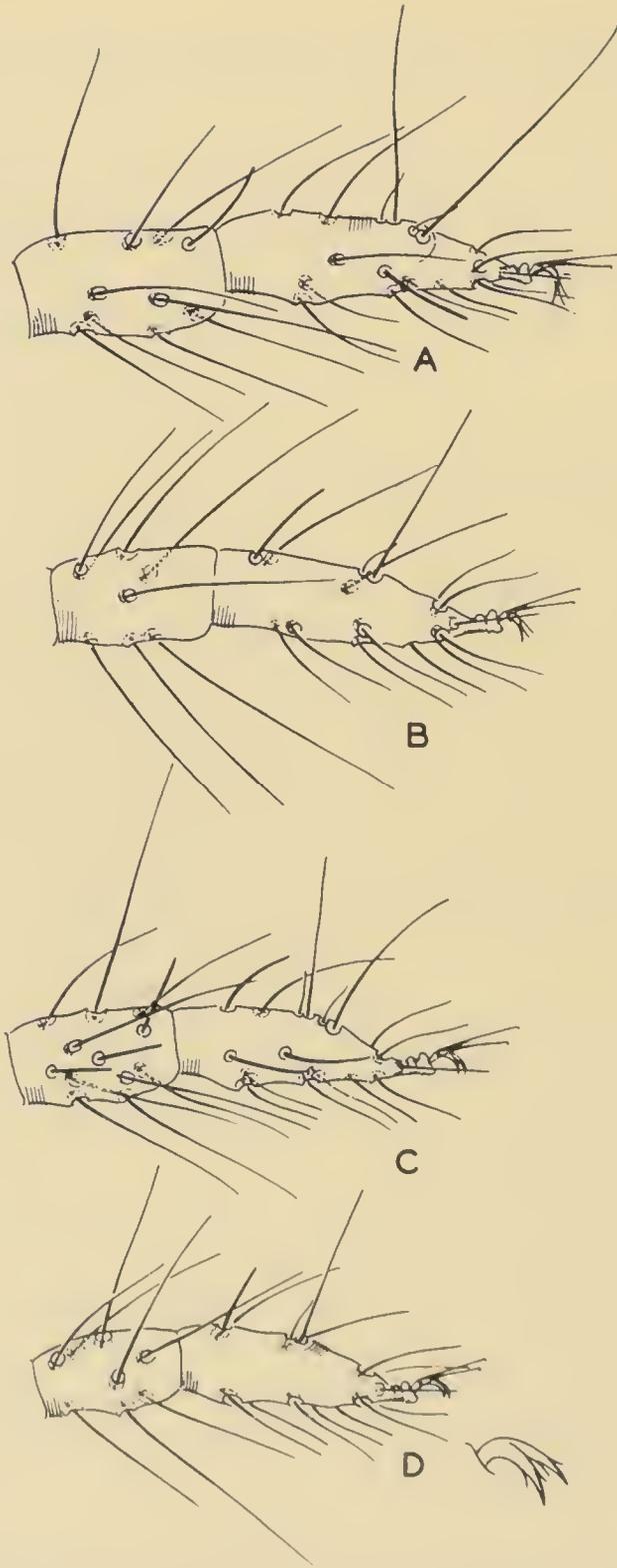


Fig. 137. *Eotetranychus coryli*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

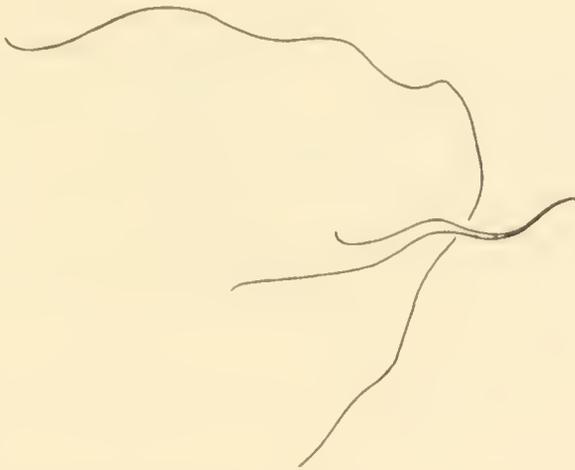


Fig. 138. *Eotetranychus coryli*: aedeagus.

Tetranychus willamettei, Garman, 1940, Bul. Conn. Agr. Exp. Sta., 431: 85. *Misidentification.*

Schizotetranychus (Eotetranychus) carpinula Reck, 1950, Trudy Inst. Zool. Akad. Nauk Gruz. S.S.R., 9: 131. Described from male and female, Gori and Lagodekhi, Georgia, S.S.R., on *Carpinus betulus*. *New synonymy.*

Schizotetranychus (Eotetranychus) pterocaryae Reck, 1950, Trudy Inst. Zool. Akad. Nauk Gruz. S.S.R., 9: 130. Described from male and female, Lagodekhi, Georgia, S.S.R., on *Pterocarya fraxinifolia*. *New synonymy.*

The peritremes of both *carpinula* and *pterocaryae* end in a simple bulb, and only the comparative size of the bulb was used to differentiate the two species. The other synonymy is based on the studies of Pritchard and Baker (1952).

The males of *Eotetranychus carpini*, *E. willamettei*, and *E. coryli*, *E. aesculi*, *E. viticola*, *E. uncatu*s, and *E. pruni*, form a complex in which each of the species has an aedeagus that is very long and slender, acutely tapering, and strongly undulate near the middle. Both sexes of *E. carpini* differ from *E. willamettei* by having the proximal member of each duplex very short in comparison with the distal member; and from the other species by having the distal end of the peritreme forming a simple bulb (not a fork as illustrated by Oudemans, 1915).

Males studied from England, on *Carpinus betulus*, have only one or two sensory setae (in addition to the nine tactile setae) on tibia I; whereas there are four sensory setae on tibia I of the males studied from the northwestern United States. Because of this discrepancy,

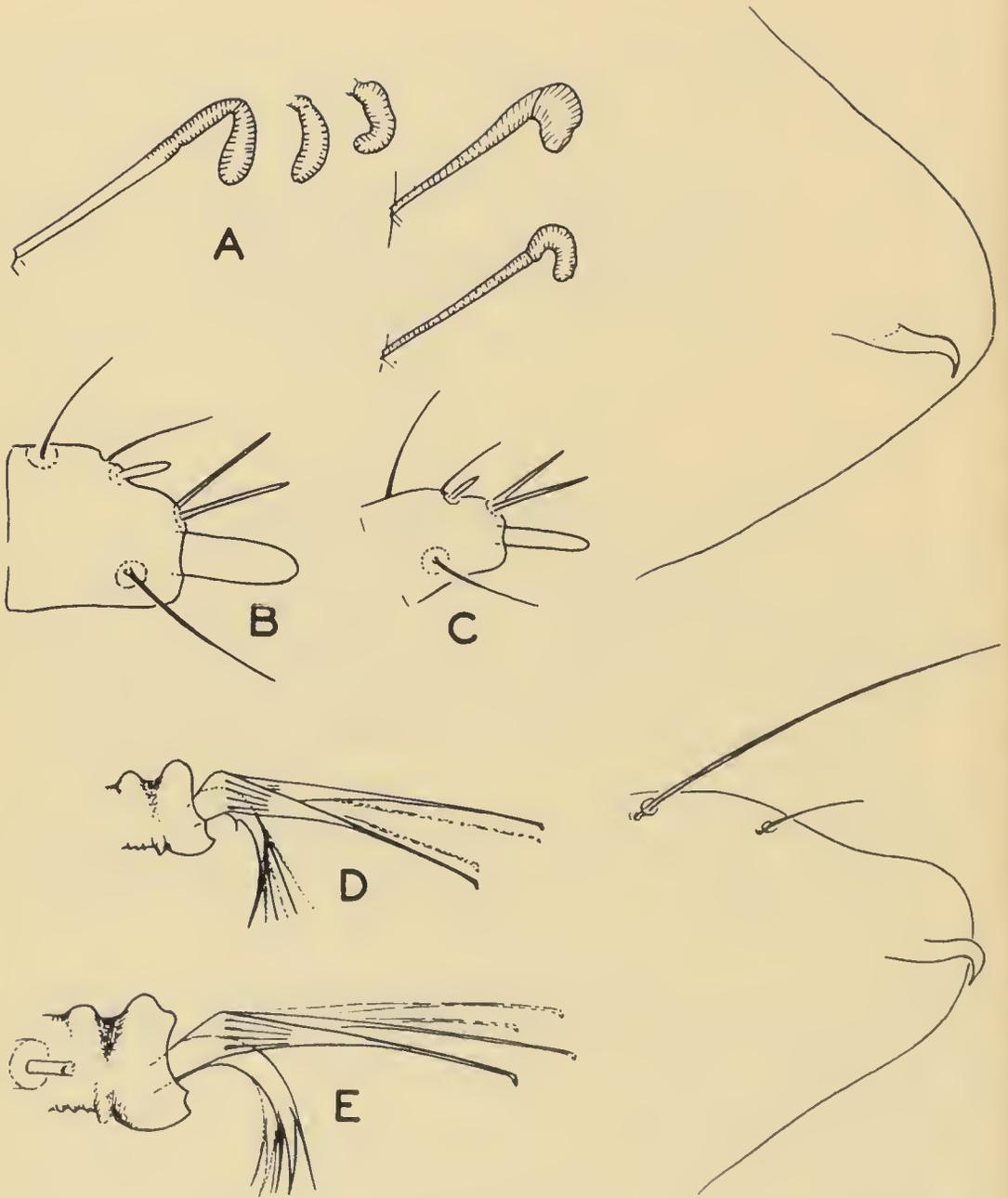


Fig. 139. *Eotetranychus coryli*: A.) terminations of the peritreme of specimens from Washington, D. C.; B.) terminal segment of the palpus of female; C.) terminal segment of male palpus; D.) appendages of tarsus I of female; E.) appendages of tarsus I of male.

Pritchard and Baker (1952) referred to the European form as *Eotetranychus carpini carpini* and that from the western United States as *E. carpini borealis*.

A third possible subspecies, or else a variation, occurs in the north-eastern United States. Specimens from Hamden, Connecticut (Philip

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Garman), on beech, differ from the two named forms in that tibia I of the male possesses three sensory setae, being intermediate between previously examined specimens.

Eotetranychus carpini carpini is recorded from Germany and England, on hornbeam, hazel nut, willow, maple, and alder.

Eotetranychus carpini borealis is known from British Columbia, Canada, to central California, where it is often a pest of apples and pears. Other hosts include cherry, raspberry, blueberry, spirea, alder, and willow.

Eotetranychus coryli (Reck), new combination

(Figures 137, 138, 139)

Schizotetranychus (*Eotetranychus*) *coryli* Reck, 1950, Trudy Inst. Zool. Akad. Nauk Gruz. S.S.R., 9: 130. Described from males and females, Staliniry, Gori, Telavi, and Lagodekhi, Georgia, S.S.R., on *Corylus avellana*.

The original description and figures of *coryli* indicate that this species differs from other members of the *carpini* complex in that the distal end of the peritreme is simply bent. The terminal sensillum of the palpus of the female is slender, about three times as long as broad.

Specimens examined from Washington, D. C., (E. W. Baker), on red maple, are tentatively referred to this species.

*Eotetranychus uncatu*s Garman

(Figure 3)

*Eotetranychus uncatu*s Garman, 1952, in Pritchard and Baker, Hilgardia, 21(9): 263. *Holotype*: male, Amherst, Massachusetts, on apple; in the collection of the Connecticut Agricultural Experiment Station.

*Eotetranychus uncatu*s is closely allied to *E. carpini* from which it differs only in having the distal end of the peritreme strongly U-shaped. Many specimens studied have shown no variation in this character. The terminal sensillum of the female palpus is two and one-half times as long as broad.

This species has recently been recognized as a serious pest of apples in Massachusetts and Connecticut. The only other specimens studied that are similar are from Utah, on white birch.

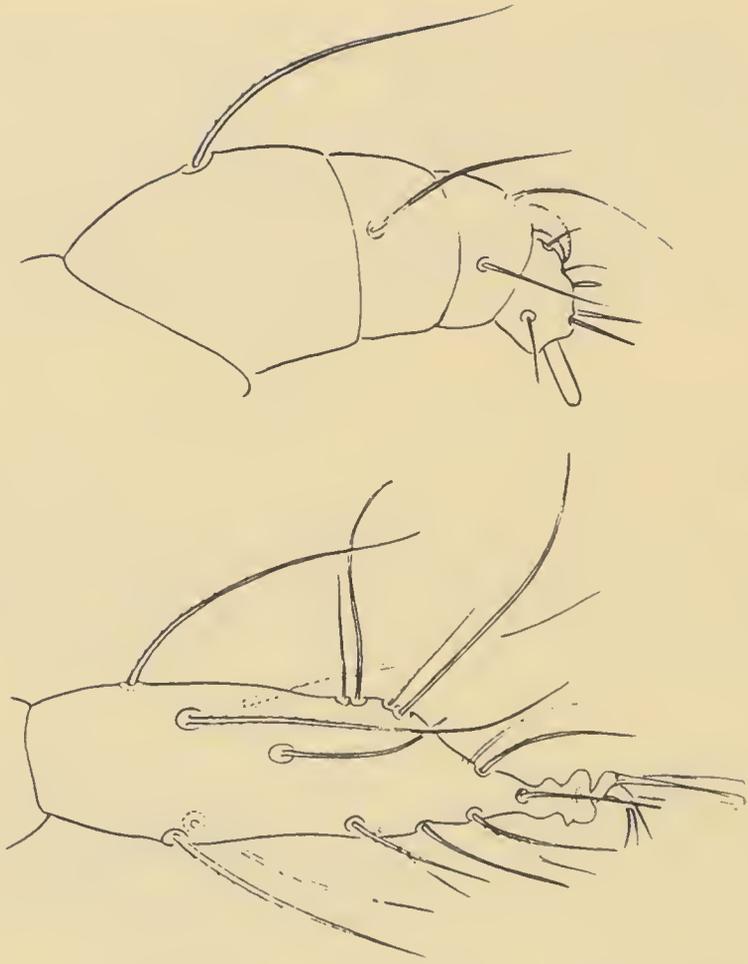


Fig. 140. *Eotetranychus willamettei*: palpus of female and tarsus I of female.

Eotetranychus aesculi (Reck), new combination

Schizotetranychus (*Eotetranychus*) *aesculi* Reck, 1950, Trudy Inst. Zool. Akad. Nauk Gruz. S.S.R., 9: 128. Described from males and females, Tiflis, Georgia, S.S.R., on street plantings of *Aesculus hippocastanum* and *Acer platanoides*.

Reck's description and figures of *aesculi* indicate that this may be a prior name for *Eotetranychus uncatius*, the peritreme being U-shaped distally. However, the terminal sensillum of the female palpus, as described and figured by Reck, is somewhat slenderer and narrows proximally.

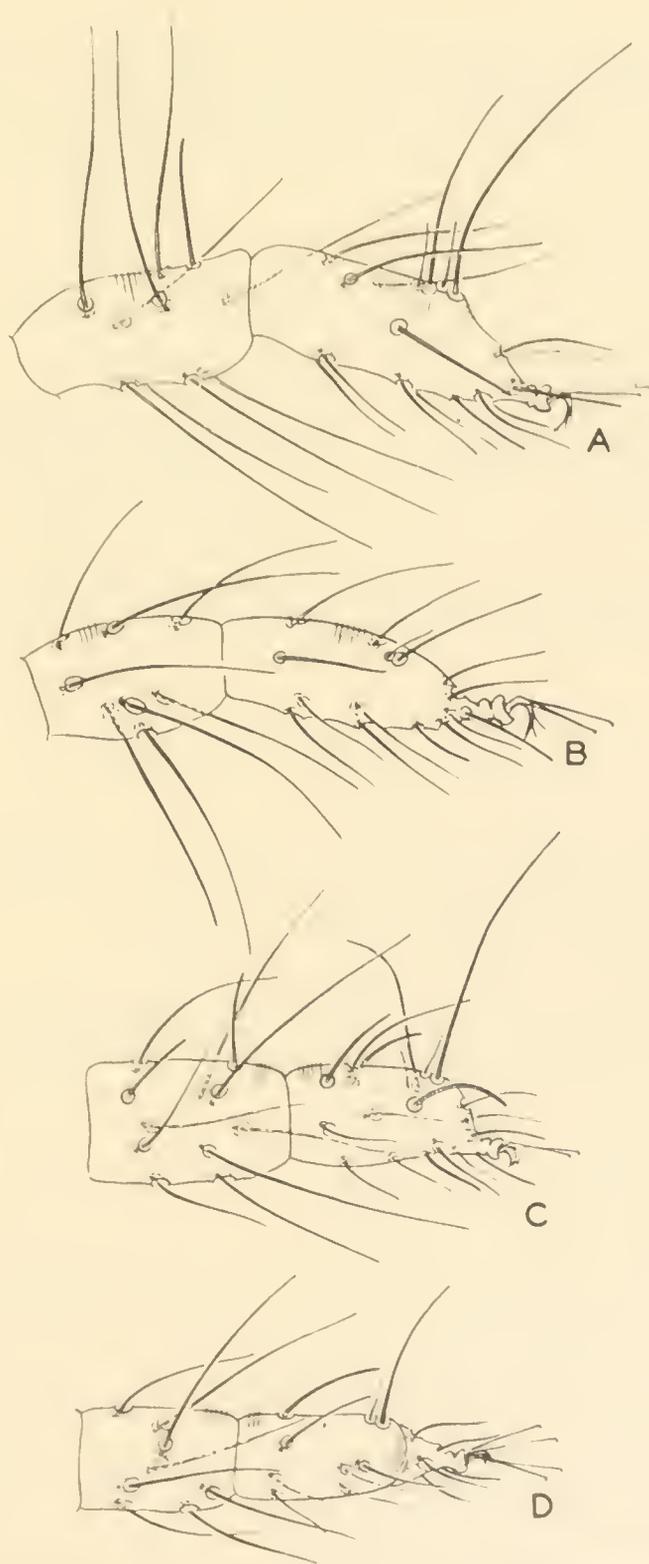


Fig. 141. *Eotetranychus populi*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

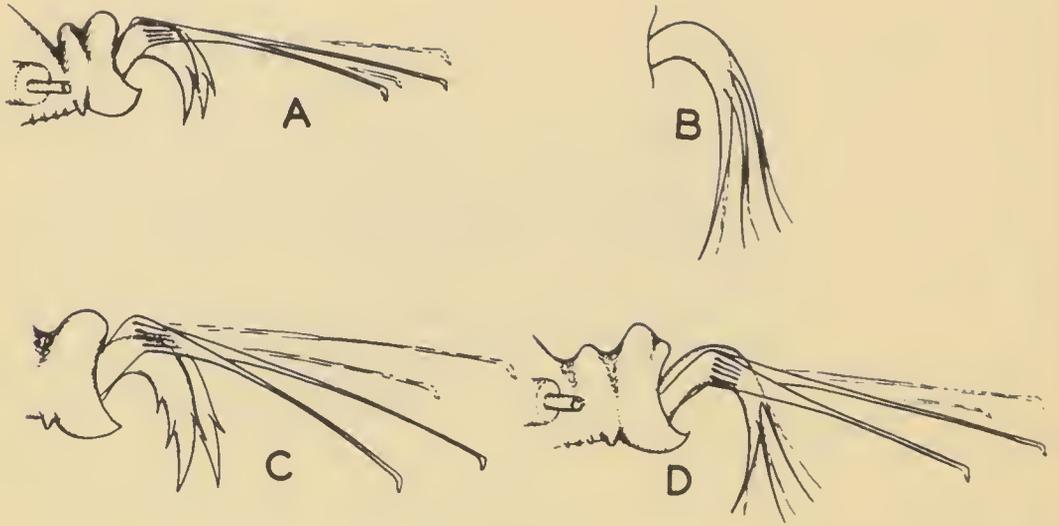


Fig. 142. *Eotetranychus populi*: A.) appendages of tarsus I of male; B.) empodium of tarsus IV of male; C.) appendages of tarsus II of male; D.) appendages of tarsus I of female.

Eotetranychus viticola (Reck), new combination

Schizotetranychus (*Eotetranychus*) *viticola* Reck, 1948, Soobsh. Akad. Nauk Gruz. S.S.R., 9(6): 374; 9(7): 446, 447. Described from specimens from Georgia, S.S.R., on grape.

The long, slender, tapering, undulate aedeagus places this species in the *carpini* complex; although the terminal sensillum is slender as in *E. willamettei*, the peritremes are hooked distally.

Eotetranychus pruni (Oudemans)

Tetranychus pruni Oudemans, 1931, Ent. Ber., 8(177): 195. Type: female, Germany, on *Prunus domestica*; possibly in the Rijksmuseum van Natuurlijke Historie, Leiden, Holland.

Eotetranychus pruni, Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 31.

Schizotetranychus (*Eotetranychus*) *pruni*, Reck, 1950, Trudy Inst. Zool. Akad. Nauk Gruz. S.S.R., 9: 129.

Oudemans original description of *pruni*, on the basis of a single female collected in Germany in 1884, on *Prunus* sp. indicates that this species differs from *carpini* in that the end of the peritreme is "gebogen"

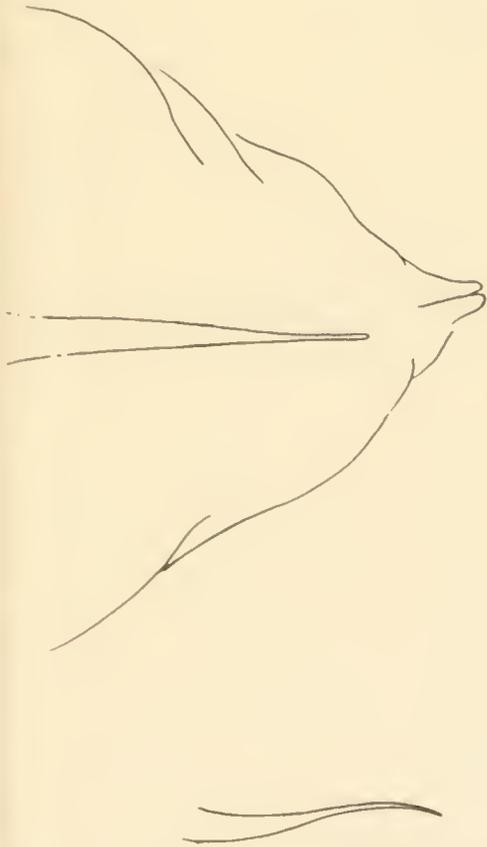
or U-shaped. Reck (1950) found a similar mite on *Prunus* spp. in Georgia, S.S.R., and gave a more ample description of both sexes. Reck's mites resemble *Eotetranychus uncatus* closely, except that the terminal sensillum of the female palpus is very slender, four times as long as broad.

Eotetranychus willamettei (McGregor)

(Figure 140)

Tetranychus willamettei McGregor, 1917, Proc. U. S. Natl. Mus., 51(2167): 586; McGregor, 1919, Proc. U. S. Natl. Mus., 56(2303): 660; *Types*: males and females, Oregon City, Oregon, on *Quercus garryana*; in the U. S. National Museum.

Eotetranychus willamettei, Pritchard and Baker, 1952, Hilgardia, 21(9): 263.



Both sexes of *Eotetranychus willamettei* differ from other species in the genus by having each member of the pair of duplex setae on tarsus II nearly equal in length. The female further differs from *Eotetranychus carpini* and *E. uncatus* by having the distal sensillum on the palpus about four times as long as broad. The peritreme is straight distally, ending in a simple bulb. The aedeagus resembles that of *Eotetranychus carpini* and *E. uncatus*, being long and slender, tapering and with a strong undulation. Tibia I of the male bears four sensory setae.

This species is known from southern California to Washington State. It is a serious pest of grapes in California and occasionally infests apple. Other hosts include antelope brush, box elder, service berry, and oak.

Fig. 143. *Eotetranychus populi*: aedeagus, Connecticut.

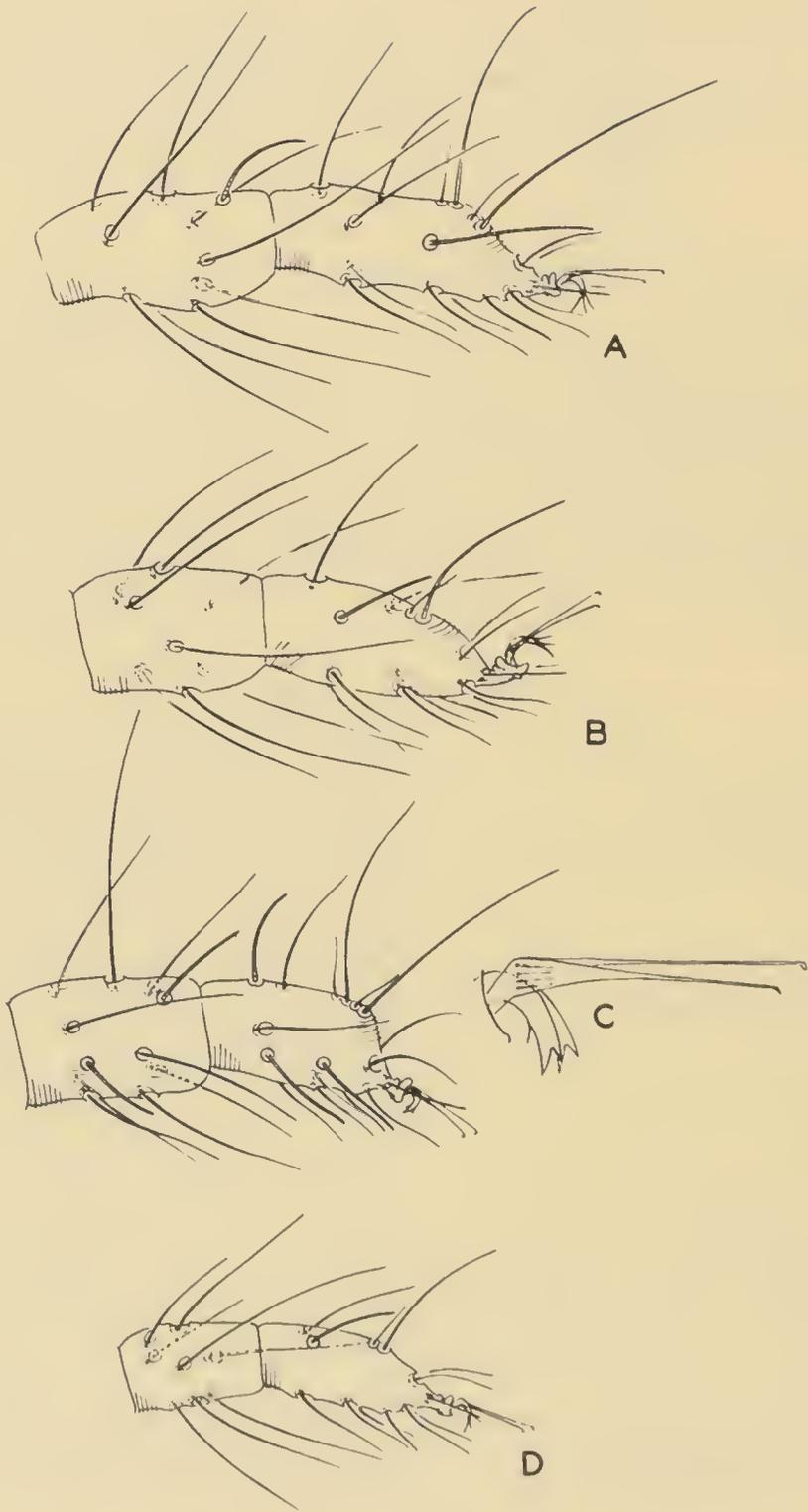


Fig. 144. *Eotetranychus weldoni*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

Eotetranychus populi (Koch)

(Figures 141, 142, 143)

Tetranychus populi Koch, 1838, Deut. Crust. Myr. Arach., 17: 14; Oudemans, 1937, Krit. Hist. Overz. Acar., 3(C): 1041; Hirst, 1920, Proc. Zool. Soc. Lond., 1920: 52; Garman, 1923, Bul. Conn. Agr. Expt. Sta., 247: 339; Oudemans, 1931, Ent. Ber., 8(178): 235; Oudemans, 1939, Krit. Hist. Overz. Acar., 3(C): 1041; Garman, 1940, Bul. Conn. Agr. Expt. Sta., 431: 85; McGregor, 1940, Amer. Midl. Nat., 44(2): 301. Described from specimens from Regensburg, Germany, on poplar.

Tetranychus salicicola Zacher, 1920, Vorläuf. Diag. ein. neu. Spinnmilb., p. 1; Zacher, 1921, Zts. angew. Ent., 7: 186. Types: males and females, Berlin-Dahlem, Germany, on willow and poplar. Possibly in the Zacher collection. *New synonymy*.

Amphitetranynchus salicicola, Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 41.

Schizotetranychus (Eotetranychus) salicicola, Reck, 1948, Soobsh. Akad. Nauk. Gruz. S.S.R., 9(7):374.

Both sexes of *Eotetranychus populi* may be differentiated from other members of the genus by having the distal end of the peritreme forming an irregular, anastomosing enlargement, together with having the dorsal setae of the body longer than the intervals between them.

The aedeagus is very long and slender, as in *Eotetranychus tiliarium* and the *E. carpini* complex, but it is slightly undulate and less tapering, being rounded at the tip.

Hirst (1920) showed that specimens from England, on poplar, and identified as *populi*, have an aedeagus similar to that of species often occurring on poplars in North America, and Zacher's description of *salicicola* indicates that of a similar aedeagus with clarification of the complex termination of the peritreme. Garman's (1940) identification of *populi* is, therefore, accepted.

This species is recorded from Germany and England, as well as Georgia, S.S.R., on poplar and willow. It also occurs in the eastern United States on the same hosts. Specimens examined are from Hamden, Connecticut (Philip Garman), on poplar; Farmingdale, New York (J. G. Matthyse), on aspen; and Durham, North Carolina (A. E. Pritchard), on weeping willow.



Fig. 145. *Eotetranychus ueldoni*: aedeagus, California.

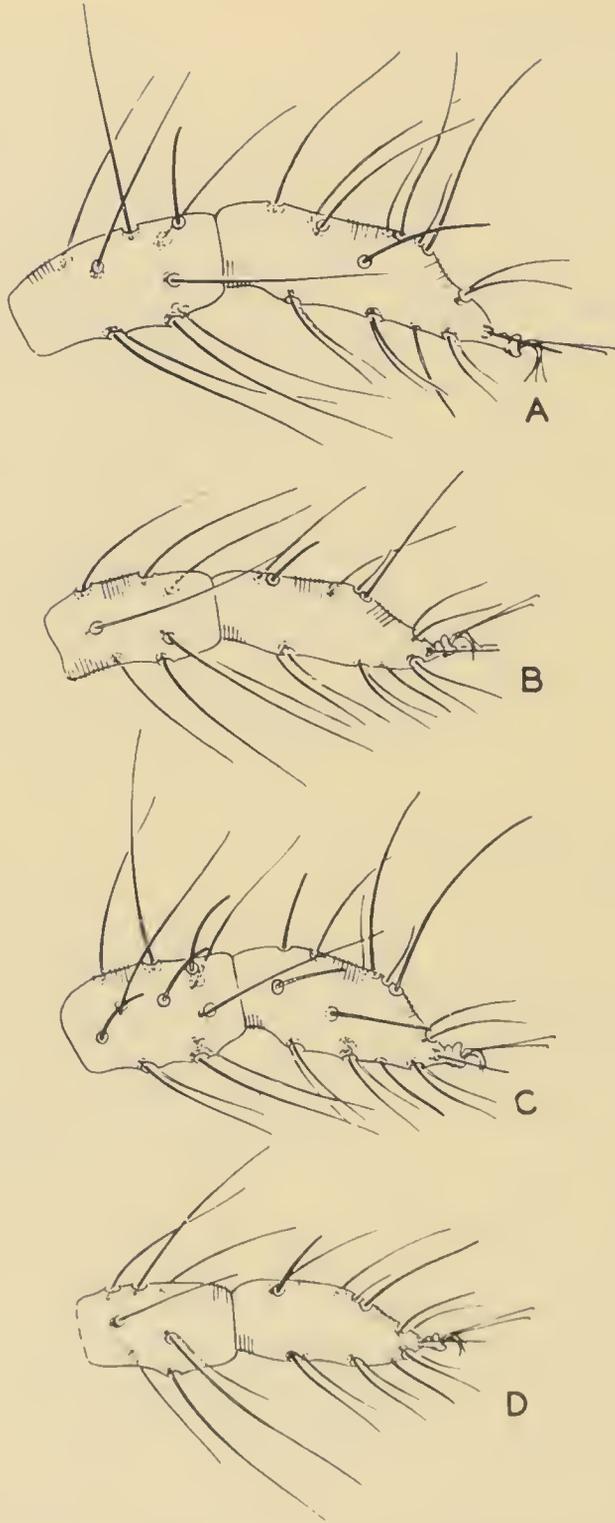


Fig. 146. *Eotetranychus malvastris*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

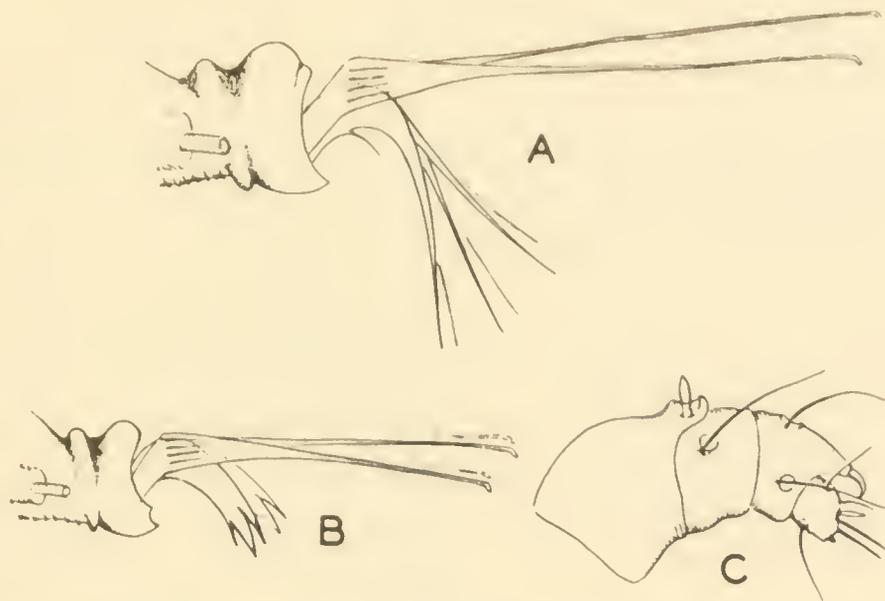


Fig. 147. *Eotetranychus malvastris*: A.) appendages of tarsus I of female; B.) appendages of tarsus I of male; C.) palpus of male.

Eotetranychus weldoni (Ewing), new combination

(Figures 144, 145)

Tetranychus weldoni Ewing, 1913, Ann. Ent. Soc. Amer., 6: 457; McGregor, 1919, Proc. U. S. Natl. Mus., 56(2303): 660; McGregor, 1950, Amer. Midl. Nat., 44(2): 305. *Types*: males and females, Grand Junction, Colorado, on cottonwood and possibly other hosts; in the U. S. National Museum.

Tetranychus californicus McGregor, 1928, Proc. Ent. Soc. Wash., 30: 11; McGregor, 1950, Amer. Midl. Nat., 44: 282. *Types*: males and females, Porterville, California, on *Populus* sp.; in the U. S. National Museum. *New synonymy*.

Eotetranychus weldoni differs from *E. populi* only in that the distal end of the peritreme forms a simple, long hook rather than being anastomosing. The two names represent allopatric species or subspecies.

This species is known from the midwestern and western United States on poplar and willow. Aside from the types of *weldoni* and *californicus*, specimens have been studied from Great Bend, Kansas (R. E. Beer), on poplar; Wildwood, Wyoming (G. F. Knowlton), on willow; Shafter, California (G. L. Smith), on poplar; Arvin, California (A. E. Pritchard), on poplar; and San Joaquin, California (G. L. Smith), on willow.

Eotetranychus malvastris (McGregor), new combination
(Figures 146, 147, 148)

Tetranychus malvastris McGregor, 1950, Amer. Midl. Nat., 44(2): 290.
Types: males and females, Whittier, California, on *Malvastrum* sp.; in the U. S. National Museum.

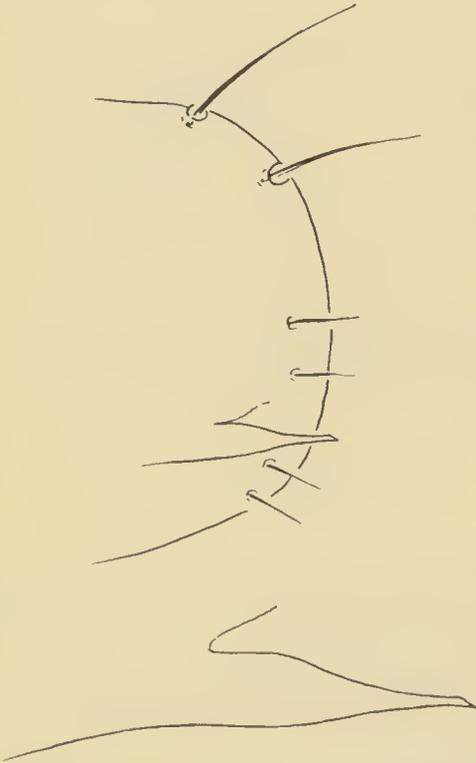


Fig. 148. *Eotetranychus malvastris*:
aedeagus, California.

The aedeagus of *Eotetranychus malvastris* is distinctive in being triangular with the ventral margin practically straight and the dorsal margin gradually narrowing to an acute tip. Females are not readily differentiated from several other members of the Tiliarium Group.

Specimens are known only from southern California and Arizona. Types of *malvastris* are from Whittier, California, on *Malvastrum* sp. and McGregor recorded specimens from Gila Bend, Arizona, on the same host. In addition to the types of *malvastris*, we have studied specimens from Aguanga, California, (A. E. Pritchard), on *Adenostema fasciculatum*; and Barrett, California (A. E. Pritchard), on *Malva* sp.

Eotetranychus smithi Pritchard and Baker, new species
(Figures 149, 150)

The male of *Eotetranychus smithi* may be recognized by having the proximal half of the aedeagus with the ventral margin directed somewhat dorsad, and with the distal portion abruptly narrowed to form a fine, caudally directed stylet.

The female resembles that of *Eotetranychus hicoriae* in that there are longitudinal striae anterior to, but not on, the genital flap, and the peritreme is strongly hooked at its distal end. The terminal sensillum on the palpus, however, is stouter than that in the female of *E. hicoriae*, being about one and one half times as long as wide proximally.

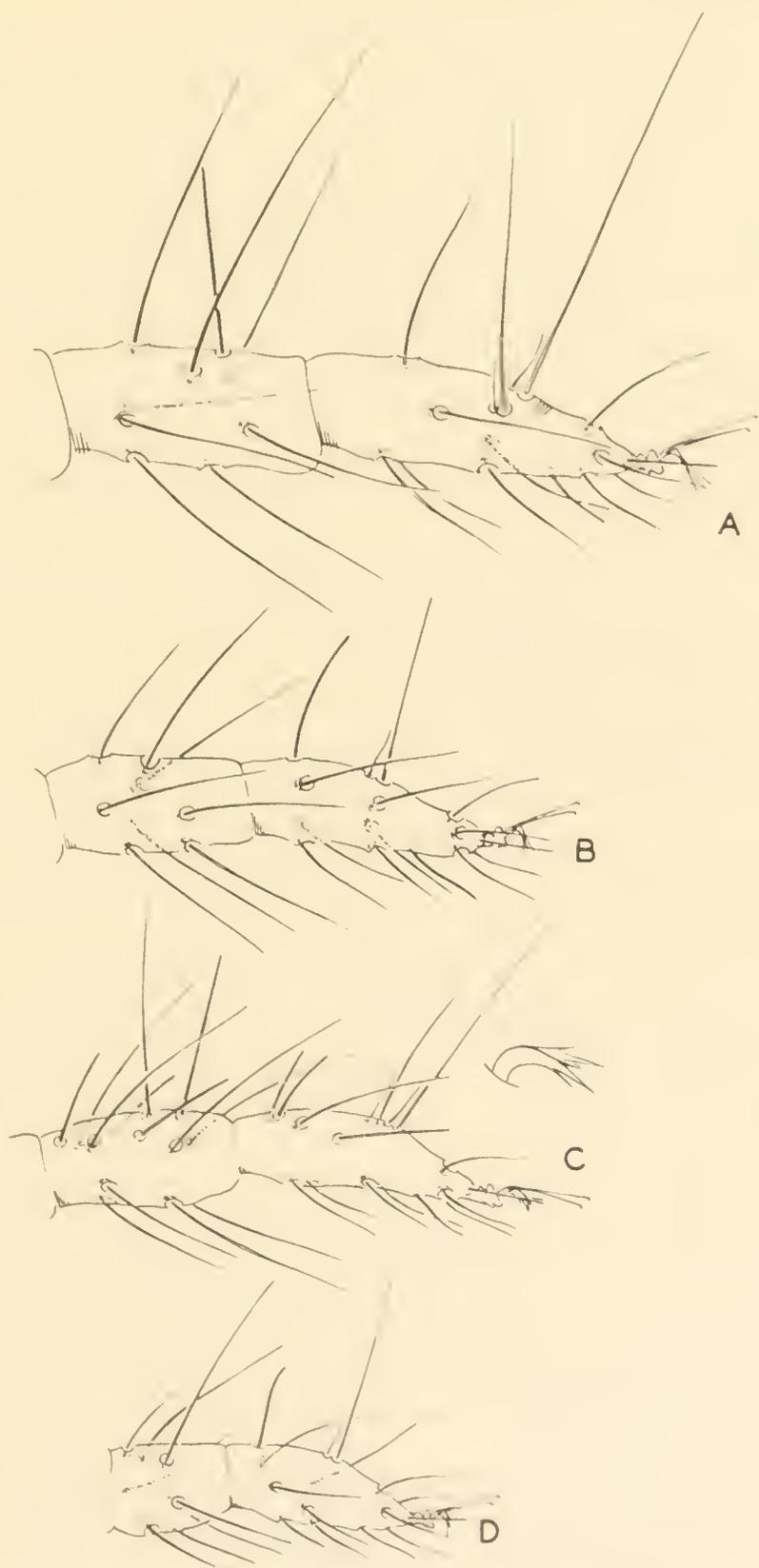


Fig. 149. *Eotetranychus smuthi*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.



Fig. 150. *Eotetranychus smithi*: aedeagus and terminal segment of palpus of male.

This species is known only from the northeastern United States on rose and bramble.

Male.—Terminal sensillum of palpus about three times as long as broad at base. Peritreme strongly retrorse at distal end. Tarsus I with four tactile and three sensory setae proximal to the duplexes; empodium I with three pairs of very slender digits, the dorsal pair being the finest. Tibia II with eight tactile setae; tibia III with six tactile setae. Body with dorsal setae slender, much longer than longitudinal intervals between them. Aedeagus with proximal portion of shaft curved dorsad, the median portion abruptly narrowed, and the distal portion very slender, tapering, caudally directed but slightly undulate. Length of body 230μ ; including rostrum 320μ .



Fig. 151. *Eotetranychus yumensis*: aedeagus, type.

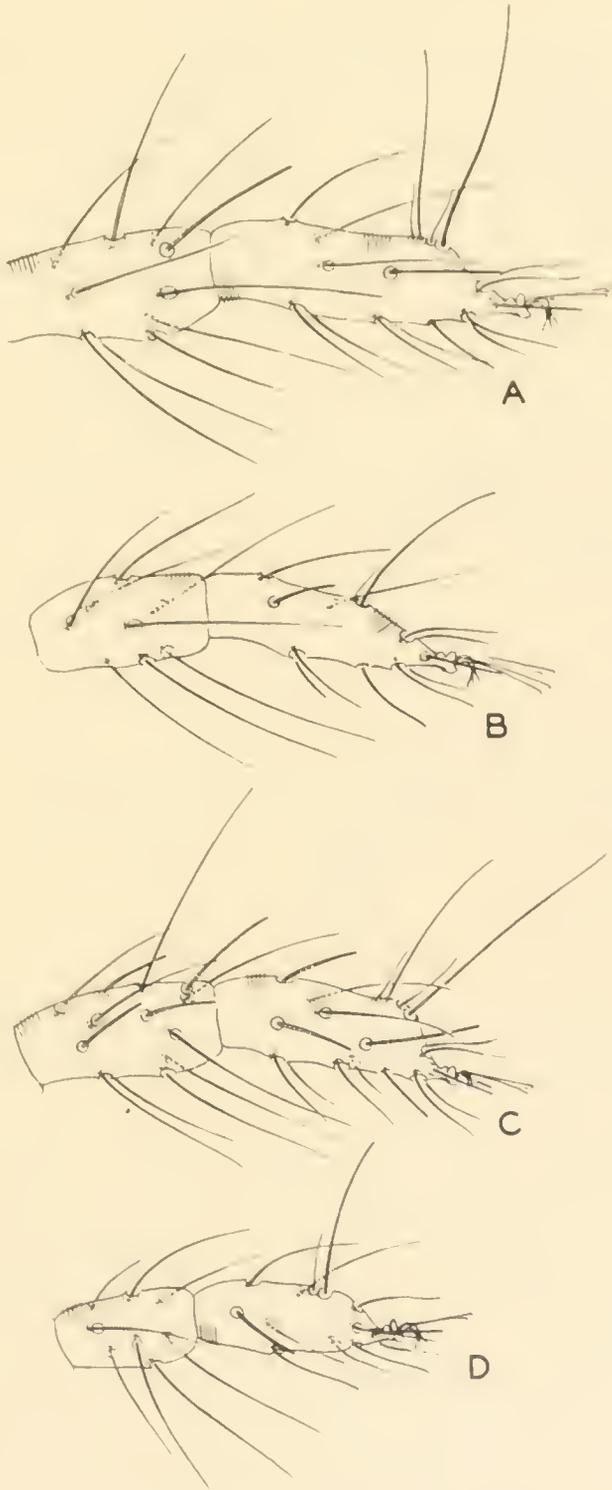


Fig. 152. *Eotetranychus frosti*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

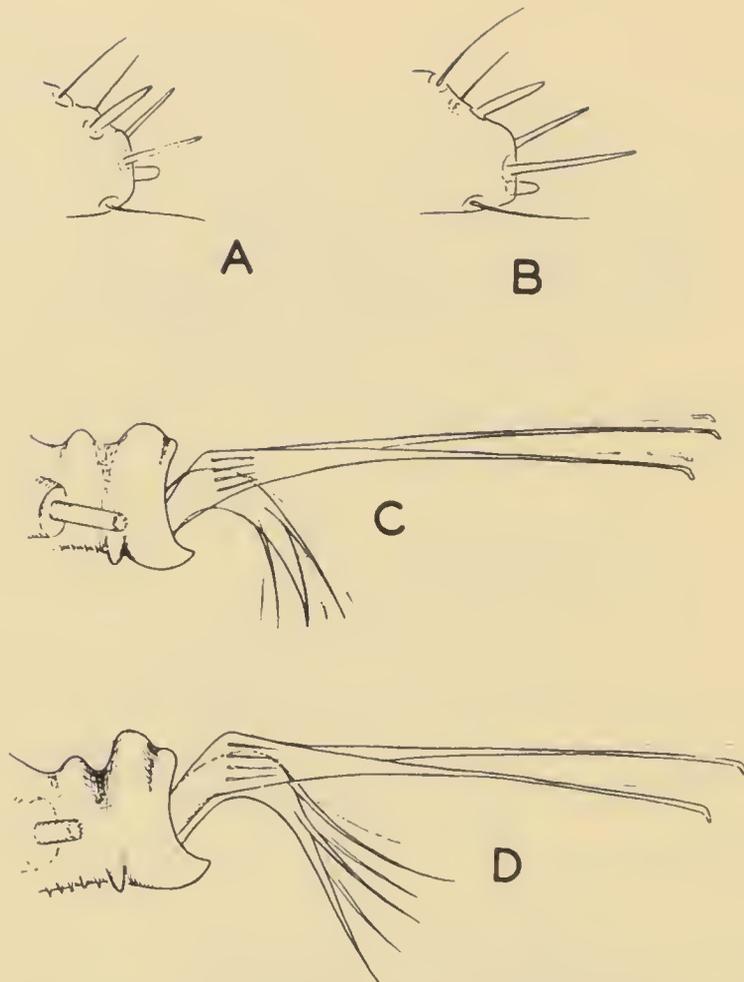


Fig. 153. *Eotetranychus frosti*: A.) terminal segment of palpus of male; B.) terminal segment of palpus of female; C.) appendages of tarsus I of male; D.) appendages of tarsus I of female.

Female.—Similar. Terminal sensillum of palpus about one and one half times as long as wide as base. Tibia I with nine tactile and one sensory setae; tarsus I with four tactile and one sensory setae proximal to duplexes. Area immediately anterior to genital flap with longitudinal striae; genital flap with transverse striae. Length of body 280 μ ; greatest width of body 385 μ .

Holotype.—Male, College Park, Maryland, June 22, 1951 (Floyd F. Smith), on rambler rose; type no. 2178 in the U. S. National Museum.

Paratypes.—Four males, 2 females, 2 nymphs, College Park, Maryland, June 22, 1951 (Floyd F. Smith) on rambler rose; 1 male, Tyson's Corner, Virginia, July 11, 1951 (E. W. Baker), on *Rubus phoenicolasius*.

This species is named in honor of Floyd F. Smith who collected part of the type series and who has made major contributions toward control of the two-spotted spider mite in greenhouses.



Fig. 154. *Fotetranychus frosti*: A.) aedeagi of types:
B.) aedeagi of specimens from Missouri.

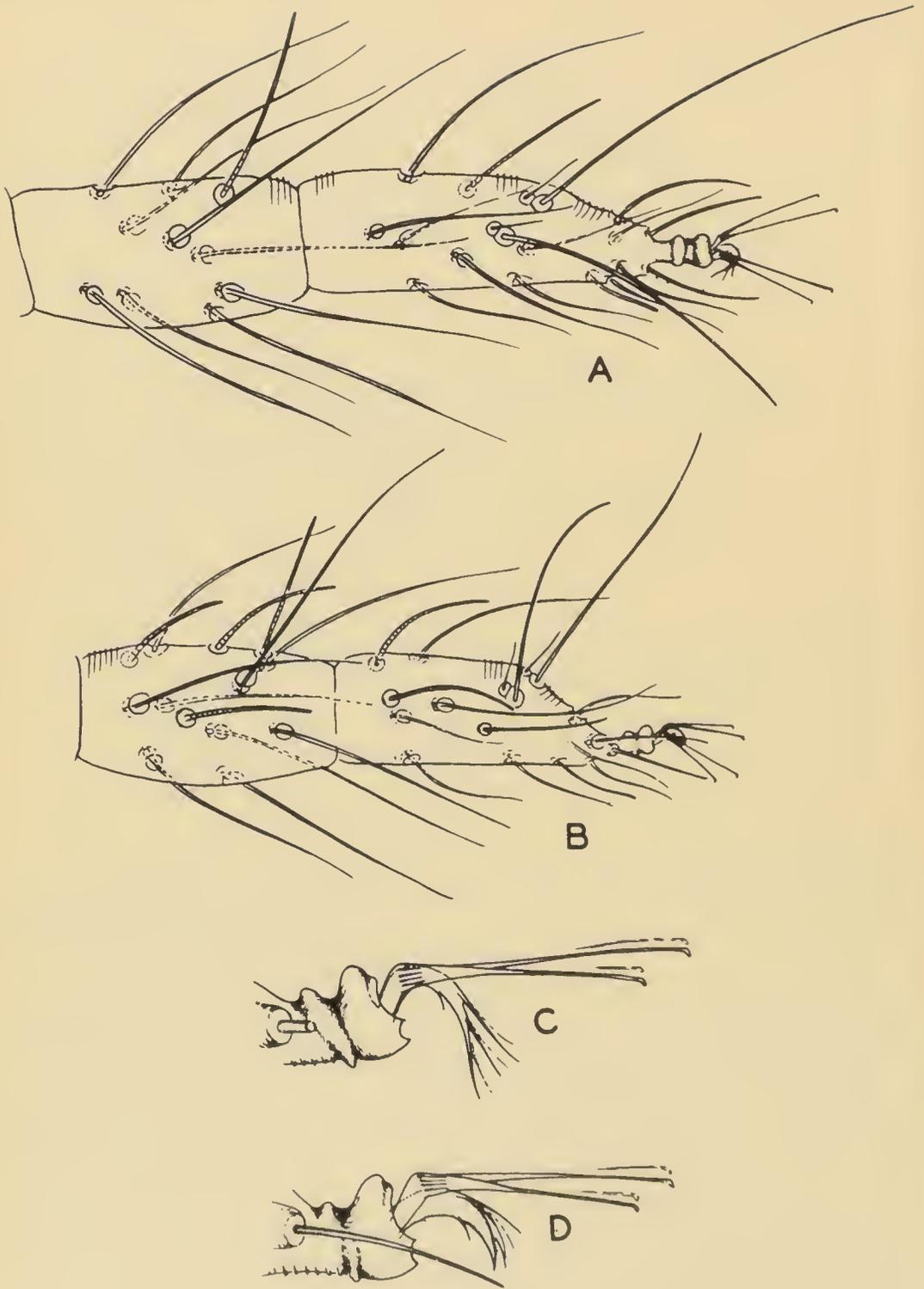


Fig. 155. *Eotetranychus sexmaculatus*: A.) tibia and tarsus I of female; B.) tibia and tarsus I of male; C.) appendages of tarsus I of female; D.) appendages of tarsus I of male.



Fig. 156. *Eotetranychus sexmaculatus*: aedeagus, Florida.

Eotetranychus yumensis (McGregor), new combination
(Figure 151)

Tetranychus yumensis McGregor, 1934, Proc. Ent. Soc. Wash., 36: 256; McGregor, 1950, Amer. Midl. Nat., 44(2): 304. *Types*: males and females, Yuma, Arizona, on citrus; in the U. S. National Museum.

The aedeagus of *yumensis* differs from other species of *Eotetranychus* in that it forms a shallow, nearly sigmoid dorsal curve, the distal end tapering gradually to a caudally directed point. The female resembles several other members of the Tiliarium Group having transverse striae anterior to the genital flap.

This species, originally known from Yuma, Arizona, has recently become rather abundant in the Coachella and Imperial Vallies of California, particularly on lemon and tangerine. Grapefruit and orange also serves as hosts. L. R. Jeppson and Andrew Deal sent us most of the specimens studied from California citrus.

Eotetranychus frosti (McGregor), new combination
(Figures 152, 153, 154)

Tetranychus frosti McGregor, 1952, Proc. Ent. Soc. Wash., 54: 142. *Types*: males and females, Tempe, Arizona, on rose; in the U. S. National Museum.

The male of *Eotetranychus frosti* may be recognized by having the aedeagus sharply bent dorsad to form a slender, sigmoid, distal end. Females are similar to several others of the Tiliarium Group that bear transverse striae anterior to the genital flap.

Spider Mites

Types from Tempe, Arizona, on rose, have been studied as well as specimens collected near Modesto, California, August 8, 1949 (A. E. Pritchard), on blackberry.

Additional specimens referred to this species are from Louisiana, Missouri, August 12, 1952 (D. W. Hamilton), on raspberry; and Valley City, North Dakota (V. Goodfellow), on raspberry. In males from these collections, the aedeagus bends somewhat more sharply dorsad and the bent portion is somewhat stouter. Moreover, the terminal sensillum on the palpus of the male is more conical.

Eotetranychus hirsti Pritchard and Baker, new name

Tetranychus fici Hirst, 1926 (not Murray, 1877) Proc. Zool. Soc. Lond., 1926: 828; Rahman and Sapra, 1940, Proc. Indian Acad. Sci. (ser. B), 11: 186. *Types*: males and females, Coimbatore, India, on fig (*Ficus carica*); probably in the British Museum (Natural History). *Primary homonym*.

This species, known only from South India, on fig leaves and fruit, is very closely related to *Eotetranychus frosti* McGregor. The aedeagus bends dorsad, with the upturned portion slender, tapering, and sigmoid. The aedeagal bend, as figured by Hirst, is constricted; whereas it is not in McGregor's species.

Murray regarded his fig mite, from near London, England, to be an introduced species. However, his description of the female as being ovate is not characteristic of most species of *Eotetranychus*; and it is likely that Murray was dealing with an infestation of the two-spotted spider mite, a species that is known to occur on fig.

Eotetranychus suginomensis (Yokoyama), new combination

Tetranychus suginamensis Yokoyama, 1922, Bul. Imp. Seric. Exp. Sta. Japan, 8(6): 282. Described from specimens from Japan, on mulberry.

Tetranychus mori Rahman and Sapra, 1940, Proc. Indian Acad. Sci. (ser. B), 11: 184. *Types*: males and females, Lyallpur, India, on mulberry (*Morus alba*). *New synonymy*.

Yokoyama's description of the mites as forming small colonies on the underside of the leaf, the hibernation of adults, and the pearly

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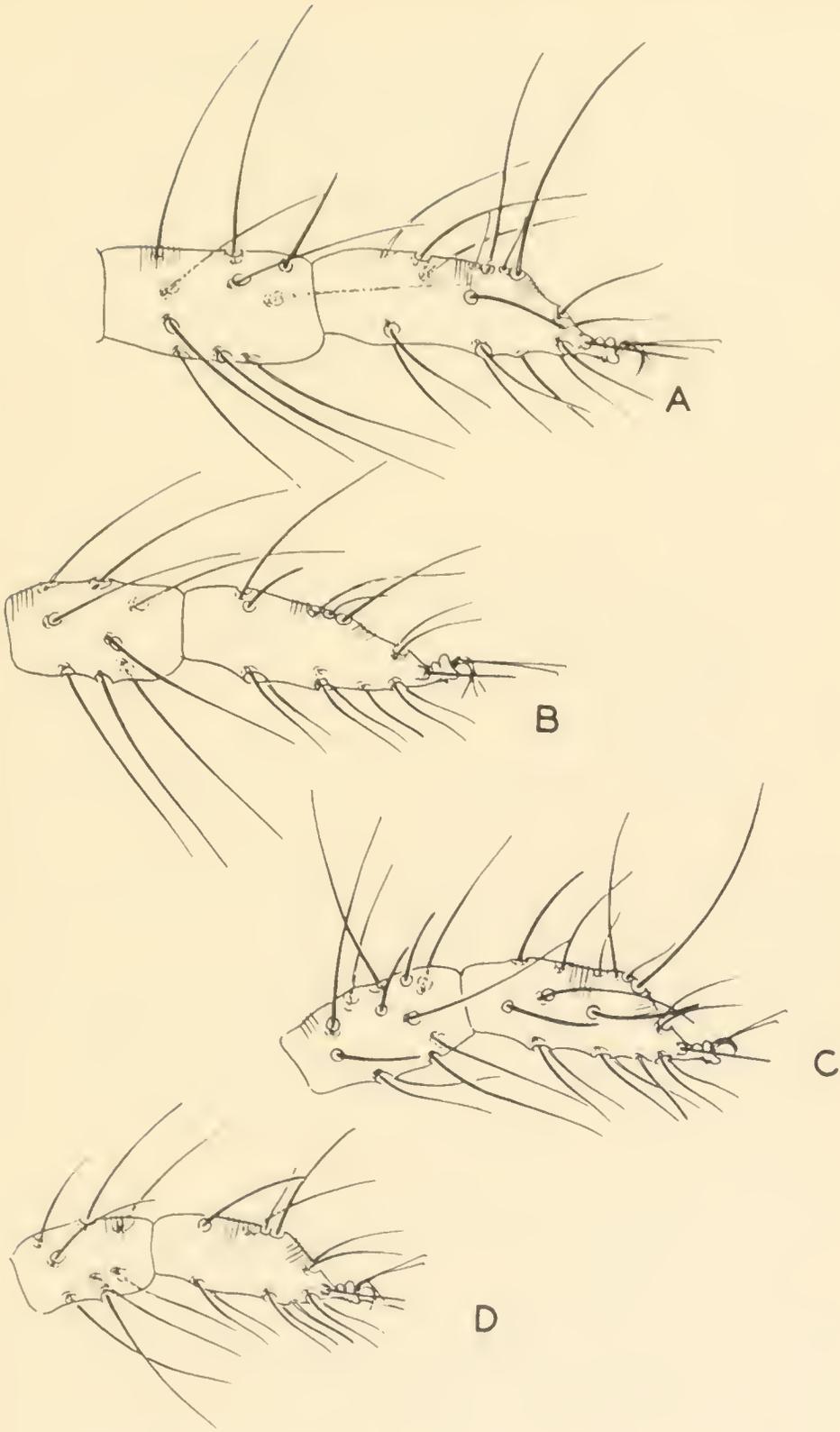


Fig. 157. *Eotetranychus lewisi*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

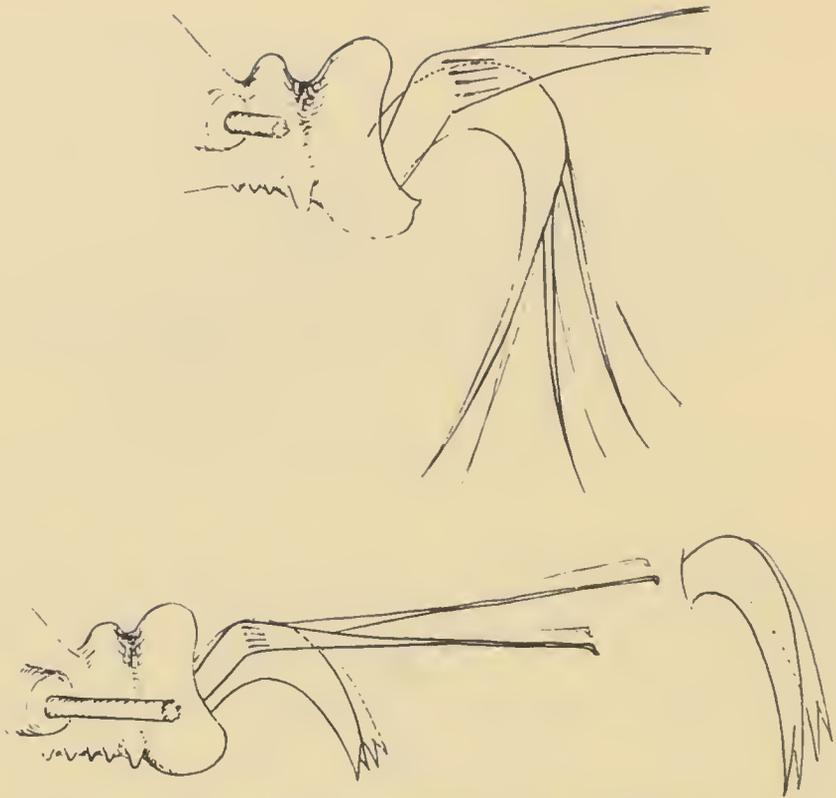


Fig. 158. *Eotetranychus lewisi*: above, empodium I of female; below, empodium I of male.

egg with a dorsal stipe all indicate that this is a species of *Eotetranychus*. The aedeagus was described as having a short shaft, tapering and bending distally to form a small hook.

The description and figure of the aedeagus of *Tetranychus mori* is similar to that of *T. suginamensis*, the aedeagus being tapering, strongly curved dorsad and with the tip directed anteriorly. Both are from the same host, mulberry. *Mori* is, therefore, considered to be a synonym of *suginamensis*. We have not seen this species.

Eotetranychus sexmaculatus (Riley), new combination
(Figures 155, 156)

Tetranychus 6-maculatus Riley, 1890, *Insect life*, 2: 225. Described from specimens from Florida, on citrus.

Tetranychus sexmaculatus, Banks, 1900, U. S. Dept. Agr. Div. Ent. Tech. Ser., 8: 75; McGregor, 1919, *Proc. U. S. Natl. Mus.*, 56(2303): 659; McGregor, 1950, *Amer. Midl. Nat.*, 44: 301; Ebeling, 1950, *Subt. Ent.*, p. 374. *Emendation*.



Fig. 159. *Eotetranychus lewisi*: aedeagi.

The aedeagus of *Eotetranychus sexmaculatus* is distinctive in that it curves slightly dorsad near the middle of the shaft; but the distal portion is caudoventrally directed, and the tip bears a diagnostic, somewhat ventrally deflexed hook.

The female is distinctive in having longitudinal striae on the genital flap.

This species has long been known as a serious pest of citrus in Florida and southern California, and more recently it has become an important pest of avocado in California. The mites are found primarily on the foliage, forming restricted colonies under the leaves.

California specimens studied by us are from Berkeley, (A. E.

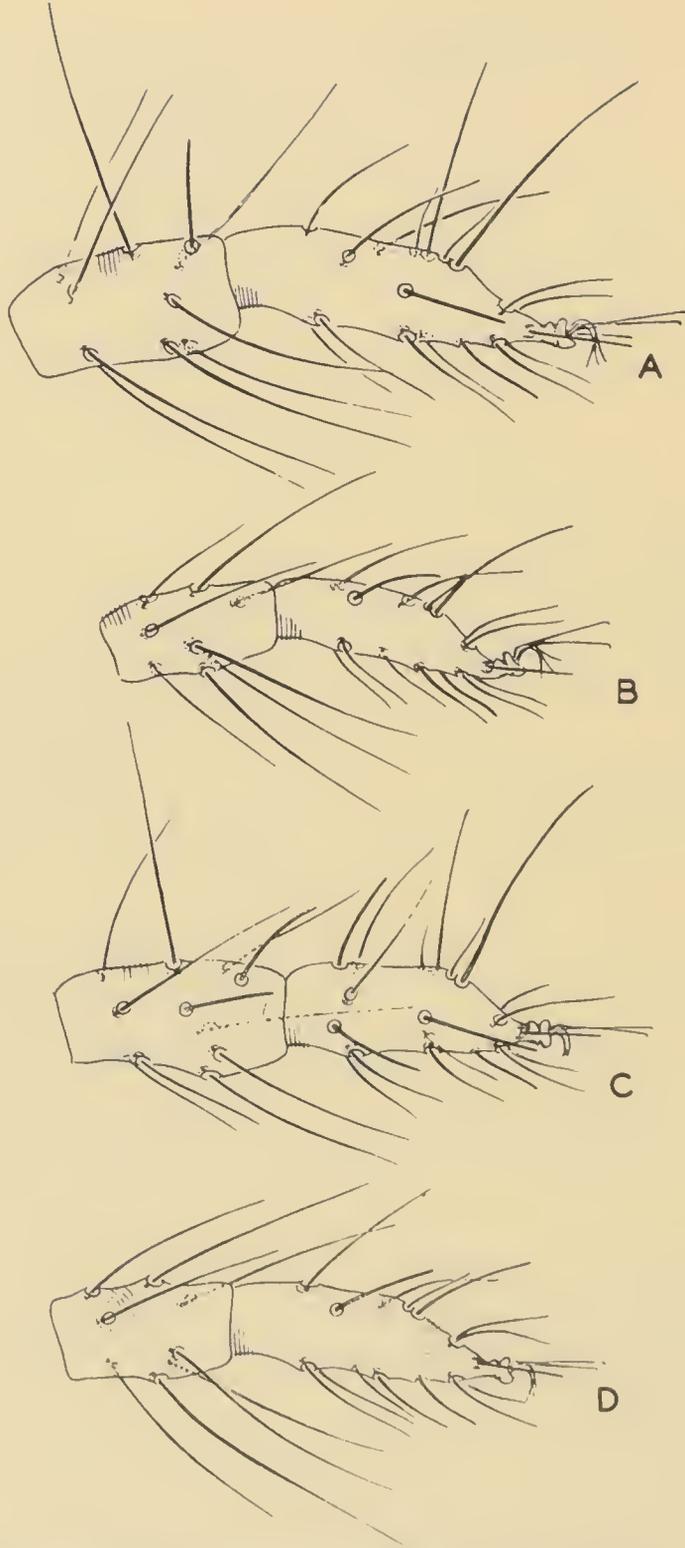


Fig. 160. *Eotetranychus deflexus*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

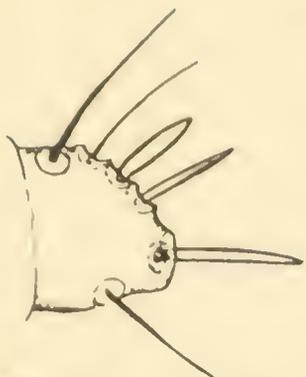


Fig. 161. *Eotetranychus deflexus*: terminal segment of male palpus.

Pritchard) on elaeagnus, royal paulonia, pyracantha, azalea, camphor, and maple; Palo Alto (A. E. Pritchard), on camphor; Ventura (L. R. Jeppson), on lemon; Capistrano (L. R. Jeppson), on citrus; Orange (C. A. Fleschner), on citrus; and Costa Mesa (M. Badgley), on citrus, Florida collections are from Ojus (O. D. Link), on citrus; Eloise Loop (L. C. Knorr), on citrus, and Lake Alfred (L. C. Knorr), on citrus. Additional material has been studied from Formosa (T. C. Mao), on *Citrus grandis*.

Eotetranychus talisiae (Hirst), new combination

Tetranychus talisiae Hirst, 1920, Proc. Zool. Soc. Lond. 1920: 54; McGregor, 1950, Amer. Midl. Nat., 44(2): 302. Types: males and females, from tropical greenhouse, Kew Gardens, England, on *Talisia princeps*; in the British Museum (Natural History).

Eotetranychus talisiae is related to *E. sexmaculatus* in that the area immediately anterior to the genital flap in the female has longitudinal striae, as does the anterior portion of the flap. *Talisiae* may be differentiated from *sexmaculatus* in that each empodium of the female possesses a small, well defined dorsal spur which is lacking in *sexmaculatus*. The aedeagus of *talisiae* is similar to that of *yumensis*, being straight distally and without the ventrally deflexed hook found in *sexmaculatus*.

Eotetranychus lewisi (McGregor), new combination

(Figures 157, 158, 159)

Tetranychus lewisi McGregor, 1943, Proc. Ent. Soc. Wash., 45: 127; McGregor, 1950, Amer. Midl. Nat., 44(2): 288; Ebeling, 1950, Subt. Ent., p. 376. Types: males and females, Corona, California, on orange; in the U. S. National Museum.

The aedeagus of *Eotetranychus lewisi* is distinctive by being gradually tapering and by forming a broad, sigmoid, ventral bend. The peritreme is strongly hooked or angulate distally. Tibia I of the male



Fig. 162. *Eotetranychus deflexus*: aedeagus, Oregon.

usually bears three sensory setae (in addition to the nine tactile setae), but rarely only two sensory setae are present.

The Lewis spider mite is found primarily along the California coast. It is a pest of citrus, having been noted primarily on the fruit, causing a silvering on lemons and a russetting of oranges. McGregor recorded this species from southern California, on orange, lemon, bur-clover, and castor-bean. Other than the types, collections studied by us are from Palo Alto, California (A. E. Pritchard), on *Ceanothus* sp.; and Santa Paula, California (C. A. Fleschner), on castor bean and olive.

Eotetranychus deflexus (McGregor), new combination
(Figures 160, 161, 162)

Tetranychus deflexus McGregor, 1950, Amer. Midl. Nat., 44(2): 284.
Types: males and females, Grant's Pass, Oregon, on *Symphoricarpos* sp.; in the U. S. National Museum.

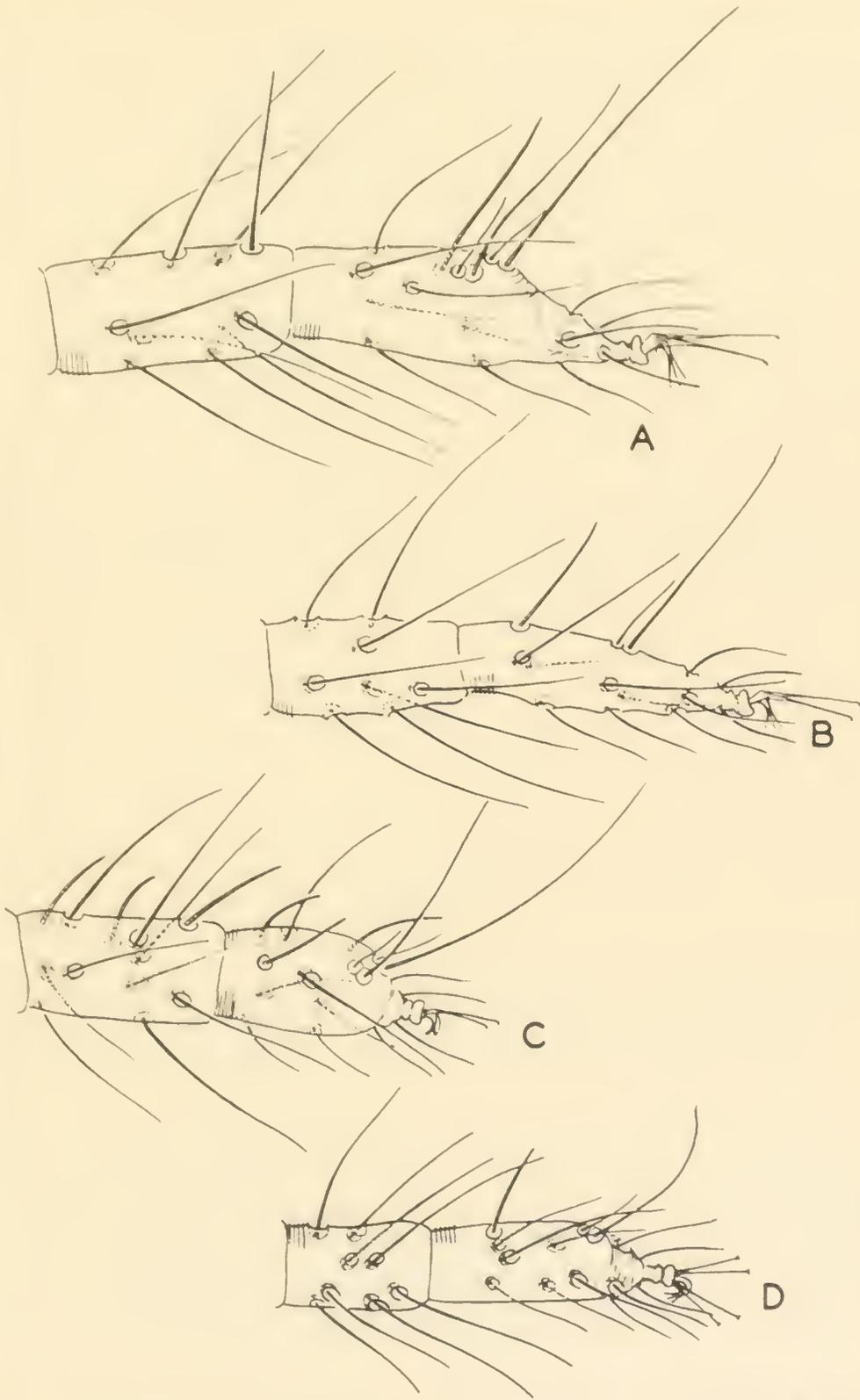


Fig. 163. *Eotetranychus ecclisis*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

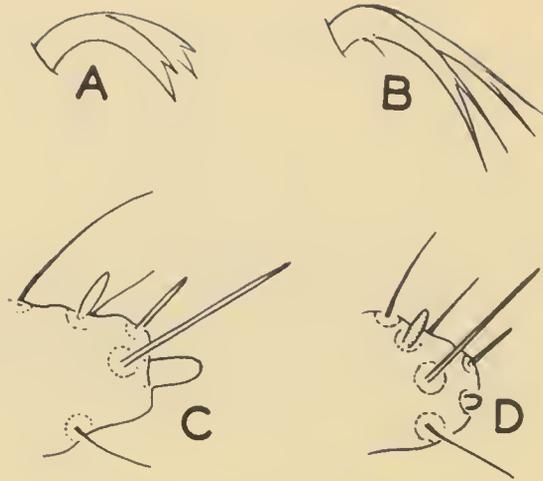


Fig. 164. *Eotetranychus ecclisis*: A.) empodium I of male; B.) empodium II of male; C.) terminal segment of palpus of female; D.) terminal segment of palpus of male.



Fig. 165. *Eotetranychus ecclisis*: aedeagus.

Schizotetranychus cercocarpi McGregor, 1950, Amer. Midl. Nat., 44(2): 308. Types: males and females, Camp Nelson, California, on *Cercocarpus* sp.; in the U. S. National Museum. *New synonymy*.

The male of *Eotetranychus deflexus* may be recognized by having the aedeagus strongly bent ventrad near the middle with the bent portion tapering and sigmoid, together with having the distal segment of the palpus provided with a rudimentary terminal sensillum. The mediadorsal, tapering sensilla of the last palpal segment of the male are subequal in length. The peritreme is straight distally, terminating in a simple bulb, and the striae on the genital flap of the female and the area immediately anterior is transverse.

This species is known only from Oregon, and California. A new collection is from The Dalles, Oregon (E. W. Baker), on snowberry.

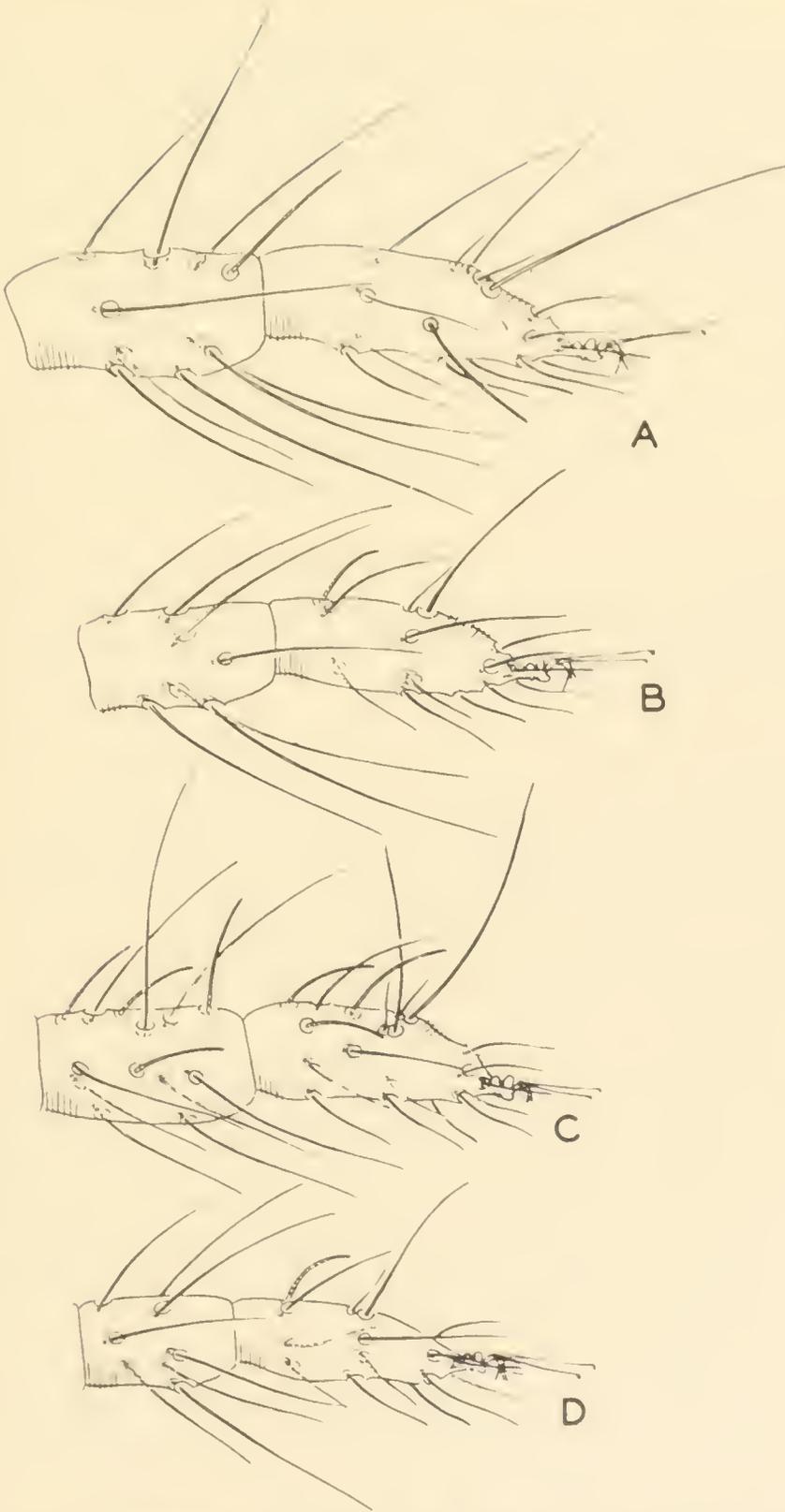


Fig. 166. *Eotetranychus pallidus*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

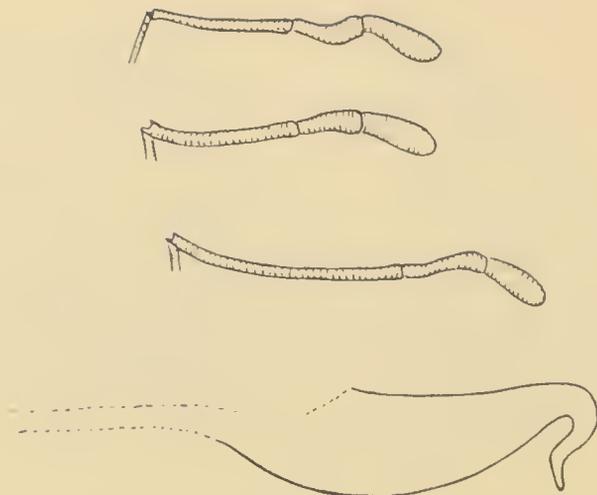


Fig. 167. *Eotetranychus pallidus*: peritremes and aedeagus.

Eotetranychus ecclisis Pritchard and Baker, new species
(Figures 163, 164, 165)

Eotetranychus ecclisis is closely allied to *E. deflexus* in that the terminal sensillum on the male palpus is rudimentary and the aedeagus is ventrally bent to form a sigmoid curve. However, the tapering sensilla on the male palpus are strongly dissimilar in length, and the aedeagus is slightly widened at the ventral bend. Moreover, the female has longitudinal striae immediately anterior to the genital flap.

This species is known only from southern Mexico, on *Artemisia mexicana*.

Male.—Terminal segment of palpus with distal sensillum rudimentary; mediodorsal, tapering sensilla with one member strongly developed, twice as long as the other and nearly four times as long as proximodorsal fusiform peg. Peritreme straight distally, ending in a single chambered bulb. Tibia I with nine tactile and three sensory setae; tarsus I with four tactile and two sensory setae proximal to duplexes; empodium I bifid with a small mediodorsal tooth, each side being composed of three short teeth. Tibia III with eight tactile setae; tibia III with six tactile setae. Body with dorsal setae slender and tapering, considerably longer than longitudinal intervals between them. Aedeagus with distal one-half bent ventrad and sigmoid, the ventral bend somewhat widened and the distal end caudally directed. Length of body $293\ \mu$; including rostrum $400\ \mu$.

Female.—Similar. Terminal sensillum of palpus about twice as long as wide at base. Tibia I with nine tactile and one sensory setae; tarsus

Subfamily Tetranychinae Berlese

I with five tactile setae posterior to duplexes. Genital flap with transverse striae; area immediately anterior to genital flap with longitudinal striae. Length of body 330 μ ; greatest width of body 460 μ .

Holotype.—Male, Mexico City—Cuernavaca Highway, kilometer 67, January 22, 1941 (E. W. Baker), on *Artemisia mexicana*; type no. 2179 in the U. S. National Museum. *Paratypes*.—One male, 7 females, Mexico City—Cuernavaca Highway kilometer 67, January 22, 1941 (E. W. Baker), on *Artemisia mexicana*.

Eotetranychus pallidus (Garman), new combination
(Figures 166, 167)

Tetranychus pallidus Garman, 1940, Bul. Conn. Expt. Sta., 431: 86; McGregor, Amer. Midl. Nat., 44(2): 297. *Types*: males, females, nymphs, larvae, and eggs, Hamden and Southington, Connecticut, on beech; in the collection of the Connecticut Agricultural Experiment Station.

Males referred to *Eotetranychus pallidus* may be readily recognized by having the aedeagus bent sharply ventrad near the middle, the shaft being abruptly constricted just before the bend. The distal portion of the aedeagus is tapering and strongly sigmoid.

The female is distinctive in that the striae of the integument immediately anterior to the genital flap are irregular, rather than being transversely or longitudinally parallel. This area of irregular striae is not as broad as in those species with longitudinal striae.

The peritreme is straight distally or with a terminal, but simple angulation. Dorsal setae on the body are but slightly longer than the longitudinal intervals between them.

This species has been known only from New Haven, Connecticut, on beech. Type material has been studied by us, as well as specimens from Cromwell, Connecticut, June 21, 1950 (P. Garman), on alder.

Eotetranychus hicoriae (McGregor), new combination
(Figure 168)

Tetranychus hicoriae McGregor, 1950, Amer. Midl. Nat., 44(2): 287. *Types*: males and females, Wiggins, Mississippi, on pecan; in the U. S. National Museum.

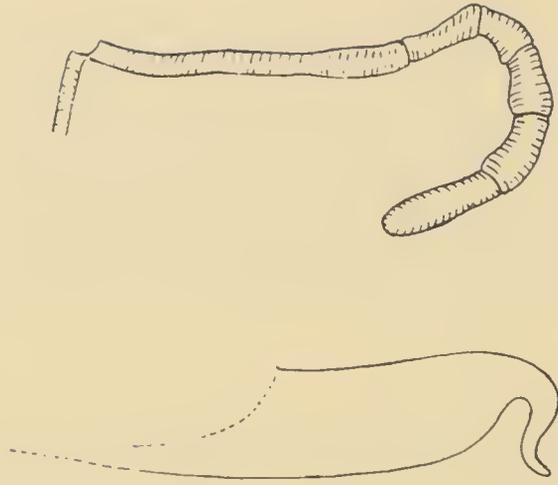


Fig. 168: *Eotetranychus hicoriae*:
peritreme and aedeagus.

The aedeagus of *Eotetranychus hicoriae* closely resembles that of *E. pallidus* in that it is bent very sharply ventrad with the bent portion strongly sigmoid. However, the shaft of the aedeagus gradually narrows to the bend.

The peritreme is strongly hooked distally; and the dorsal setae of the body are much longer than the longitudinal intervals between them.

The female is similar to *Eotetranychus smithi* and *E. ecclisis* in that the integumentary striations immediately anterior to the genital flap are longitudinal. The genital flap bears transverse striae.

The species is common in the southeastern United States, and Pierce (1953) reported serious infestations on pecan scattered throughout northern Louisiana.

Specimens studied by us, in addition to the types, are from Durham, North Carolina (A. E. Pritchard), on hickory, horse chestnut and black-jack oak; Glendale, Maryland (E. Van Leeuwen), on Asiatic and European chestnut; Ithaca, New York (J. G. Matthysse), on red oak; and many specimens from Georgia, on pecan.

Eotetranychus fagi (Zacher), new combination

Epitetranychus fagi Zacher, 1922, Verh. Deut. Gesel. ang. Ent., 5: 6; Zacher, 1932, Zoo. Anz., 97(7)8: 181; Zacher, 1933, Mitt. Zool. Mus. Berlin, 19: 587. Types: probably males and females, on *Fagus silvatica*; possibly in the Zacher collection.

Subfamily Tetranychinae Berlese

Schizotetranychus (*Eotetranychus*) *fagi*, Reck, 1950, Trudy Inst. Zool. Akad. Nauk Gruz. S.S.R., 9: 131.

The illustration of the aedeagus that was presented by Zacher (1932) indicates that this species may be recognized by having the aedeagus bent sharply ventrad, the bent portion straight and broadly tapering to a point. However, Reck (1950) illustrates the aedeagus as being sharply bent dorsad and narrowly tapering to a point. The peritreme is straight distally, ending in a small bulb.

Zacher indicates that this is a common species in Germany, on European beech, and Reck recorded specimens from Georgia, S.S.R. on beech.

Eotetranychus jungiae Oudemans

Eotetranychus jungiae Oudemans, 1931, Ent. Ber., 8(178): 225; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 32. Type: female, Triesdorf, Germany, on *Salvia* (= *Jungia*) *splendens*; possibly in the Zacher collection.

This species was described on the basis of a single female, found in association with cotypes of *Tetranychus ludeni* Zacher (in Europe), and supposedly originating from Brazil. Oudemans' description of the female indicates only that it is similar to females of *Eotetranychus tiliarium* and *E. carpini*, but the terminal sensillum of the palpus was described as being very small and lancet-like.

Eotetranychus aurantii (Targioni Tozzetti), new combination

Tetranychus aurantii Targioni Tozzetti, 1878, Ann. Agric., 1: 253, fig. 4a. Described from females (probably Florence) Italy, on live oak.

Tetranychus quercinus Berlese, 1886, Acari Dann. Piante Coltivate, p. 23. Based on the description of Targioni Tozzetti (1878) of mites from Italy, on oak. *New synonymy*.

Targioni Tozzetti referred in his text (p. 253) to this mite as "*Tetranychico della Erinosi del Leccio*," apparently not intending to give it a scientific name. However, in his legend to the figures of this species, the name *Tetranychus aurantii* is validated. The figures of the tarsal appendages indicate that there are three pairs of empodial hairs.

Spider Mites

Topotype material must be studied before the true status of this species can be determined.

Eotetranychus aceri (Reck), new combination

Schizotetranychus (*Eotetranychus*) *aceri* Reck, 1948, Soobsh. Akad. Nauk Gruz. S.S.R., 9(6): 373; 9(7): 446. Described from specimens from Tiflis, Georgia, S.S.R., on *Acer negundo*.

This species is very similar to *E. coryli* and may prove to be the same. The peritreme ends distally in a simple bulb which is bent weakly posteriorly.

Eotetranychus bakuriensis (Reck), new combination

Schizotetranychus (*Eotetranychus*) *bakuriensis* Reck, 1948, Soobsh. Akad. Nauk Gruz. S.S.R., 9(6): 374; 9(7): 448. Described from specimens from Bakuriani, Georgia, S.S.R., on *Alchimilla erythropoda*.

Reck's figure of the aedeagus, although showing it bending dorsally rather than ventrally, indicates a relationship with *E. deflexus* and *E. ecclisis*. The peritreme ends distally in a simple bulb which is bent weakly posteriorly.

Eotetranychus fraxini (Reck), new combination

Schizotetranychus (*Eotetranychus*) *fraxini* Reck, 1948, Soobsh. Akad. Nauk Gruz. S.S.R., 9(6): 374; 9(7): 448, 449. Described from specimens from Georgia, S.S.R., on *Fraxinus* spp.

The aedeagus is short, gently sigmoid, somewhat similar to that of *E. lewisi*. The peritreme ends in a simple bulb.

Eotetranychus rubiphilus (Reck), new combination

Schizotetranychus (*Eotetranychus*) *rubiphilus* Reck, 1948, Soobsh. Akad. Nauk Gruz. S.S.R., 9(6): 374; 9(7): 447. Described from specimens from Georgia, S.S.R., on *Rubus* sp.

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This species is similar to *E. bakuriensis* but with a much shorter aedeagus. The peritreme ends in a simple bulb.

Eotetranychus ulmicola (Reck), new combination

Schizotetranychus (*Eotetranychus*) *ulmicola* Reck, 1948, Soobsh. Akad. Nauk Gruz. S.S.R., 9(6): 374; 9(7): 449. Described from specimens Georgia, S.S.R., on *Ulmus* spp.

The figure of the aedeagus indicates a close relationship with *E. carpini*. The peritreme ends in a simple bulb which may be bent weakly posteriorly.

GENUS NEOTETRANYCHUS TRÄGÅRDH

Neotetranychus Trägårdh, 1915, Medd. Centralanst. försöks. jordbruk. Ent., 109(20): 23; Trägårdh, 1915, Zts. aug. Ent., 2: 163; McGregor, 1919, Proc. U. S. Natl. Mus., 56(2303): 646; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 45. *Type of genus: Neotetranychus rubi* Trägårdh: monobasic.

Anatetranychus Womersley, 1940, Trans. Roy. Soc. S. Australia, 64(2): 261. *Type of genus: Anatetranychus hakea* Womersley: monobasic. *New synonymy.*

An unusually long extension of the base of the empodium of both females and males was the basis on which Trägårdh differentiated the genus *Neotetranychus* from *Eotetranychus*. McGregor assigned a second species to *Neotetranychus* because of a similar development of the female empodium. However, the male of McGregor's species departs even more from the *Eotetranychus* pattern in that all empodia are simply clawlike. The genus *Anatetranychus* was based on a species in which the empodia of the female (male unknown) were described as simply clawlike.

The species that are here considered under the generic name *Neotetranychus* probably do not constitute a phylogenetic unit, the structure of the empodium representing parallel development. The chaetotaxy of the legs, the development of the dorsal setae of the body, the form of the aedeagus and empodium I of the male, and the color of the body in life all indicate that the species are not closely allied.

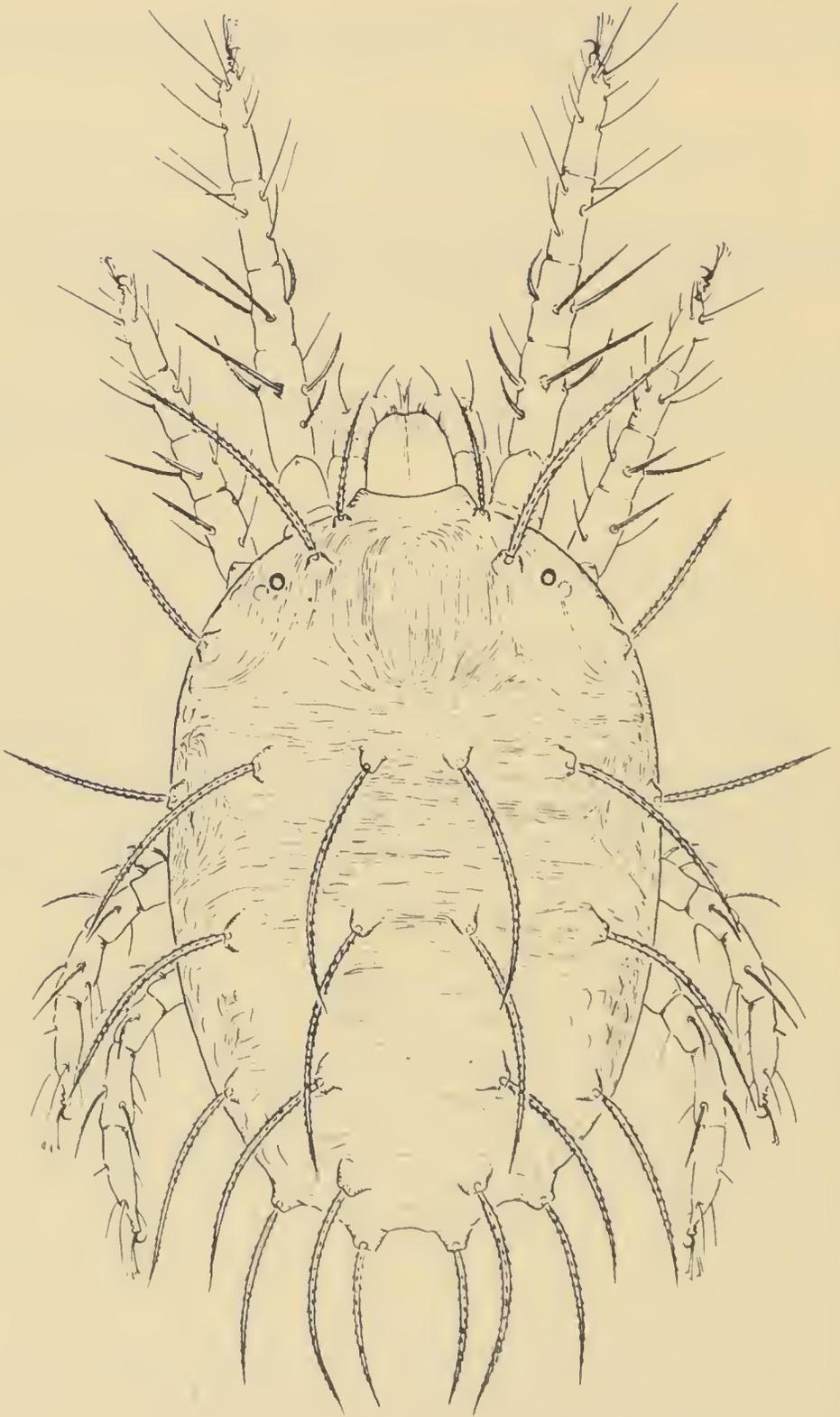


Fig. 169. *Neotetranychus rubi*: dorsal aspect of female.

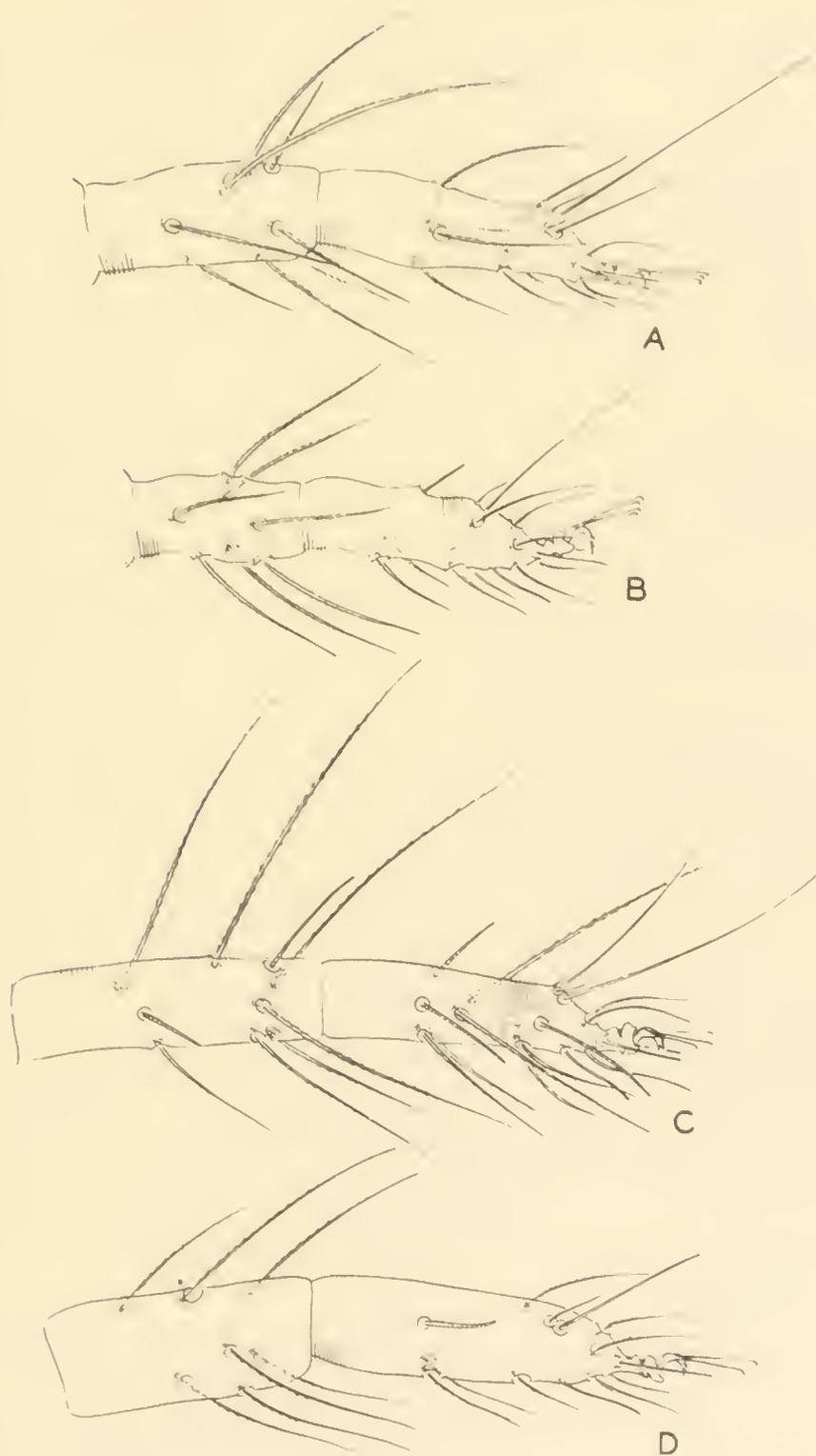


Fig. 170. *Neotetranychus rubi*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

Key to the species of *Neotetranychus*
Females

1. Body with dorsal setae longer than longitudinal intervals between them and set on tubercles 2
1. Body with dorsal setae shorter than longitudinal intervals between them and not set on tubercles 3
2. Tibia II with seven tactile setae (Europe) *rubi* (p. 218)
2. Tibia II with six tactile setae (southwestern United States) *siccus* (p. 219)
3. Empodium with three pairs of hairs at distal end (eastern United States) *virginiensis* (p. 223)
3. Empodium simply clawlike (Australia) *hakea* (p. 225)

Neotetranychus rubi Trägårdh
(Figures 169, 170, 171, 172)

Neotetranychus rubi Trägårdh, 1915, Medd. Centralanst. försöks jordbruk. Ent., 109(20): 33; McGregor, 1919, Proc. U. S. Natl. Mus., 56(2303): 647; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 45. *Types*: males and females, Stockholm, Sweden, on *Rubus* sp.; possibly in the Trägårdh collection.

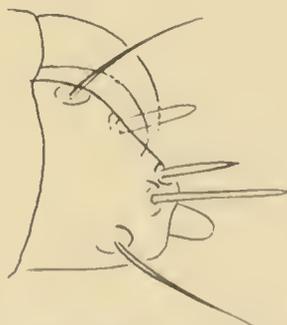
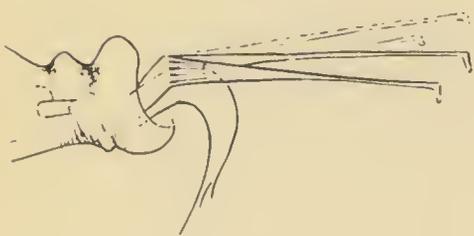


Fig. 171. *Neotetranychus rubi*: empodium of female and terminal palpal segment of male.

Neotetranychus rubi may be readily recognized by having long, acutely tapering setae that are set on strong tubercles on the dorsum of the body. The empodium of the female has a very long, slender, curved base, and only the distal end is divided into three pairs of hairs. The empodia of the male are similar except that on leg I it resembles a split claw.

Tibia I of the female bears seven tactile and one sensory setae, and two sensory setae are present in the male; tibia II bears seven tactile setae in both sexes; and tibia III bears six tactile setae in both sexes. Tarsus I bears four tactile setae proximally in the female, along with two or three sensory setae in the male.



Fig. 172. *Neotetranychus rubi*: aedeagus.

The aedeagus is sickle-shaped, curved sharply dorsad and tapering to the tip.

This species is known only from *Rubus* spp. in Europe. Records are from Sweden, the type locality, and from Germany. Our material is from Germany, kindly presented by Dr. F. Zacher.

Neotetranychus siccus Pritchard and Baker, new species
(Figures 173, 174)

Females of *Neotetranychus siccus* resemble those of *N. rubi* except that the body is much smaller and the dorsal setae are narrower and not borne on as prominent tubercles. The paired hairs at the distal end of the empodium are quite obvious, and tibia II bears only six tactile setae. The male is unknown.

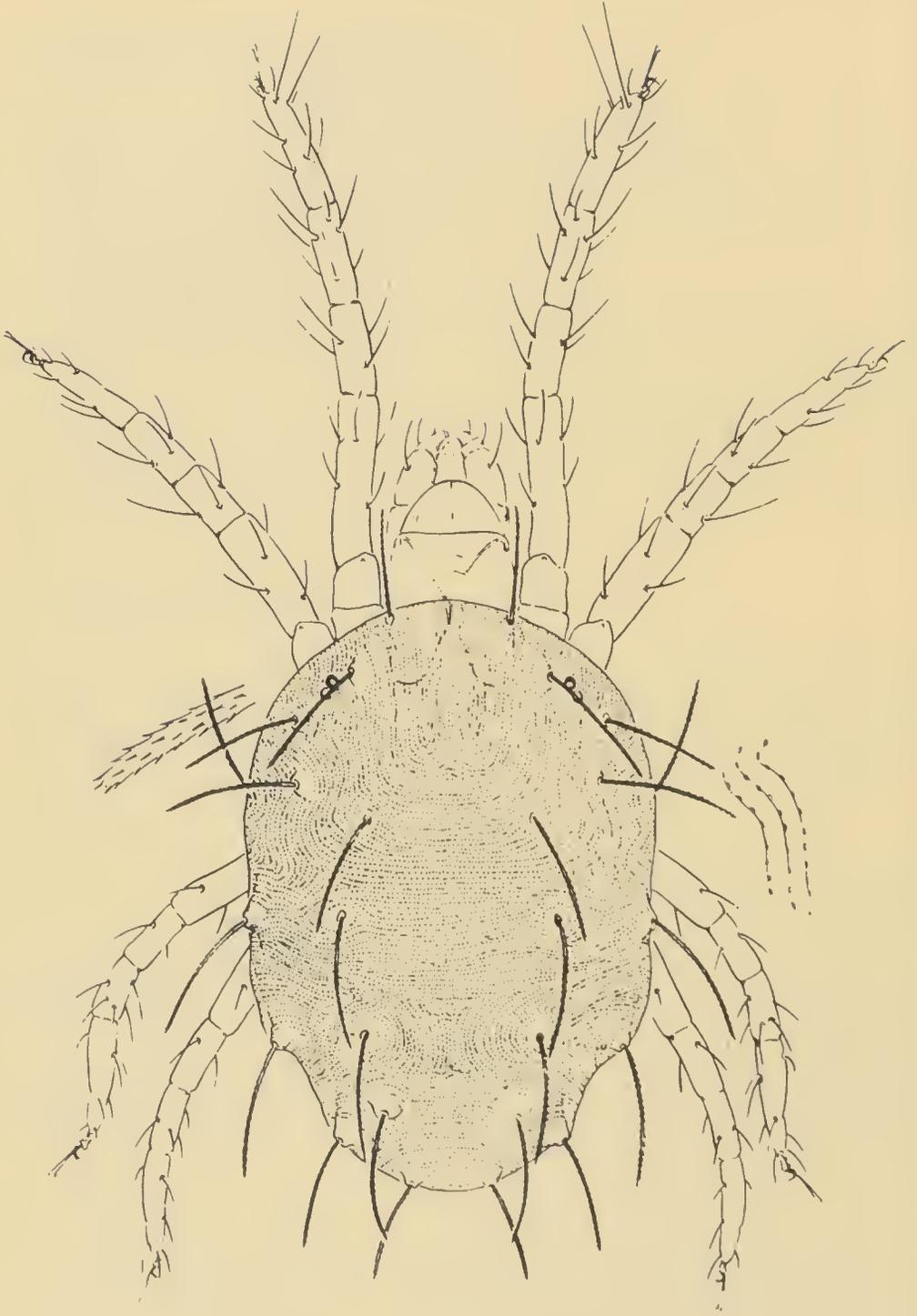


Fig. 173. *Neotetranychus siccus*: dorsal aspect of female.

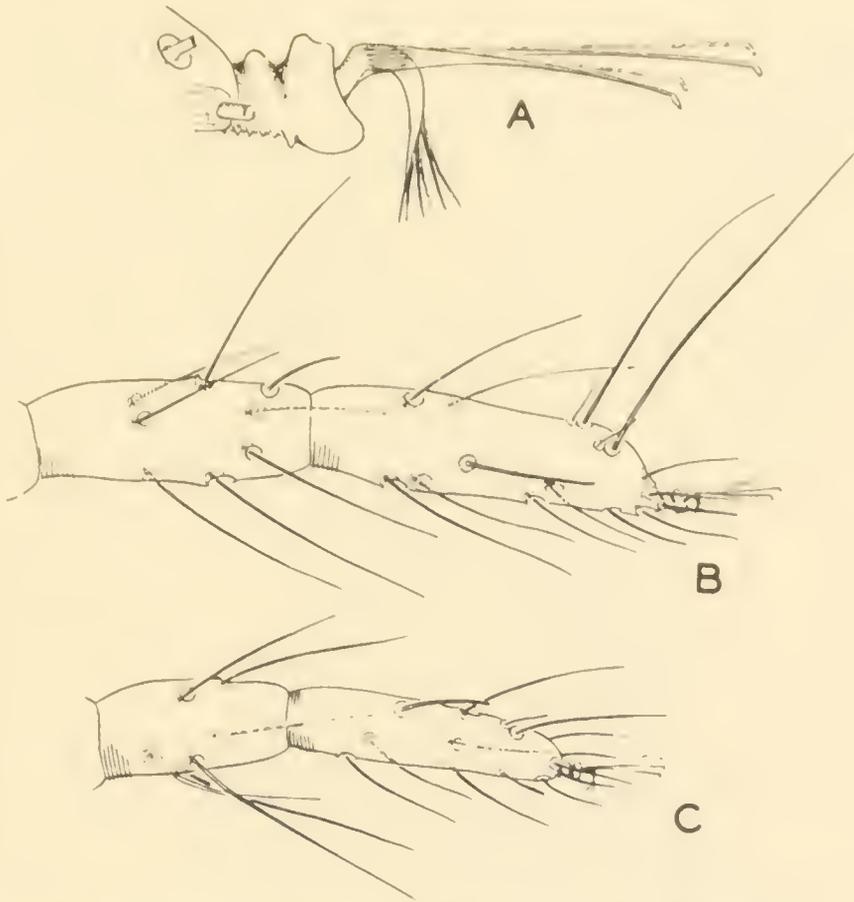


Fig. 174. *Neotetranychus siccus*: A.) empodium of female; B.) tibia and tarsus I of female; C.) tibia and tarsus II of female.

This species is known only from the Arizona desert.

Female.—Palpus with terminal sensillum about three times as long as broad. Stylophore about twice as long as broad. Peritreme straight distally, ending in a simple bulb. Tibia I with seven tactile and one sensory seta; tarsus I with four tactile and one sensory seta proximal to duplexes; empodium stem slender, slightly longer than the six distal hairs. Tibia II with six tactile setae. Body with dorsal setae arising from tubercles, slender, slightly longer than longitudinal intervals between them. Hysterosomal integumentary striae mostly transverse, but longitudinal between third dorsocentrals. Length of body 276μ , including rostrum 335μ ; greatest width of body 193μ .

Holotype.—Female, Phoenix, Arizona, September 27, 1953 (F. F. Bibby), on leguminous desert shrub: type no. 2180 in the U. S. National Museum.

Paratypes.—Five females, 3 nymphs, Phoenix, Arizona, September 27, 1953 (F. F. Bibby), on desert shrub (legume).

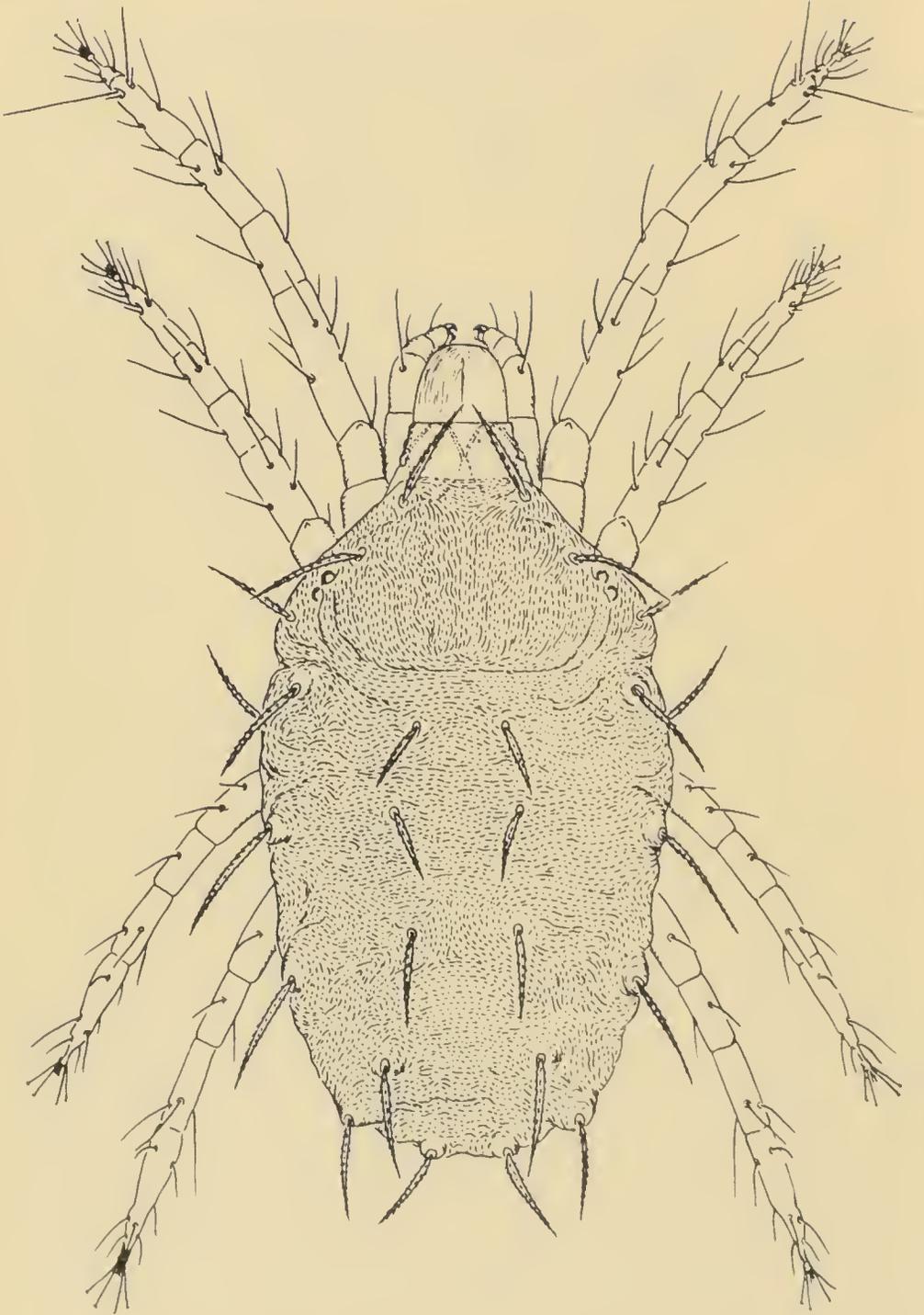


Fig. 175. *Neotetranychus virginensis*: dorsal aspect of female.

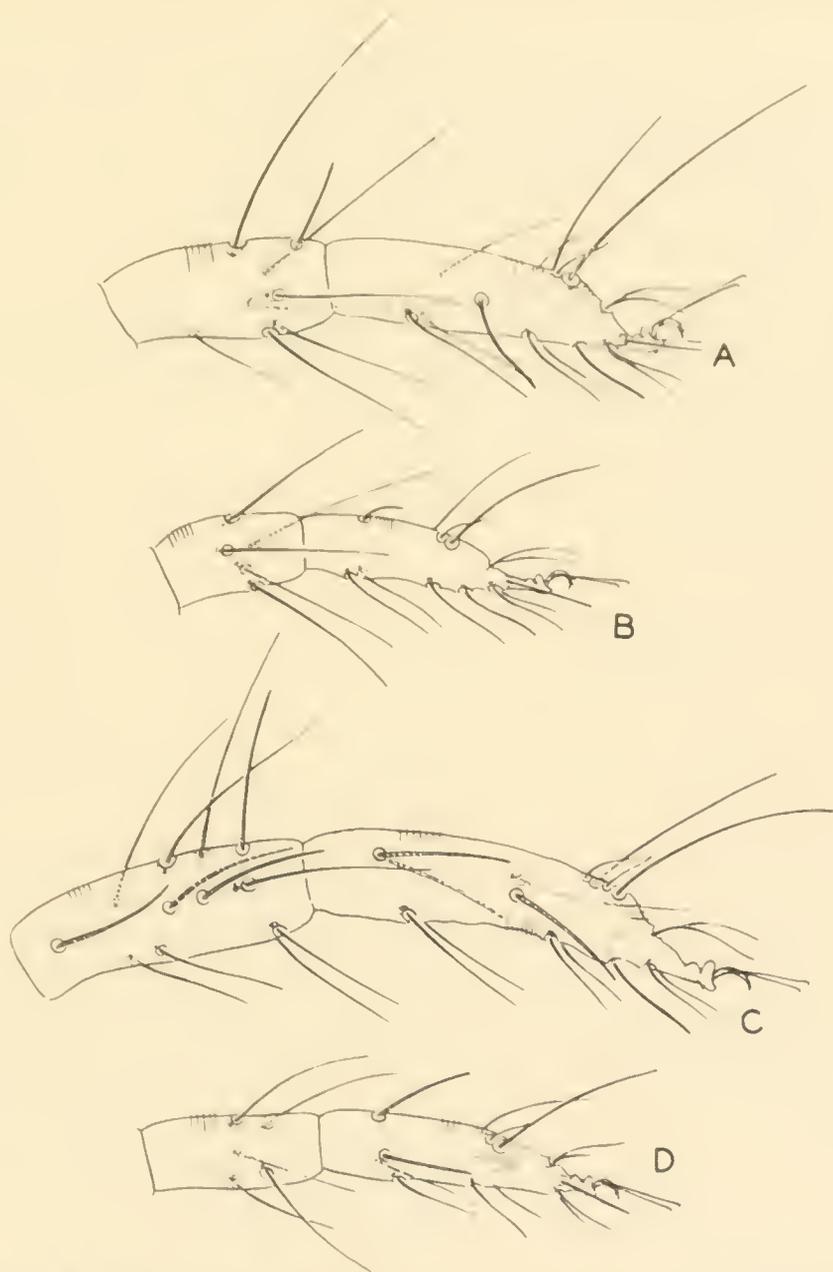


Fig. 176. *Neotetranychus virginiensis*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

Neotetranychus virginiensis McGregor
(Figures 175, 176, 177, 178)

Neotetranychus virginiensis McGregor, 1950, Amer. Midl. Nat., 44(2): 275. Types: males and females, Arlington Farm, Virginia, on black locust; in the U. S. National Museum.



Fig. 177. *Neotetranychus virginiensis*: above, appendages of tarsus I of male; below, appendages of tarsus II of female.



Fig. 178. *Neotetranychus virginiensis*: aedeagus.

Adults of *Neotetranychus virginiensis* may be recognized by having the dorso-central hysterosomals shorter than the longitudinal intervals between them, not set on tubercles, and the empodium with a long, slender base. The empodium of the male forms a simple clawlike appendage on all legs, and the aedeagus characteristically curves slightly ventrad to form a distal knob having the anterior and posterior angulations more or less similarly developed.

Tibia I bears six or seven tactile setae in the female plus one sensory seta, and eight tactile setae in the male plus four sensory setae; tibiae II and III each bears five tactile setae in both sexes. Tarsus I bears three (rarely two or four) tactile setae in both sexes proximal to the duplexes, plus one sensory seta in the female and three sensory setae in the male.

This species is known only from black locust in the eastern United States. Specimens, other than the types, examined are from Beltsville, Maryland (E. W. Baker), on locust; and Natchitoches, Louisiana (L. D. Newsom), on black locust.

Neotetranychus hakea (Womersley), new combination

Anatetranychus hakea Womersley, 1940, Trans. Roy. Soc. S. Australia, 4(2): 262. Type: female, Claremont, Western Australia, on *Hakea* sp.; in the South Australian Museum.

The female of *hakea* differs from other members of the genus *Neotetranychus* in that the empodium of this sex is described as being simply clawlike, and the color of the body in life is reddish. The dorso-central hysterosomals are slender and shorter than the longitudinal intervals between them. The male is unknown.

This species is known only from the type female from Australia, on *Eucalyptus*.

GENUS *SCHIZOTETRANYCHUS* TRÄGÅRDH

Schizotetranychus Trägårdh, 1915, Stockholm Landtbr.-Akad. Handl., 54: 277; Trägårdh, 1915, Medd. Centralanst. försöks. jordbrück. Ent. avdeln., 20(109): 20; Trägårdh, 1915, Zts. angew. Ent., 2: 162; McGregor, 1917, Proc. U. S. Natl. Mus., 56(2303): 647; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42: 28; Garman, 1940, Bul. Conn. Agric. Expt. Sta., 431: 74; McGregor, 1950, Amer. Midl. Nat., 44: 307. Type of genus: *Tetranychus schizopus* Zacher, by original designation.

Stigmaeopsis Banks, 1917, Ent. News., 28: 195. Type of genus: *Stigmaeopsis celarius* Banks; monobasic.

Divarinychus McGregor, 1930, Proc. Ent. Soc. Wash., 32: 161. Type of genus: (*Divarinychus floridensis* McGregor) = *Schizotetranychus asparagi* (Oudemans); monobasic and by original designation.

Peritetranychus Ugarov and Nikolskii, 1937, Trudy Sredneaz. Stan. Zash. Rast., p. 37. Type of genus: *Peritetranychus tuberculatus* Ugarov and Nikolskii; by present designation. New synonymy.

The genus *Schizotetranychus* is an offshoot of the *Eotetranychus* stem. The ventrolateral pair of empodial hairs is enlarged to form two clawlike appendages, and this development will serve for generic recognition. The other two pairs of empodial hairs are extremely thin in proportional size, usually difficult to see, and sometimes one or both pairs of hairs are absent.

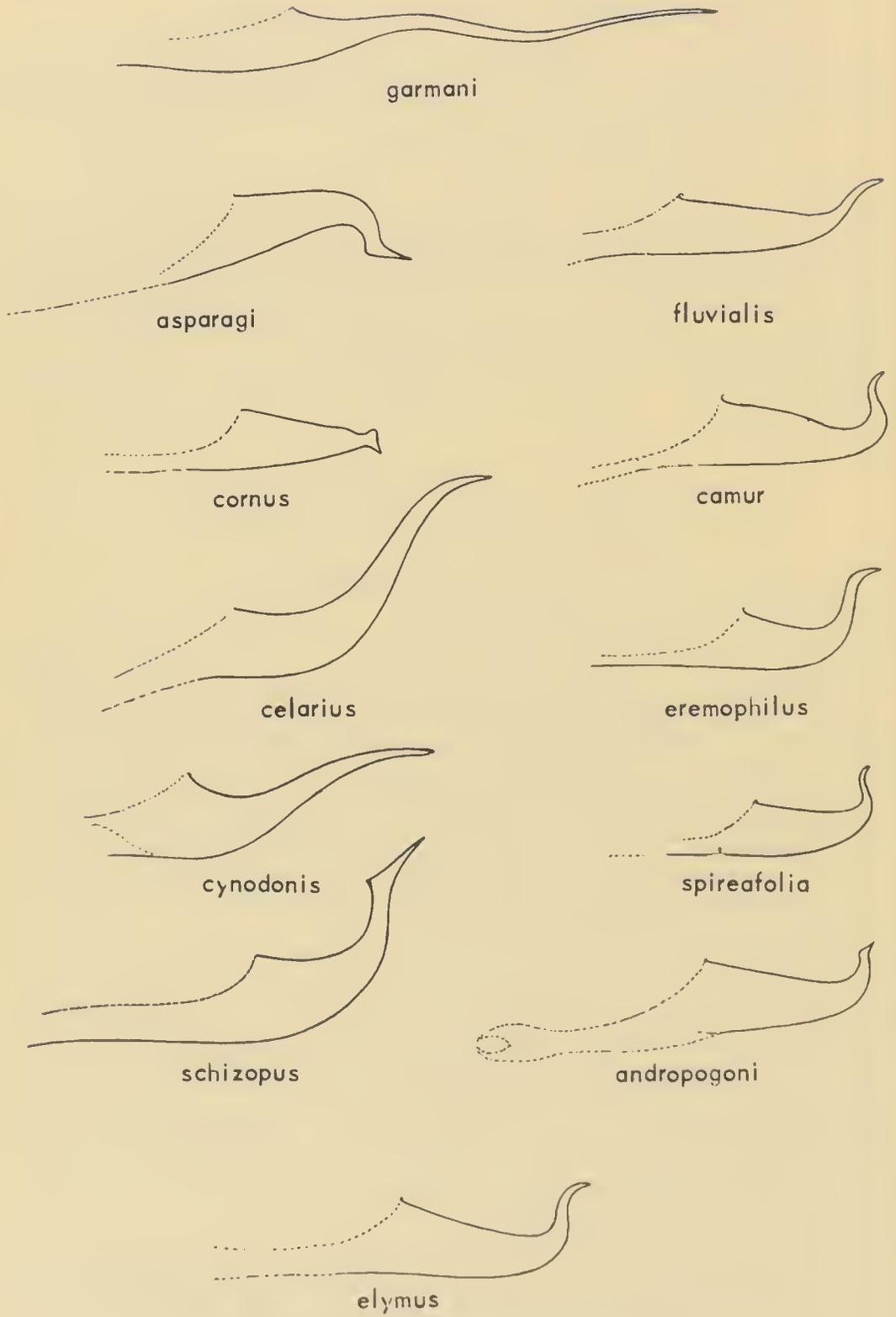


Fig. 179. *Schizotetranychus*, aedeagi.

Species of *Schizotetranychus* are most commonly found on monocotyledonous plants, particularly grasses, but also bamboo, and asparagus. Other hosts include willow and spirea. The adult females are greenish, sometimes slightly pinkish, with a number of dark spots of pigment within the body on each side. They spin considerable webbing, and in the case of *S. celarius* a dense canopy is spun over each colony on the under surface of the leaf.

One species, (*Schizotetranychus cercocarpi* McGregor) = *Eotetranychus deflexus* has been erroneously referred to the genus.

Key to North American species of *Schizotetranychus* Females

The female of *Schizotetranychus camur* is unknown.

1. Body with dorsal setae lanceolate, acutely tapering from the widened proximal portion, nearly nude, and shorter than the intervals between them; on *Spirea* . . . *spireaefolia* (p. 248)
1. Body with dorsal setae slender, not obviously widened proximally 2
- 2.(1). Hysterosoma with first pair of dorsocentrals similar in length to first dorsolaterals 3
- 2.(1). Hysterosoma with first pair of dorsocentrals about one-half as long as first dorsolaterals; on grass. . . *eremophilus* (p. 251)
- 3.(2). Hysterosoma with first pair of dorsocentrals similar in length to second pair of dorsocentrals 4
- 3.(2). Hysterosoma with first pair of dorsocentrals about one-half as long as second pair of dorsocentrals; on bamboo
. *celarius* (p. 249)
- 4.(3). Hysterosoma with dorsal setae much shorter than intervals between them 5
- 4.(3). Hysterosoma with dorsal setae nearly as long as or longer than intervals between them 7
- 5.(4). Stylophore very slender, over twice as long as wide; dorsal setae finely pubescent; on grass 6
- 5.(4). Stylophore comparatively broad, only one-third longer than wide; dorsal setae densely pubescent; on asparagus fern
. *asparagi* (p. 237)
- 6.(5). Hysterosoma with second and third dorsolaterals similar in length to second and third dorsocentrals *fluvialis* (p. 254)

Spider Mites

- 6.(5). Hysterosoma with second and third dorsolaterals much longer than second and third dorsocentrals *nugax* (p. 264)
- 7.(4). Empodium with proximolateral chaeta 8
- 7.(4). Empodium without proximolateral chaeta 10
- 8.(7). Tarsus with ventral tactile setae very strongly pubescent; hysterosoma with dorsal setae approximately as long or slightly longer than longitudinal intervals between their bases; on grass *cynodonis* (p. 229)
- 8.(7). Tarsus with ventral tactile setae minutely pubescent 9
- 9.(8). Hysterosoma with dorsal setae much longer than longitudinal intervals between them; on grass *parasemus* (p. 230)
- 9.(8). Hysterosoma with dorsal setae slightly shorter than longitudinal intervals between them; on willow *schizopus* (p. 240)
- 10.(7). Dorsal hysterosomals far surpassing the longitudinal intervals between them; on willow *garmani* (p. 233)
- 10.(7). Dorsal hysterosomals slightly longer than longitudinal intervals between them; on grass *elymus* (p. 254)

Males

The males of *parasemus* and *nugax* are unknown.

1. Aedeagus flanked by a pair of triangular genital stylets; empodium with proximolateral chaeta; on grass *cynodonis* (p. 229)
1. Aedeagus not accompanied by genital stylets; empodium without proximolateral chaeta 2
- 2.(1). Aedeagus strongly bent, dorsad or ventrad 3
- 2.(1). Aedeagus slender, undulate, caudally directed; on willow *garmani* (p. 233)
- 3.(2). Aedeagus bent ventrad, the distal end with an anterior angulation; on asparagus *asparagi* (p. 237)
- 3.(2). Aedeagus bent dorsad 4
- 4.(3). Distal end of aedeagus forming a knob with an acute angulation anteriorly and a slender angulation posteriorly *schizopus* (p. 240)
- 4.(3). Distal end of aedeagus without an anterior angulation 5
- 5.(4). Tarsi I and II with some sensory setae fusiform *eremophilus* (p. 251)

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- 5.(4). Tarsi I and II with sensory setae all slender 6
- 6.(5). Aedeagus bent dorsad to form an acute angle; dorsal setae of body very minutely pubescent, widened proximally and tapering to a very fine point; on spirea *spireaefolia* (p. 248)
- 6.(5). Aedeagus bent dorsad at not more than a right angle; dorsal setae of body obviously pubescent and not very acutely tapering from a widened base; on monocots 7
- 7.(6). Aedeagus bent sharply dorsad at nearly a right angle; on grasses 8
- 7.(6). Aedeagus broadly curved dorsad at an obtuse angle; on bamboo *celarius* (p. 249)
- 8.(7). Hysterosoma with dorsocentrals less than one-half as long as longitudinal intervals between them *fluvialis* (p. 254)
- 8.(7). Hysterosoma with dorsocentrals nearly as long as longitudinal intervals between them 9
- 9.(8). Bent portion of aedeagus about one-half as long as external portion of shaft *elymus* (p. 254)
- 9.(8). Bent portion of aedeagus less than one-third as long as external portion of shaft *camur* (p. 260)

Schizotetranychus cynodonis McGregor

(Figures 180, 181, 182)

Schizotetranychus cynodonis McGregor, 1950, Amer. Midl. Nat., 44: 309. Types: 12 males and 18 females, Julian, California, on Bermuda grass; in the U. S. National Museum.

The male of *Schizotetranychus cynodonis* is distinctive in that a pair of triangular plates, the genital stylets, accompany the aedeagus. These stylets are not known to occur elsewhere in the Tetranychinae.

The female may be recognized by having a pair of proximolateral chaetae on the empodium, together with having the ventral setae of the tarsi strongly pubescent.

Schizotetranychus cynodonis has been known only from southern California, on Bermuda grass and salt grass. New collections are from San Rafael, California (A. E. Pritchard), on salt grass; Coalinga, California (A. E. Pritchard), on *Agrostis*; and Palm Springs, California (A. E. Pritchard), on Bermuda grass.

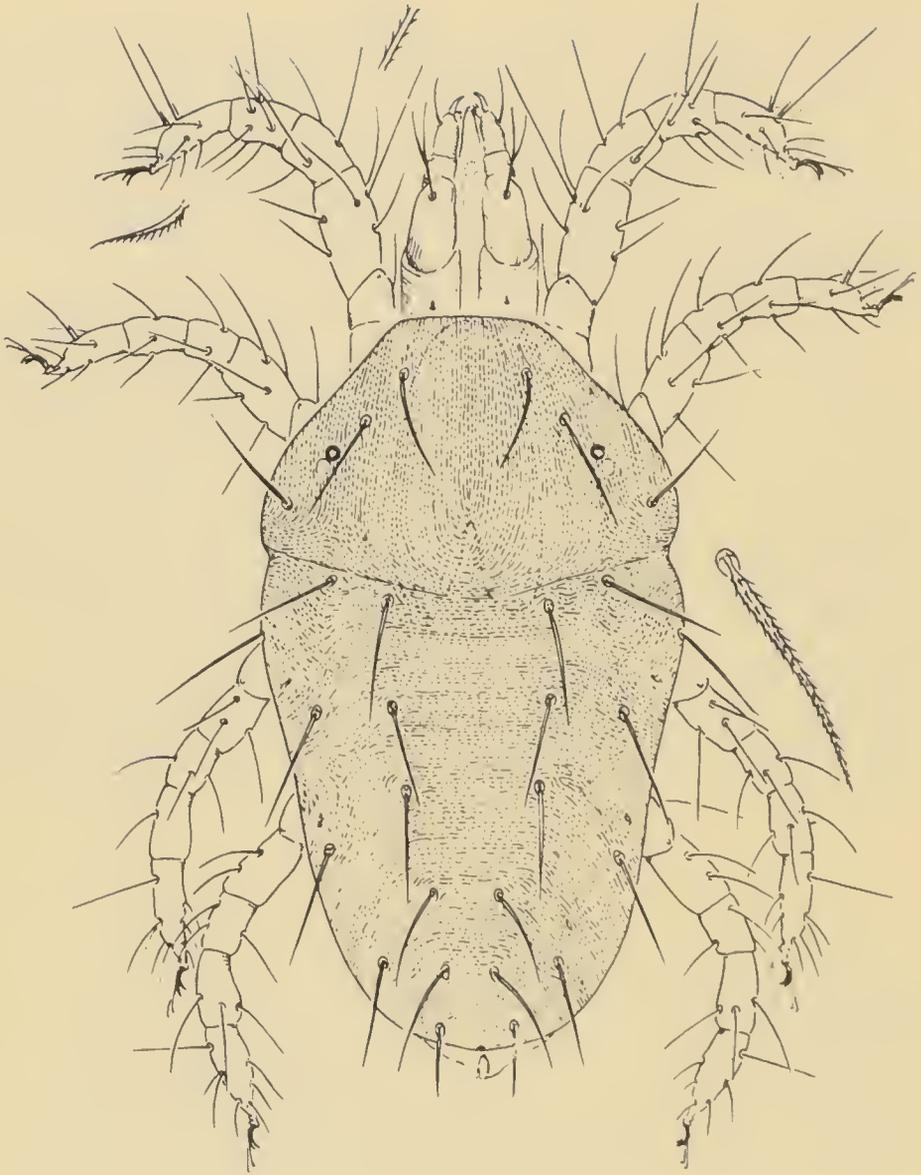


Fig. 180. *Schizotetranychus cynodonis*: dorsal aspect of female.

Schizotetranychus parasemus Pritchard and Baker, new species
(Figures 183, 184)

Schizotetranychus parasemus appears to be closely related to *S. cynodonis*, and it similarly possesses a pair of proximolateral chaetae on the empodium. However, the dorsal setae of the body are much longer in *S. parasemus* than in *S. cynodonis*, and the tactile setae of the tarsi are nearly nude. The male of *S. parasemus* is unknown.

Female.—Gnathosoma reaching end of femur I, the palpi slightly

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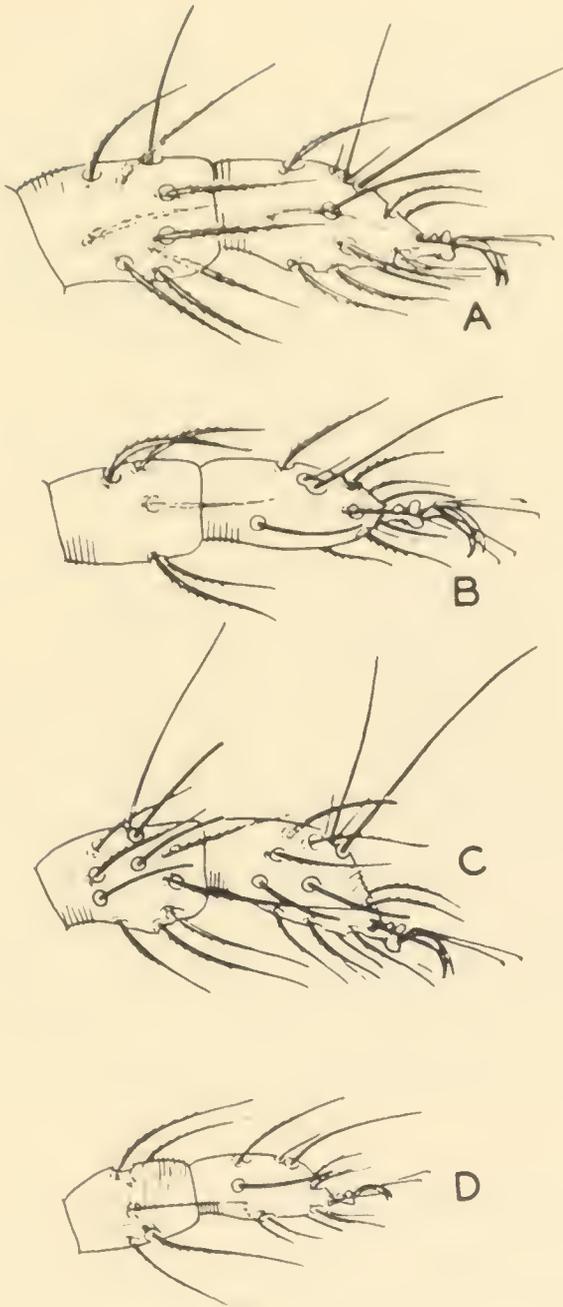


Fig. 181. *Schizotetranychus cynodonis*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

longer than the rostrum. Palpus with terminal sensillum on fifth segment slender, about four times as long as wide, the mediodorsal sensilla somewhat long, and the proximal, fusiform sensillum also slender and somewhat longer. Peritreme straight distally, ending in a bulb. Tibia I with seven tactile setae and one sensory seta; tarsus I slender

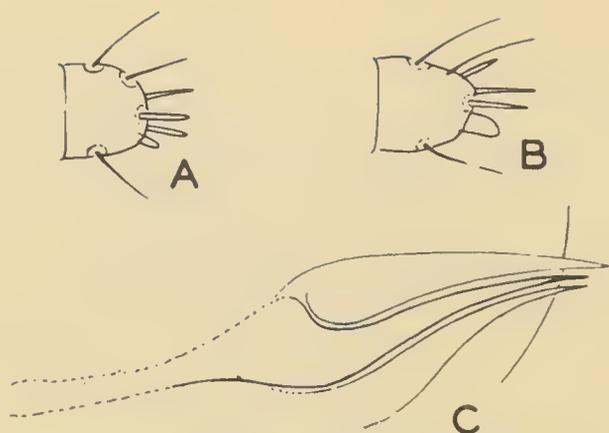


Fig. 182. *Schizotetranychus cynodonis*: A.) terminal segment of palpus of male; B.) terminal segment of palpus of female; C.) aedeagus.

with three tactile setae and a sensory seta as proximal end; and all tactile setae minutely pubescent. Tibia II with six tactile setae; tibia III with five tactile setae. Empodium with each of the clawlike divisions bearing a pair of fine dorsal hairs, and with an obvious pair of proximalateral chaetae. Body with dorsal setae very long, reaching nearly to base of second seta caudad, tapering and densely pubescent. Length of body including rostrum 346 μ ; greatest width of body, 193 μ .

Holotype.—Female, Nortonville, 10 miles east of Clayton, Contra Costa County, California, October 15, 1952 (W. C. Bentinck), on *Distichlis spicata*; type no. 2128 in the U. S. National Museum. *Paratypes*.—Female, Nortonville, California, October 15, 1952 (W. C. Bentinck), on *Distichlis spicata*; 3 females, 1 nymph, Clayton, California, October 8, 1952 (J. W. MacSwain), on salt grass; 5 females, Sage, California, August 23, 1935 (E. A. McGregor), on *Cynodon* sp.

Schizotetranychus oudemansi Reck

Schizotetranychus schizopus, Oudemans, 1931, Ent. Ber. 8(179): 260, 261; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 28, 29. On *Vaccinium uliginosum*, Winterswijk, Holland. *Misidentification*.

Schizotetranychus oudemansi Reck, 1948, Soobsh. Akad. Nauk Gruz. S.S.R., 9(6): 374, 375.

Until Oudemans' material can be studied the exact status of this species will remain in doubt. It is probably closely related to *S. cynodonis* and *S. parasemus*, with all dorsal setae of equal length but longer than the longitudinal intervals between them.

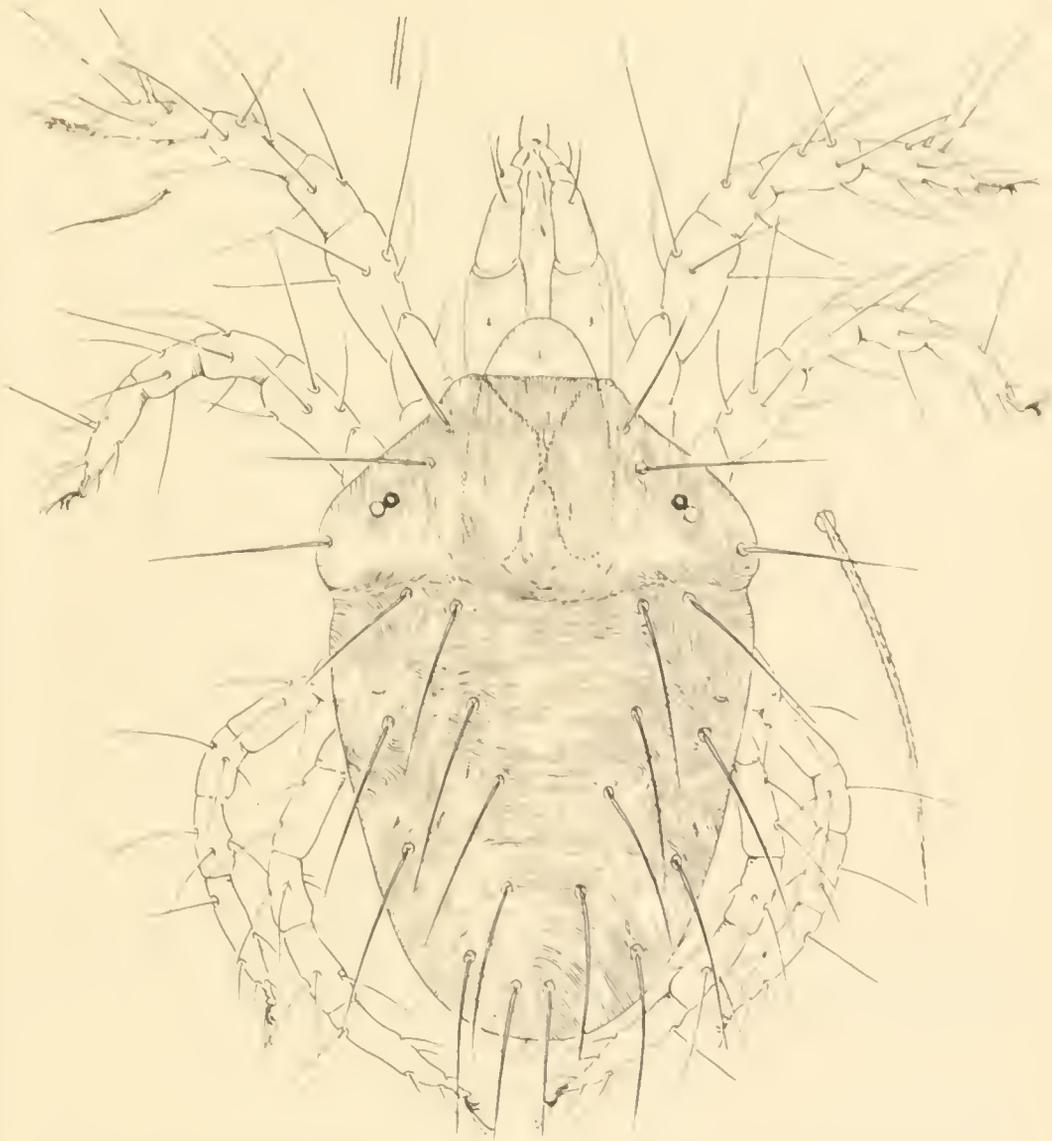


Fig. 183. *Schizotetranychus parasemus*: dorsal aspect of female.

Schizotetranychus garmani Pritchard and Baker, new species
(Figures 185, 186, 187, 188)

Schizotetranychus schizopus, Garman, 1940, Bul. Conn. Agric. Exp. Sta., 431: 74. Misidentification.

Garman's identification of *Schizotetranychus schizopus* Zacher, from Connecticut, is not accepted because the aedeagus of the New England species differs markedly from that of *S. schizopus* as figured by Hirst (1920) and McGregor (1950).

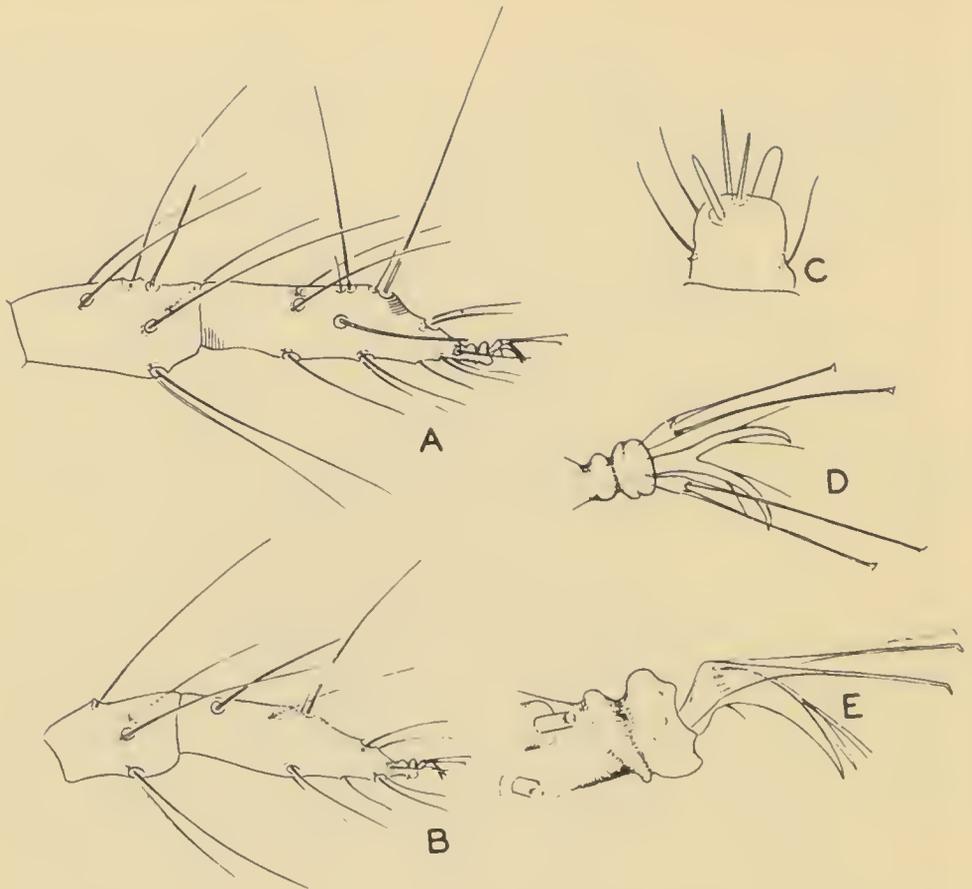


Fig. 184. *Schizotetranychus parasemus*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) terminal segment of palpus of female; D.) empodium I of female; E.) lateral view of female empodium.

The aedeagus of *S. garmani* is distinctive in that it forms a slender, undulating rod as in *Eotetranychus carpini* and related species. The female does not possess a pair of proximolateral chaetae on the empodium, and the dorsal setae of the body are all long and slender, much longer than the longitudinal intervals between them.

This species is known only from Connecticut, on willow.

Male.—Fifth segment of palpus with terminal sensillum moderately slender, about four times as long as wide at base; mediodorsal sensillum about as long as terminal sensillum; the proximal, fusiform sensillum shorter. Peritreme straight distally, ending in a simple chamber. Tibia I with eight tactile and four sensory setae; tarsus I short with duplex setae just beyond middle of segment, with four tactile and three sensory setae proximal to the duplexes; empodial claws I each with three slender teeth of which the inner, ventral tooth is fine. Tibia II with eight tactile setae; tibia III with six tactile setae; empodia

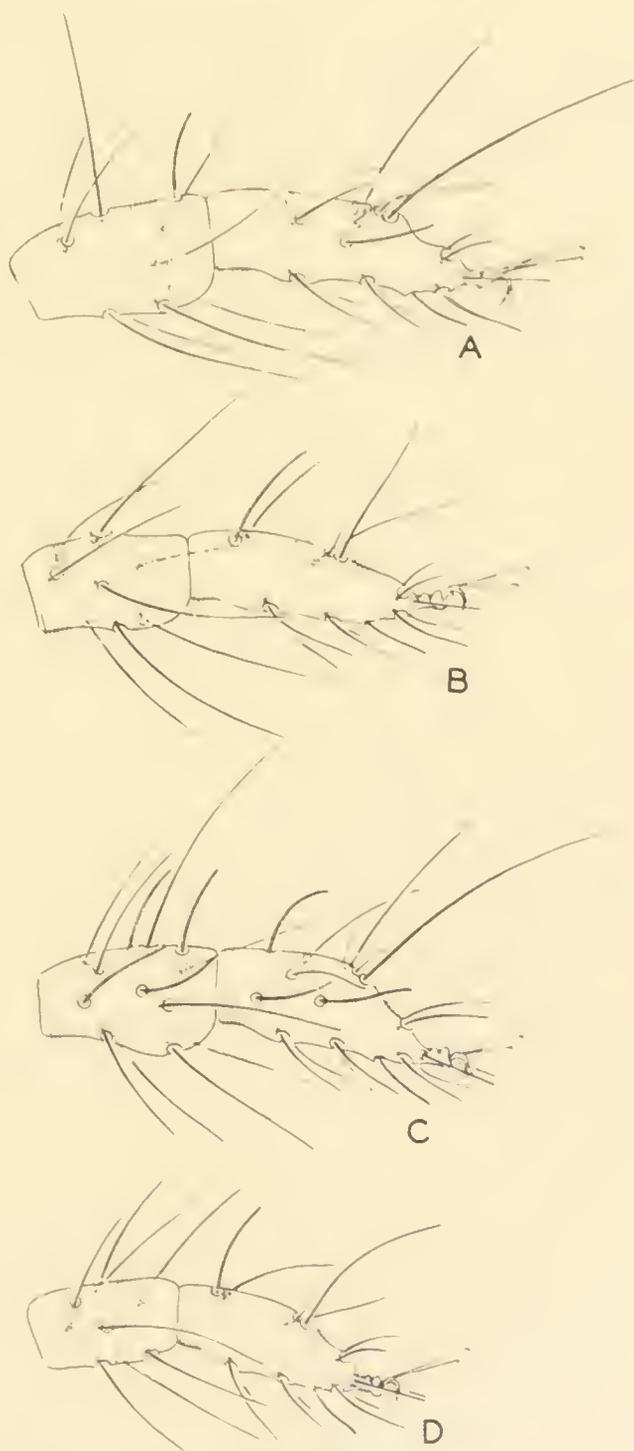


Fig. 185. *Schizotetranychus garmani*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

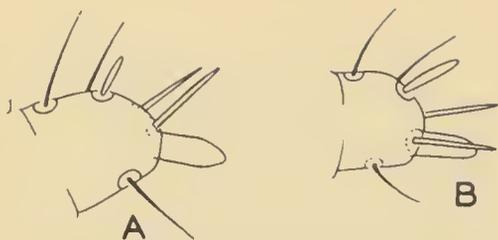


Fig. 186. *Schizotetranychus garmani*: A.) terminal segment of palpus of female; B.) terminal segment of palpus of male.

II-IV with two pairs of very fine hairs dorsally on each clawlike division; proximolateral chaeta minute. Dorsum of body with very long setae, much longer than intervals between them. Aedeagus very long and slender, tapering, caudally directed but with distinct wave near the middle. Length of body, 213 μ ; including rostrum, 272 μ .

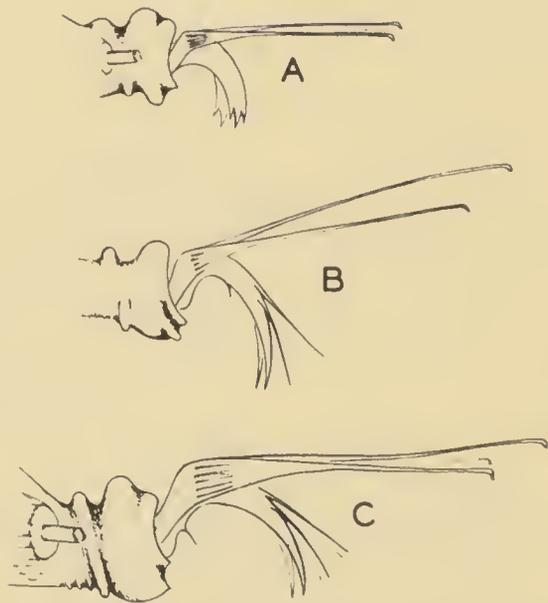


Fig. 187. *Schizotetranychus garmani*: A.) appendages of tarsus I of male; B.) appendages of tarsus IV of male; C.) appendages of tarsus I of female.

Female.—Similar to male except tibia I with two or three sensory setae and tarsus I with a single sensory seta proximally; empodial claws with dorsal hairs less evident and proximolateral denticulation more evident; and dorsal setae of body only about as long as longitudinal intervals between them. Length of body, 316 μ , including rostrum, 383 μ ; greatest width of body, 210 μ .

Holotype.—Male, Hamden, Connecticut, September 24, 1922, on willow leaves; type no. 2127 in the U. S. National Museum. *Paratypes*.—Eight females, Hamden, Connecticut, September 24, 1922, on willow; 13 females, Amherst, Massachusetts, July 17, 1950 (W. B. Becker), on willow.

This species is named in honor of Philip Garman, a pioneer in the study of spider mites in North America.



Fig. 188. *Schizotetranychus garmani*: aedeagus.

Schizotetranychus asparagi (Oudemans)

(Figures 189, 190, 191)

Epitetranychus asparagi Oudemans, 1928, Ent. Ber., 7: 288. Types: males and females, Amsterdam, Holland, on *Asparagus springeri*.

Schizotetranychus asparagi, Oudemans, 1931, Ent. Ber., 8: 292; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42: 29; Pritchard, 1949, Bul. California Exp. Sta., 713: 7.

Divarinychus floridensis McGregor, 1930, Proc. Ent. Soc. Wash., 32: 161. Types: males and females, Longwood, Florida, on *Asparagus plumosus*; in the U. S. National Museum. *New synonymy*.

Schizotetranychus floridensis, McGregor, 1950, Amer. Midl. Nat., 44: 312.

Females of *Schizotetranychus asparagi* may be readily recognized by having the dorsal setae of the body all similar in length, slender, densely pubescent, and much shorter than the intervals between them. The stylophore is comparatively broad, little longer than wide.

The male of *Schizotetranychus asparagi* is distinctive in that the aedeagus turns rather abruptly ventrad, and the distal end is nearly sigmoid with an anterior angulation on the barb.

This species is found only on *Asparagus* ferns, which are usually grown under greenhouse or lath-house conditions in the United States. *Asparagus springeri* and *A. plumosus* are the only recorded hosts. Holland, Florida, and California are the only localities from which the mite has been recorded.

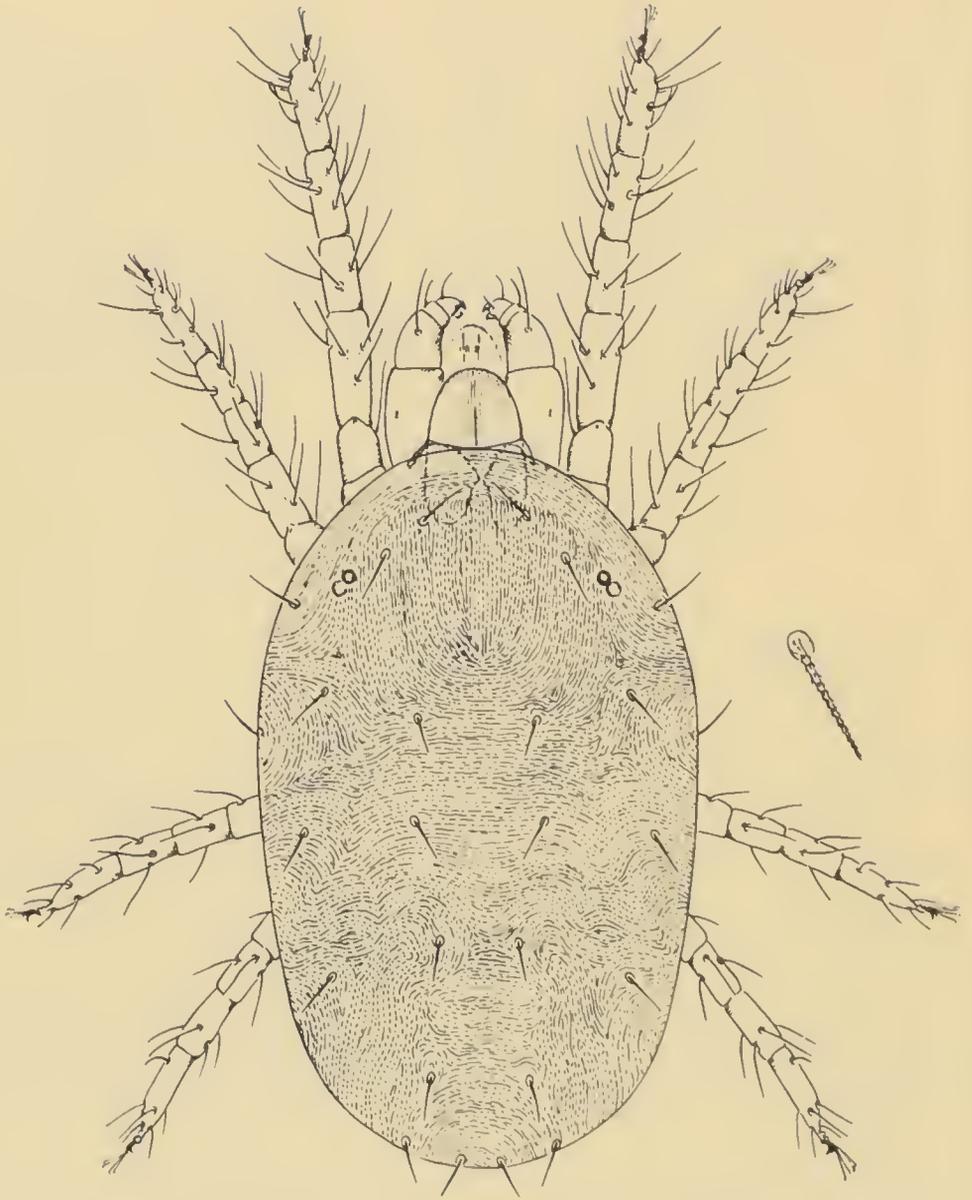


Fig. 189. *Schizotetranychus asparagi*: dorsal aspect of female.

Collections studied by us, in addition to the types of *floridensis*, are from Oakland and Colma, California (A. E. Pritchard), on *Asparagus plumosus*; Rio Piedras, Puerto Rico (F. Sein), on *Asparagus plumosus*; Waipahu, Hawaii (C. Schmidt), on *Asparagus* sp.; Washington, D. C. (Smith and Lang), on *Asparagus plumosus*; and Deland, Florida (M. I. Wright), on *Asparagus plumosus*.

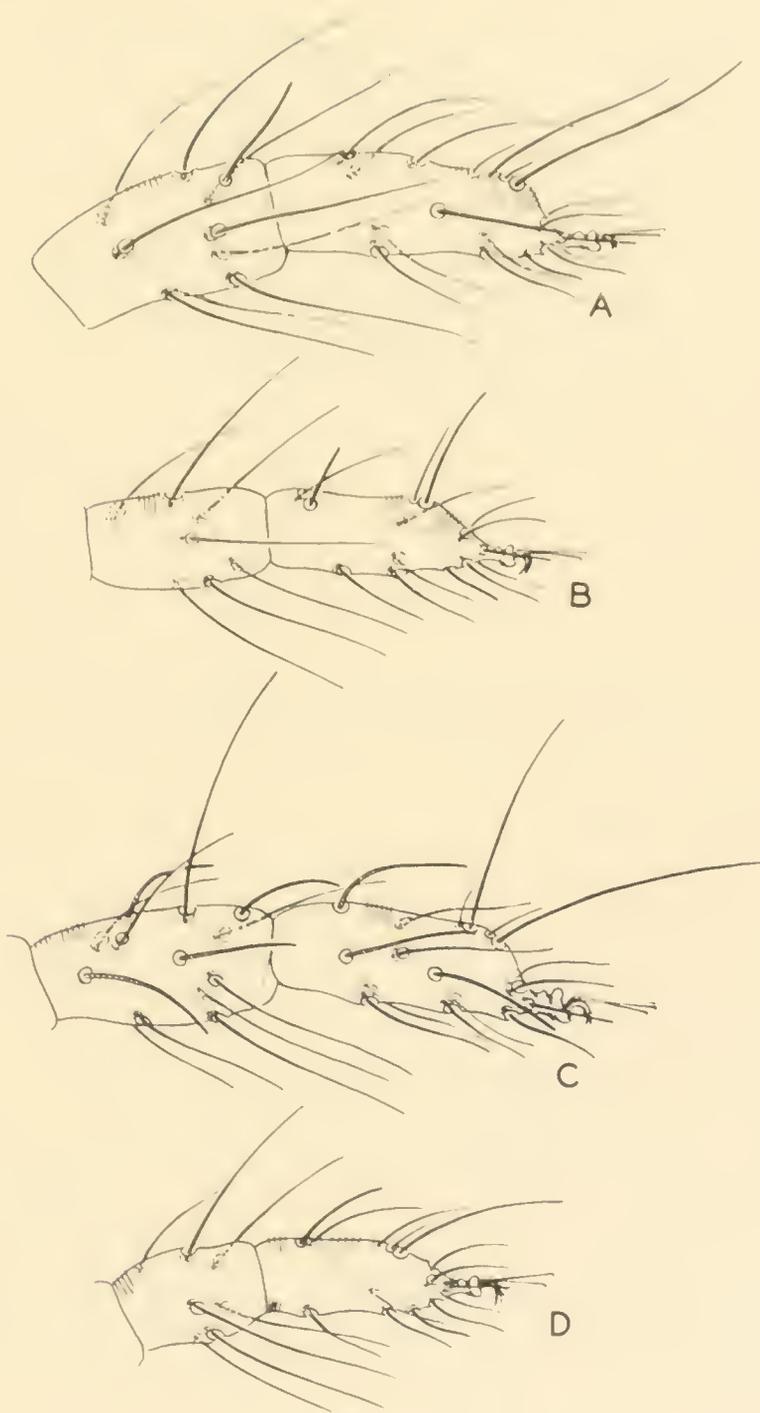


Fig. 190. *Schizotetranychus asparagi*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; C.) tibia and tarsus II of male.

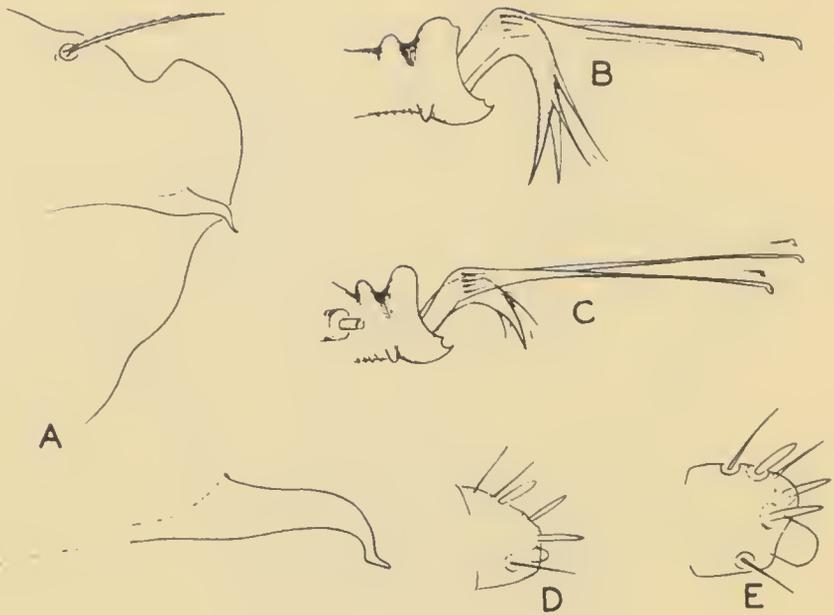


Fig. 191. *Schizotetranychus asparagi*: A.) aedeagus; B.) empodium III of female; C.) empodium I of male; D.) palpus of male; E.) palpus of female.

Schizotetranychus schizopus (Zacher)

(Figures 192, 193)

Tetranychus schizopus Zacher, 1913, Mitt. kais. biol. Anst. Land Forst., 9: 40; Hirst, 1920, Proc. Zool. Soc. Lond. 1920: 50. Types: from Dahlem, Germany, on willow; possibly in the Zacher collection.

Schizotetranychus schizopus, Trägårdh, 1915, Stockholm Landtbr.-Akad. Handl., 44: 277; Trägårdh, 1915, Medd. Centralanst. försöks. jordbrucks. Ent. avdeln., 20(109): 20; Trägårdh, 1915, Zts. angew. Ent., 2: 162; Zacher, 1921, Zts. angew. Ent., 7: 184; McGregor, 1917, Proc. U. S. Natl. Mus., 56(2303): 648; Oudemans, 1931, Ent. Ber., 8(179): 260; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42: 28; Reek, 1948, Soobsh. Akad. Nauk Gruz. S.S.R., 9(7): 450; McGregor, 1950, Amer. Midl. Nat., 44: 313.

The male of *Schizotetranychus schizopus* may be readily recognized by having an anterior angulation on the distodorsad curvature.

The female may be recognized by having a pair of obvious proximo-lateral chaetae on the empodium and the empodial "claws" each with a single dorsal hair. The dorsal hysterosomals are slightly shorter than the longitudinal intervals between them.

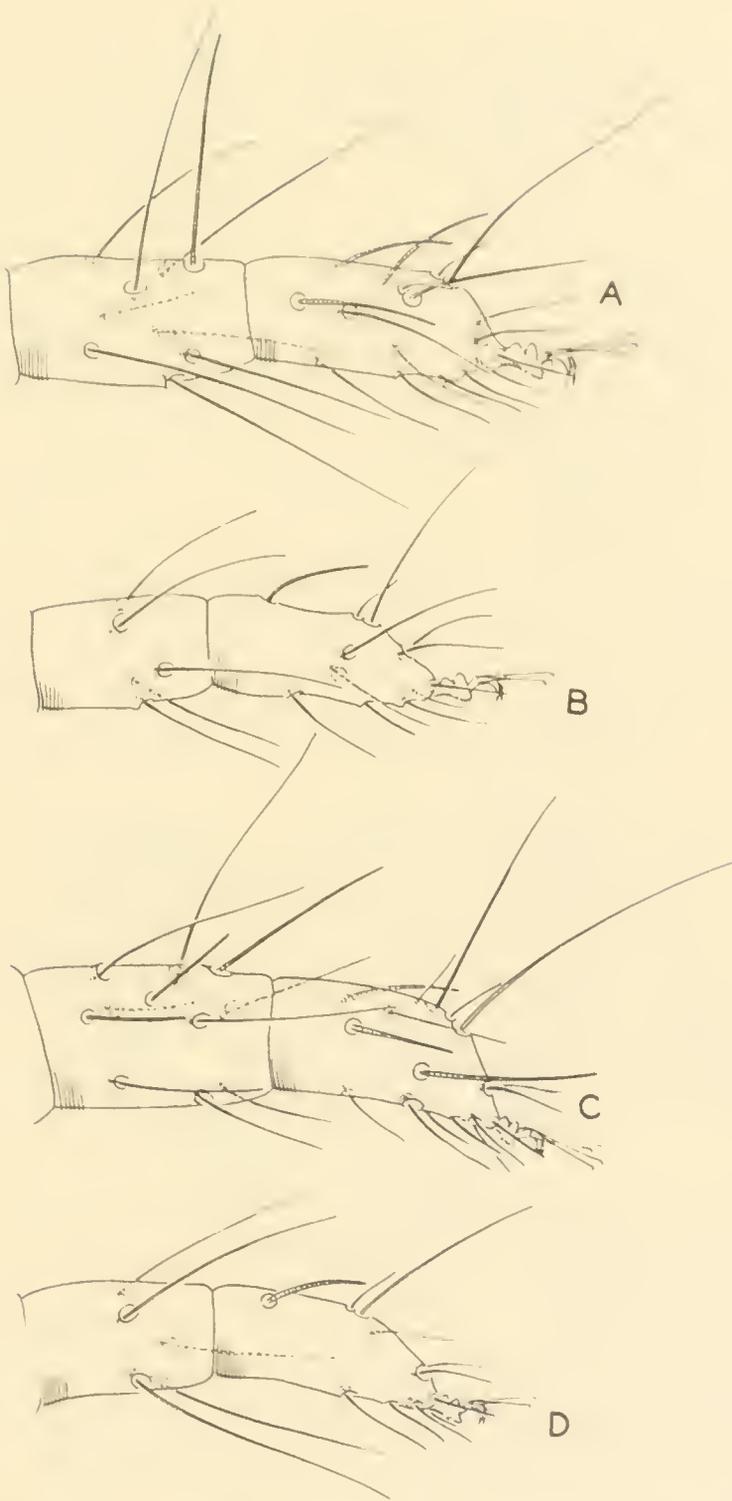


Fig. 192. *Schizotetranychus schizopus*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

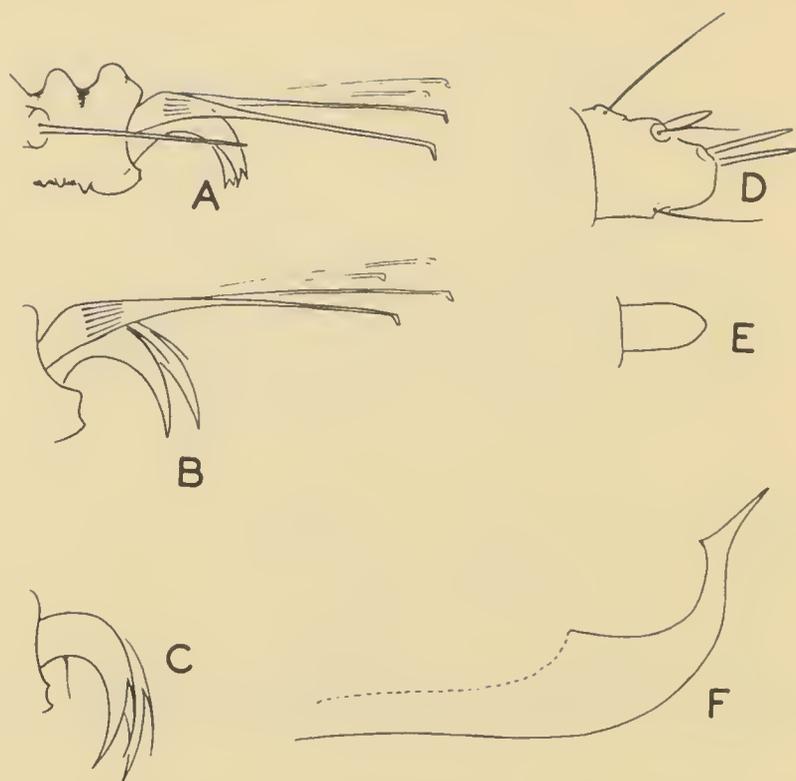


Fig. 193. *Schizotetranychus schizopus*: A.) empodium I of male; B.) empodium II of male; C.) empodium I of female; D.) terminal segment of palpus of male; E.) terminal sensillum of palpus of female; F.) aedeagus.

This species is known from Europe and Georgia, S.S.R., on willow. Material examined by us is from Ithaca, New York (J. G. Matthyse), on willow. The species recognized by Garman (1940) under this name is described as *Schizotetranychus garmani* in this publication.

Schizotetranychus cornus Pritchard and Baker, new species
(Figures 194, 195, 196, 197)

The male of *cornus* differs from all other members of the genus *Schizotetranychus* in that the aedeagus is caudally directed and simple except for a small, terminal enlargement (much as in *Eotetranychus perplexus*). The adult female may be recognized by having all the hysterosomals similar in length and less than one-half as long as the intervals between them.

This species is known only from New Zealand, on *Elaeocarpus*.

Male.—Palpus with terminal sensillum of fifth segment nearly twice as long as broad at base and triangular; mediodorsal sensilla slender



Fig. 194. *Schizotetranychus cornus*: dorsal aspect of female.

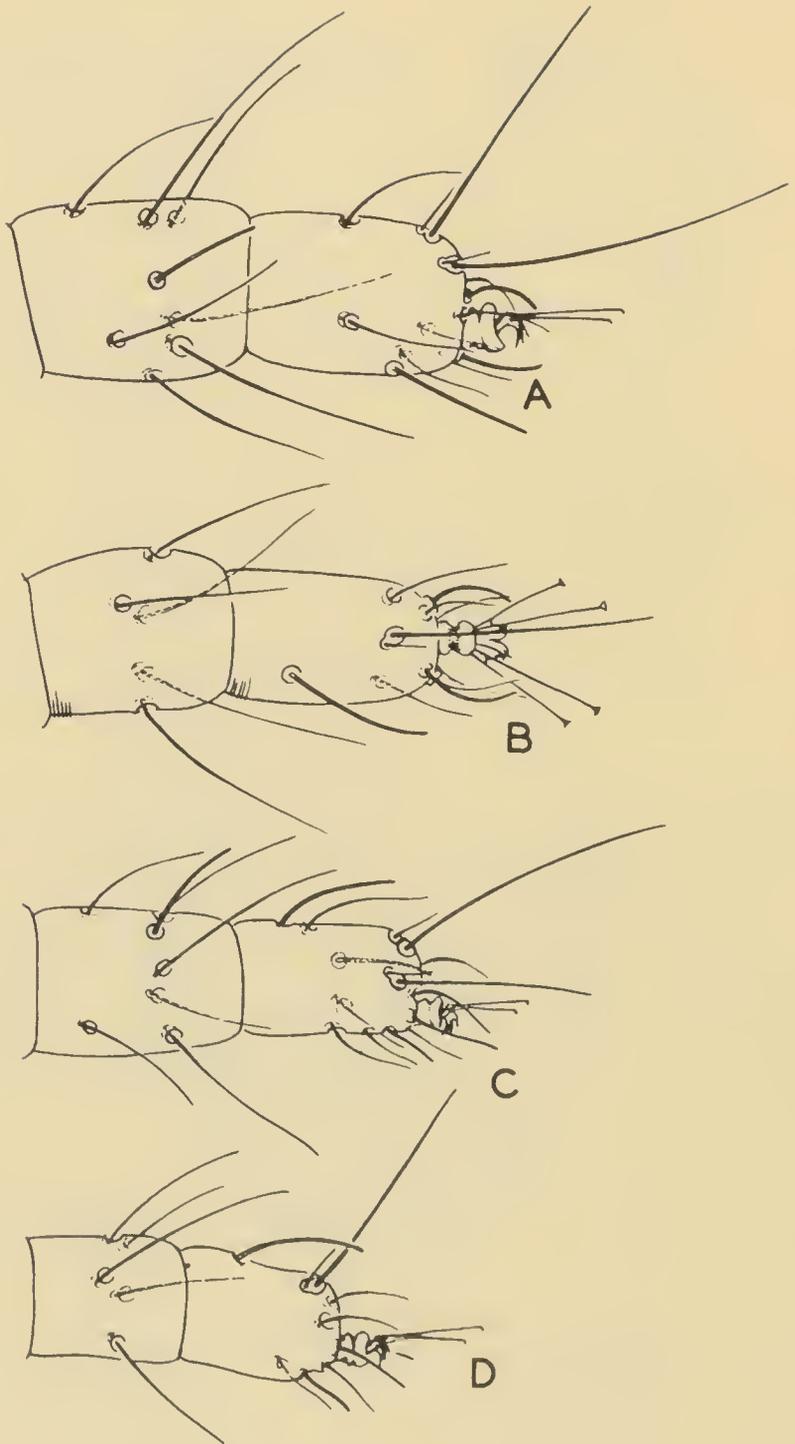


Fig. 195. *Schizotetranychus cornus*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

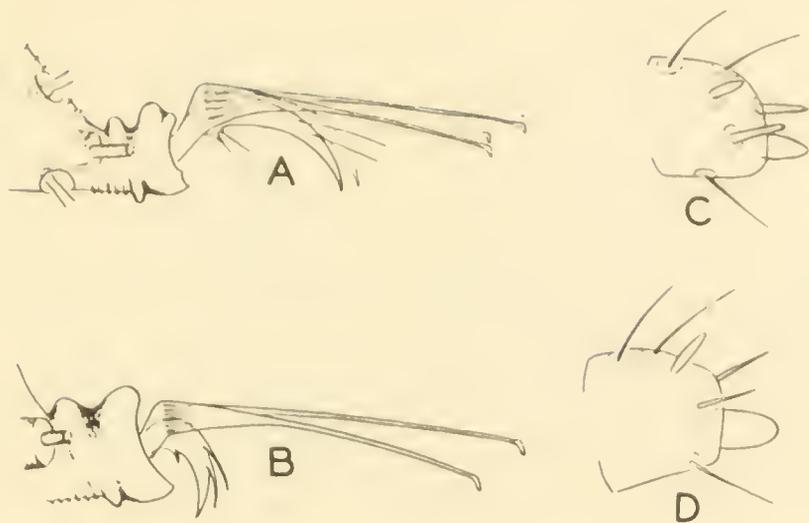


Fig. 196. *Schizotetranychus cornus*: A.) appendages of tarsus I of female; B.) appendages of tarsus I of male; C.) terminal segment of aplpus of male; D.) terminal segment of palpus of female.



Fig. 197. *Schizotetranychus cornus*: aedeagus.

with one twice as long as the other; proximal, fusiform sensillum similar to shorter mediodorsal sensillum. Peritreme with distal end hooked. Tibia I with six tactile and one sensory seta; tarsus I very short, with one tactile and one sensillum at proximal end of segment. Tibia II and III with five tactile setae. Empodia I and II with three very strong cusps on each digit; empodia III and IV with a pair of dorsal hairs on each of the clawlike parts. Body with dorsal setae slender and pubescent, somewhat less than one-half as long as longitudinal intervals between them. Aedeagus straight, several times longer than wide at base, gradually narrowing, and with the distal end slightly widened, especially caudoventrally. Length of body, 293 μ ; greatest width of body, 170 μ .

Female.—Similar to male, the terminal sensillum of the palpus larger, not over twice as wide as long; dorsal setae of body even shorter than in the male; and all empodial claws with a pair of dorsal setae and a pair of obvious proximolateral chaetae. Length of body, 345 μ , including gnathosoma 450 μ ; greatest width of body 200 μ .

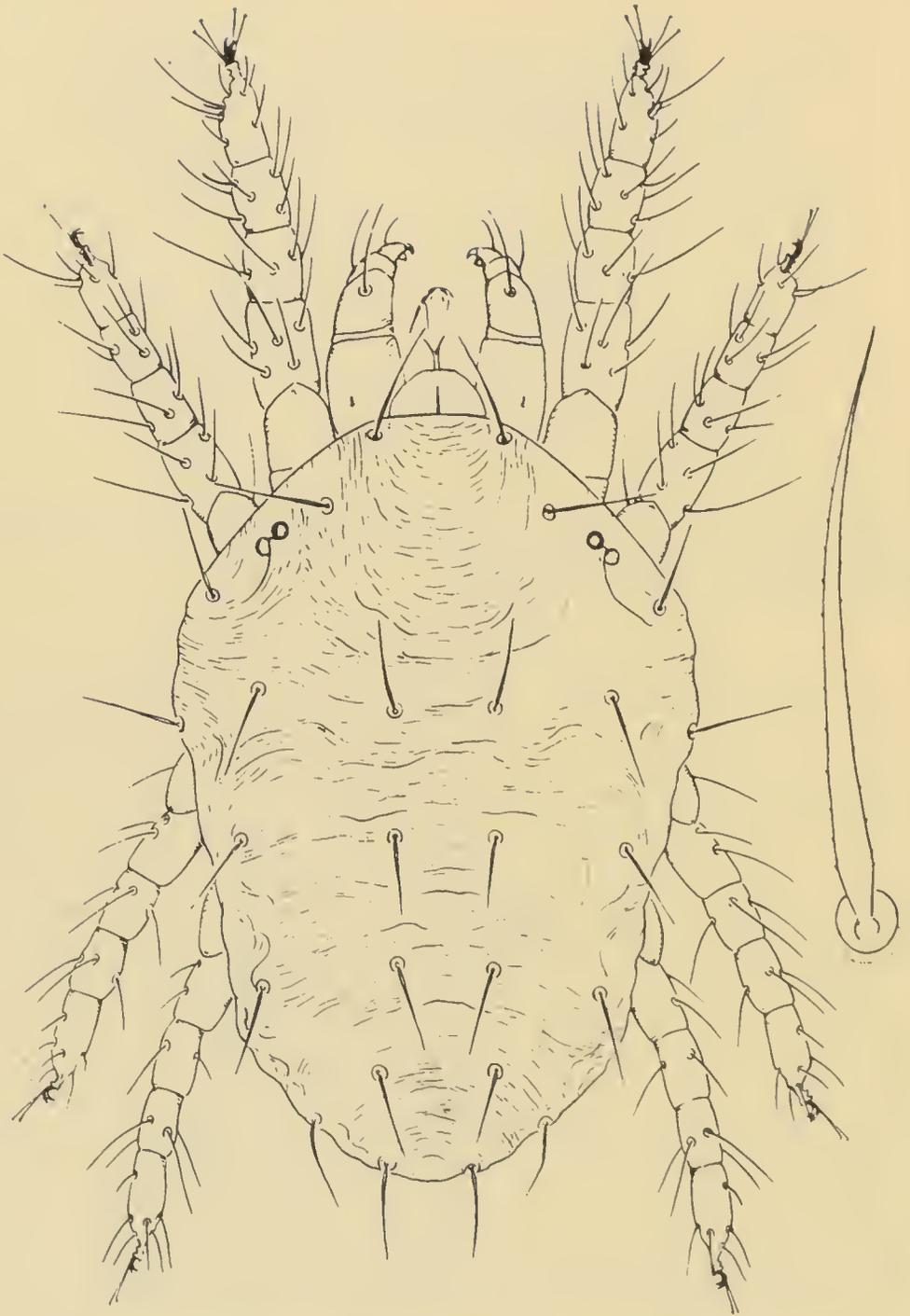


Fig. 198. *Schizotetranychus spireaefolia*: dorsal aspect of female.

Holotype.—Male, Levin, New Zealand, December, 1949 (A. Lush), on *Elaeocarpus dentatus*; type no. 2138 in the U. S. National Museum.
Paratypes.—Five males, 12 females, Levin, New Zealand, December 1949 (A. Lush), on *Elaeocarpus dentatus*.

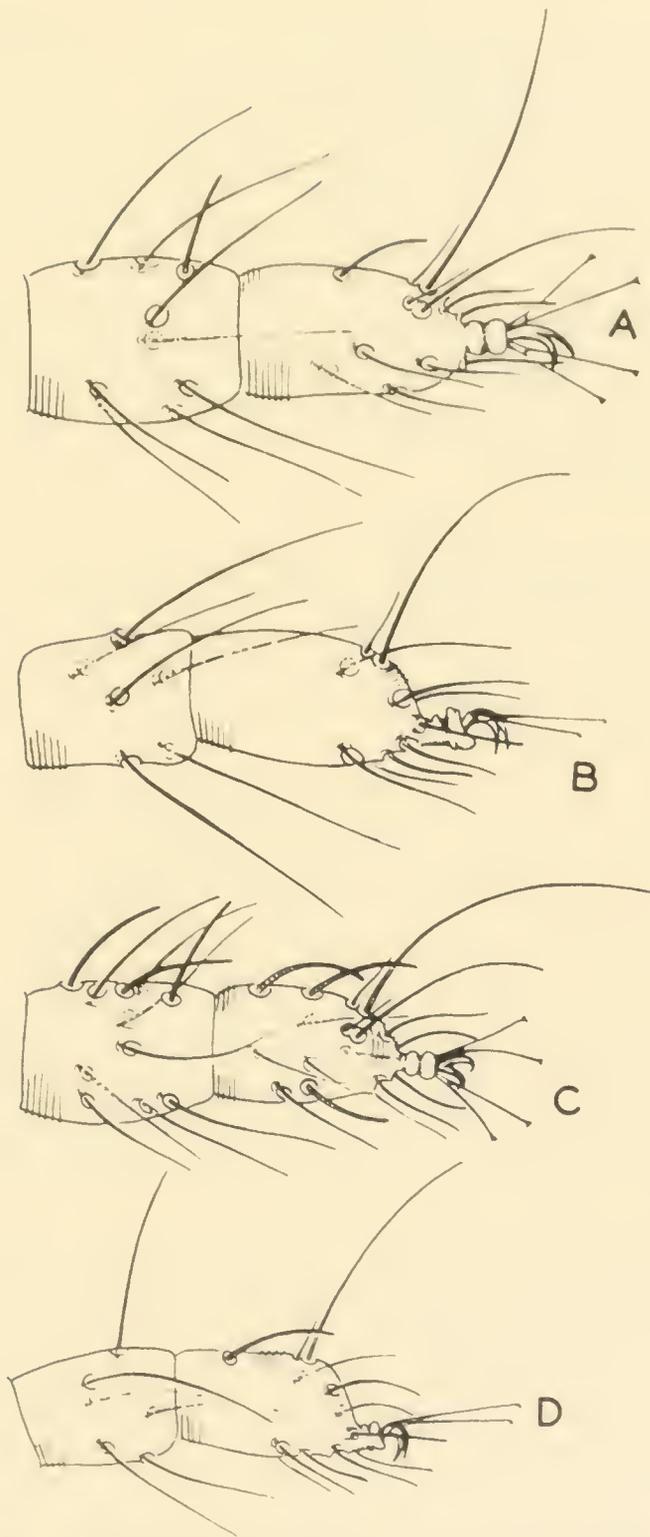


Fig. 199. *Schizotetranychus spireaefolia*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

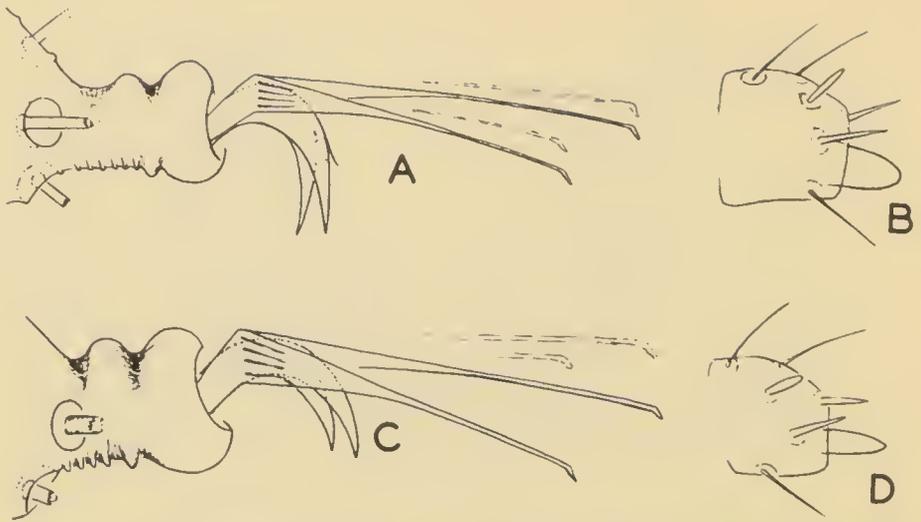


Fig. 200. *Schizotetranychus spireafolia*: A.) appendages of tarsus III of female; B.) distal segment of palpus of female; C.) appendages of tarsus I of male; D.) distal segment of palpus of male.

Schizotetranychus spireafolia Garman

(Figures 198, 199, 200, 201)

Schizotetranychus spireafolia Garman, 1940, Bul. Conn. Agr. Exp. Sta., 431: 74; McGregor, 1950, Amer. Midl. Nat., 44: 315. *Types*: all stages, Connecticut, on *Spirea latifolia*; in the collection of the Connecticut Agricultural Experiment Station.

Specimens of *Schizotetranychus spireafolia* may be readily recognized by the shape of the dorsal setae on the body. These setae are very minutely pubescent, widened near each base, tapering to a slender, acute tip, and they are somewhat shorter than the longitudinal intervals between them. The aedeagus bends upward at less than a right angle to form a slender, sigmoid, acuminate tip.

Schizotetranychus spireafolia, previously known only from *Spirea latifolia* in Connecticut, has been collected on a similar host in Philadelphia, Pennsylvania (T. Parr).

Schizotetranychus andropogoni (Hirst), new combination

(Figures 202, 203, 204)

Tetranychus (*Schizotetranychus*) *andropogoni* Hirst, 1926, Proc. Zool. Soc. Lond., 1926: 829. *Types*: male and female, Coimbatore, India, on *Andropogon annulatus*; in the British Museum (Natural History).

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Fig. 201. *Schizotetranychus spireafolia*: aedeagus.

Adults of *Schizotetranychus andropogoni* resemble those of *S. spireafolia* in that the dorsal setae of the body are very minutely pubescent and lanceolate, being broadened proximally and finely tapering distally. In the female, however, the dorsal setae are about as long as the longitudinal intervals between them. In the male, the aedeagus distally forms a dorsally directed sigmoid curve, but it is less acutely turned than in *spireafolia*.

Specimens studied by us are from Coimbatore, India, August 12, 1950 (G. H. Rao), on *Saccharum spontaneum*.

Schizotetranychus celarius (Banks)

(Figures 205, 206, 207)

Stigmaeopsis celarius Banks, 1917, Ent. News, 28: 196; Essig, 1926. Insects West. N. Amer., p. 32. Types: females, Oneco, Florida, on bamboo; in the U. S. National Museum.

Schizotetranychus celarius, McGregor, 1950, Amer. Midl. Nat., 44: 308.

Schizotetranychus latitarsus Ewing, 1917, Jour. Econ. Ent., 10: 498.

Types: females, Pasadena, California, on bamboo.

Females of *Schizotetranychus celarius* may be readily recognized by having the first pair of dorsocentral hysterosomals about one-half as long as the second pair of dorsocentrals and similar in length to the first pair of dorsolateral hysterosomals. The aedeagus is distinctive in being broadly curved dorsad.

This species is found only on bamboo. It forms restricted colonies on the undersides of the leaves and lives underneath a dense cover of webbing.

Schizotetranychus celarius is known only from Florida, Georgia, and California.

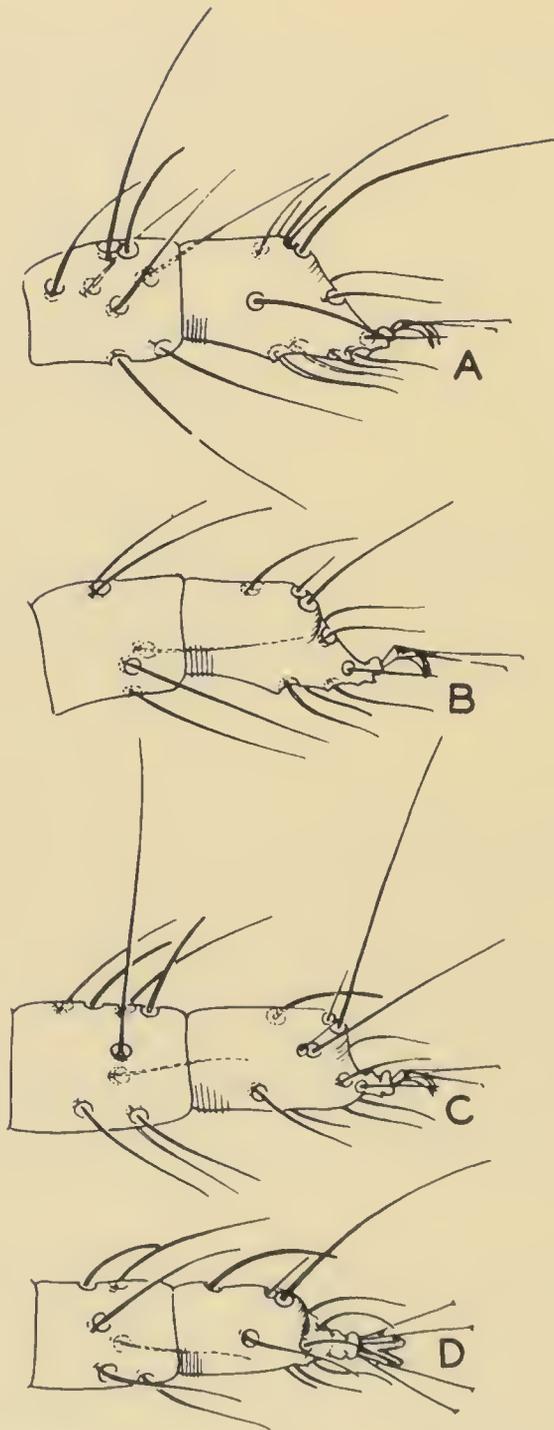


Fig. 202. *Schizotetranychus andropogoni*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

Schizotetranychus bambusae Reck

Schizotetranychus bambusae Reck, 1941, Soobsh. Akad. Nauk. Gruz. S.S.R., 2(5); Reck 1948, Soobsh. Akad. Nauk. Gruz. S.S.R., 9(6): 375; 9(7): 451. Described from specimens from Georgia, S.S.R., on *Phyllostachys* spp.

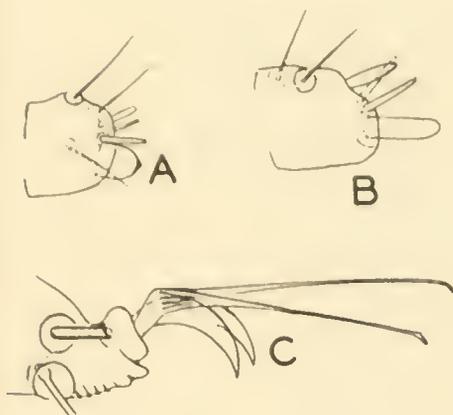


Fig. 203. *Schizotetranychus andropogoni*: A.) terminal segment of palpus of female; B.) terminal segment of palpus of male; C.) tarsal appendages of female.

The description of the aedeagus states that it is short and with a hook. *S. celarius*, also from bamboo, has the aedeagus broadly curved dorsad.



Fig. 204. *Schizotetranychus andropogoni*: aedeagus.

Schizotetranychus eremophilus McGregor

(Figures 208, 209, 210, 211)

Schizotetranychus eremophilus McGregor, 1950, Amer. Midl. Nat., 44: 311. Types: males and females, Plaster City, California, on Bermuda grass; in the U. S. National Museum.

Adults of *Schizotetranychus eremophilus* may be readily recognized by having the first pair of dorsocentral hysterosomals much shorter than both the second pair of dorsocentral hysterosomals and the first pair of dorsolateral hysterosomals.

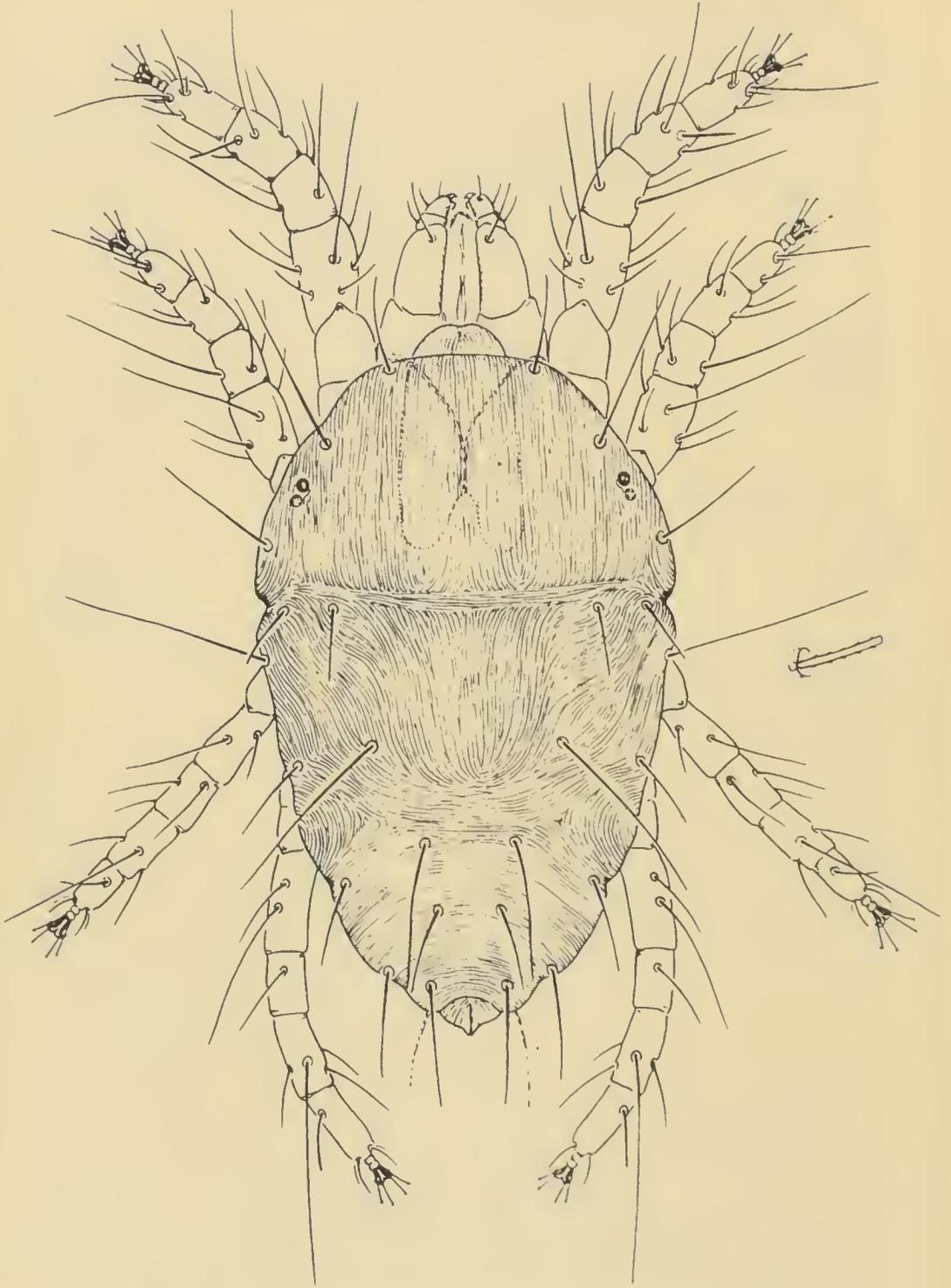


Fig. 205. *Schizotetranychus celarius*: dorsal aspect of female.

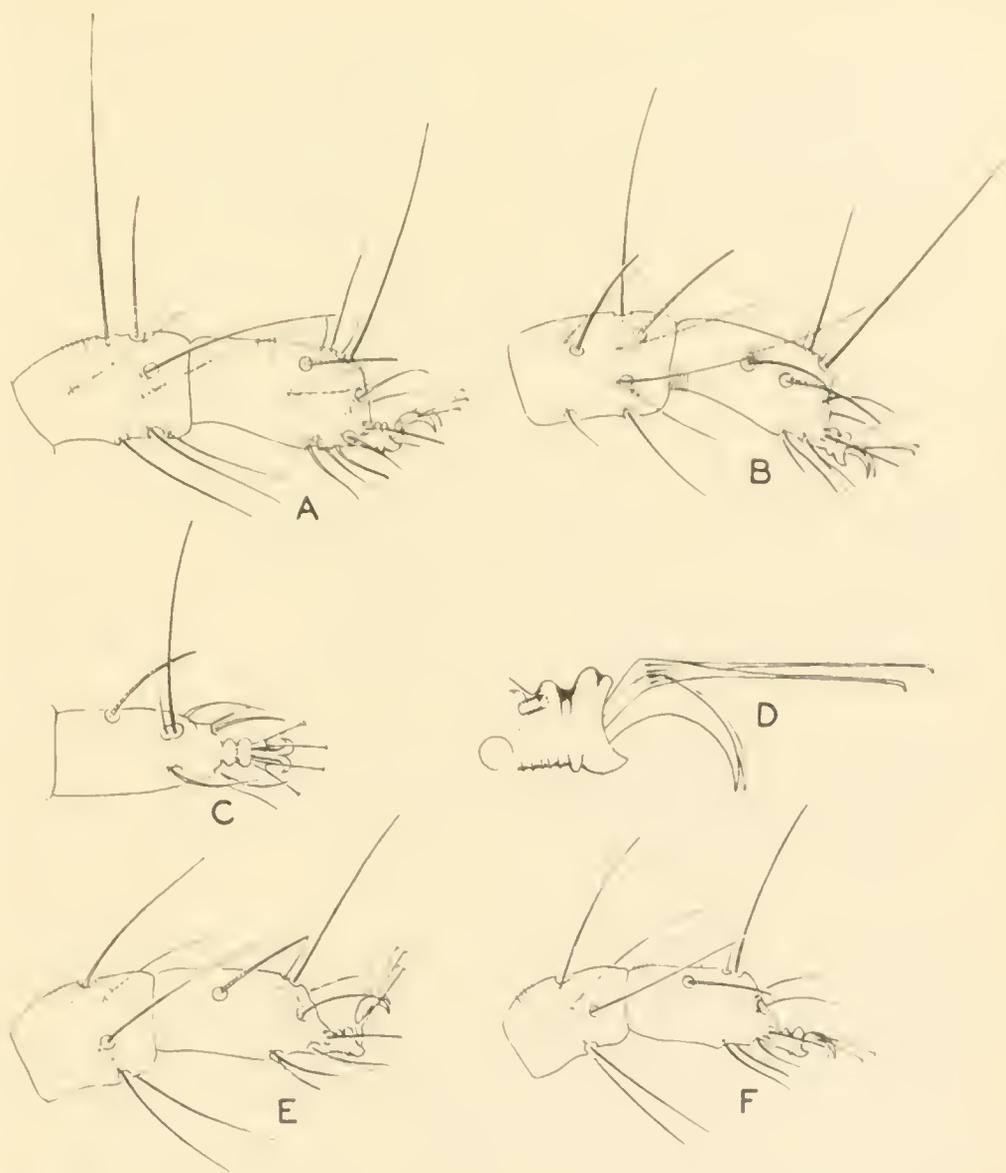


Fig. 206. *Schizotetranychus celarius*: A.) tibia and tarsus I of female; B.) tibia and tarsus I of male; C.) tarsus II of female; D.) tarsal appendages of female; E.) tibia and tarsus II of female; F.) tibia and tarsus II of male.

Two sensory setae on tibia I and the three proximal sensory setae on tarsus I of the male are fusiform, and this is distinctive of the sex. The aedeagus bends upward to form a sigmoid distal end as in *Schizotetranychus elymus*, *S. fluvialis*, and *S. camur*.

This species is known only from southern California, on Bermuda grass. New collections are from the Coachella Valley, California (R. F. Smith), on Bermuda grass: Bond's Corner, 15 miles east of Calexico, California (F. M. Summers), on Bermuda grass: and Riverside, California (Jack Hall), on Bermuda grass.

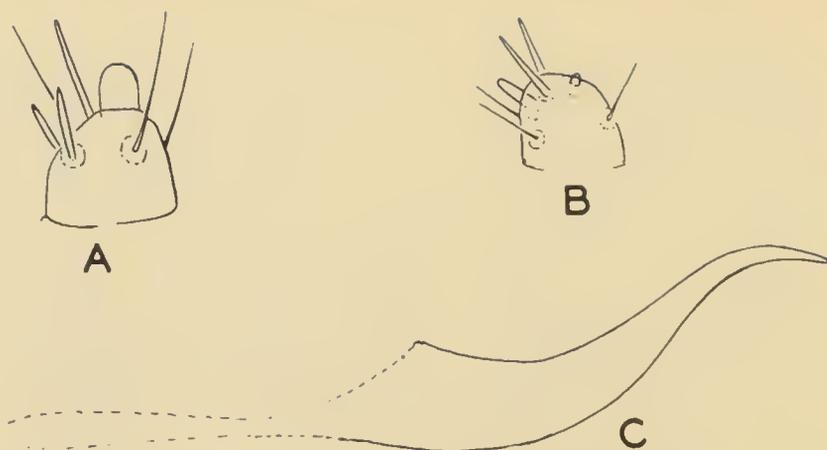


Fig. 207. *Schizotetranychus celarius*: A.) distal segment of palpus of female; B.) distal segment of palpus of male; C.) aedeagus.

Schizotetranychus fluvialis McGregor

(Figures 212, 213, 214, 215)

Schizotetranychus fluvialis McGregor, 1928, Proc. Ent. Soc. Wash., 30: 13; McGregor, 1950, Amer. Midl. Nat., 44: 313. *Types*: males and females, Lemon Cove, California, on *Epicampes rigens*; in the U. S. National Museum.

The female of *Schizotetranychus fluvialis* may be recognized by having the dorsal setae of the body slender, much shorter than the longitudinal intervals between them, and rather finely pubescent.

The aedeagus resembles that of *Schizotetranychus eremophilus*, *S. elymus*, and *S. camur* in that the distal end forms a dorsally directed sigmoid curve. However, the short dorsal setae of the body will serve for differentiation. This species is known only from the type series from central California, on grass.

Schizotetranychus elymus McGregor

(Figures 216, 217, 218, 219)

Schizotetranychus elymus McGregor, 1950, Amer. Midl. Nat., 44(2): 310. *Types*: males and females, Pine Valley, San Diego County, California, on *Elymus* sp.; in the U. S. National Museum.

The male of *Schizotetranychus elymus* may be recognized by having the aedeagus with a dorsally directed sigmoid portion that is about

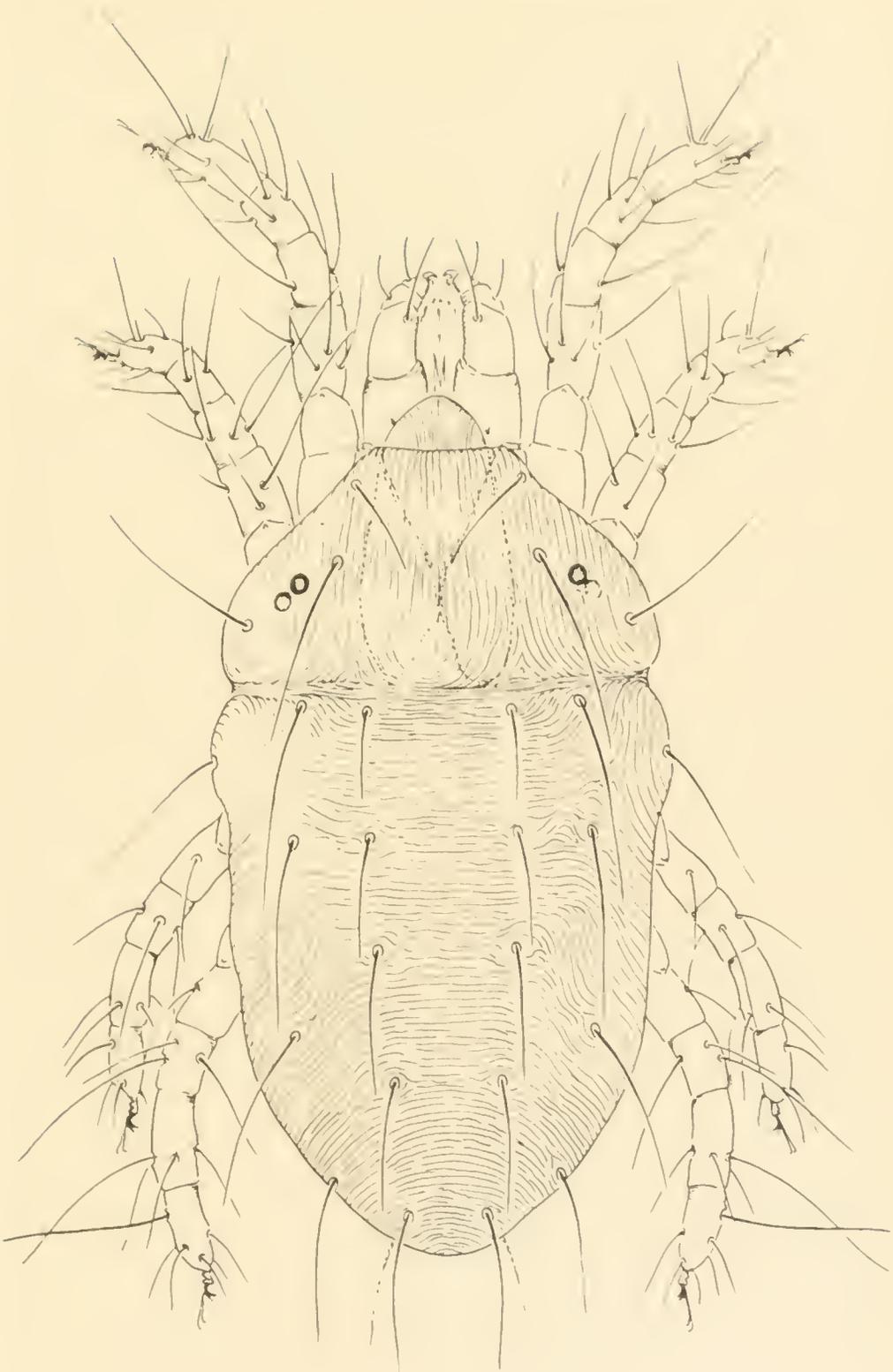


Fig. 208. *Schizotetranychus eremophilus*: dorsal aspect of female.

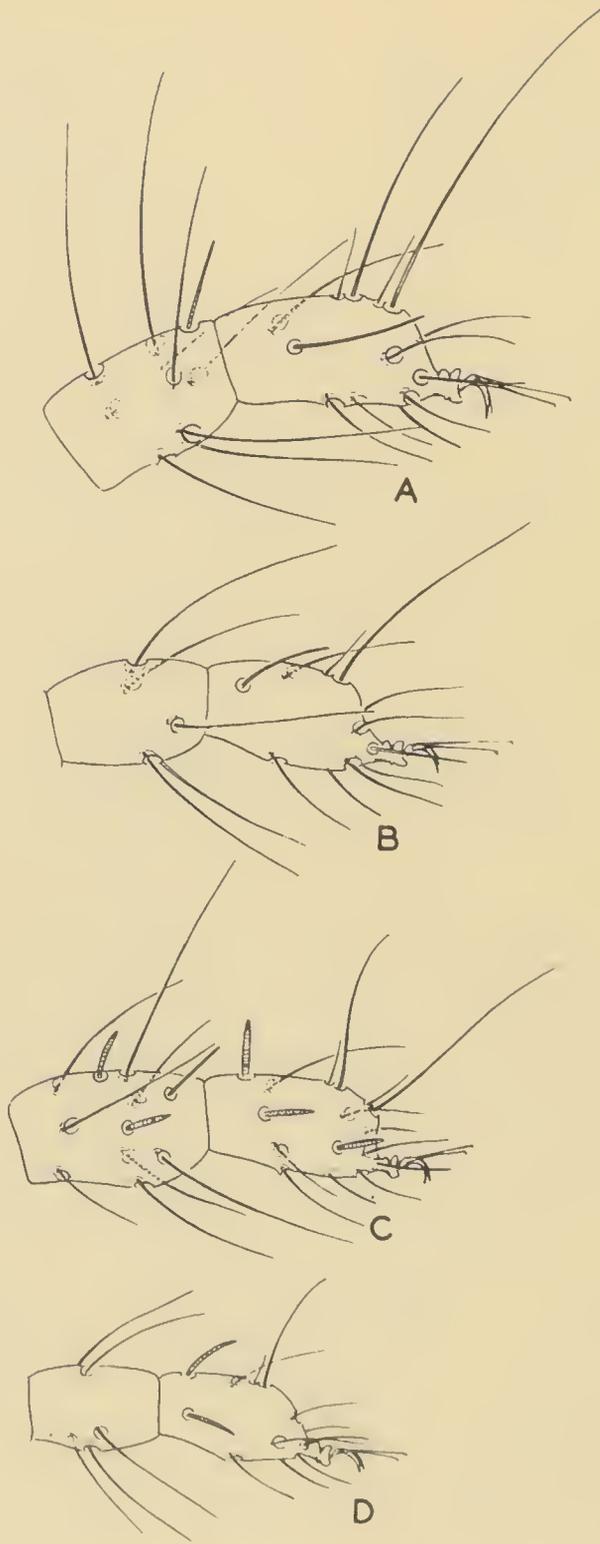


Fig. 209. *Schizotetranychus eremophilus*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

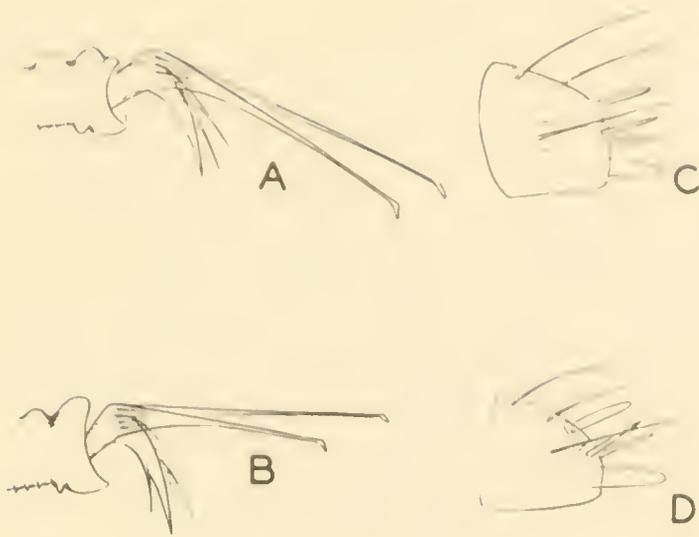


Fig. 210. *Schizotetranychus eremophilus*: A.) appendages of tarsus I of female; B.) appendages of tarsus I of male; C.) distal segment of palpus of female; D.) distal segment of palpus of male.



Fig. 211. *Schizotetranychus eremophilus*: aedeagus.

one-half as long as the shaft, together with having the dorsal setae of the body similar in length, slender, and slightly longer than the longitudinal intervals between them.

The female may be recognized by having similar dorsal setae on the hysterosoma; and no proximolateral chaeta is evident on the empodium.

This species is known only from the western United States. Collections studied, other than the types, are from Coalinga, California (A. E. Pritchard), on *Agrostis* sp.: Niles, California (A. E. Pritchard), on Bermuda grass: Tesla, California (J. E. Gillaspay and A. E. Pritchard), on grass: Modesto, California (R. E. Beer), on grass: Antioch, California (W. C. Bentinck), on grass: and Logan, Utah (G. F. Knowlton).

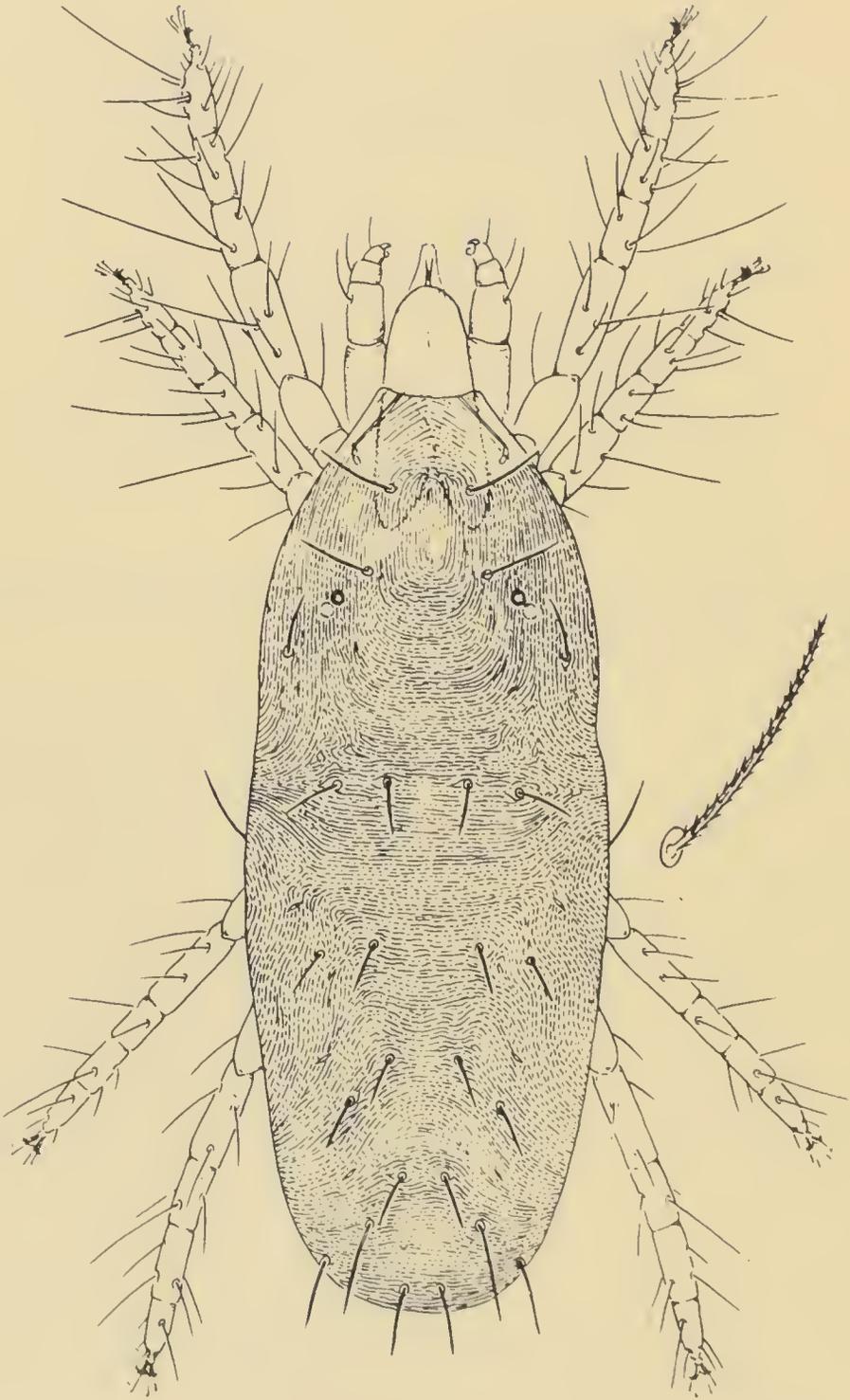


Fig. 212. *Schizotetranychus fluvialis*: dorsal aspect of female.

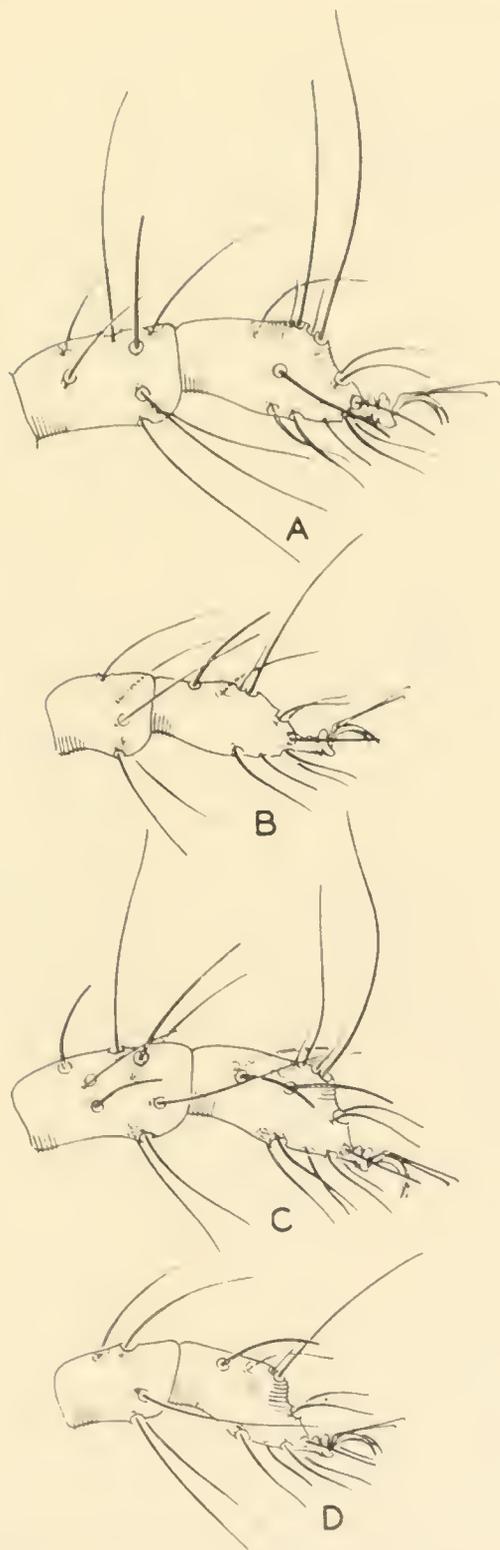


Fig. 213. *Schizotetranychus fluviialis*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

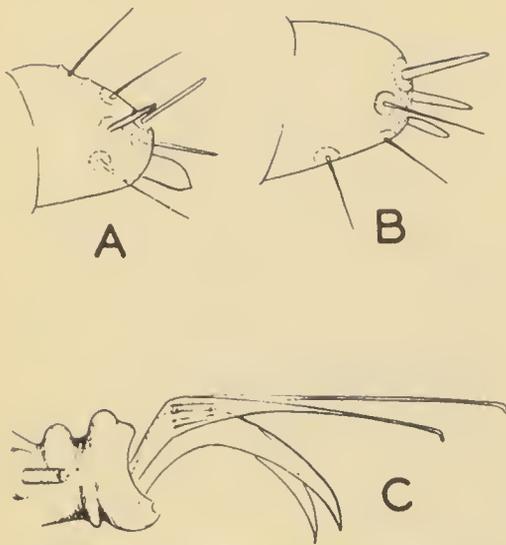


Fig. 214. *Schizotetranychus fluvialis*:
A.) distal segment of palpus of female;
B.) distal segment of palpus of male;
C.) appendages of tarsus I of female.



Fig. 215. *Schizotetranychus fluvialis*: aedeagus.

Schizotetranychus camur Pritchard and Baker, new species
(Figure 220)

The male of *Schizotetranychus camur* may be recognized by having the aedeagus with the distal one-third dorsally directed and sigmoid, together with having the dorsal setae of the hysterosoma similar and slender, nearly as long as the longitudinal intervals between them. No proximolateral chaeta is evident on the empodium. The female is unknown.

This species is known only from Florida, on grass.

Male.—Palpus with terminal sensillum absent. Stylophore slender, rounded anteriorly; peritreme hooked distally. Tibia I with seven tactile and two sensory setae; tarsus I short and abruptly declivate distally, with one tactile and three sensory setae proximal to duplexes; empodium composed of two simple claws, without dorsal setae or proximolateral chaetae. Tibia II with five tactile setae. Hysterosoma with dorsal setae slender, tapering, nearly as long as longitudinal intervals between them, but with longer humerals. Aedeagus with distal one-third bent dorsad at a right angle, the distal end curved caudad. Length of body 320μ , including rostrum 400μ ; greatest width of body 200μ .

Holotype.—Male, East Palatka, Florida, February 27, 1950 (O. D. Link), on reed grass; type no. 2188 in the U. S. National Museum.
Paratypes.—Two males, 1 larva, 1 nymph, East Palatka, Florida, February 27, 1950 (O. D. Link), on reed grass.

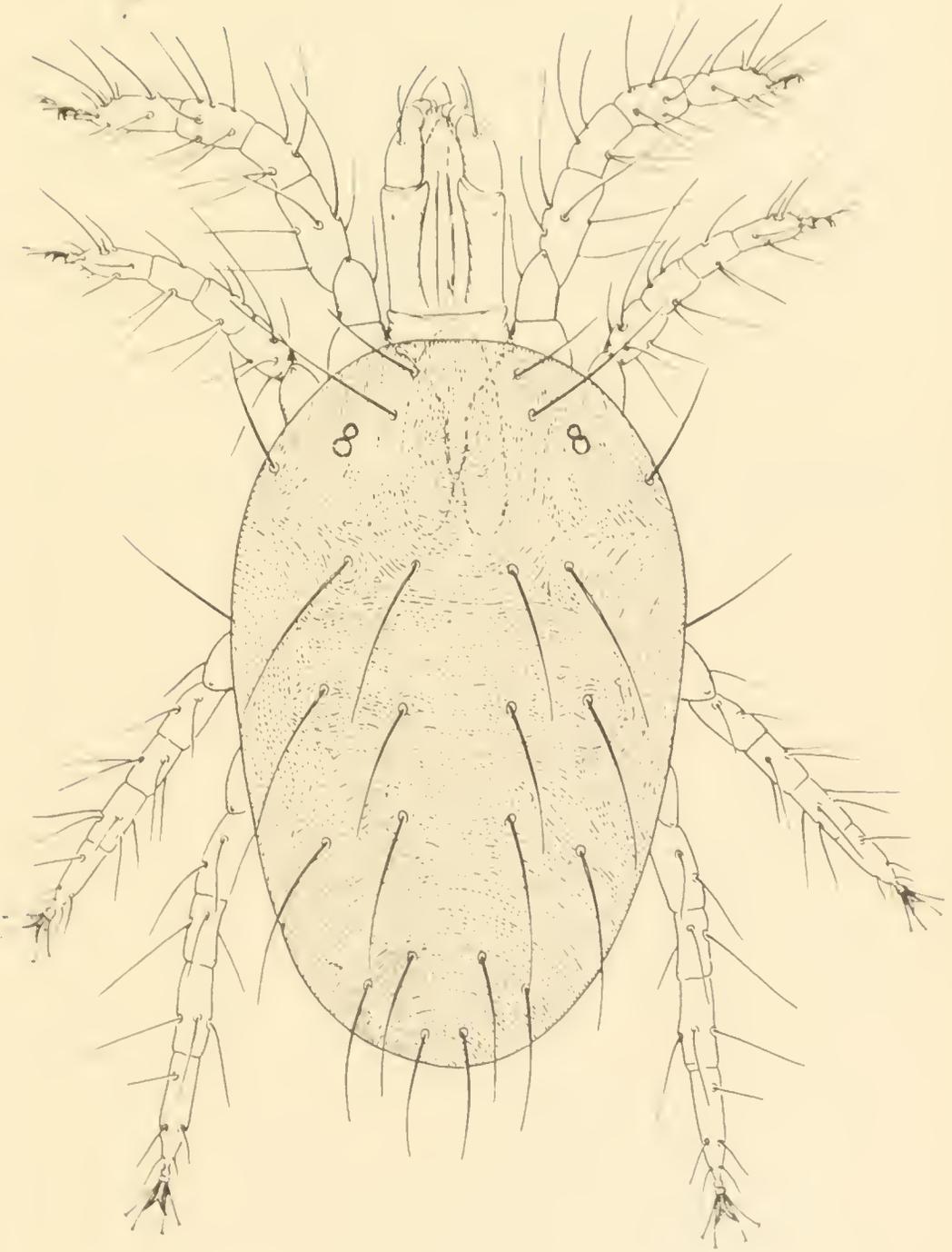


Fig. 216. *Schizotetranychus elymus*: dorsal aspect of female.

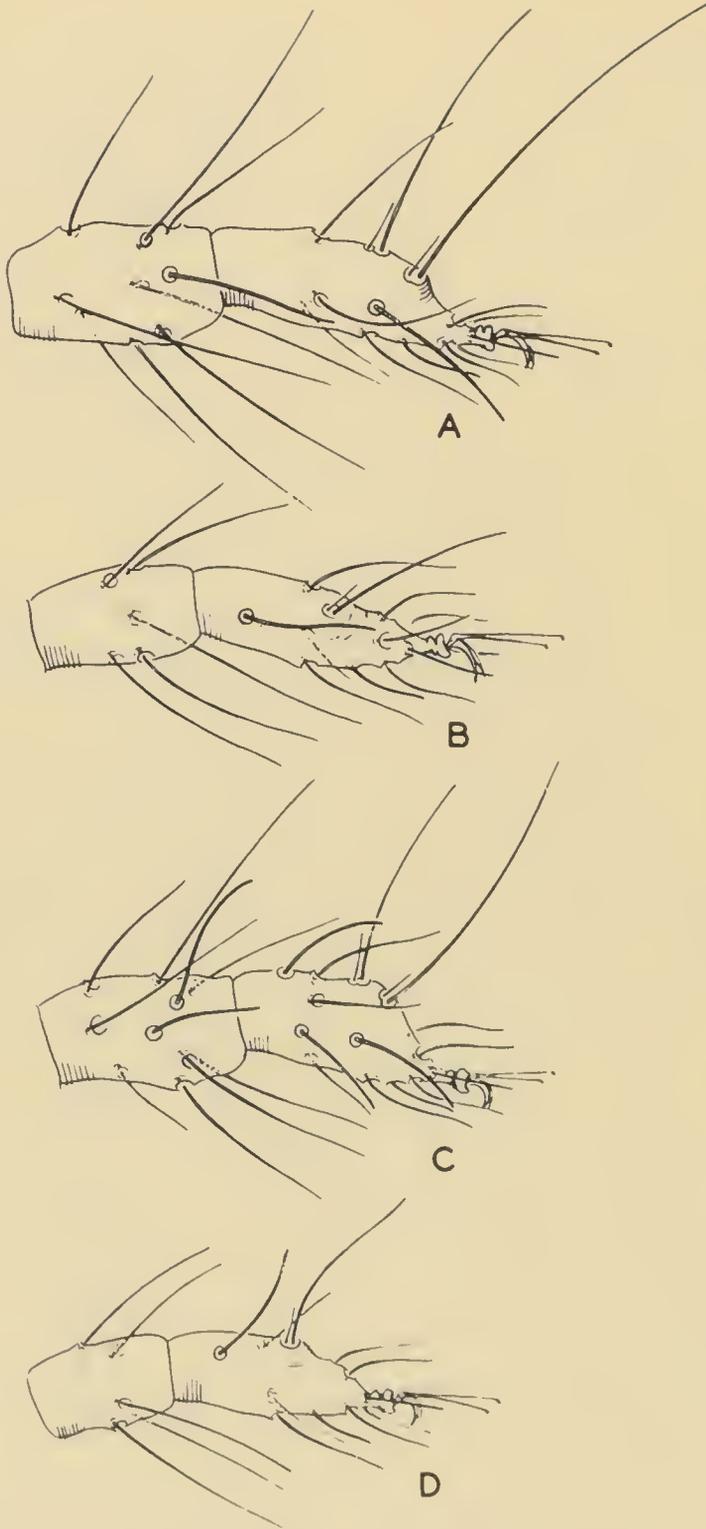


Fig. 217. *Schizotetranychus elymus*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

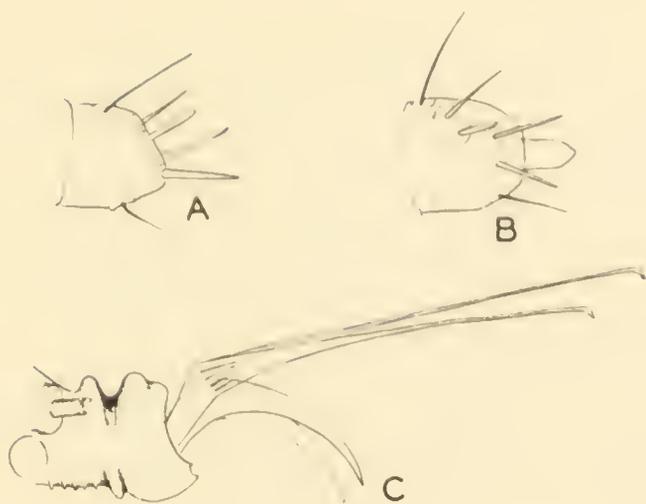


Fig. 218. *Schizotetranychus elymus*: A.) distal segment of palpus of male; B.) distal segment of palpus of female; C.) appendages of tarsus of female.



Fig. 219. *Schizotetranychus elymus*: aedeagus.

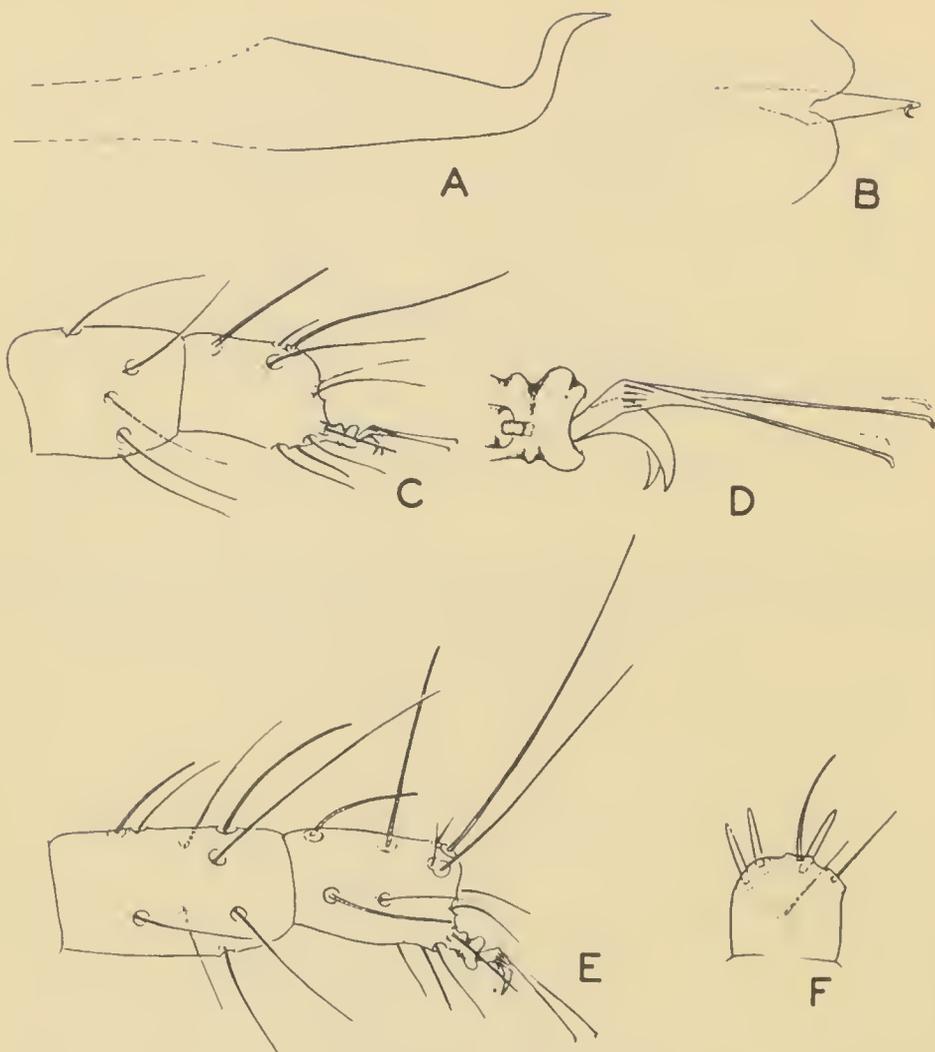


Fig. 220. *Schizotetranychus camur*: A.) lateral view of aedeagus; B.) dorsal aspect of aedeagus; C.) tibia and tarsus II of male; D.) appendages of tarsus I of male; E.) tibia and tarsus I of male; F.) distal segment of palpus of male.

Schizotetranychus nugax Pritchard and Baker, new species
(Figures 221, 222)

The female of *Schizotetranychus nugax* may be recognized by having the dorsocentral hysterosomals shorter than the intervals between them, the second and third dorsolaterals being much longer. The male is unknown.

Female.—Stylophore slender, nearly acuminate anteromedially. Tibia I with seven tactile and one sensory setae; tarsus I short and abruptly declivate distally, with two tactile and one sensory setae proximal to the duplexes; empodium consisting of two simple

Subfamily Tetranychinae Berlese

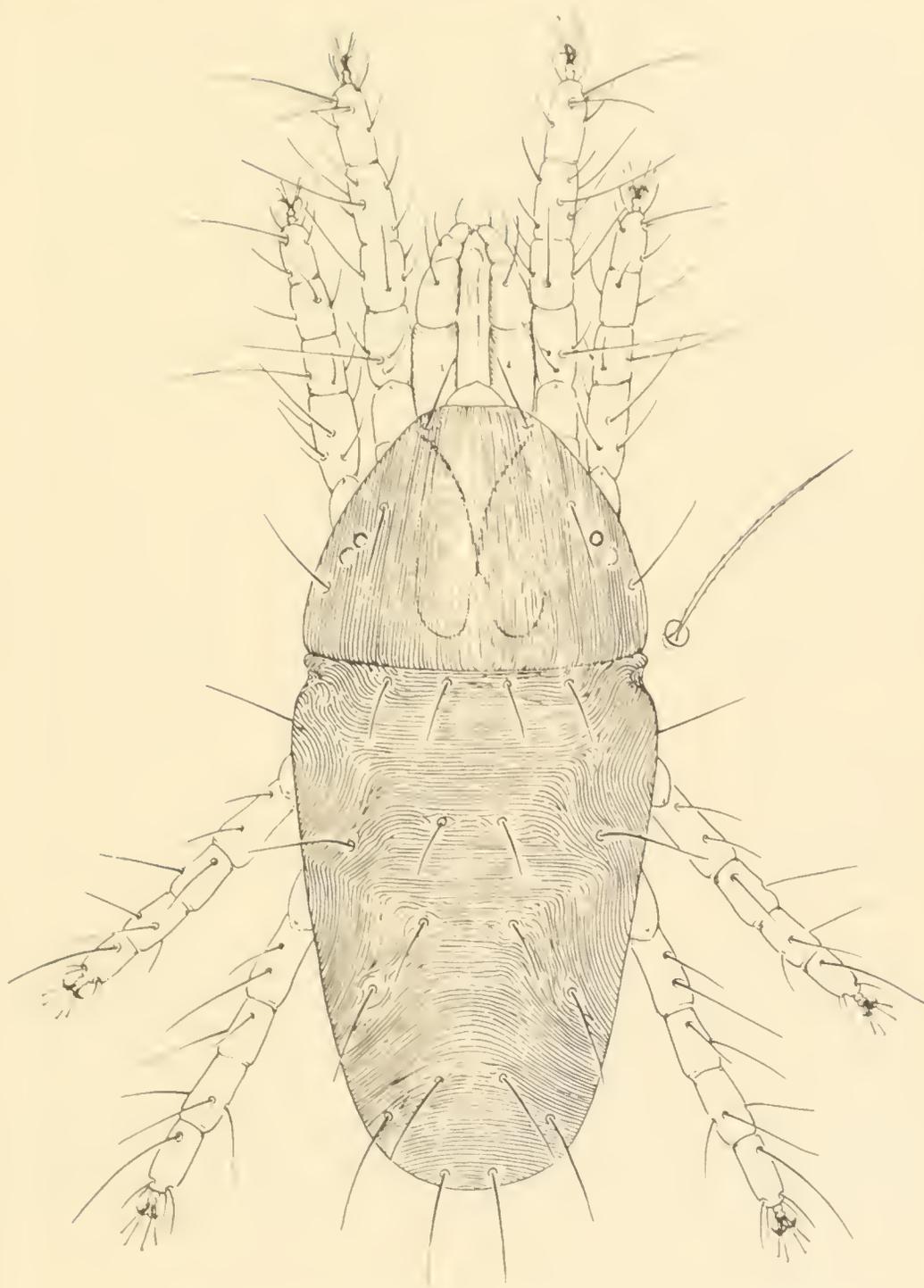


Fig. 221. *Schizotetranychus nugax*: dorsal aspect of female.

claws, without dorsal setae or proximolateral chaetae. Propodosoma with dorsal setae somewhat shorter than intervals between them, slender, tapering, and finely pubescent: hysterosoma with dorsocentrals and

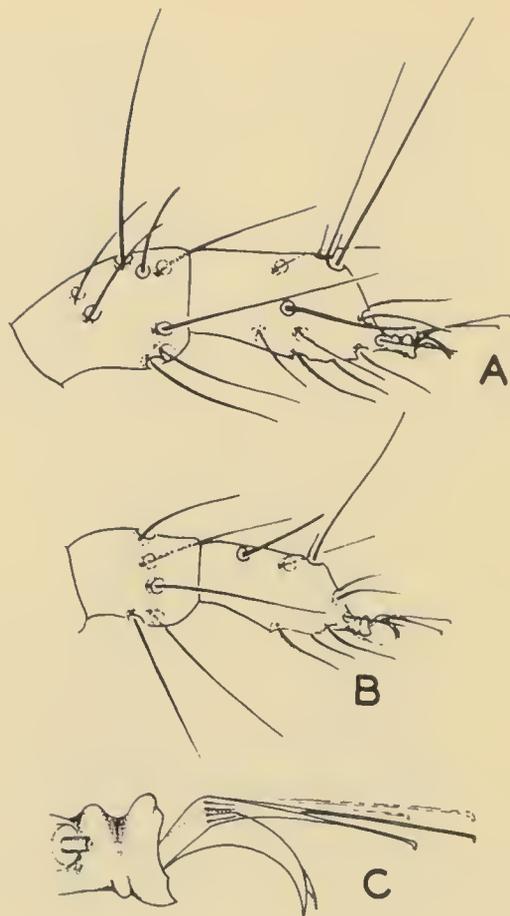


Fig. 222. *Schizotetranychus nugax*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) appendages of the female tarsus.

first dorsolaterals similar in length, shorter than the longitudinal intervals between them; other dorsal hysterosomals considerably longer. Length of body $283\ \mu$, including rostrum $333\ \mu$; greatest width of body $133\ \mu$.

Holotype.—Female, Portales, New Mexico, August, 1953, (T. L. Harvey), on native grasses; type no. 2189 in the U. S. National Museum. *Paratypes*.—Twenty-eight females, Portales, New Mexico, August, 1953, (T. L. Harvey), on native grasses.

Schizotetranychus hindustanicus (Hirst), new combination

Tetranychus (*Schizotetranychus*) *hindustanicus* Hirst, 1924, Ann. Mag. Nat. Hist. (ser. 14), 9: 525. *Types*: males and females, Coimbatore, South India, on citrus; probably in the British Museum (Natural History).

Subfamily Tetranychinae Berlese

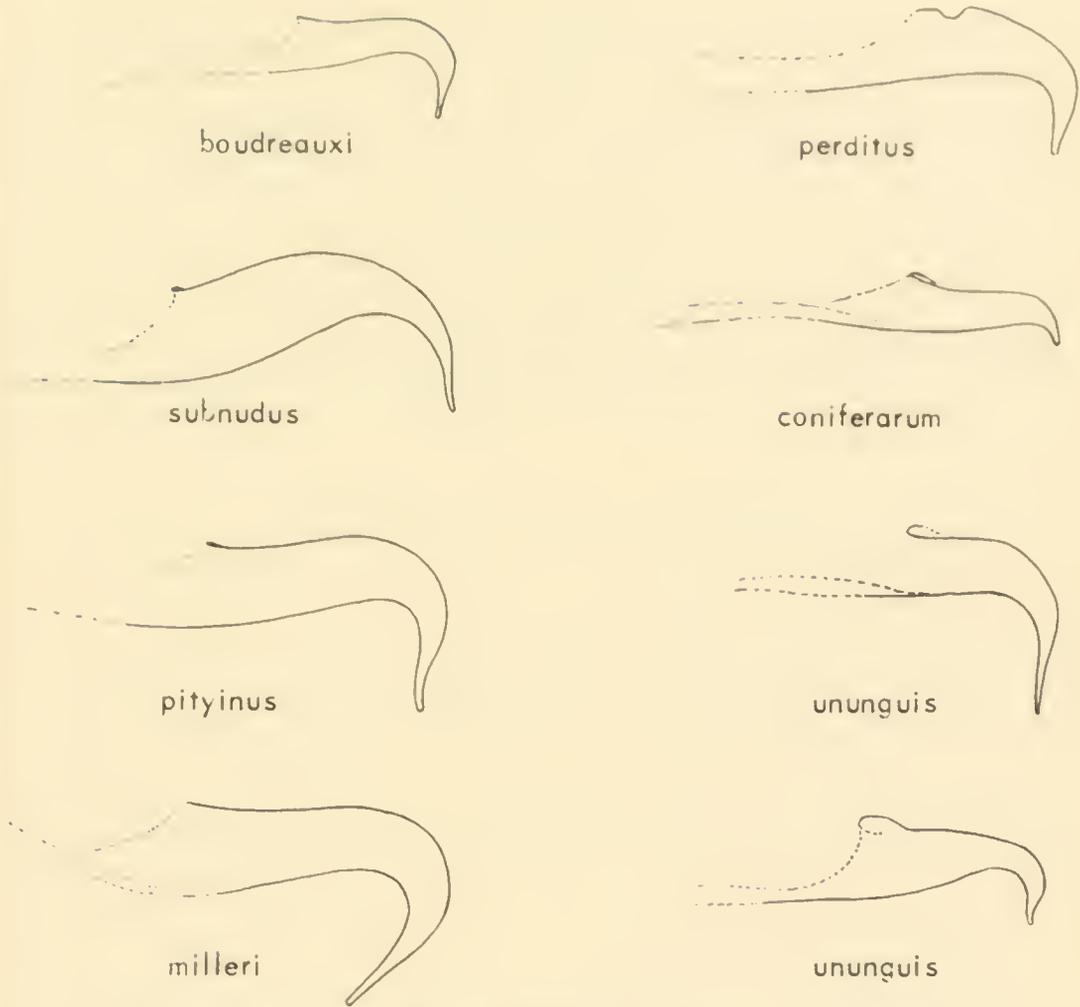


Fig. 223. *Oligonychus*, aedeagi of species on conifers.

This species is known only from the type series from South India, on citrus. The description and figures of the aedeagus indicates that *Schizotetranychus hindustanicus* is closely allied to those species in which the distal portion turns dorsad to form a sigmoid distal end. However, the dorsal aspect of the distal curvature of the aedeagus is distinctively truncate.

Schizotetranychus graminicola Goux

Schizotetranychus graminicola Goux, 1949, Bul. Soc. Linn. Lyon, 18(6): 100. Types: males, females, and immature stages, Bessenay (Rhône), France, on grass.

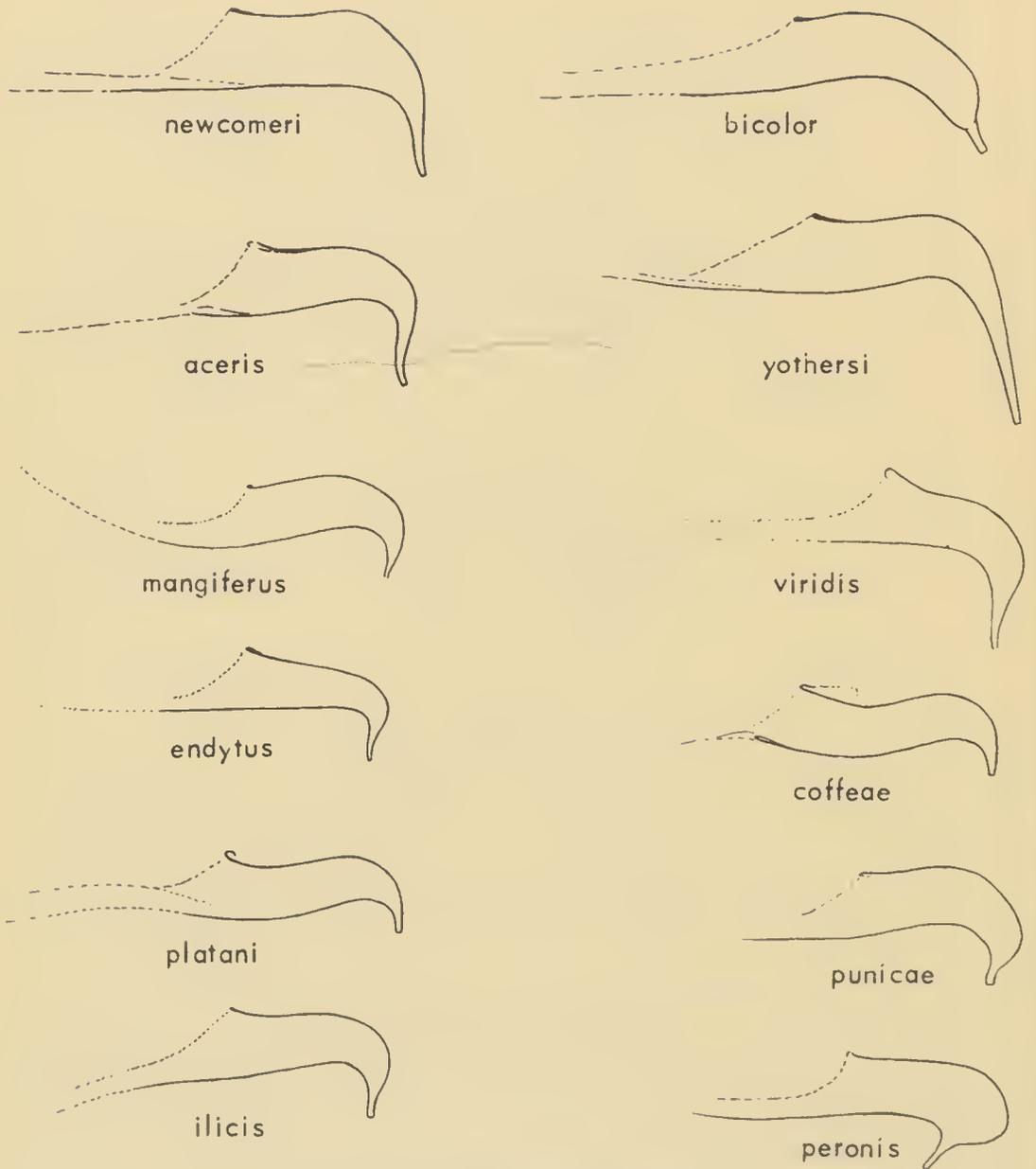


Fig. 224. *Oligonychus*, aedeagi.

The illustration of the adults of *Schizotetranychus graminicola* that was presented by Goux indicates that this species may be readily recognized by having the second pair of dorsocentral hysterosomals greatly longer than the other dorsocentral and dorsolateral hysterosomals. The figure of the aedeagus indicates that this species is closely allied to *Schizotetranychus eremophilus*, *S. elymus*, *S. fluvialis*, and *S. camur*. This species is known only from the type series.

Schizotetranychus tuberculatus (Ugarov and Nikolskii), new combination

Peritetranychus tuberculatus Ugarov and Nikolskii, 1937, Trudy Sreadneaz. Stan. Zash. Rast., p. 37. Described from females, Tashkent, Russia, on mulberry.

Two species of *Schizotetranychus* that are known from Russia are distinctive in that the dorsal setae of the body are borne on tubercles. In *S. tuberculatus* the dorsal setae are strongly pubescent. This species is known only from the types.

Schizotetranychus glabrisetus (Ugarov and Nikolskii), new combination

Peritetranychus glabrisetus Ugarov and Nikolskii, 1937, Trudy Sreadneaz. Stan. Zash. Rast., p. 39. Described from a single female, Tashkent, Russia, on grass.

Schizotetranychus glabrisetus was described on the basis of a single female that differs from *S. tuberculatus* in that the dorsal setae of the body are nearly nude.

Schizotetranychus guatemalae-novae (Stoll), new combination

Tetranychus guatemalae-novae Stoll, 1886, Biol. Cent.-Amer., Zool., Arach., Acar., p. 8. Described from Guatemala City, on *Cassia nictitans*.

This species was recorded as webbing the undersides of the leaves of wild sensitive plant near Guatemala City. The description allows reference of the species to the genus *Schizotetranychus*, but no further diagnosis is possible.

Schizotetranychus ibericus Reck

Schizotetranychus ibericus Reck, 1947, Soobsh. Akad. Nauk Gruz. S.S.R., 8(7); Reck, 1948, Soobsh. Akad. Nauk Gruz. S.S.R. 9(6): 375; 9(7): 451. Described from specimens from Georgia, S.S.R., on *Quercus* spp.

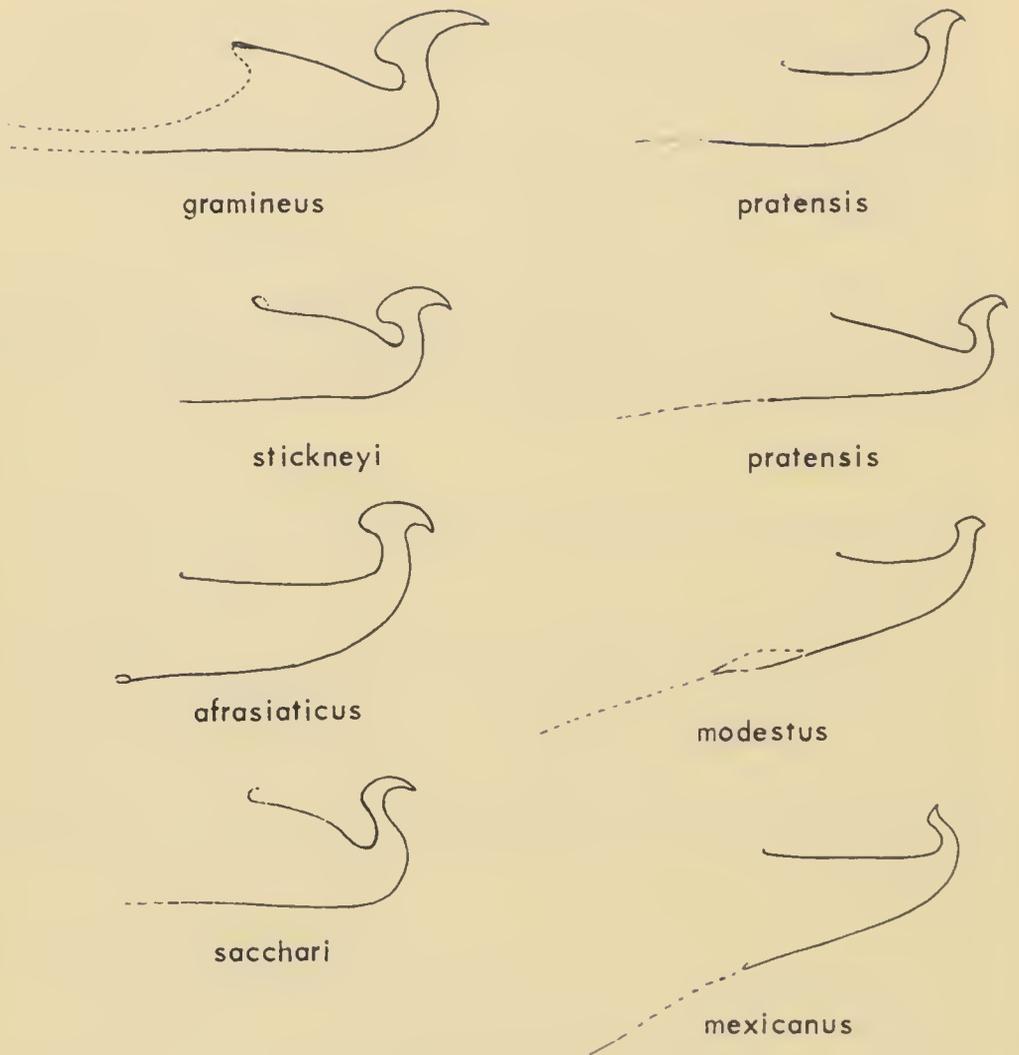


Fig. 225. *Oligonychus*, aedeagi.

The bent portion of the aedeagus is at right angles to the shaft, and the tip is curved slightly caudad somewhat similar to that of *elymus*. The body setae are long, reaching to the bases of the setae of the next row.

GENUS **OLIGONYCHUS** BERLESE

Oligonychus Berlese, 1886, Aeari Dann. Piante Coltiv., p. 24; Canestrini, 1889, Atti Reale Ist. Veneto Sei. Let. Arti (ser. 6), 7: 532, 534; Banks, 1917, Ent. News, 28: 197; Hirst, 1920, Proc. Zool. Soc. Lond., 1920: 58; Ewing, 1921, Proc. U. S. Natl. Mus.,

Subfamily Tetranychinae Berlese

59(2394): 659. *Type of genus: Heteronychus brevipodus* Targioni Tozzetti; monobasic.

Paratetranychus Zacher, 1913, Mitt. Kais. biol. Anst. Land- Först., 14: 39; Trägårdh, 1915, Zts. angew. Ent., 2: 162; McGregor, 1919, Proc. U. S. Natl. Mus., 56(2303): 665; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 33; Garman, 1940, Bul. Conn. Agr. Exp. Sta., 43: 75; McGregor, 1950, Amer. Midl. Nat., 44: 329; Baker and Pritchard, 1953, Hilgardia, 22(7): 209. *Type of genus: Tetranychus ununguis* Jacobi; by present designation.

Panonychus Yokoyama, 1929, Nippon Sangyô Gaichû Zensho (Tokyo), p. 531. *Type of genus: Panonychus mori* Yokoyama; monobasic. *New synonymy.*

Tacebia Yokoyama, 1929, Nippon Sangyô Gaichû Zensho (Tokyo), p. 536. *Type of genus: Tacebia parva* Yokoyama; monobasic. *New synonymy.*

Berlese's description of the genus *Oligonychus* was based on his identification of *brevipodus* Targioni Tozzetti, from holly oak in Italy. Both authors emphasize that the empodium is clawlike, and Berlese further noted, although inaccurately, that proximoventral hairs are present. Several acarologists have considered *Oligonychus* to have priority over *Paratetranychus*, and we have no reason not to accept this synonymy.

The genus *Rhodaxes* Kirchner, 1863, has been regarded by some workers as possibly being synonymous with *Oligonychus*. We regard *Rhodaxes* as belonging to the Eriophyidae.

Mites belonging to the genus *Oligonychus* may be recognized by having the empodial claw well developed, with six to twelve hairs proximoventrally, and the caudal pair of para-anal setae absent.

These mites are usually found on trees, shrubs, or perennial grasses, where they overwinter in the temperate zone as eggs. The egg bears a dorsal stipe and is more or less radially striated dorsally; and it is reddish or amber when laid by reddish females or pearly when laid by greenish females. The mites usually feed on the dorsal surface of broad leaves (*Oligonychus aceris* is an exception), and leave the entire upper surface speckled.

The number of tactile setae on tibia I and tarsus I are here employed for segregation of species groups or subgroups. The number of sensory setae on these segments is often constant, as in other genera, but sometimes subject to considerable variation. Moreover, the proximal tactile setae on tarsus I of the female may be of a distinctive number when males all exhibit similar numbers of tactile setae. Exceptions,

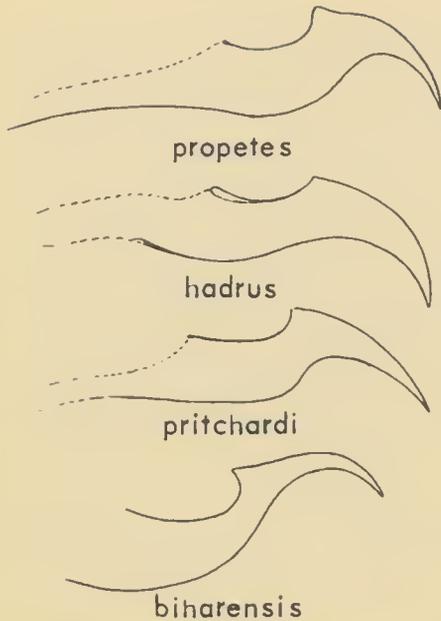


Fig. 226. *Oligonychus*, aedeagi.

of course, are sometimes encountered, but the present breakdown on this basis has proved to be very useful for identification. Males have more sensory setae than the females, as a rule.

We recognize five major species groups of the genus *Oligonychus* and each is probably worthy of subgeneric rank.

The first group consist of *Oligonychus ununguis* and related species in which the aedeagus bends down. The fore tibia bears only five, six, or seven tactile setae, and the fore tarsus bears from none to four tactile setae proximal of the duplex setae and one ventral, tactile seta (with one exception) just distal to the duplex setae (on the portion

with longitudinal striae). The empodium bears four to six pairs (apparently only three pairs in *O. cunliffei* and the fore tarsus of males of some species) of ventral hairs proximoventral to the empodial claw.

The second group consists of *Oligonychus peruvianus* alone. The configuration of the dorsal striae of the idiosoma is distinctive. The fore tarsus agrees with the Ununguis Group in that there is a single tactile seta ventrodistad of the duplex setae. The aedeagus bends ventrad also as in *O. ununguis*. However, tibia I bears nine tactile setae, and the empodium consists of only three pairs of proximoventral hairs, both characters being as in the following groups.

The remainder of the genus *Oligonychus* consists of those species in which the aedeagus bends dorsad, and tibia I bears eight or usually, nine tactile setae. There are two tactile setae ventrally at or just beyond the duplex setae of tarsus I (on the portion with longitudinal striae); and there are only three pairs of proximoventral hairs on the empodium. The dorsal striae of the body of the female as well as the structure of the aedeagus will separate the Pritchardi, Pratensis, and McGregori Groups.

It is emphasized that the following key is not infallible. Occasionally a specimen is encountered in which a tactile seta of the leg is lacking or else an additional seta is present. However, the tactile setae of the tibia and tarsi have proved to be much more constant than the sensory setae on these segments, and their numbers are valuable, at least with consideration to populations, for purposes of identification.

Key to American and Hawaiian species of OLIGONYCHUS
Females

1. Tibia I with five, six, or seven tactile setae; tarsus I with a single tactile seta on venter beyond first duplex; empodium usually with four to six pairs of proximoventral hairs (Ununguis Group) 2
1. Tibia I with eight or nine tactile setae; tarsus I usually with two tactile setae on venter beyond first duplex; empodium with only three pairs of proximoventral hairs 13
- 2.(1). Hysterosoma with first pair of dorsocentrals not reaching bases of second pair 3
- 2.(1). Hysterosoma with first pair of dorsocentrals reaching well beyond bases of second pair 7
- 3.(2). Tibia I with seven tactile (and one sensory) setae; tarsus I with three tactile (and one sensory) setae proximal to duplex setae; on cypress (Boudreauxi Subgroup) . *boudreauxi* (p. 291)
- 3.(2). Tibia I with five or six tactile (and one sensory) setae; tarsus I with one or no tactile (and one sensory) setae proximal to duplex setae; on pine (Subnudus Subgroup) 4
- 4.(3). Hysterosoma with first pair of dorsocentrals over one-half as long as interval to second pair; dorsal setae and para-anals nearly nude *pityinus* (p. 290)
- 4.(3). Hysterosoma with first pair of dorsocentrals less than one-half as long as interval to second pair; dorsal setae and para-anals obviously pubescent 5
- 5.(4). Dorsocentral hysterosomals with anterior pair much shorter than posterior pair *milleri* (p. 280)
- 5.(4). Dorsocentral hysterosomals all similar in length 6
- 6.(5). Tarsi III and IV much longer than tibiae III and IV, and gradually narrowing distally *subnudus* (p. 281)
- 6.(5). Tarsi III and IV subequal in length to tibiae III and IV and abruptly declivate at tip. *cunliffei* (p. 284)
- 7.(2). Tibia I with six tactile (and one sensory) setae (Aceris Subgroup) 8
- 7.(2). Tibia I with seven tactile setae (and one or more sensory) setae 9
- 8.(7). Idiosoma with dorsal setae not conspicuously heavy: sensory seta on tibia I more than one half as long as dorsal tactile seta; on maple *aceris* (p. 297)
- 8.(7). Idiosoma with dorsal setae large: sensory seta on tibia I about

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- one fourth as long as dorsal tactile setae; on oak and chestnut *endytus* (p. 301)
- 9.(7). Tarsus I with three tactile setae proximal to duplex setae (Bicolor Subgroup).
- 9.(7). Tarsus I with four tactile setae proximal to duplex setae (Ununguis Subgroup)
- 10.(9). Duplex setae with proximal member nearly as long as distal seta *platani* (p. 304)
- 10.(9). Duplex setae with proximal member very short in comparison with distal setae 11
- 11.(10). Outer sacrals much shorter than inner sacrals. . *ilicis* (p. 305)
- 11.(10). Outer sacrals similar in length to inner sacrals
 *bicolor, viridis, newcomeri, coffeae* (pp. 308, 311, 312, 315)
- 12.(9). On conifers *ununguis, coniferarum* (pp. 319, 328)
- 12.(9). On other hosts
 *yothersi, punicae, mangiferus, peronis* (pp. 330, 335, 336)
- 13.(1). Body with dorsal setae broadened proximally and strongly tapering distally; integumentary striae longitudinal between third pair of dorsocentral hysterosomals (Peruvianus Group) *peruvianus* (p. 342)
- 13.(1). Body with dorsal setae not acutely tapering from an obviously widened base; integumentary striae transverse between third pair of dorsocentral hysterosomals 14
- 14.(13). Hysterosoma with integumentary striae longitudinal caudad of inner sacrals 15
- 14.(13). Hysterosoma with integumentary striae transversely parallel between inner and outer sacral setae (Pritchardi Group). . 16
- 15.(14). Peritreme ending in a simple bulb (Pratensis Group)
 *stickneyi, gramineus, pratensis, modestus, indicus, sacchari* (pp. 344, 347, 349, 354, 355)
- 15.(14). Peritreme retrorse distally (McGregori Group)
 *mcgregori* (p. 359)
- 16.(14). Peritreme retrorse distally *biharensis* (p. 364)
- 16.(14). Peritreme straight distally, ending in a simple bulb
 *pritchardi, propetes* (pp. 365, 366)

Males

1. Aedeagus bent ventrad; tarsus I with not more than a single tactile seta on venter just distad of duplex setae. 2

Subfamily Tetranychinae Berlese

1. Aedeagus bent dorsad, although the distal end may be directed ventrad; tarsus I with two tactile setae on venter just distad of duplex setae 21
- 2.(1). Body with dorsal setae obviously widened proximally and acutely tapering distally; tibia I with nine tactile setae; empodium with three pairs of proximoventral hairs; on dicotyledonous plants (Peruvianus Group) . . . *peruvianus* (p. 342)
- 2.(1). Body with dorsal setae slender, not acutely tapering from widened proximal portion; tibia I with six or seven tactile setae; empodium usually with four to six pairs of proximoventral hairs (Ununguis Group) 3
- 3.(2). First pair of dorsocentral hysterosomals shorter than interval to second pair 4
- 3.(2). First pair of dorsocentral hysterosomals longer than interval to second pair 8
- 4.(3). Tibia I with seven tactile setae; tarsus I with three tactile setae proximad of duplex setae; on cypress (Boudreauxi Subgroup) *boudreauxi* (p. 291)
- 4.(3). Tibia I with five or six tactile setae; Tarsus I with one or no tactile setae proximad of duplex setae; on pine (Subnudus Subgroup) 5
- 5.(4). First pair of dorsocentral hysterosomals about one-half length of interval to second pair, finely pubescent . . . *pityinus* (p. 290)
- 5.(4). First pair of dorsocentral hysterosomals not over one-fourth length of interval to second pair, coarsely pubescent . . . 6
- 6.(5). Dorsocentral hysterosomals with anterior pair much shorter than posterior pair; aedeagus with ventrally directed portion from two-thirds to as long as dorsal part of shaft
. *milleri* (p. 280)
- 6.(5). Dorsocentral hysterosomals all similar in length; aedeagus with ventrally directed portion about one-fourth as long as dorsal portion of shaft 7
- 7.(6). Tarsi III and IV much longer than tibiae III and IV, and gradually narrowing to distal end *subnudus* (p. 281)
- 7.(6). Tarsi III and IV about as long as tibiae III and IV, and abruptly declivate over base of pretarsus *cunliffei* (p. 284)
- 8.(3). Tibia I with six tactile setae (Aceris Subgroup) 9
- 8.(3). Tibia I with seven tactile setae; on other hosts (Bicolor and Ununguis Subgroups) 10

Spider Mites

- 9.(8). Body with dorsal setae very strong; anterior dorsal sensory seta of tibia I about one fourth as long as dorsal tactile seta; on oak and chestnut *endytus* (p. 301)
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Fig. 227. *Oligonychus milleri*: dorsal aspect of female, Pomona Park, Florida.

Ununguis Group

Adults of the Ununguis Group may be recognized by having only six or seven tactile setae on tibia I (*Oligonychus cunliffei* is an exception in that there are only five such setae). Tarsus I bears from one to four tactile setae proximal to the duplex setae, and a single tactile seta on the venter of the segment near or beyond the duplex setae (except in *O. perditus* where there are two such setae). There are from four to six pairs of proximoventral setae on the empodium,

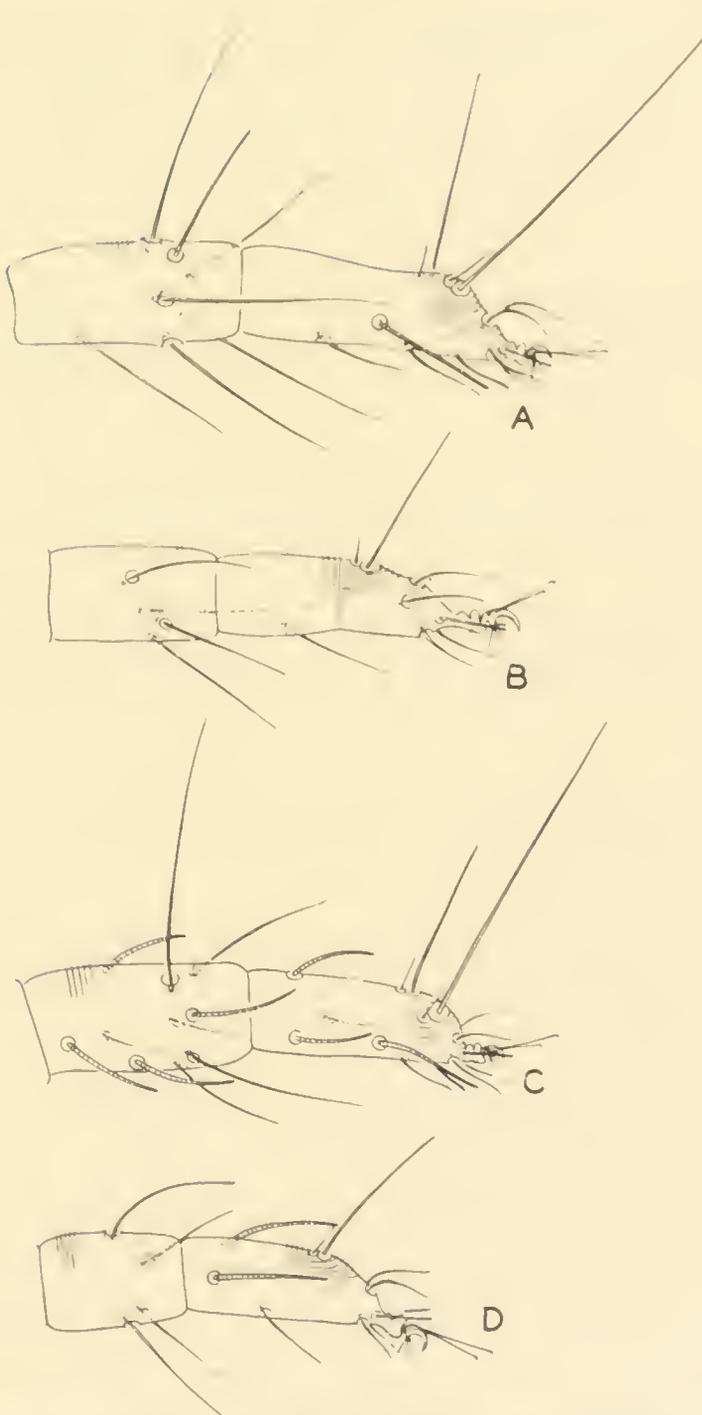


Fig. 228. *Oligonychus milleri*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

except on tarsus I of the male where there are often only three pairs. The aedeagus bends ventrad as found otherwise in the genus only in the Peruvianus Group. The integumentary striae of the adult female

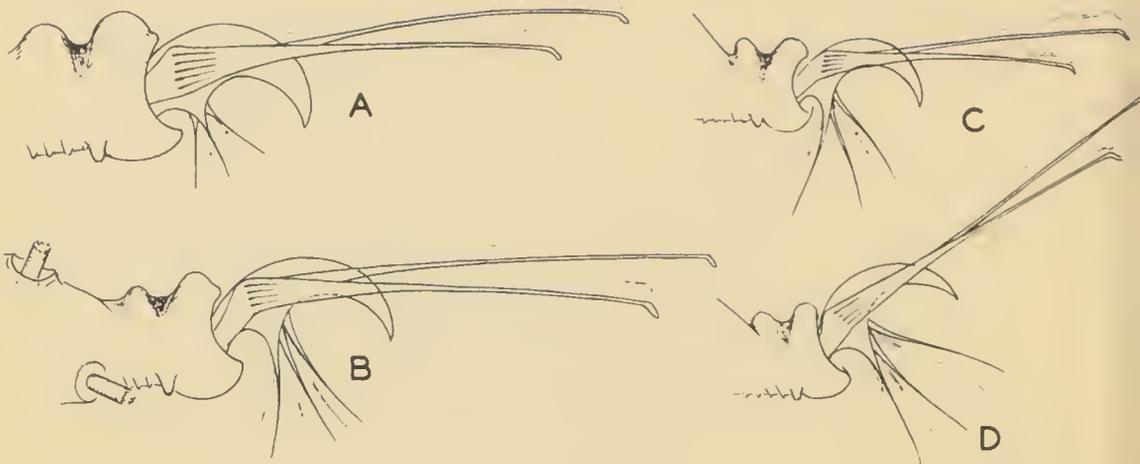


Fig. 229. *Oligonychus milleri*: A.) empodium I of male; B.) empodium IV of male; C.) empodium I of female; D.) empodium II of female.

are transverse throughout the dorsocentral area of the hysterosoma.

Members of the Ununguis Group are ordinarily found on trees and shrubs.

Oligonychus milleri (McGregor), new combination

(Figures 227, 228, 229, 230)

Paratetranychus milleri McGregor, 1950, Amer. Midl. Nat., 44: 343.

Types: males and females, Placerville, California, on *Pinus ponderosa*; in the U. S. National Museum.

Adults of *Oligonychus milleri* may be recognized by having the dorsocentral hysterosomals successively increasing in length, the first pair being very short, the second pair longer, and the third pair much longer than the first.

The aedeagus is also distinctive among the Subnudus Subgroup (tibia I with six tactile setae and tarsus I with one tactile seta proximal to duplex setae) in that the distal end is very long, from two-thirds to as long as dorsal portion of shaft, and it narrows evenly from a very broad curvature. There is no geographical correlation with the comparative length of the turned down portion of the aedeagus, nor with variations in the length of the dorsal seta of the body.

Specimens examined other than the types, are from El Cerrito, California (A. E. Pritchard), on pine; Coeur d'Alene, Idaho (J. C. Evenden), on ponderosa pine; Logan, Utah, on scots pine; Lakewood, Wisconsin (H. E. Milliron), on jackpine; Coushaeta, Louisiana (L. D. Newson),

on loblolly pine; Bryceland, Louisiana (J. D. Newsom), on pine; Pomona Park, Florida (O. D. Link), on pine; Lake Placid (Archbold Foundation) and St. Petersburg, Florida (E. W. Baker), on pine; Durham, North Carolina (A. E. Pritchard), on pine; and Rehobeth Beach, Delaware (E. W. Baker), on pine. McGregor also recorded specimens from Arizona and Virginia, on pine.

Oligonychus subnudus (McGregor), new combination

(Figures 231, 232, 233)

Paratetranychus subnudus McGregor, 1950, Amer. Midl. Nat., 44: 355.

Types: males and females, Oxnard, California, on pine; in the U. S. National Museum.

Adults of *Oligonychus subnudus* may be recognized by having all the dorsocentral hysterosomals very short and more or less similar in length, together with having the tarsi, especially III and IV, slender and longer than the tibiae.

Differences in the shape and length of the lateral and caudal setae of the body of specimens studied indicate considerable variation, or else that a species complex is involved. In typical specimens of *O. subnudus* (coastal California), the dorsolateral hysterosomals and humerals are rodlike, scarcely longer than the dorsocentral hysterosomals, but the outer pair of sacrals are obviously longer than the inner pair. Specimens from inland southern California exhibit dorsolateral hysterosomal setae that are tapering and much longer than the dorsocentrals, the humerals being even longer; and the dorsocentrals are also tapering.

The stylophore is deeply emarginate distally in most of the specimens studied, but it is only slightly cleft or else broadly convex in specimens studied from the interior of southern California.

The aedeagus is distinct from that of *Oligonychus milleri* in that



Fig. 230. *Oligonychus milleri*:
aedeagus.



Fig. 231. *Oligonychus subnudus*: dorsal aspect of female, Yakima, Washington.

the ventrally bent distal portion is not over one-fourth as long as the dorsal portion of the shaft, and the distal end is acuminate and slightly sigmoid. Variation in the comparative length and the curvature of the bent distal portion is evident.

Specimens examined, except for the types, are from Richmond, Berkeley, Oakland, Hayward, Monterey, Julian, and Keen Camp, California (A. E. Pritchard), on pine; Mountain View, California (M. Klaid), on Monterey pine; Grant Grove, California (A. E. Pritchard), on red fir; and Yakima, Washington (E. W. Baker), on pine.



Fig. 232. *Oligonychus subnudus*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

Oligonychus hondoensis (Ehara), new combination

? *Teramychus* sp. ? (partim), Niijima, 1903, Textb. Jap. Forest Protect., p. 335, fig. 51.

? *Tetranychus* sp. (partim), Niijima, 1923, Textb. Forest Protect., new ser., vol. 1, p. 339, fig. 106; Matsushita, 1948, Textb. Forest Pests, p. 401; Yamamoto, 1948, Textb. Forest Protect., p. 137.

Paratetranychus hondoensis Ehara, 1954, Annotat. Zool. Jap. 27(2): 102, 103. *Types*: Males and females, Sibusawa, Japan, on *Cryptomeria japonica*; in Zoological Institute, Faculty of Science, Hokkaido University, Japan.



Fig. 233. *Oligonychus subnudus*: aedeagus.

Oligonychus hondoensis is related to *O. subnudus* by the type of aedeagus, and the dorsal setal structure of the female. It is differentiated by having the first two pairs of propodosomal setae and the humeral setae quite long in the female, and in having comparatively long dorsal body setae in the male.

Oligonychus cunliffei Pritchard and Baker, new species
(Figures 234, 235, 236, 237)

Oligonychus cunliffei is closely allied to *O. subnudus* and similarly possesses very short dorsocentral hysterosomals. It differs, however, in that all of the tarsi are short and stubby, and tarsus I lacks the tactile seta proximad of the duplex setae. The body size is also considerably smaller.

This species is known only from Florida, on pine.

Female.—Palpus with terminal sensillum shorter than the dorsal, fusiform seta. Stylophore broadly rounded anteriorly and slightly emarginate medially. Peritreme straight distally. Tibia I with five tactile and one sensory setae; tarsus I very short, abruptly declivate beyond duplexes, with a single sensory seta proximoventral to duplexes, and with a single tactile seta just beyond the duplexes before the terminal setae of the tarsus; empodial claw very short, strongly hooked, shorter than the three pairs of proximoventral hairs. Tibia II with four tactile setae. Propodosoma with dorsal setae setiform, much shorter than intervals between them, the second pair shorter than first and third pairs. Hysterosoma with dorsocentrals similar in length and much

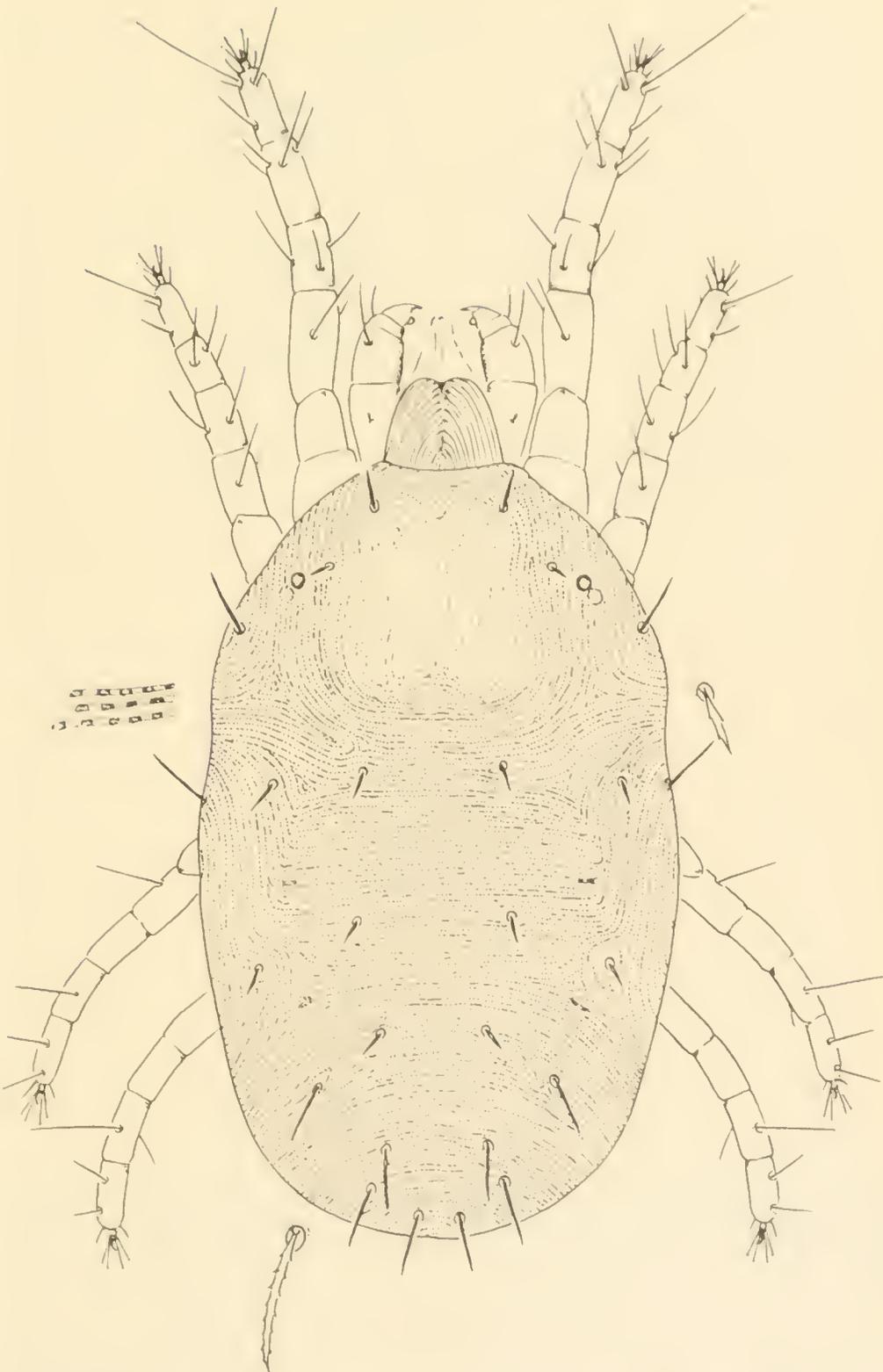


Fig. 234. *Oligonychus cunliffei*: dorsal aspect of female.

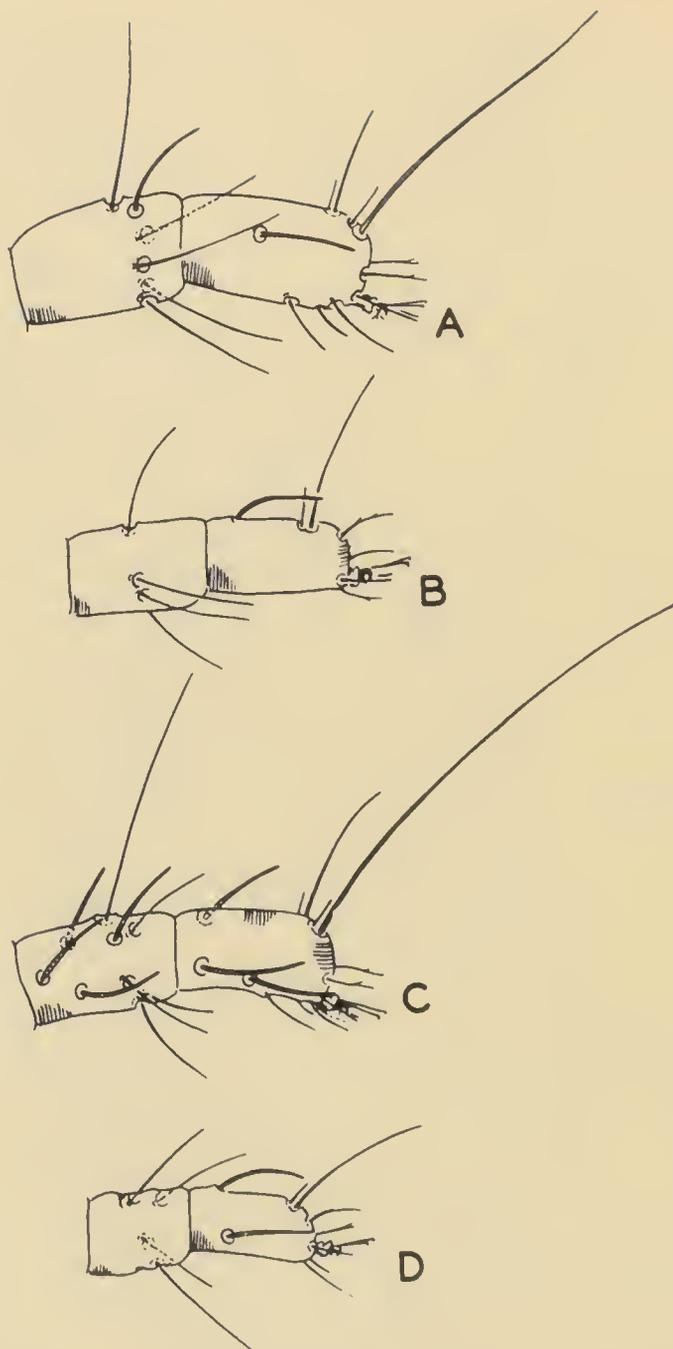


Fig. 235. *Oligonychus cunliffei*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

shorter than intervals between them, the first and second dorsolaterals similar; humerals, third dorsolaterals, sacrals, and clunals all considerably longer; para-anals similar to clunals. Length of body $320\ \mu$, including rostrum $380\ \mu$; greatest width of body, $193\ \mu$.

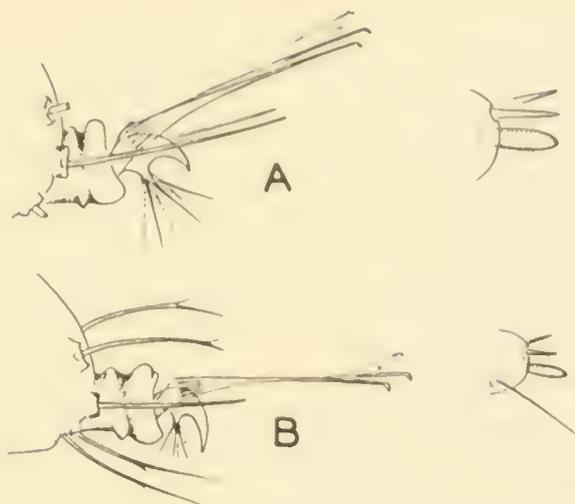


Fig. 236. *Oligonychus cunliffei*: A.) empodium I and tip of palpus of female; B.) empodium I and tip of palpus of male.



Fig. 237. *Oligonychus cunliffei*: aedeagus.

Holotype.—Female. St. Petersburg, Florida, June 27, 1952, (E. W. Baker), on *Pinus palustris*: type no. 2139 in the U. S. National Museum.

Paratypes.—Five females, St. Petersburg, Florida, June 27, 1952 (E. W. Baker), on pine; 4 females, Pomona Park, Florida (O. D. Link), on pine; 1 female, Lake Placid, (Archbold Foundation), Florida, July 1952. (E. W. Baker), on pine. The male has been misplaced.

This species is named in honor of Frederick Cunliffe, of the Pinellas Biological Laboratory, St. Petersburg, Florida, because of his keen interest in advancing knowledge of plant-feeding mites.

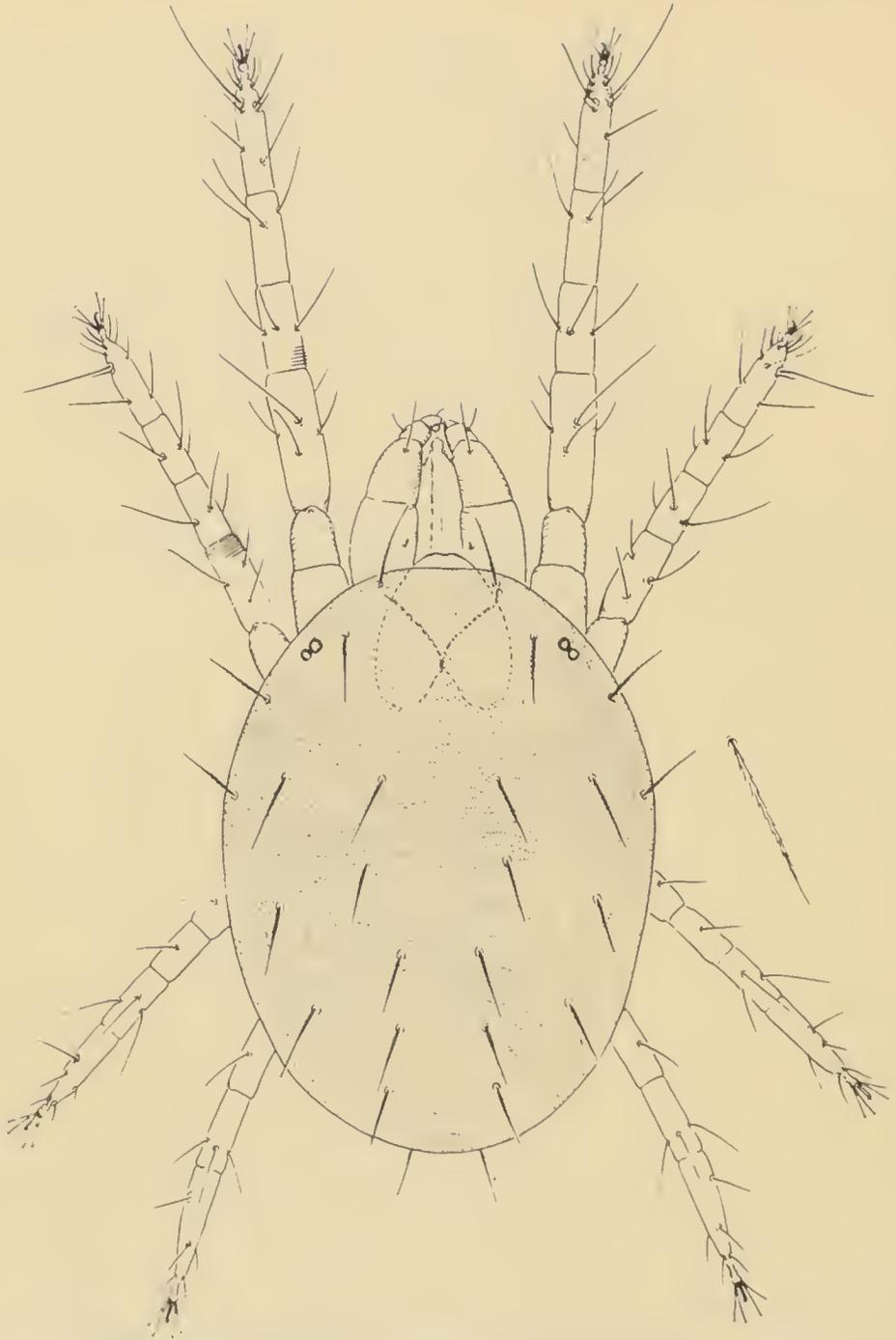


Fig. 238. *Oligonychus pityinus*: dorsal aspect of female.

Oligonychus brevipilosus (Zacher), new combination

Paratetranychus brevipilosus Zacher, 1932, Zool. Anz., 97: 179; Reek, 1950, Trudy Inst. Zool. Akad. Nauk S.S.R., 9: 126. Types: females, Baden, Germany, on conifers; possibly in the Zacher collection.

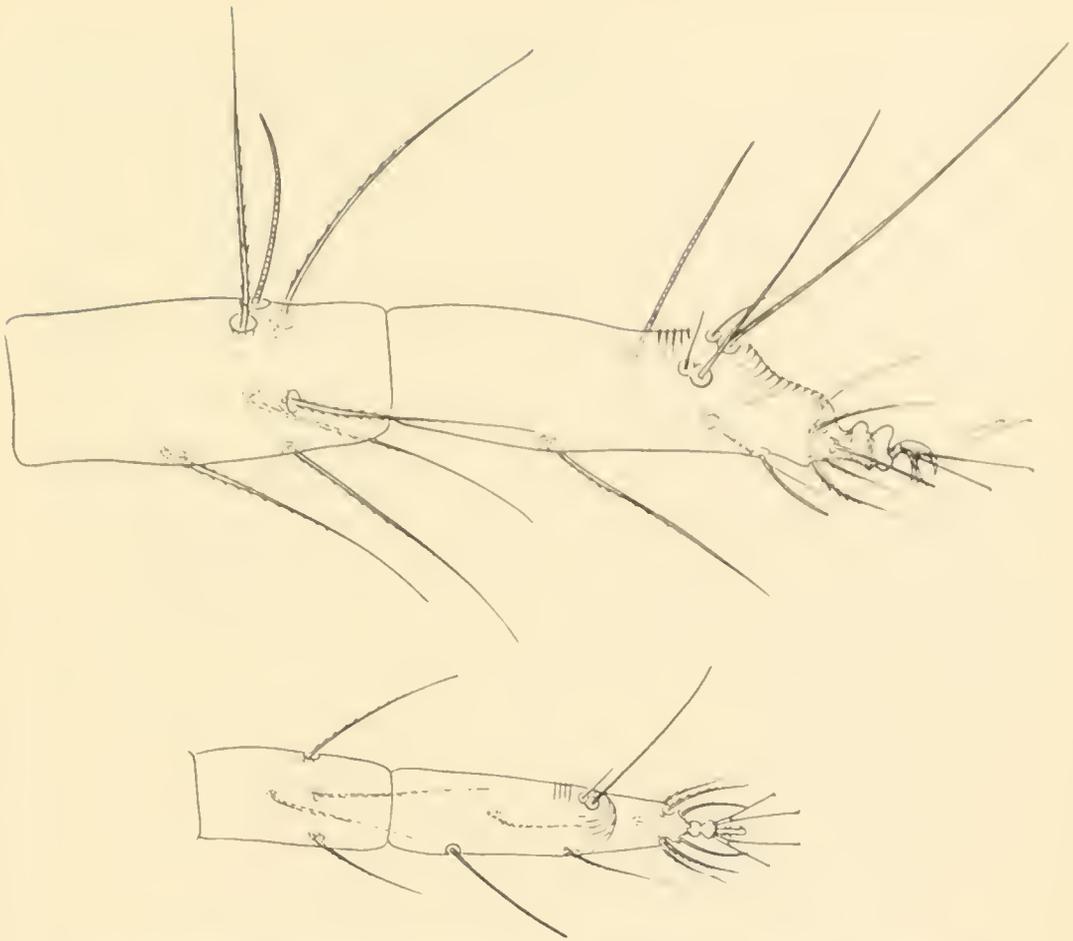


Fig. 239. *Oligonychus pityinus*: above, tibia and tarsus I of female; below, tibia and tarsus II of female.

The photograph and drawings of the female presented by Zacher indicate that this species is similar to *Oligonychus subnudus* (McGregor).

This species is known only from the types from Germany, on pine, and from Reck's record from Georgia, S.S.R., on pine.

Oligonychus picei (Canestrini), new combination

Tetranychus picei Canestrini, 1889. Atti. Reale Ist. Veneto Sci. Let. Arti (ser. 6), 7: 502. Described from specimens from Trentino, Italy, on spruce.

Although Berlese (1894) and Geijskes (1939) considered *Tetranychus picei* to be a synonym of *Oligonychus minimus*, this synonymy is not accepted because of the difference in type hosts, and the longer dorsal setae of the body in *picei*.

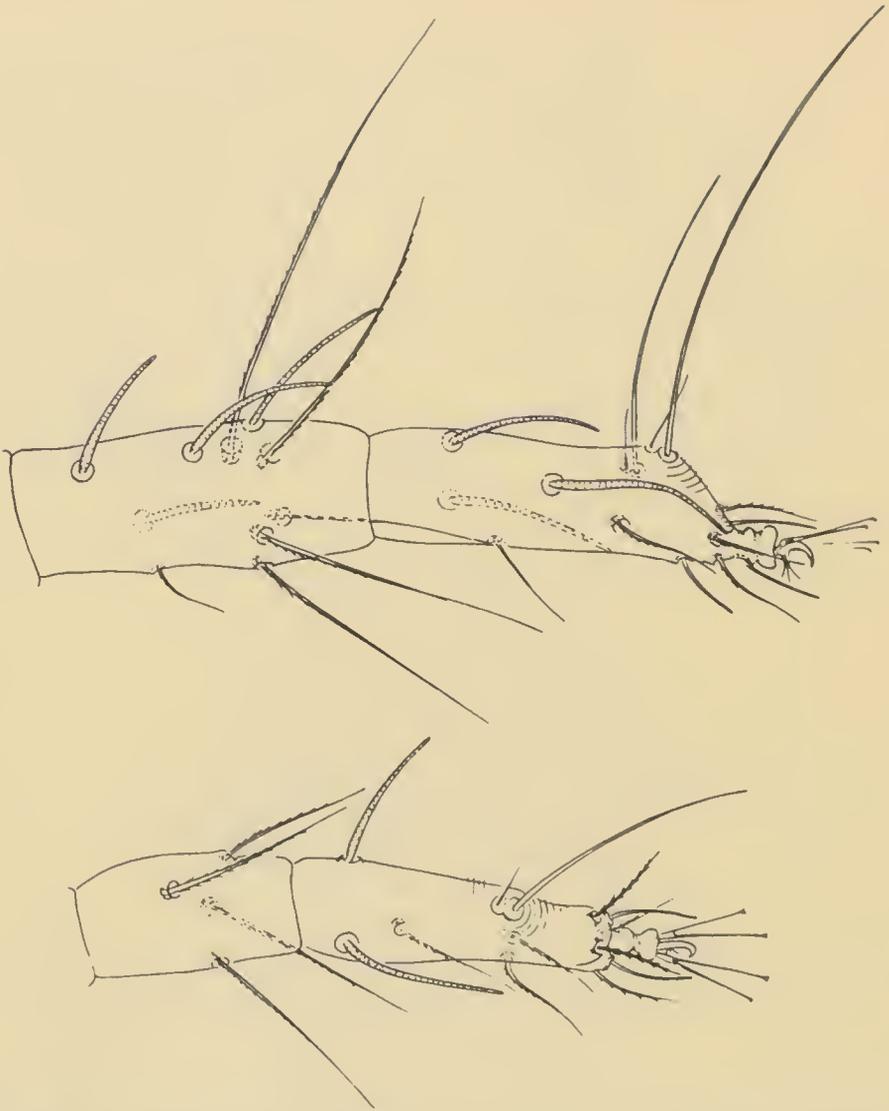


Fig. 240. *Oligonychus pityinus*: above, tibia and tarsus I of male; below, tibia and tarsus II of male.

A study of three type females in the Berlese collection indicates that *picei* is closely allied to *subnudus*. The dorsal setae of the body are short and lanceolate but not much shorter than the intervals between them longitudinally.

Oligonychus pityinus Pritchard and Baker, new species
(Figures 238, 239, 240, 241)

The adults of *Oligonychus pityinus* may be recognized by having the first pair of dorsocentral hysterosomals from one-half to three-fourths as long as the interval to the second pair, tapering, and sparsely

pubescent. The second and third pair of dorsocentral hysterosomals are similar. The fore tibia bears six pairs of tactile setae, and the fore tarsus bears a single tactile seta as in *O. milleri* and *O. subnudus*. The aedeagus resembles that of *O. subnudus* in that the distal, ventrally

directed portion is tapering and somewhat curved, but it is only about one-half as long as the dorsal portion of the shaft.

This species is known only from southern California, on pine.

Male.—Palpus with terminal sensillum much shorter than fusiform sensillum, about as long as wide. Peritreme straight distally. Tibia I with five tactile and four sensory setae; tarsus I with one tactile and three sensory setae proximal to the duplexes and with a single tactile seta ventrally at the level of the duplexes; empodial claw short, slightly shorter than the four pairs of proximoventral hairs. Tibia II with four tactile setae. Propodosoma with dorsal setae slender, tapering, finely pubescent, about as long as longitudinal intervals between them. Hysterosoma with dorsal setae similar to dorsal propodosomals; para-anals similar to clunals. Aedeagus with distal one-half bent sharply ventrad at a right angle, the distal portion with caudal face curved and tapering to near the tip. Length of body $233\ \mu$; including rostrum $300\ \mu$.

Female.—Similar. Terminal sensillum of palpus larger. Stylophore broad and very slightly emarginate anteromedially. Tibia I with five tactile and one sensory setae; tarsus I with one tactile and one sensory setae proximal to duplexes. Length of body $333\ \mu$, including gnathosoma $433\ \mu$; greatest width of body $233\ \mu$.

Holotype.—Male, Big Pine, Inyo County, California, May 24, 1951 (A. E. Pritchard), on *Pinus monophylla*; type no. 2140 in the U. S. National Museum. *Paratypes*.—Six males, 4 females, Big Pine, California, May 24, 1951 (A. E. Pritchard), on *Pinus monophylla*.

Oligonychus boudreauxi Pritchard and Baker, new species
(Figures 242, 243, 244, 245)

Adults of *Oligonychus boudreauxi* may be distinguished by having the first pair of dorsocentral hysterosomals much shorter than the interval to the second pair, together with having seven tactile setae on tibia I and three tactile setae proximal to the duplex setae on tarsus I. The ventrally directed end of the aedeagus is tapering, slightly



Fig. 241. *Oligonychus pitytinus*:
aedeagus.

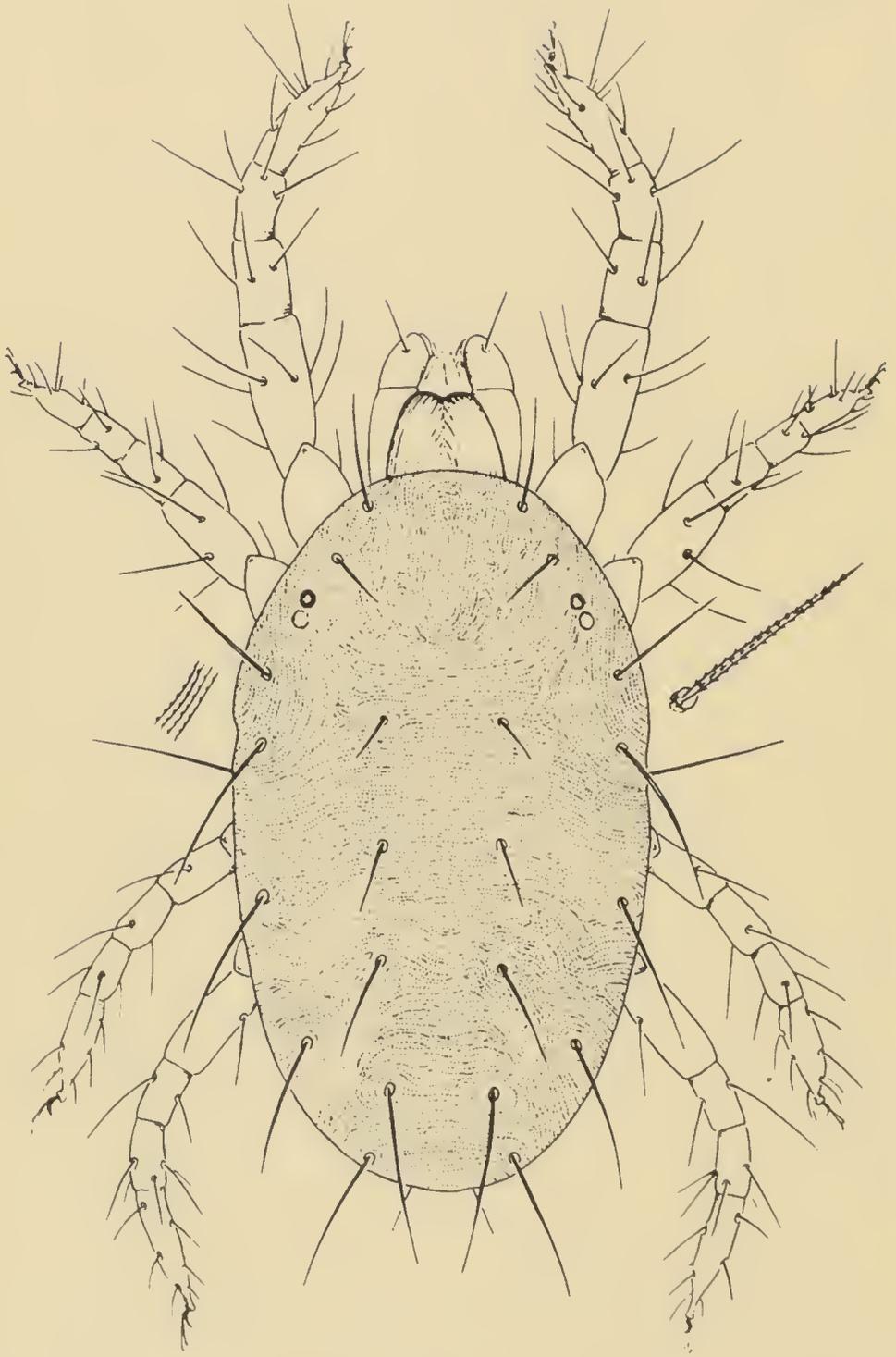


Fig. 242. *Oligonychus boudreauxi*: dorsal aspect of female, Leland, Mississippi.

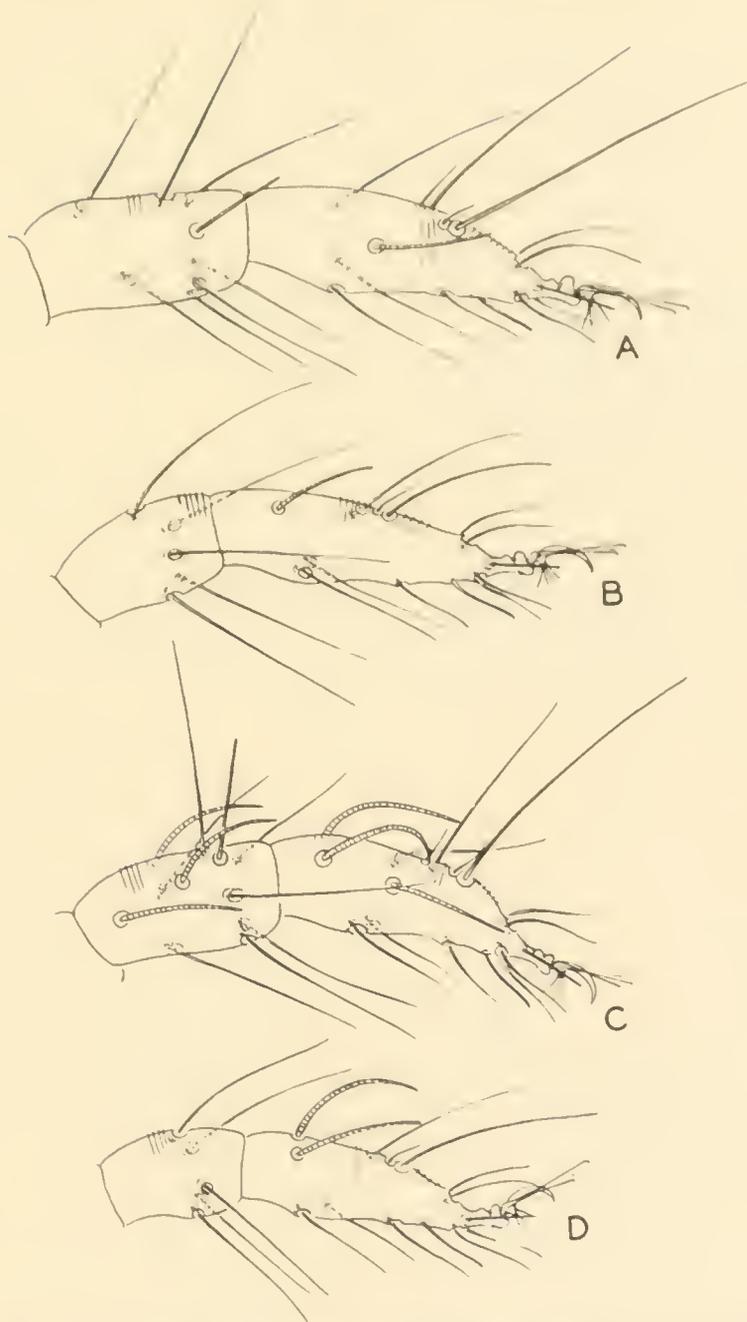


Fig. 243. *Oligonychus boudreauxi*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

curved, and not over one-fourth as long as the dorsal portion of the shaft.

This species is known to occur only in the southeastern United States, on cypress.

Male.—Palpus with terminal sensillum very small. Peritreme straight distally, slightly enlarged at distal end. Tibia I with seven tactile

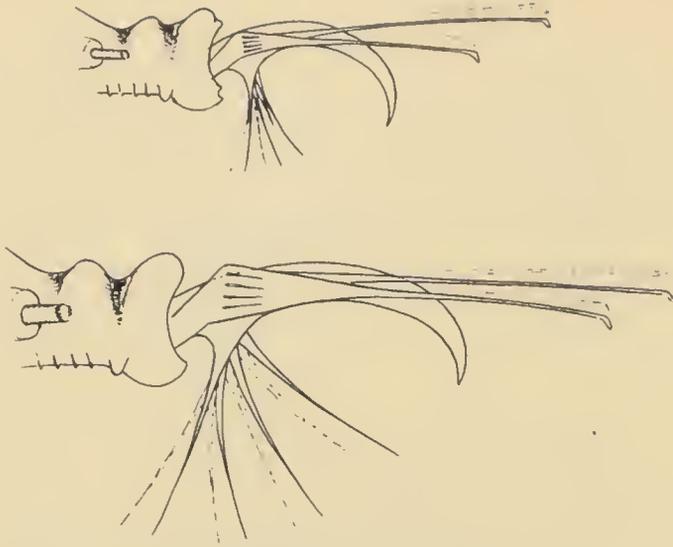


Fig. 244. *Oligonychus boudreauxi*: above, empodium I of male; below, empodium I of female.



Fig. 245. *Oligonychus boudreauxi*: aedeagus.

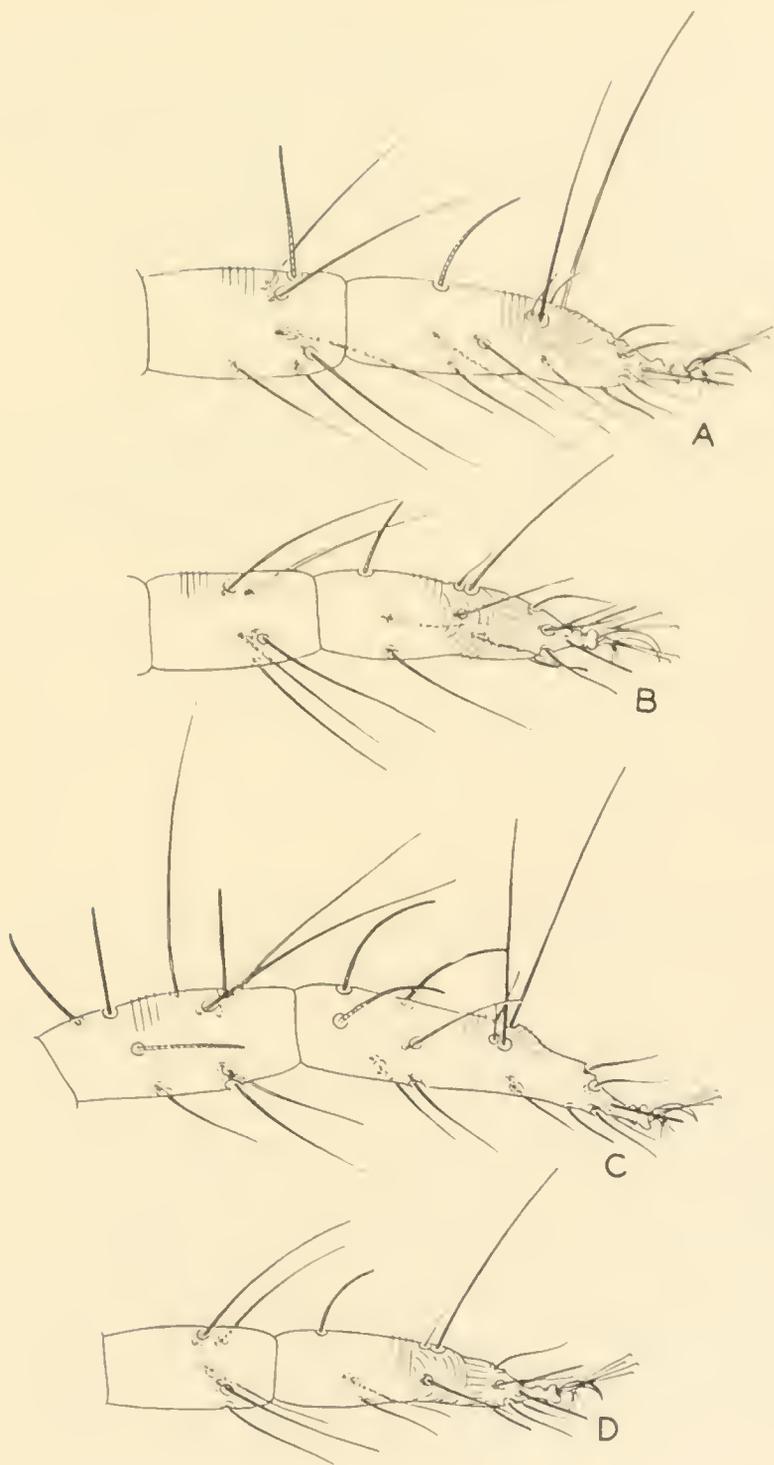


Fig. 246. *Oligonychus aceris*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; C.) tibia and tarsus II of male.

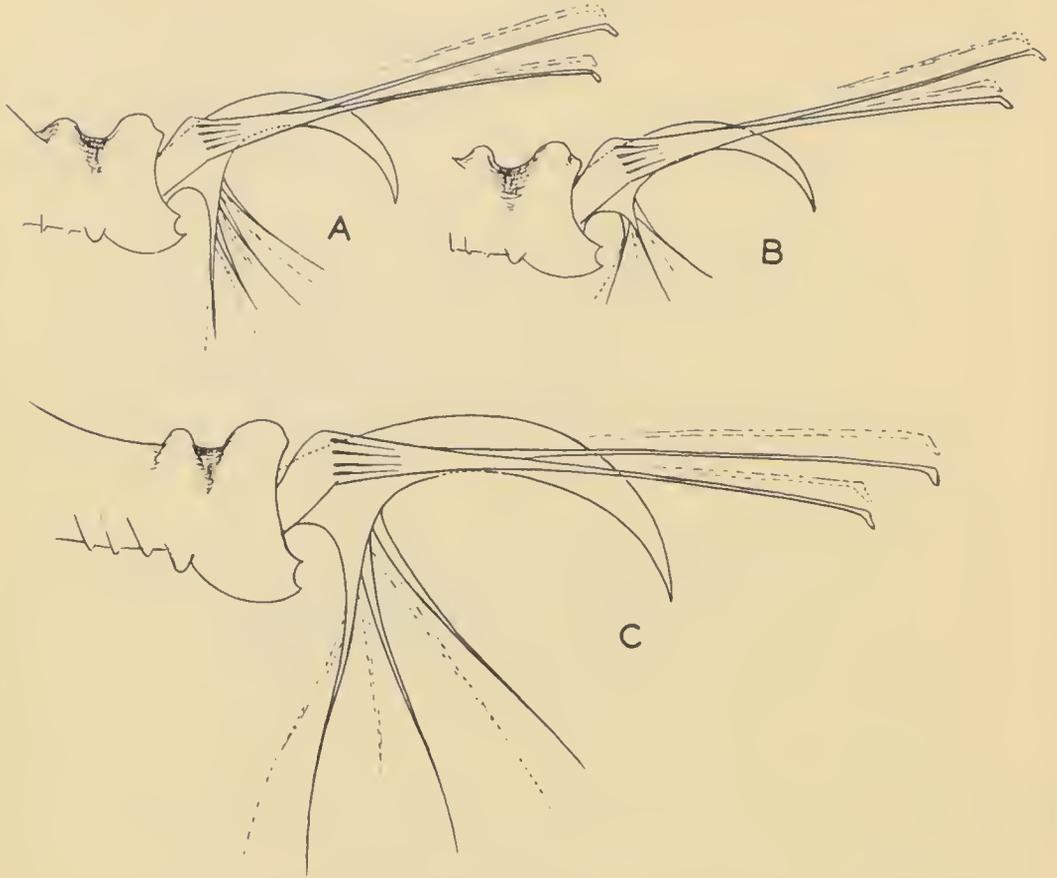


Fig. 247. *Oligonychus aceris*: A.) empodium III of male; B.) empodium I of male; C.) empodium III of female.

and three sensory setae; tarsus I with three tactile and three sensory setae proximal to duplexes and a single tactile seta ventrally just distal to duplexes; empodial claw I slender, curved, longer than the four (sometimes apparently three) pairs of proximoventral hairs. Tibia II with four tactile setae. Propodosoma with dorsal setae slender, tapering, rather coarsely pubescent, the first pair longer than the interval to the second, the third pair similar, the second pair considerably shorter. Hysterosoma with dorsocentrals gradually increasing in length, the first pair being less than one-half as long as interval to second pair, the third pair reaching the inner saerals; dorsolaterals, humerals, and saerals as long as third pair of dorsocentrals. Aedeagus with distal one-fourth directed ventral, slightly curved and tapering. Length of body $233\ \mu$, including rostrum $282\ \mu$; greatest width of body, $120\ \mu$.

Female.—Similar. Terminal sensillum of palpus larger. Stylophore comparatively broad, distinctly emarginate mediocephalically. Tibia I with seven tactile and one sensory seta; tarsus I with three tactile



Fig. 248. *Oligonychus aceris*: aedeagus.

and one sensory seta proximal to duplexes. Length of body $366\ \mu$, including gnathosoma $400\ \mu$; greatest width of body $200\ \mu$.

Holotype.—Male, Baton Rouge, Louisiana, May 29, 1953 (R. W. Burrell), on cypress; type no. 2141 in the U. S. National Museum.

Paratypes.—Five males, 20 females, Baton Rouge, Louisiana, May 29, 1953 (R. W. Burrell), on cypress; 3 males, 5 females, Baton Rouge, Louisiana, June 5, 1951 (L. D. Newsom), on cypress; 1 male, 7 females, Leland, Mississippi (C. J. Hay), on *Taxodium distichum*.

This species is named in honor of H. B. Boudreaux, an outstanding student of spider mites of the southeastern United States.

Oligonychus aceris (Shimer), new combination

(Figures 246, 247, 248)

Acarus aceris Shimer, 1869, Trans. Amer. Ent. Soc., 2: 320. Described from specimens from Illinois, on maple.

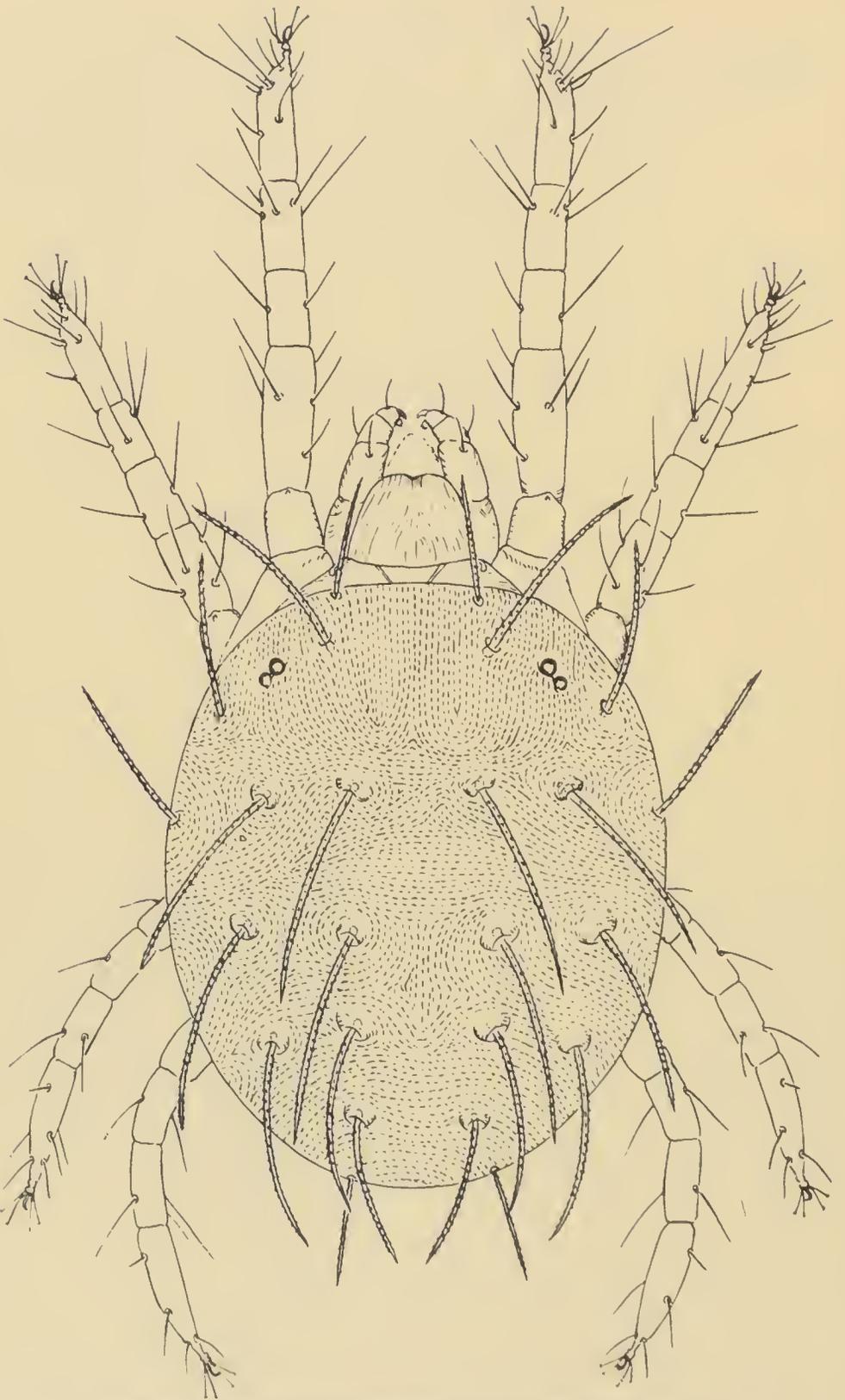


Fig. 249. *Oligonychus endytus*: dorsal aspect of female.

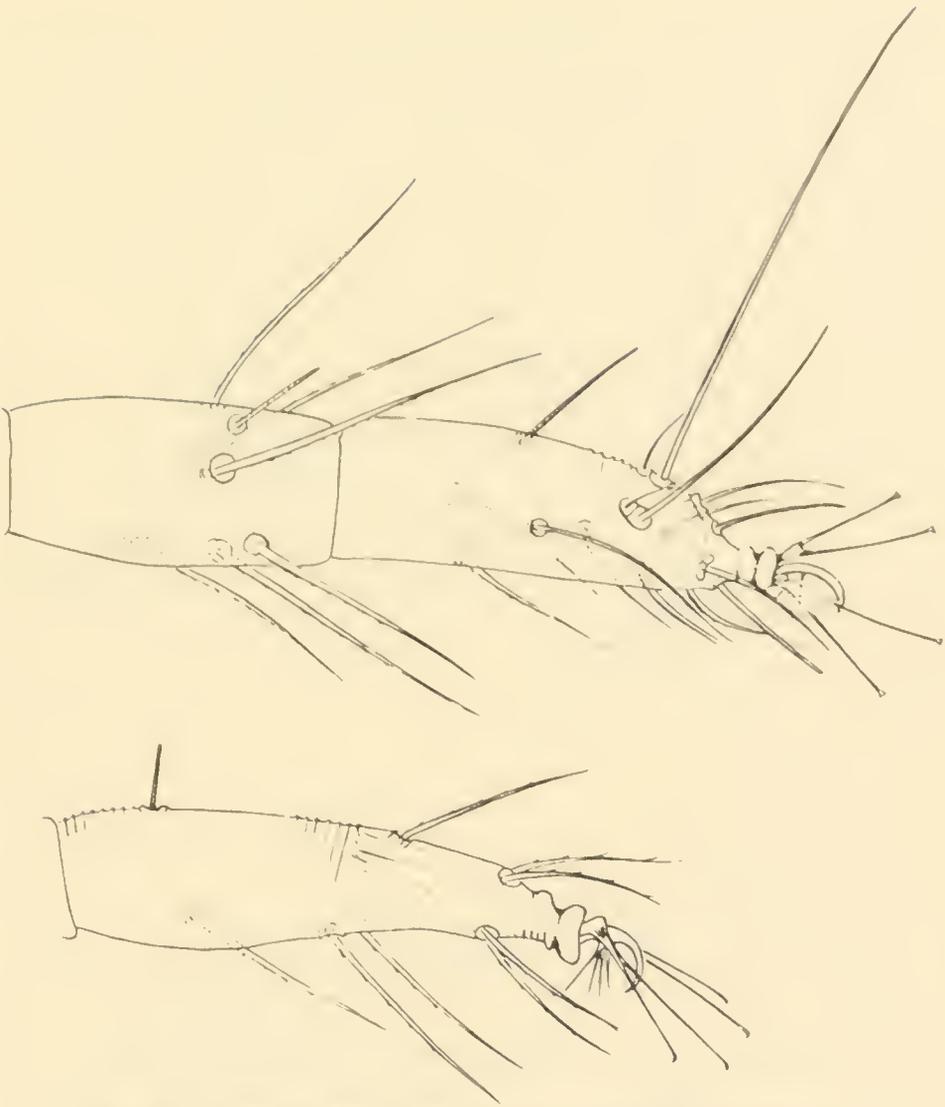


Fig. 250. *Oligonychus endytus*: above, tibia and tarsus I of female; below, tarsus II of female.

Tetranychus aceris, Banks, 1907, Proc. U. S. Natl. Mus., 32(1553): 598.

Adults of *Oligonychus aceris* may be readily recognized by having only six tactile setae on tibia I, together with having the dorsal setae of the body long and slender, set on small tubercles. The fore tarsus bears three tactile setae proximal to the duplex setae, and the empodial claw is very long.

In contrast to other members of the Ununguis Group that feed on broad-leaved plants, *Oligonychus aceris* is found primarily on the lower surface of the leaf. Adult females are straw colored with large black markings.

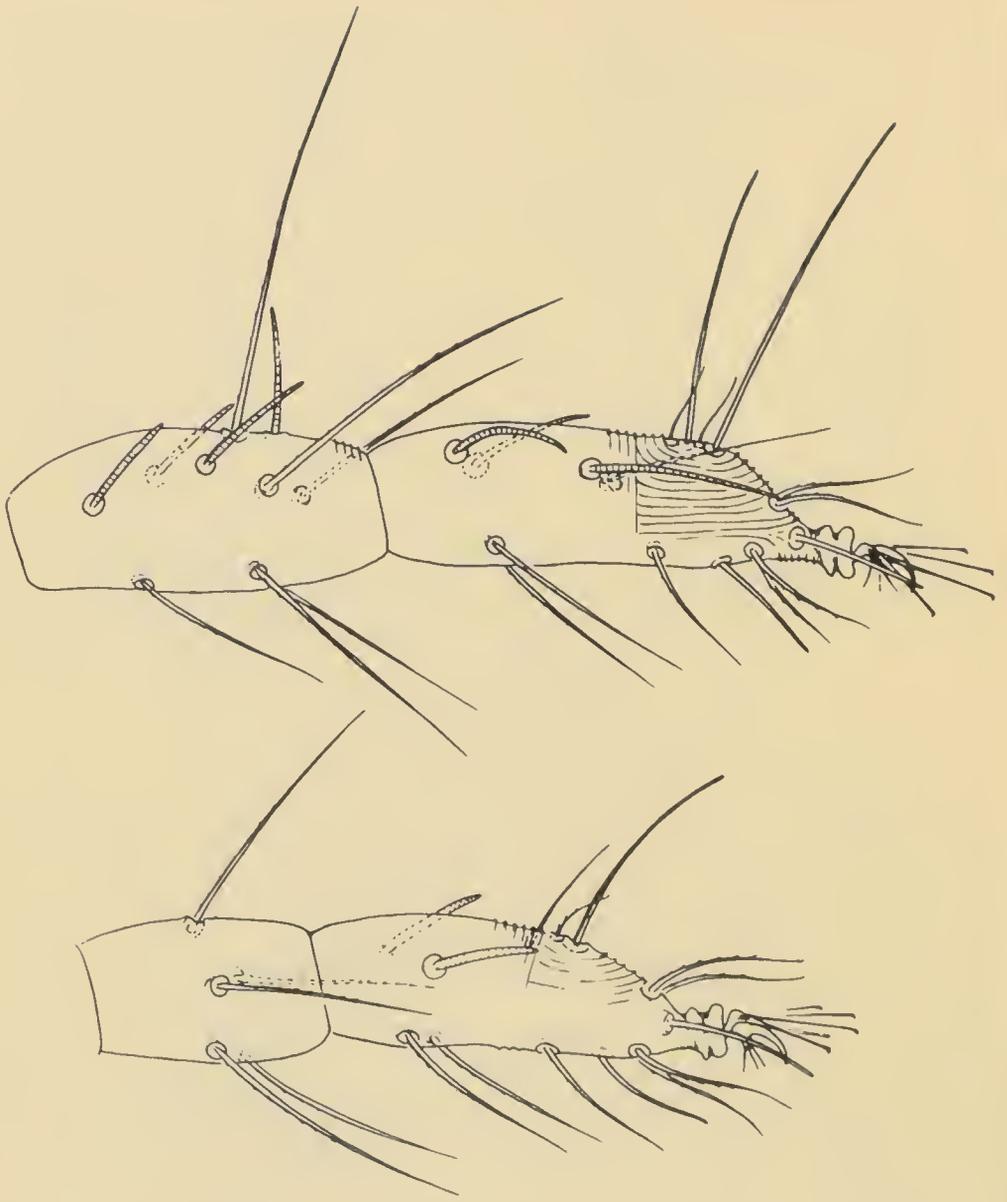


Fig. 25I. *Oligonychus endytus*: above, tibia and tarsus I of male; below, tibia and tarsus II of male.

This species is widespread and often abundant on maples in the eastern United States. Specimens have been studied from Ithaca, New York (J. G. Matthysse), on maple; New York City (from Philip Garman) on sugar maple; Princeton, New Jersey (E. G. Brewer) on red maple; Washington, D. C. (E. W. Baker), on red maple; Durham, North Carolina (A. E. Pritchard), on maple; Vincennes, Indiana (S. A. Summerland) on maple; Lawrence, Kansas (R. E. Beer), on maple; and Yakima, Washington (E. J. Newcomer), on maple.

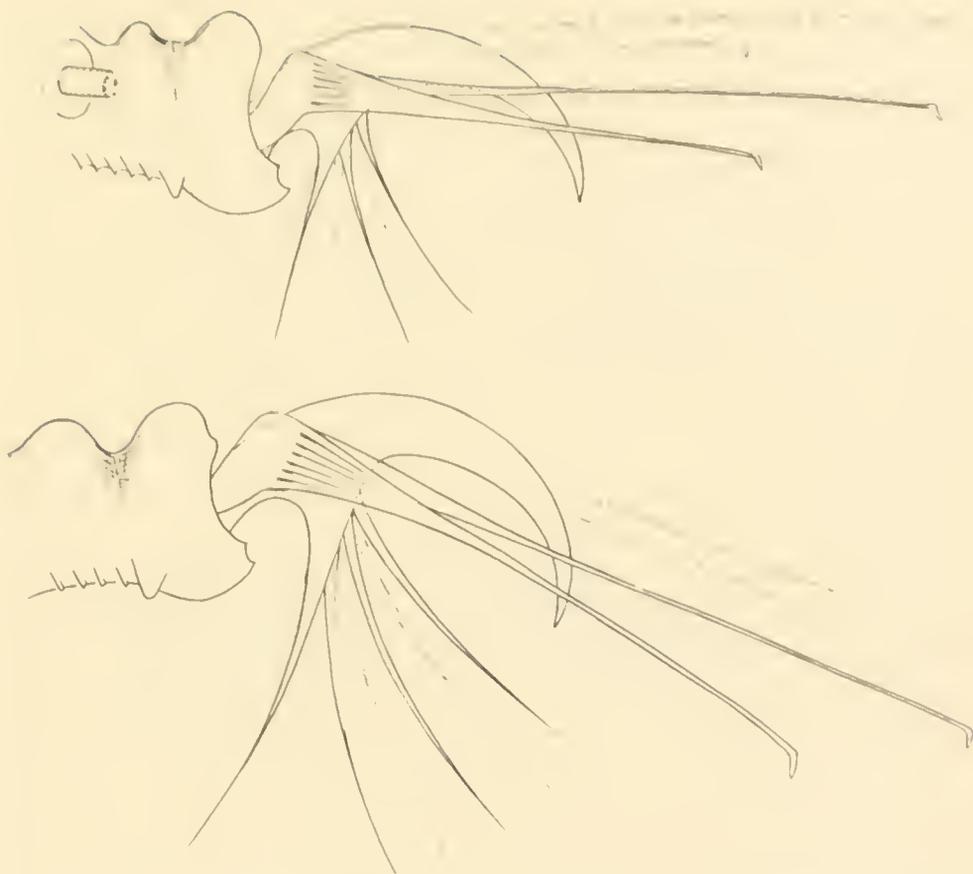


Fig. 252. *Oligonychus endytus*: above, empodium I of male
below, empodium I of female.

Oligonychus endytus Pritchard and Baker, new species
(Figures 249, 250, 251, 252, 253)

Adults of *Oligonychus endytus* may be readily recognized by the very long and stout dorsal setae that are borne on strong tubercles.

This species is known only from California, on valley oak and chestnut.

Male.—Palpus with terminal sensillum very short and conical. Peritreme straight and simple distally. Tibia I with six tactile and three sensory setae; tarsus I with three tactile and three sensory setae proximal to duplexes; with a single tactile seta ventrad of duplexes; empodial claw moderately long and slender but shorter than the three pairs of proximoventral hairs. Tibia II with five tactile setae. Dorsal setae of the body moderately stout, narrowing, borne on tubercles, and longer than longitudinal intervals between their bases; second dorsal propodosomal much larger than first or third; humerals somewhat shorter



Fig. 253. *Oligonychus endytus*: aedeagus.

than dorsal hysterosomals except for the shorter clunals and outer sacrals. Aedeagus with distal one-third bent ventrad, the terminal portion narrowed to an acute tip. Length of body $266\ \mu$; including gnathosoma $313\ \mu$.

Female.—Terminal sensillum of palpus broader and larger. Stylophore moderately broad, somewhat emarginate anterodistally. Tibia I with six tactile and one sensory seta; tarsus I with three tactile and one sensory setae proximal to duplexes; empodial claw with four pairs of proximoventral setae. Body with dorsal setae stronger. Length of body $286\ \mu$, including gnathosoma $328\ \mu$; greatest width of body $233\ \mu$.

Holotype.—Male, Berkeley, California, October 20, 1951 (W. C. Bentinck), on oak; type no. 2142 in the U. S. National Museum.

Paratypes.—Four males, two females, Berkeley, California, October 20, 1951 (W. C. Bentinck), on oak; 1 female, Berkeley, California, October 4, 1949 (A. E. Pritchard), on valley oak; 4 males, 2 females, 1 nymph, Lafayette, California, September 10, 1952 (A. D. Borden), on chestnut.

According to A. D. Borden, this species is a serious pest of chestnut. Deciduous oaks on the University of California campus are only moderately infested. The mites feed primarily on the upper surfaces of the leaves, as is characteristic of most other members of the genus.

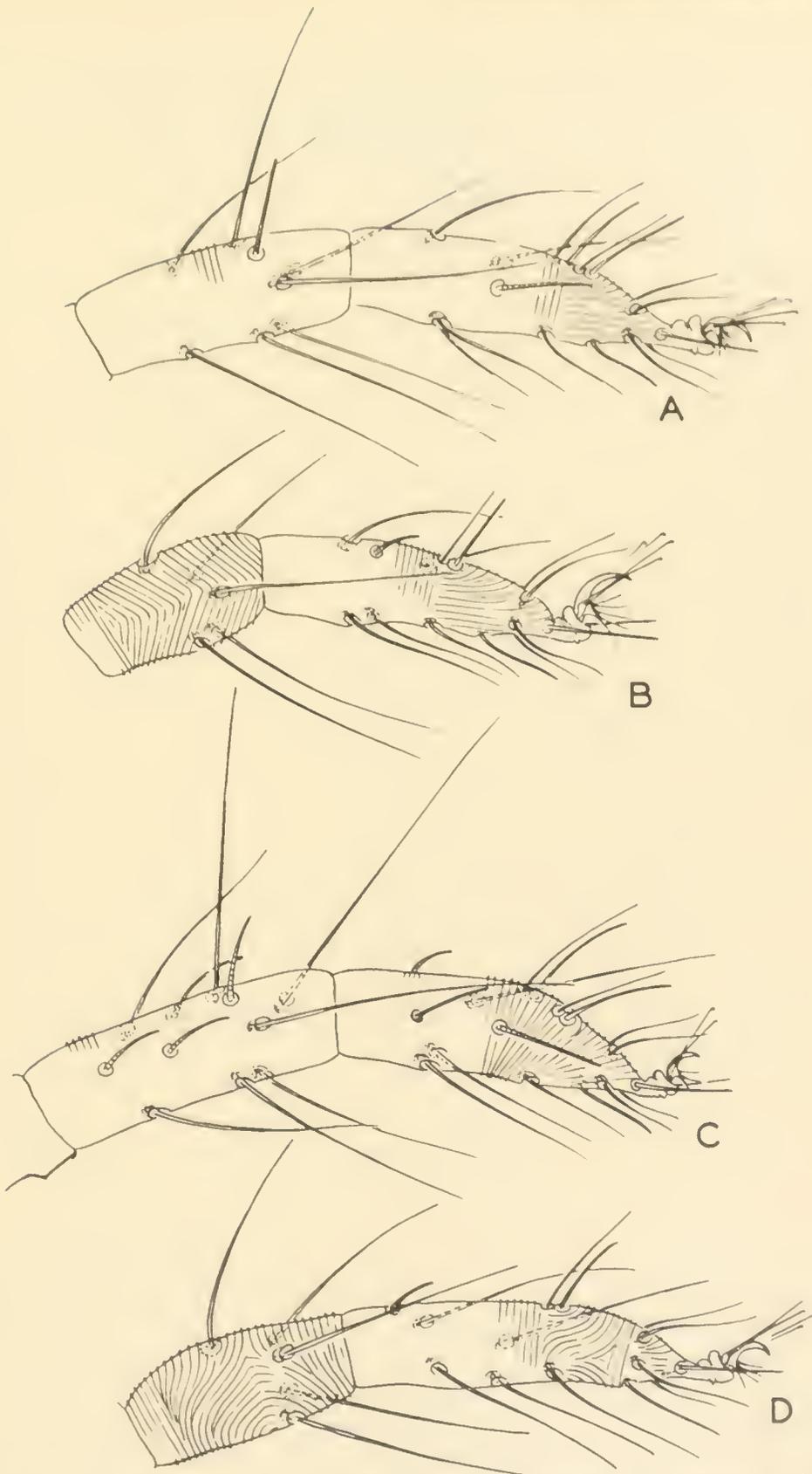


Fig. 254. *Oligonychus platani*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

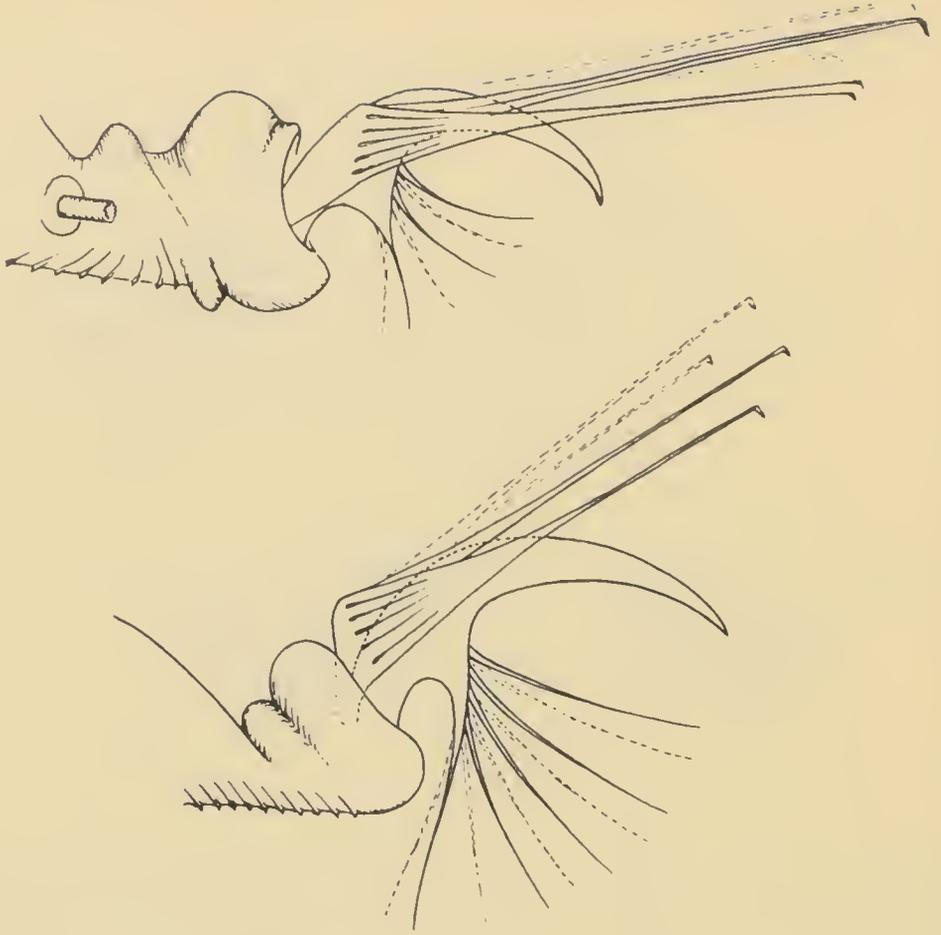


Fig. 255. *Oligonychus platani*: above, empodium I of male; below, empodium I of female.

Oligonychus platani (McGregor), new combination
(Figures 254, 255, 256)

Paratetranychus platani McGregor, 1950, Amer. Midl. Nat., 44: 349.

Types: males and females, Davis, California, on sycamore; in the U. S. National Museum.

Adult females of *Oligonychus platani* have seven tactile setae on tibia I and three tactile setae proximad of the duplex setae on tarsus I. Adults are distinctive in that the proximal member of each pair of duplex setae is nearly as long as the distal member. The aedeagus closely resembles that of *Oligonychus viridis*: the distal one-fourth bends abruptly ventrad, and the distal end is slender.

California females have one sensory seta proximally on tarsus I; whereas Mexican specimens bear two or three such setae. The color

Subfamily Tetranychinae Berlese



Fig. 256. *Oligonychus platani*:
aedeagi.

(A. E. Pritchard), on pyracantha; and Mexico (J. A. Baker, at El Paso, Texas, quarantine), on oak.

of the adult female in life is somewhat greenish with pronounced black spots. The eggs are pale, radially striate dorsally, and with a dorsal stipe.

It is possible that there are two species or subspecies involved in this taxonomic category. *Oligonychus platani* is a constant, serious pest of the sycamore in the hot, interior valleys of California. Specimens have not been collected from London plane trees on the coastal area of California, even though similar specimens are common on and sometimes a serious pest in this area on broad-leaved evergreens.

Specimens examined are from Davis, Tracy, Delano, Madera, and Bakersfield, California (A. E. Pritchard), on London plane tree; Berkeley, California (A. E. Pritchard), on loquat, toyon, coast live oak, and valley oak; Redwood City and Palo Alto, California (A. E. Pritchard), on coast live oak; Niles, California (A. E. Pritchard), on cork oak; Sacramento, California (A. E. Pritchard), on cork oak; Glendora, California (J. W. MacSwain), on toyon; Riverside, California

Oligonychus ilicis (McGregor), new combination

(Figures 257, 258, 259)

Tetranychus ilicis McGregor, 1917, Proc. U. S. Natl. Mus., 51(2167): 586. Types: males and females, Batesburg, South Carolina, on American holly; in the U. S. National Museum.

Paratetranychus ilicis, McGregor, 1919, Proc. U. S. Natl. Mus., 56(2303): 673; Garman, 1940, Bul. Conn. Agr. Exp. Sta. 431: 78; McGregor, 1950, Amer. Midl. Nat., 44: 340.

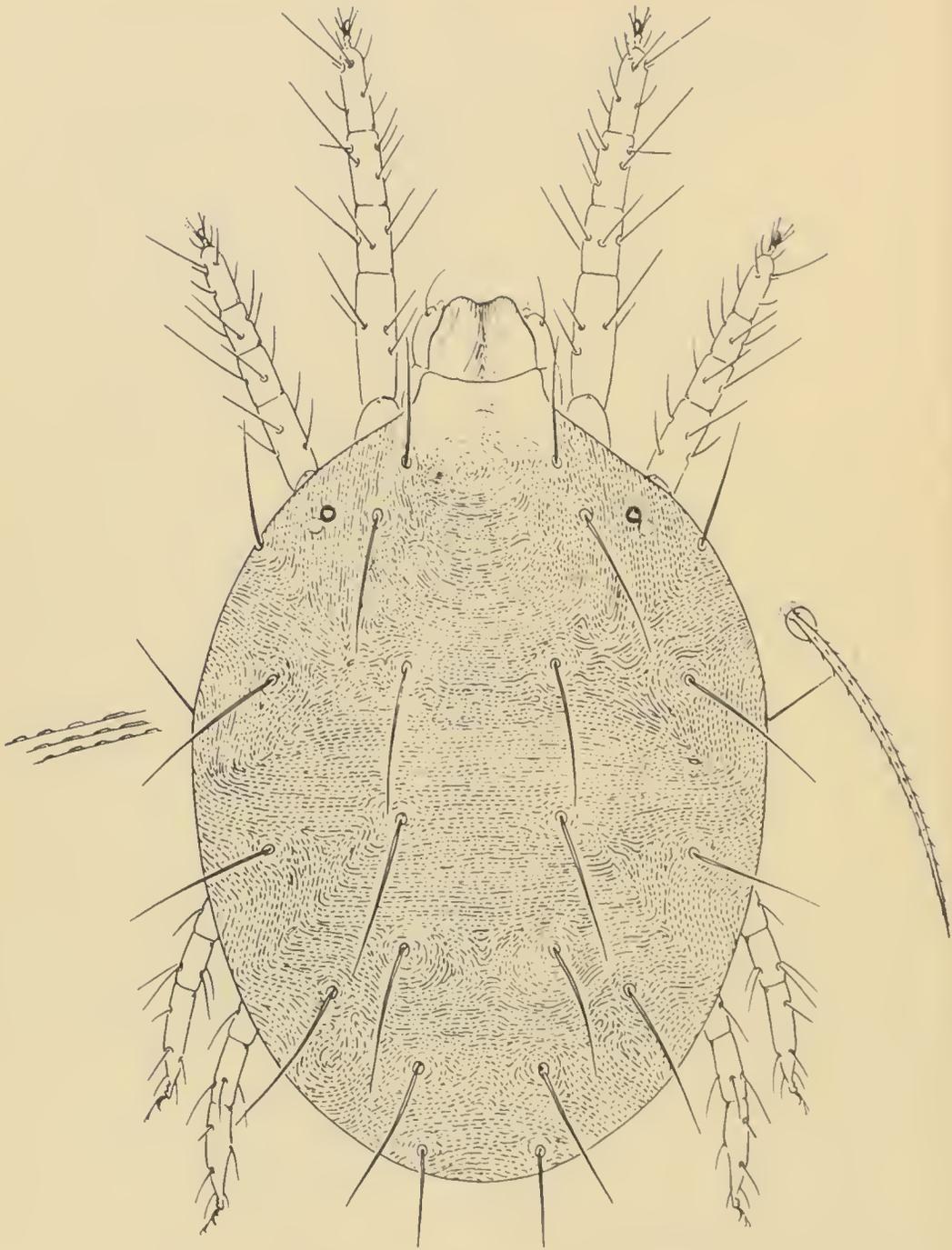


Fig. 257. *Oligonychus ilicis*: dorsal aspect of female, North Carolina, holly.

The adult female of *ilicis* belongs to that species subgroup of the genus *Oligonychus* in which the fore tibia bears seven tactile setae and the fore tarsus three tactile setae proximal to the duplex setae. Adults are distinct from other members of this subgroup (as well as the

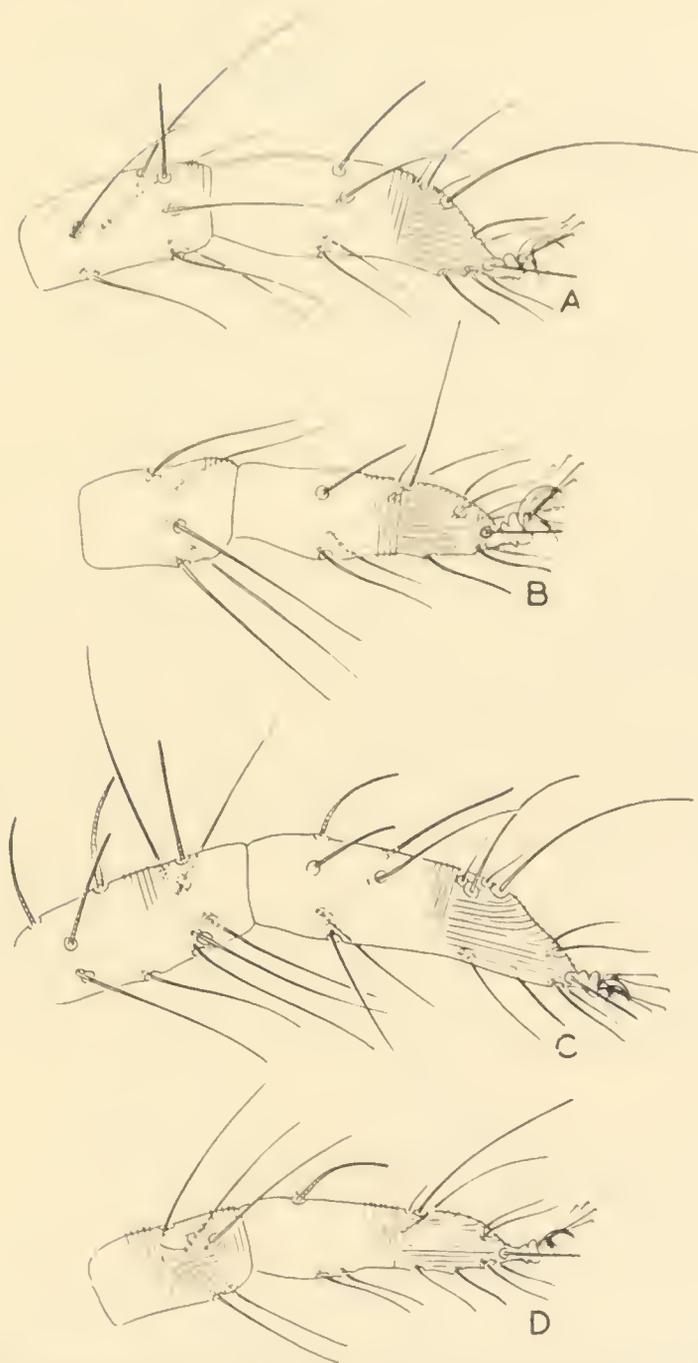


Fig. 258. *Oligonychus ilicis*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

Ununguis Subgroup) in that the outer sacral setae are obviously smaller than the inner sacralis. The body of the female is basically purplish or reddish, paler anteriorly and with a paler spot medially, and the dorsal setae are borne on small tubercles (sometimes not evident in mounted specimens). The aedeagus closely resembles that of *Oligonychus platani*.



Fig. 259. *Oligonychus ilicis*: empodium of female and aedeagus.

Oligonychus ilicis is particularly a pest of camellias and azaleas in the southeastern United States, although its native home is probably the Far East. English and Turnipseed (1940) have discussed its importance in Alabama.

Specimens, other than the types, that have been studied are from Brookville, New York (J. Matthyse), on laurel; Tareytown, New York (J. Matthyse), on camellia; Patchoque, Long Island, New York (C. V. Johnson), on camellia; Raleigh, North Carolina (C. F. Smith), on holly and azalea; Durham, North Carolina (A. E. Pritchard), on camellia; Lake Co., Ohio (R. Neiswander), on boxwood; Baton Rouge, Louisiana (J. Roussel), on camellia; Hayward and San Leandro, California (A. E. Pritchard), on camellia and azalea; and Kyushu, Japan (M. Tanaka), on rhododendron.

Oligonychus bicolor (Banks), new combination

(Figures 260, 261, 262)

Tetranychus bicolor Banks, 1894, Trans. Amer. Ent. Soc., 21: 218; Banks, 1900, U. S. Dept. Agric. Div. Ent. Tech. Bul., 8: 72; Types: females, Sea Cliff, New York, on oak; in the U. S. National Museum.

Paratetranychus bicolor, McGregor, 1919, Proc. U. S. Natl. Mus., 56 (2303): 675; Garman, 1940, Bul. Conn. Agr. Exp. Sta., 431: 77; McGregor, 1950, Amer. Midl. Nat., 44: 334.

The adult female of *Oligonychus bicolor* resembles that of *O. viridis*, *O. newcomeri*, and *O. coffeae* in that the fore tibia bears seven tactile setae and the fore tarsus bears three tactile setae proximad of the duplex setae. The female resembles that of *O. newcomeri* and *O. coffeae* in that it is reddish in basic color.

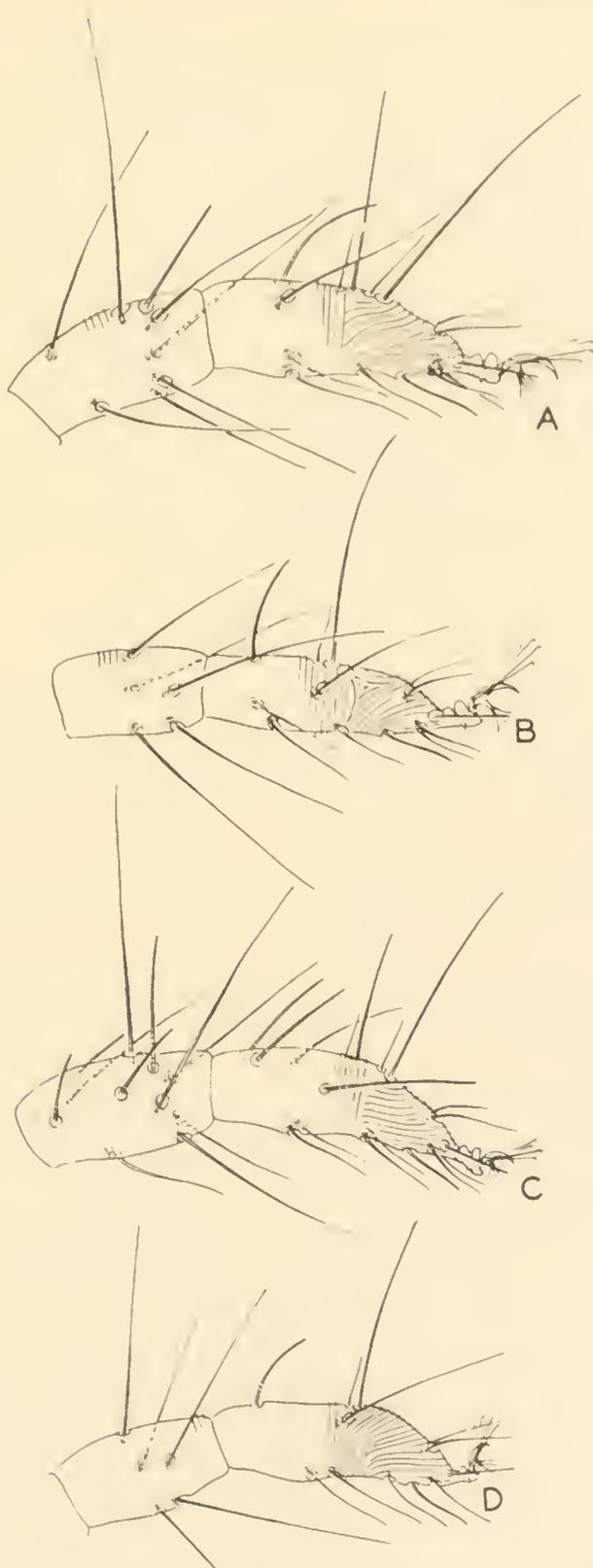


Fig. 260. *Oligonychus bicolor*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

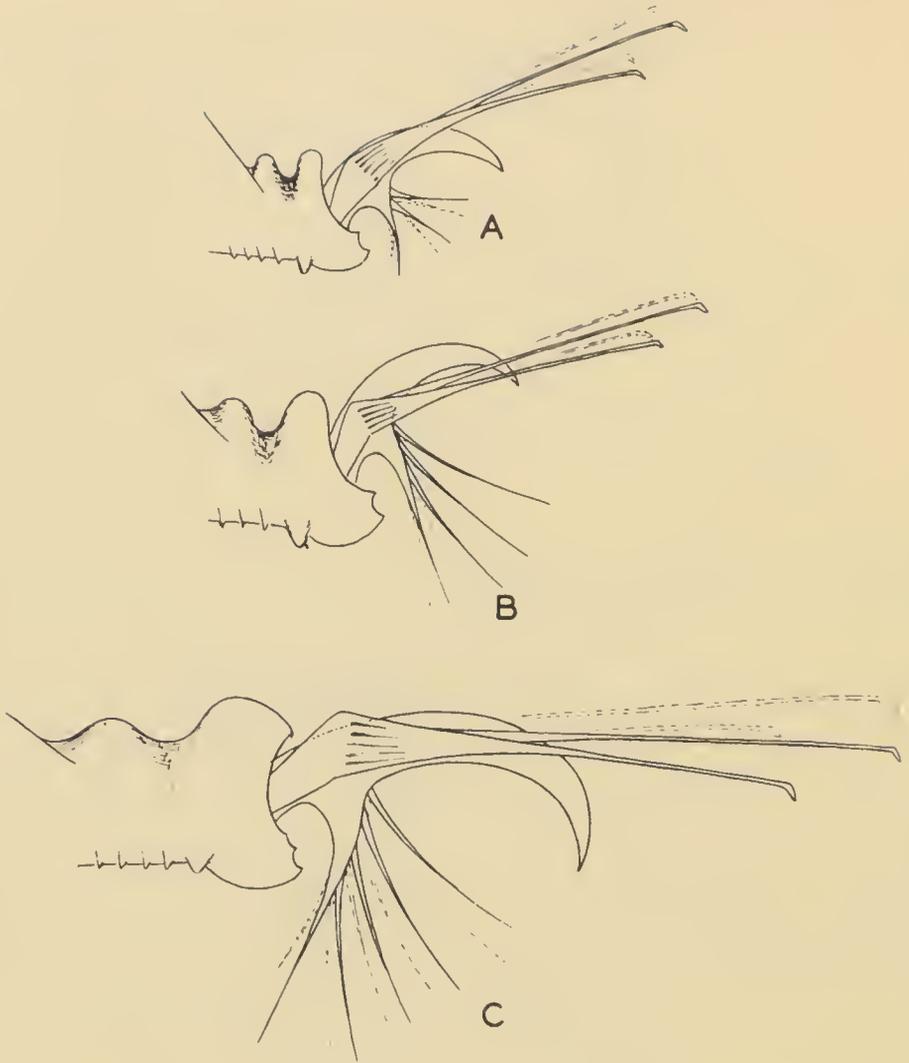


Fig. 261. *Oligonychus bicolor*: A.) empodium I of male; B.) Empodium III of male; C.) empodium IV of female.

The aedeagus of this species is distinctive in that the distal end of the ventrally bent portion is very abruptly narrowed and the bend forms an obtuse curvature with the shaft.

Specimens of *Oligonychus bicolor* that have been studied by us are all from oak or chestnut in the eastern United States, and severe damage may be caused to shade trees. Series examined are from Ithaca, New York (J. G. Matthysse), on oak; Hamden, Connecticut (Philip Garman), on red oak; Washington, D. C. (E. W. Baker), on red oak; Durham, North Carolina (A. E. Pritchard), on willow oak and white oak; and Lawrence, Kansas (R. E. Beer), on pin oak.



Fig. 262. *Oligonychus bicolor*: aedeagus, Kansas.

Oligonychus viridis (Banks), new combination
(Figure 263)

Tetranychus viridis Banks, 1894, Trans. Amer. Ent. Soc., 21: 218.
Described from specimens from Texas, on pecan: of unknown disposition.

Paratetranychus viridis, McGregor, 1919, Proc. U. S. Natl. Mus., 56 (2303): 671; McGregor, 1950, Amer. Midl. Nat., 44: 357.

The female of *Oligonychus viridis* closely resembles that of *O. bicolor*, *O. newcomeri*, and *O. coffeae*. However, the basic color of the body in life is greenish.

The aedeagus of *Oligonychus viridis* differs from those species from which the females are morphologically indistinguishable in that the portion bent ventrad tapers evenly to an acute tip, and it is sigmoid, the distal end being somewhat caudally directed.

Specimens have been studied from Baton Rouge, Louisiana (Hardwick), on pecan; Keatchie, Louisiana (W. C. Pierce), on pecan; Albany, Georgia (G. F. Moznette), on pecan; and Monticello, Florida (J. B. Gill), on pecan.

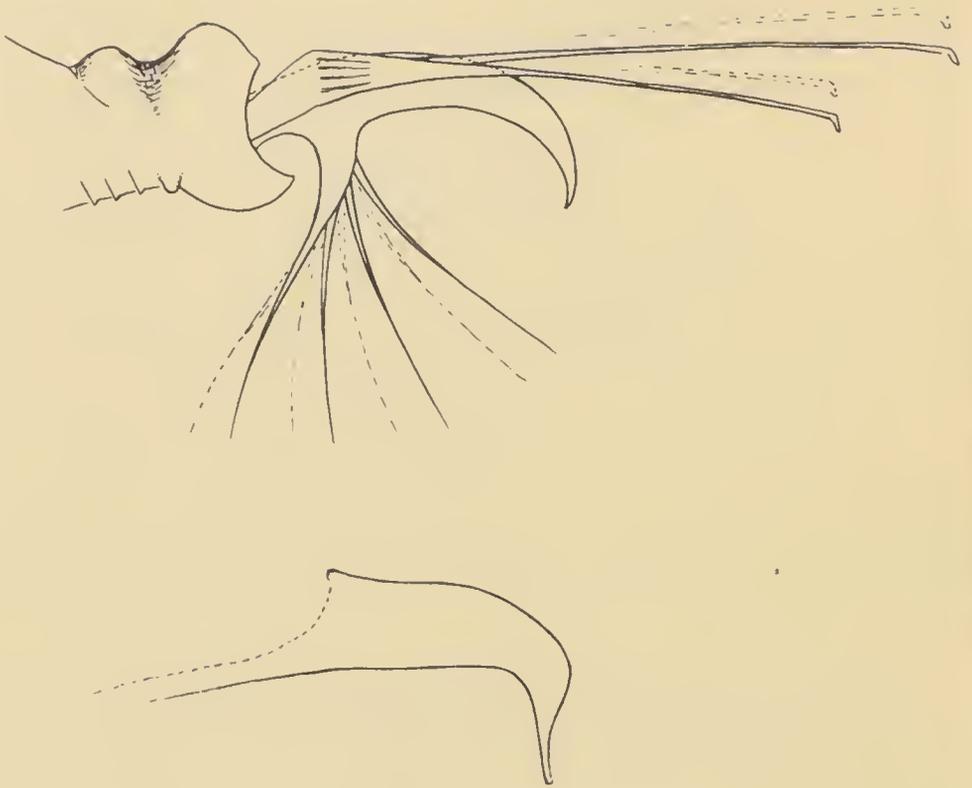


Fig. 263. *Oligonychus viridis*: tarsus IV of female and aedeagus.

Oligonychus newcomeri (McGregor), new combination
(Figures 264, 265, 266, 267)

Paratetranychus newcomeri McGregor, 1950, Amer. Midl. Nat., 44: 345.
Pritchard and Baker, 1952, Hilgardia, 21(9): 261. *Types*: males
and females, Yakima, Washington, on pear; in the U. S. National
Museum.

Adult females of *Oligonychus newcomeri* are reddish in basic color, and they are indistinguishable from females of *P. bicolor*. The fore tibia bears seven tactile setae, and there are three tactile setae proximal of the duplex setae on tarsus I.

The aedeagus of *Oligonychus newcomeri* is distinctive in that it is widened at the bend with the upper surface straight on the dorso-caudal portion of the bend, and it is acutely tapering distally.

Specimens studied include the types and topotypes, Yakima, Washington (R. W. Burell), on pear.

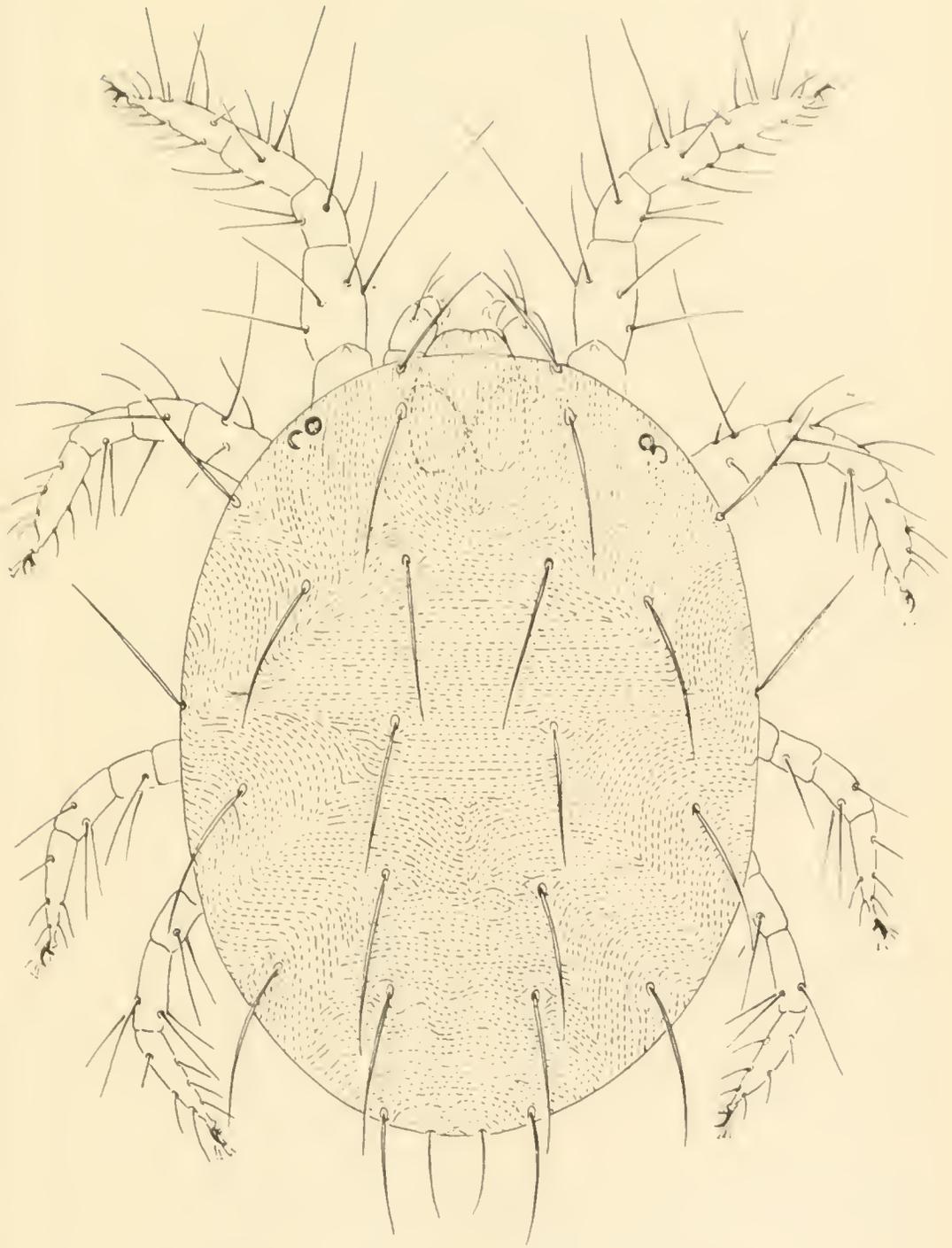


Fig. 264. *Oligonychus newcomeri*: dorsal aspect of female.

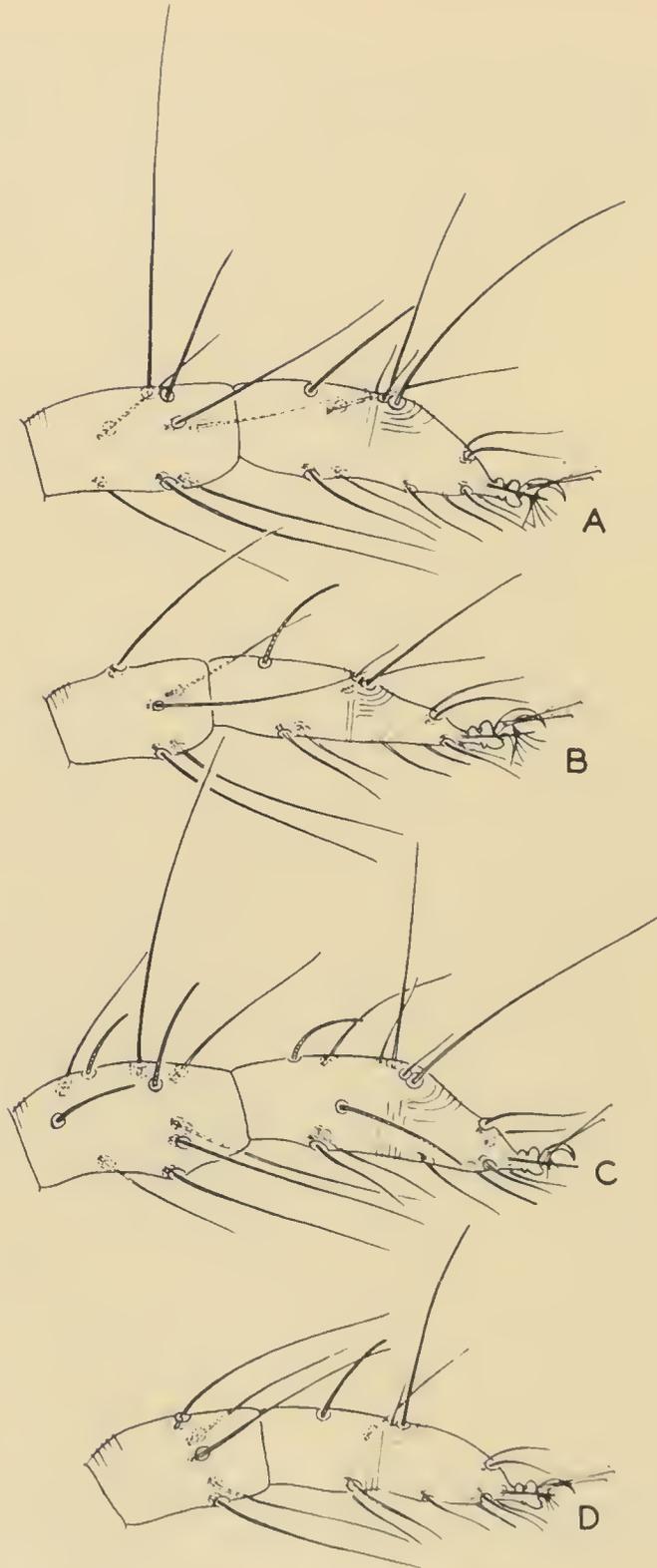


Fig. 265. *Oligonychus newcomeri*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.



Fig. 266. *Oligonychus neucomeri*: empodium IV of female.

Oligonychus coffeae (Nietner), new combination
(Figures 268, 269)

Acarus coffeae Nietner, 1861, Observ. Enem. Coffee Tree Ceylon; Nietner and Green, 1880, Coffee Tree Enemies, pp. 19, 20. Described from specimens from Ceylon, on coffee trees.

Tetranychus bioculatus Wood-Mason, 1884, Rep. Tea-Mite Tea-Bug Assam, p. 1. Described from specimens from Ceylon, on tea. *New synonymy.*

Paratetranychus bioculatus, Baker and Pritchard, 1953, Hilgardia, 22(7): 213.

Oligonychus merwei Tucker, 1926, Ent. Mem. Dept. Agric. Pretoria, 5: 6. Described from males and females, Stanger, Natal, on tea plants. *New synonymy.*

Our identification of *Oligonychus bioculatus* is based on topotypes submitted by courtesy of C. A. Loos.

We have not seen the 1861 publication in which Nietner described *Acarus coffeae*, but the description in the second edition, 1880, is probably identical. The description allows reference of the species to the genus *Oligonychus*. Although we have not seen specimens from coffee, it is assumed that they would represent the same species that occurs commonly in Ceylon on tea.

The female bears seven tactile (and one sensory) setae on tibia I and three tactile (and one sensory) setae proximal to the duplex setae on tarsus I. This sex is morphologically indistinguishable from *Oligonychus bicolor*, *O. viridis*, and *O. neucomeri*.

However, the aedeagus differs from these three species in that the distal bend is at right angles to the shaft and it gradually narrows to a slender distal end. The tip is truncate. In specimens from Florida, on *Melaleuca*, the bent portion appears somewhat shorter and more pointed, but other Florida material is typical.



Fig. 267. *Oligonychus newcomeri*:
aedeagus.

Oligonychus merwei was described from South Africa, on tea, the description and figures obviously referring to a member of the Ununguis Group. Specimens have been studied by us that are from South Africa, on Virginia creeper, and they are indistinguishable from *O. coffeae*. Because *O. coffeae* is thus known to occur in South Africa and because it is regarded as occurring on tea, *O. merwei* is here considered to be a synonym.

Specimens studied by us that are referred to this species are from Ceylon (C. A. Loos), on tea; Pretoria, Transvaal, South Africa (E. K. Hartwig), on *Parthenocissus quinquefolia*; Brisbane, Australia (E. H. Derrick), on *Quisqualis indica*; Gainesville, Florida (L. C. Kuitert), on camellia; and Richmond, Florida (F. G. Butcher), on *Melaleuca* sp.

Oligonychus terminalis (Sayed), new combination

Paratetranychus terminalis Sayed, 1946, Bul. Soc. Fouad 1^{er} Ent., 30: 94. Types: males and females, Egypt, on *Mangifera indica*, *Terminalia* sp., *Eugenia gambolana*, and *Vitis vinifera*; probably in the collection of M. T. Sayed.

Sayed's original description of *terminalis* indicates that this species belongs to the Ununguis Group. The figure of the aedeagus is not sufficiently detailed, however, to give positive identification. The figure of tarsus I of the female, together with figures of the dorsal chaetotaxy, indicates that this species is possibly a synonym of *Oligonychus coffeae*.

Oligonychus perditus Pritchard and Baker, new species
(Figures 270, 271, 272, 273)

Oligonychus perditus may be differentiated from all other members of the Ununguis Group by possessing two tactile setae ventrally just

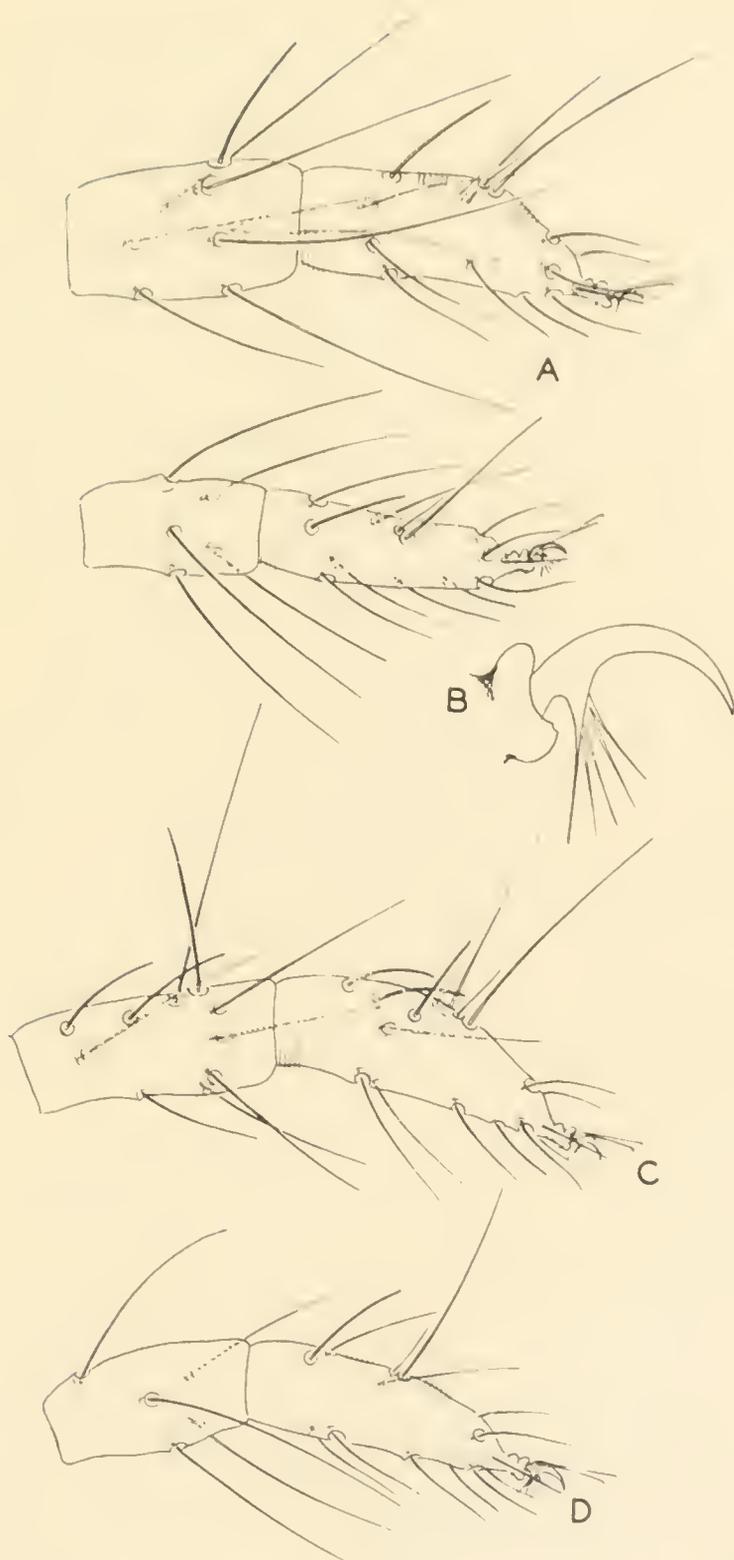


Fig. 268. *Oligonychus coffeae*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female, with enlargement of empodium; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.



Fig. 269. *Oligonychus coffeae*:
aedeagus, South Africa.

beyond the duplexes on tarsus I. The aedeagus is of the *ununguis* type, but it is distinctive in having a mediodorsal notch near the base of the external portion of the shaft.

This species is known only from Japan where it is apparently common on cupressaceous conifers.

Male.—Palpus with terminal sensillum very small, about as long as the fusiform dorsal rod. Peritreme straight distally, slightly enlarged at tip. Tibia I with seven tactile and four sensory setae; tarsus I with three tactile and three sensory setae proximal to duplexes and with a pair of tactile setae ventrad of the duplexes. Tibia II with five tactile setae. Empodial claw slender, cultriform, about as long as the five or six pairs of proximoventral hairs. Dorsal setae of body slender, tapering,

somewhat longer than longitudinal intervals between them. Aedeagus with distal one-third bent abruptly ventrad, the distal end narrow; dorsum of shaft with a conspicuous notch near base. Length of body $333\ \mu$, including rostrum $410\ \mu$.

Female.—Similar. Terminal sensillum of palpus much larger than fusiform rod. Stylophore slightly emarginate anteromedially. Tibia I with seven tactile and one sensory setae; tarsus I with three tactile and one sensory setae proximal to duplexes. Length of body $345\ \mu$, including gnathosoma $433\ \mu$; Greatest width of body $300\ \mu$.

Holotype.—Male, Japan, May 20, 1952 (E. I. Smith), at Seattle, Washington quarantine, on juniper; type no. 2143 in the U. S. National Museum. *Paratypes*.—Three males, 15 females, Japan, July 24, 1950 (at Seattle, Washington quarantine), on dwarf juniper; 2 males, Japan, August 29, 1950 (C. V. Scott, at Seattle, Washington quarantine), on juniper; 1 male, Japan, May 3, 1951 (Howard, at San Francisco, California quarantine), on *Juniperus* sp.; 11 females, Japan, May 20, 1952 (E. I. Smith, at Seattle, Washington quarantine), on juniper.

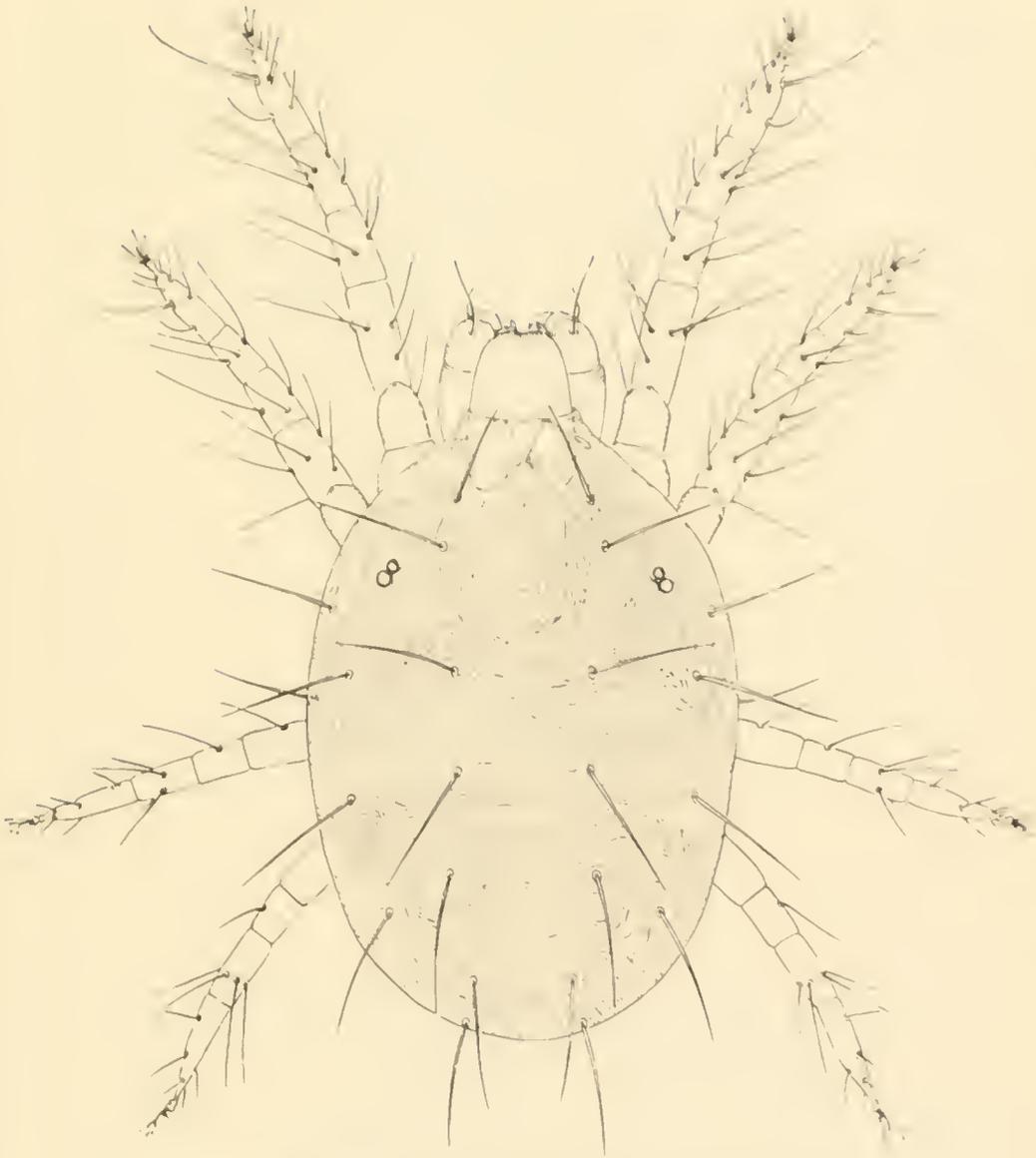


Fig. 270. *Oligonychus perditus*: dorsal aspect of female.

Oligonychus ununguis (Jacobi)

(Figures 274, 275, 276, 277)

Tetranychus ununguis Jacobi, 1905, Naturw. Zts. Land.-Forstw., 3: 239. Described from specimens from Dahlem, Germany, on spruce.

Paratetranychus ununguis, Zacher, 1913, Mitt. kais. biol. Anst. Land.-Forstw., 14: 39; Trägårdh, 1915, Medd. Centralanst. Försöksv. jordbruksonr. Ent. Avdeln. 109: 29, 57; Zacher, 1916, Mitt.

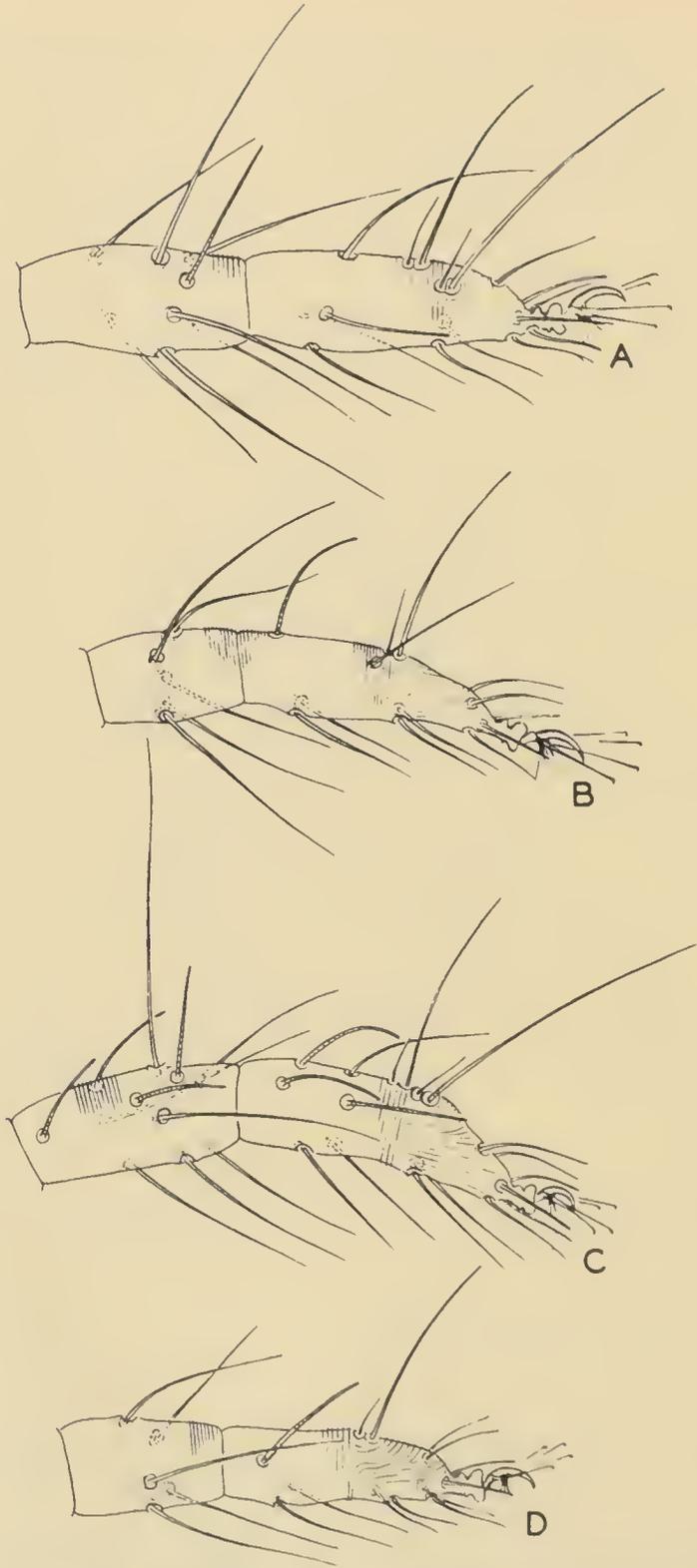


Fig. 271. *Oligonychus perditus*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

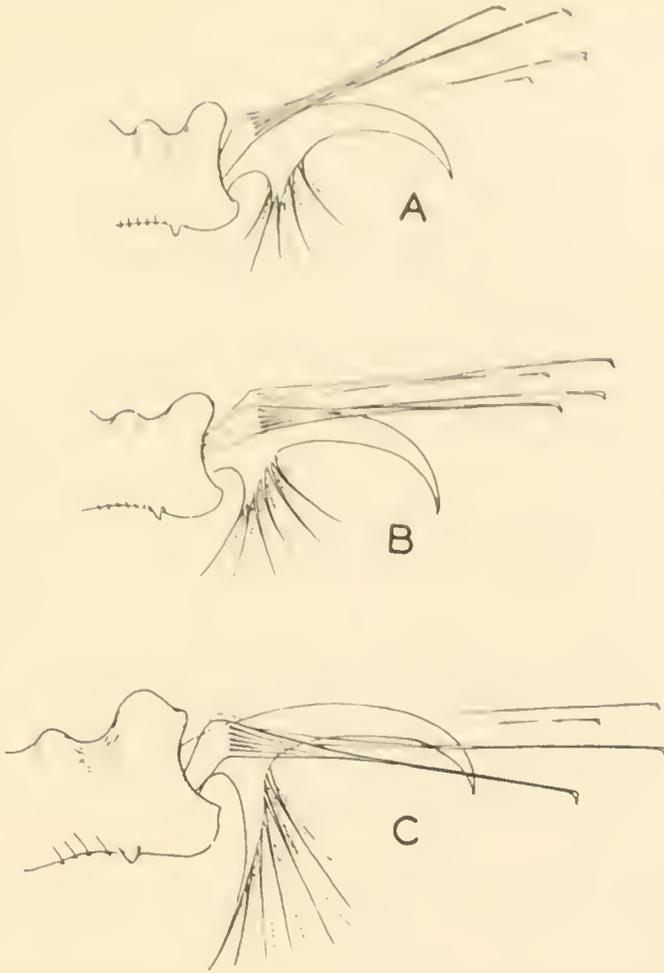


Fig. 272. *Oligonychus perditus*: A.) empodium I of male; B.) empodium I of female; C.) empodium IV of female.

kaiserl. biol. Anst. Land.-Forstw., 16: 25; McGregor, 1919, Proc. U. S. Natl. Mus., 56(2303): 669; Garman, 1923, Bul. Conn. Agr. Exp. Sta., 247: 340; Zacher, 1921, Zts. ang. Ent., 7: 184; Ryle, 1925, Quar. Jour. Forestry, Lond., 1925: 1; Hirst, 1924, Ann. Mag. Nat. Hist. (ser. 9), 14: 526; Oudemans, 1931, Ent. Ber., 8(180): 277; Zacher, 1932, Zool. Anz., 97: 180; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 34; Garman, 1940, Bul. Conn. Agr. Exp. Sta., 431: 80; McGregor, 1950, Amer. Midl. Nat., 44: 356; Reck, 1950, Trudy Inst. Zool. Akad. Nauk S.S.R., 9: 126.

Oligonychus ununguis. Hirst, 1920, Proc. Zool. Soc. Lond. 1920:59.

Tetranychus uniunguis Ewing, 1917, Jour. Econ. Ent., 10: 497. Types: females, Urbana, Illinois, on arbor vitae; in the U. S. National Museum. *New synonymy*.

Spider Mites

- Neotetranychus ununguis*, McGregor, 1919, Proc. U. S. Natl. Mus., 56(2303): 647.
- Paratetranychus ununguis*, McGregor, 1950, Amer. Midl. Nat., 44: 356.
- Oligonychus americanus* Ewing, 1921, Proc. U. S. Natl. Mus., 59(2394): 660. *Types*: males and females, Saskatchewan, Canada, on spruce; in the U. S. National Museum. *New synonymy*.
- Paratetranychus americanus*, McGregor, 1950, Amer. Midl. Nat., 44: 333.
- Paratetranychus alpinus* McGregor, 1936, Ann. Ent. Soc. Amer., 29: 770. *Types*: males and females, Camp Nelson, California, on *Libocedrus decurrens*; in the U. S. National Museum. *New synonymy*.
- Paratetranychus pini* Hirst, 1924, Ann. Mag. Nat. Hist. (ser. 9), 14: 526. *Types*: males and females, Oxshott, Surrey, England, on *Pinus sylvestris*; probably in the British Museum (Natural History).

The female of *Oligonychus ununguis* bears seven tactile (and usually one sensory) setae on tibia I and four tactile (and usually one sensory) setae proximal to the duplex setae on tarsus I. This sex is indistinguishable from *O. coniferarum*, *O. mangiferus*, *O. yothersi*, *O. punicae*, and *O. peronis*.

The aedeagus is distinctive among these species in that the bend is at a right angle to the shaft and the bent portion tapers gradually to an acute tip; no dorsal notch is present on the shaft. The length of the bent portion varies considerably, being from less than one-half to nearly as long as the dorsal margin of the shaft. It is probable that a species complex is involved, but no clear-cut morphological separations are indicated, and no distributional pattern nor host relationship is correlated.

That *Oligonychus ununguis* is ordinarily found only on conifers has been demonstrated by extensive collecting in the San Francisco Bay region where no morphologically similar species has ever been found on hosts other than conifers.

In collections from Amherst, Massachusetts, the only series studied from spruce, the female bears in addition to the normal number of tactile setae, four sensory setae proximally on tarsus I. The additional setae are considered to be a variation.



Fig. 273. *Oligonychus perditus*: aedeagus.

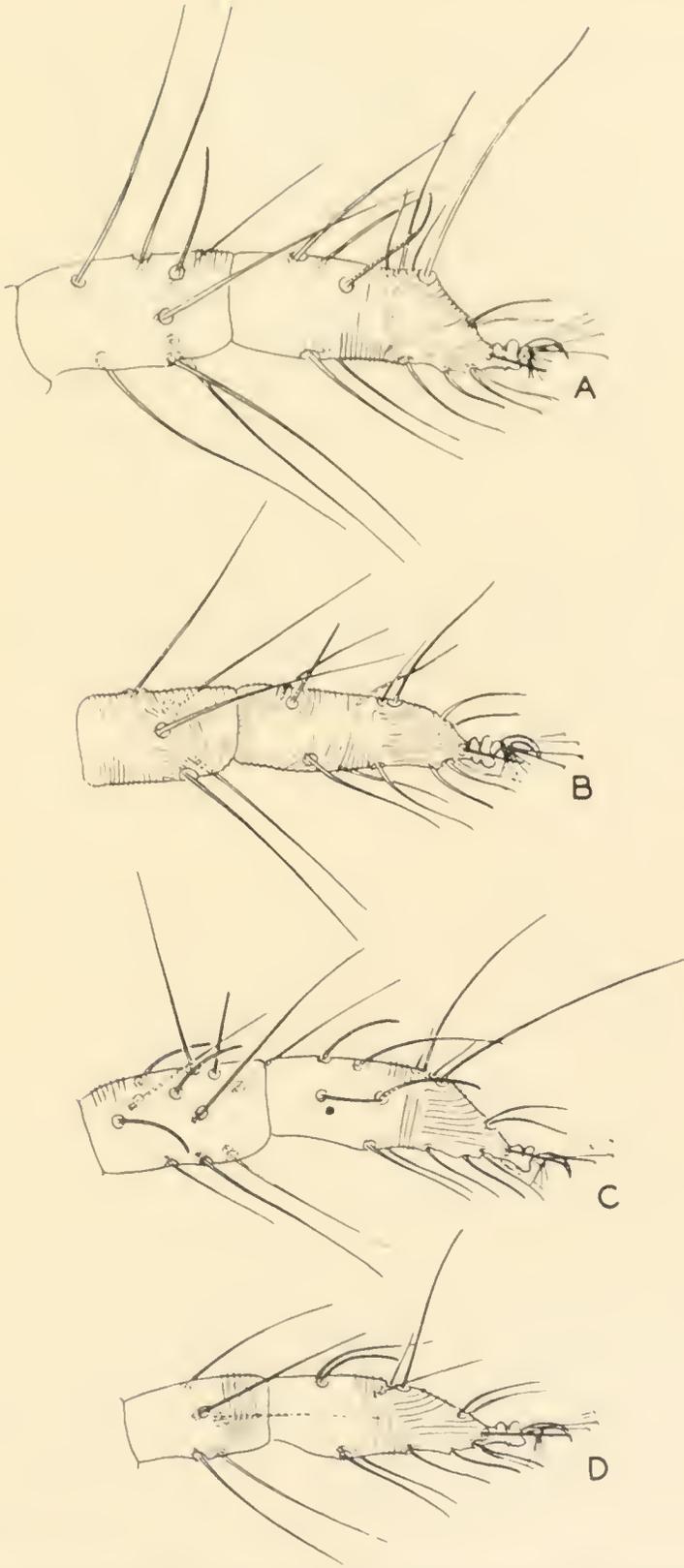


Fig. 274. *Oligonychus ununguis*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II

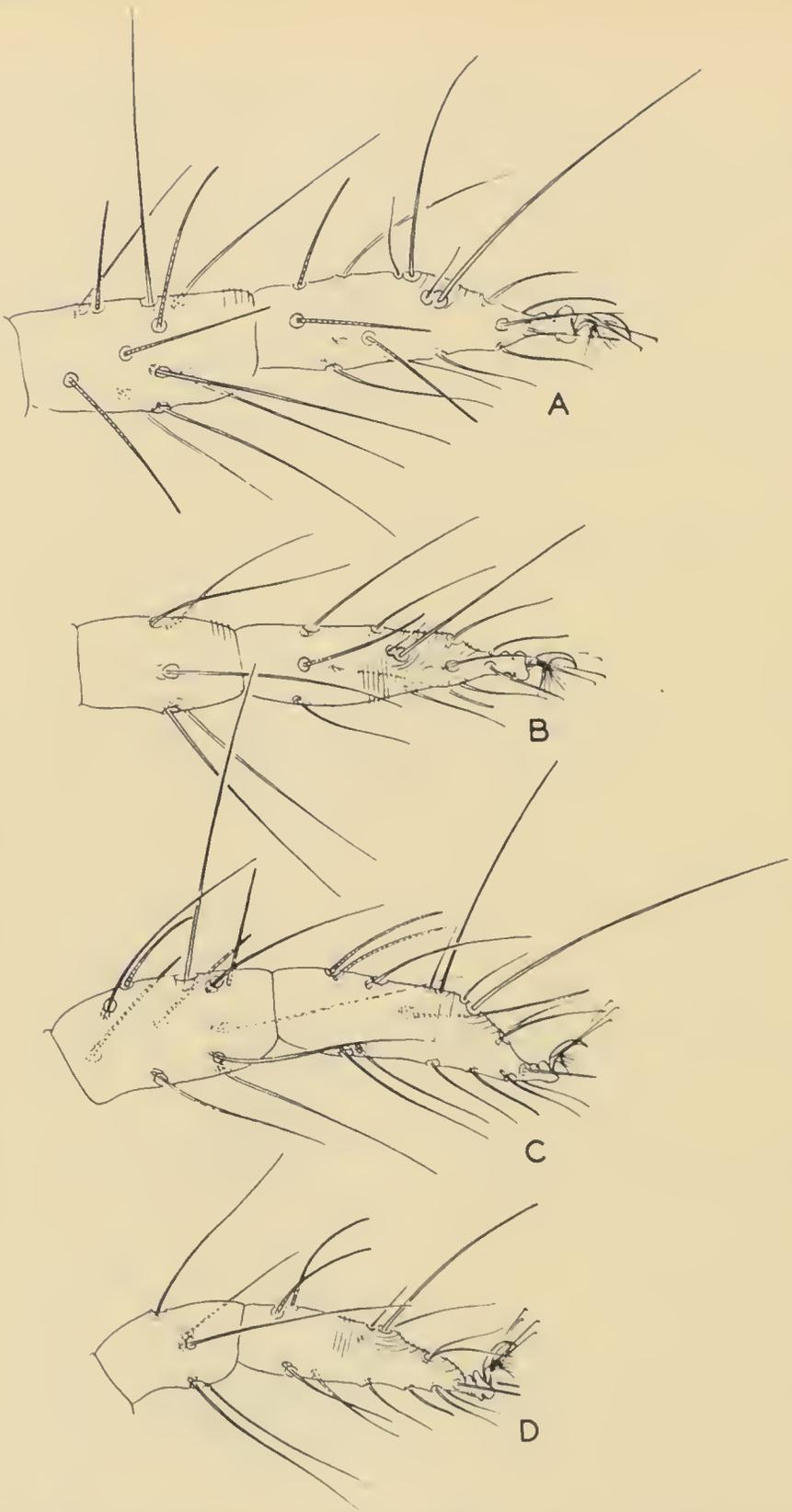


Fig. 275. *Oligonychus ununguis*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male, all from Anherst, Massachusetts, spruce.

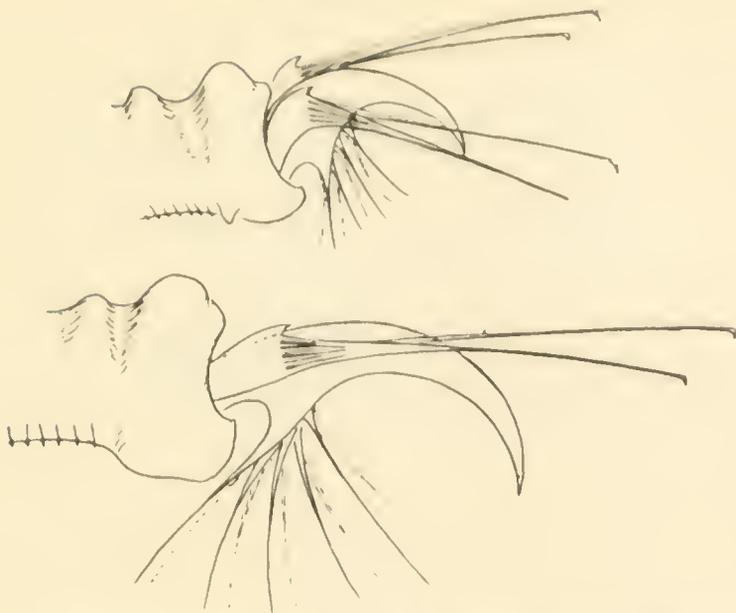


Fig. 276. *Oligonychus ununguis*: above, empodium I of male; below, empodium of female, both from Coachella Valley, California.



Fig. 277. *Oligonychus ununguis*: left, aedeagus, Coachella Valley, California; right, aedeagus, Amherst, Massachusetts.

In collections from Beltsville, Maryland, on pine, the only specimens studied from this host, the females consistently bear only three tactile setae proximal to the duplexes on tarsus I. These specimens could represent a distinct species, but no other differences are apparent. The striae in the area immediately anterior to the genital flap are transverse in the specimens from pine. These striae are usually longitudinal in females from cupressaceous hosts, but they vary to being transverse.

Hirst gave the name *pini* to specimens from England, on pine, that he had previously (1920) identified as *Oligonychus ununguis*. Specimens later examined by Hirst (1924) from England, on spruce, were identified as the *ununguis* of Trägårdh, and *pini* was regarded as having the distal, bent portion of the aedeagus as being less slender and drawn out. No

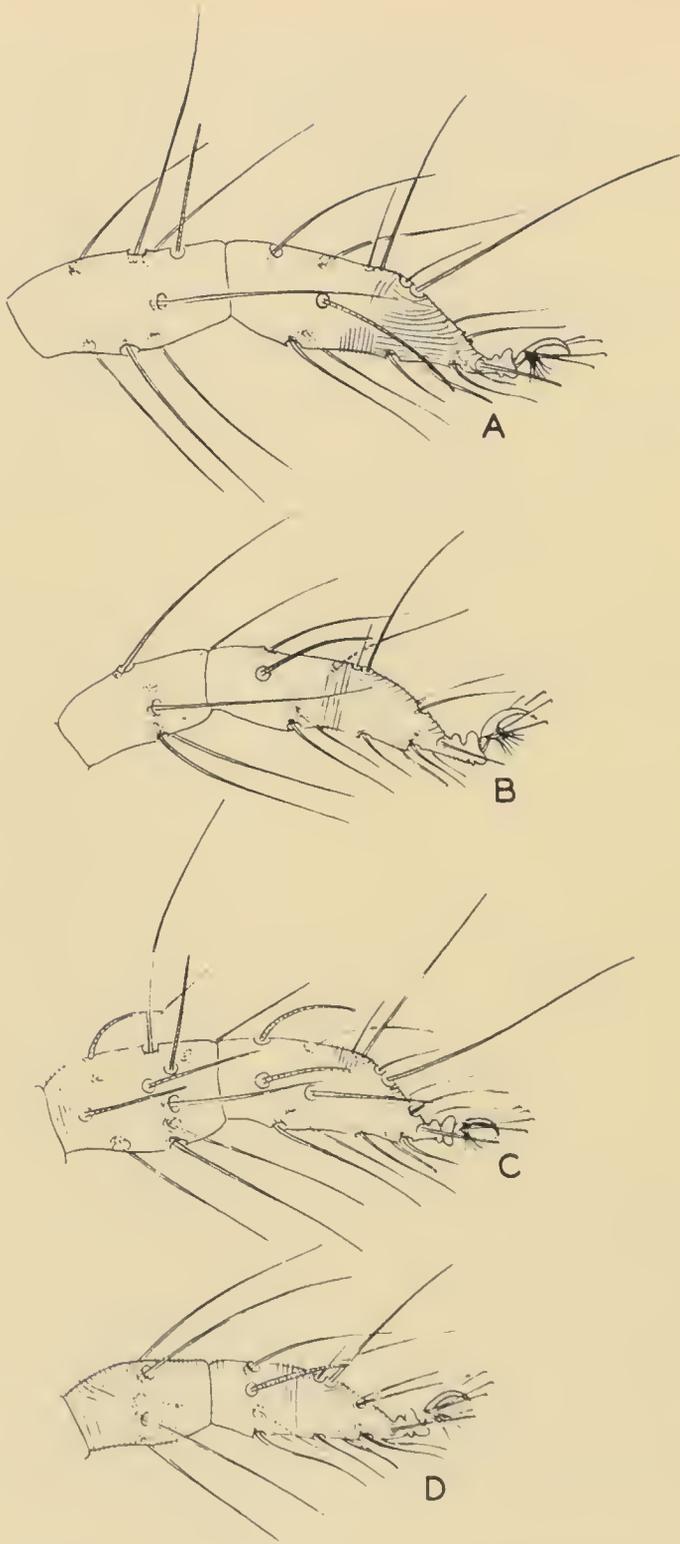


Fig. 278. *Oligonychus coniferarum*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

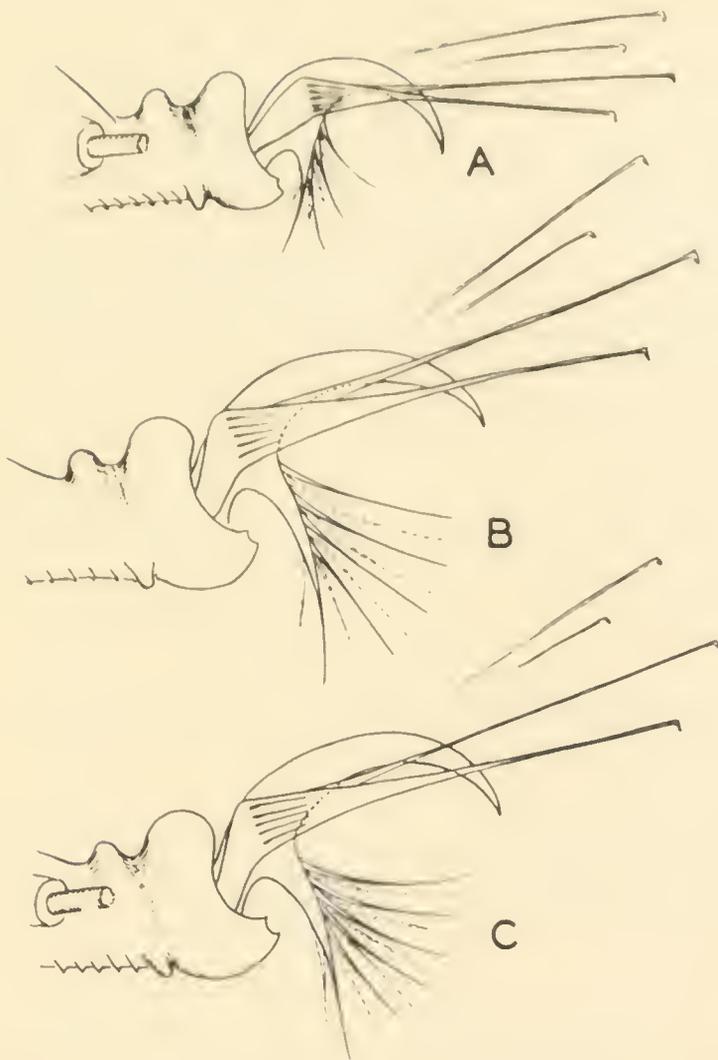


Fig. 279. *Oligonychus coniferarum*: A.) empodium I of male; B.) empodium III of male; C.) empodium II of female.

other characters were given by Hirst for differentiating the two species, and the length of the dorsal setae of *pini* was not noted. Because the comparative length of the distal bend of the aedeagus is here considered to be variable, *pini* is considered to be a synonym. The figure given by Hirst (1920) of the aedeagus of *pini* is more typical of *ununguis* than that presented by Hirst (1924) for *ununguis*.

We have studied a large number of specimens collected from throughout the United States and many specimens from Europe that were intercepted at American ports. Members of the Cupressaceae are among the favorite hosts: *Juniperus*, *Cupressus*, *Thuja*, *Chamaecyparis*, and *Libocedrus*. Spruce is reported to be a favorite host; and specimens have been collected on redwood and sequoia in California.

Oligonychus inouei (Ehara), new combination

? *Tetranychus* sp. (partim), Harada, 1927, *Principl. Forest Enem. Control*, p. 72; Inoue, 1942, *Prakt. Anleit. f. Vorbeug. u. Vertilg. v. biolog. Forstschäd.*, p. 121, fig. 75; Matsushita, 1943, *Textb. Forest Pests*, p. 403, fig. 187.

Paratetranychus inouei Ehara, 1954, *Annotat. Zool. Jap.* 27(2): 104-106. *Types*: Males and females, Hokkaido, Japan, on *Picea jezoensis* and *Abies mayriana*, and Mombetsu, Japan, on *Abies mayriana*; in Zoological Institute, Faculty of Science, Hokkaido University, Japan.

Oligonychus inouei appears to be closely related to *O. ununguis* by reason of the dorsal setal pattern, tarsus I setal pattern of the female, and aedeagus of the male.

Oligonychus coniferarum (McGregor), new combination
(Figures 278, 279, 280)

Paratetranychus coniferarum McGregor, 1950, *Amer. Midl. Nat.*, 44: 338. *Types*: males and females, Glen St. Marys, Florida, on arbor vitae; in the U. S. National Museum.

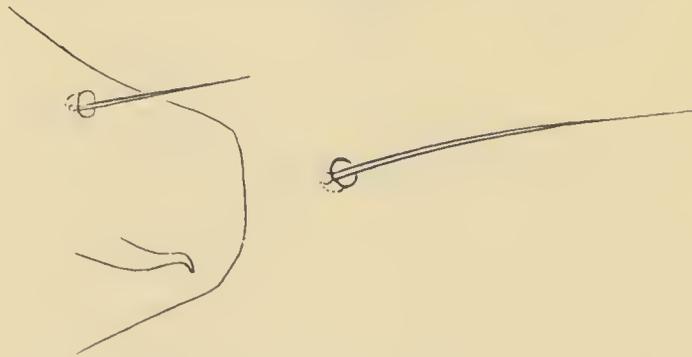


Fig. 280. *Oligonychus coniferarum*: aedeagus.

Oligonychus coniferarum differs from *O. ununguis* only in that the aedeagus forms a short, truncate, caudolaterally directed bend.

This species was originally known from specimens collected in Florida, but other specimens have been examined from Brownsville, Texas (R. Alexander), on arbor vitae; and Ysleta, Texas (P. Netterville), on Pfitzer juniper. McGregor stated that "other conifers" are also hosts.

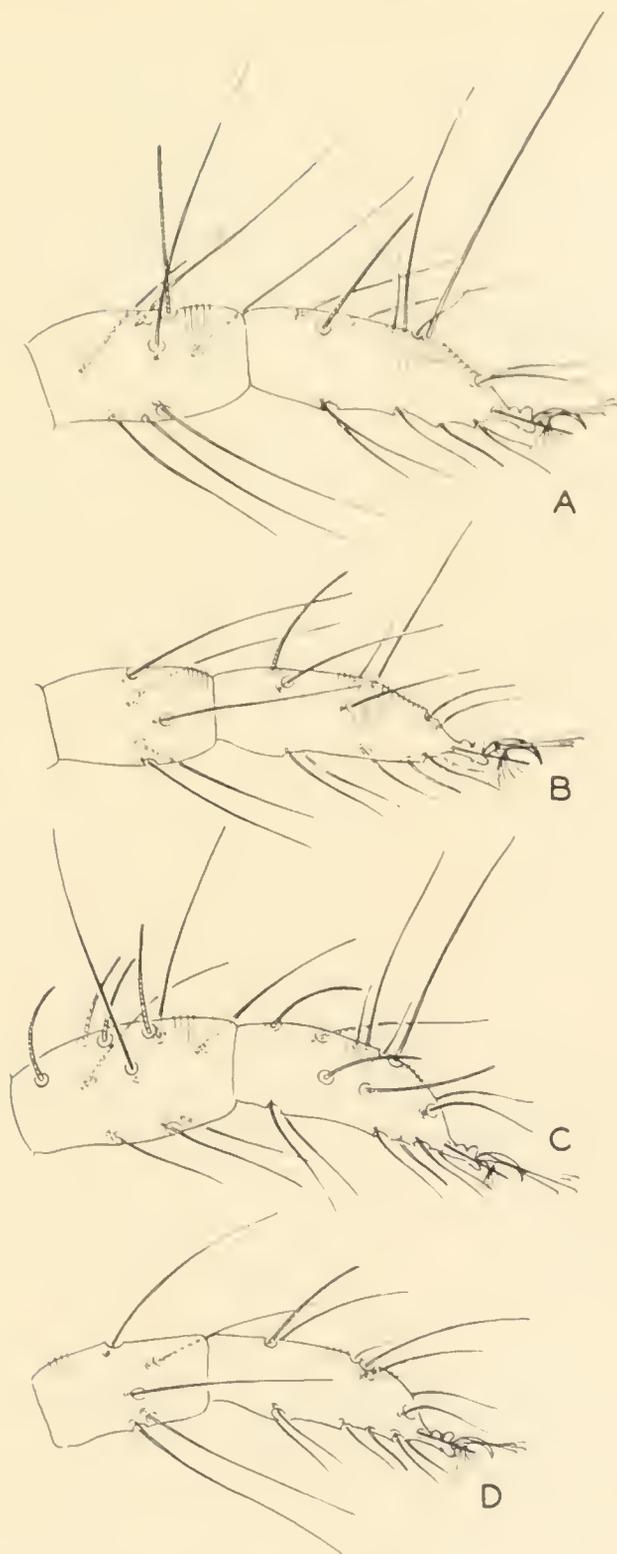


Fig. 281. *Oligonychus mangiferus*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

Oligonychus mangiferus (Rahman and Punjab), new combination
(Figures 281, 282)

Paratetranychus mangiferus Rahman and Punjab, 1940, Proc. Indian Acad. Sci. (ser. B), 11: 192. Described from males and females, Lyallpur, India, on mango, grape, and *Eugenia jambolana*.

Paratetranychus insularis McGregor, 1950, Amer. Midl. Nat., 44: 341. Types: males and females, Poamoho, Oahu, on mango; in the U. S. National Museum. *New synonymy*.

The female of *Oligonychus mangiferus* is indistinguishable from other members of the Ununguis Subgroup, which is characterized by having seven tactile setae on tibia I and four tactile setae proximal to the duplexes on tarsus I. The aedeagus is distinctive in that the bent portion is small, triangularly tapering or nearly so, and forming an acute angle with the shaft.

The synonymy of *insularis* with *mangiferus* is based on a similarity in drawings of the aedeagus, and both were described from the same hosts. There are no tetranychids endemic to Hawaii, and tropical Asia is probably the original home of this mite.

Specimens studied by us, other than the types, are from Honolulu, Hawaii (F. S. Morishita), on mango; Mopulehu, Malokai (F. S. Morishita), on mango; Poamoho, Oahu (F. S. Morishita), on *Anona* sp.; and Peru (at Houston, Texas quarantine), on rose.



Fig. 282. *Oligonychus mangiferus*: aedeagus.

Oligonychus yothersi (McGregor), new combination
(Figures 283, 284, 285)

Tetranychus yothersi McGregor, 1914, Ann. Ent. Soc. Amer., 7: 355. Types: females, Orlando, Florida, on camphor; in the U. S. National Museum.

Paratetranychus yothersi, Banks, 1915, U. S. Dept. Agric. Rep., 108: 37; McGregor, 1919, Proc. U. S. Natl. Mus., 56(2303): 676;

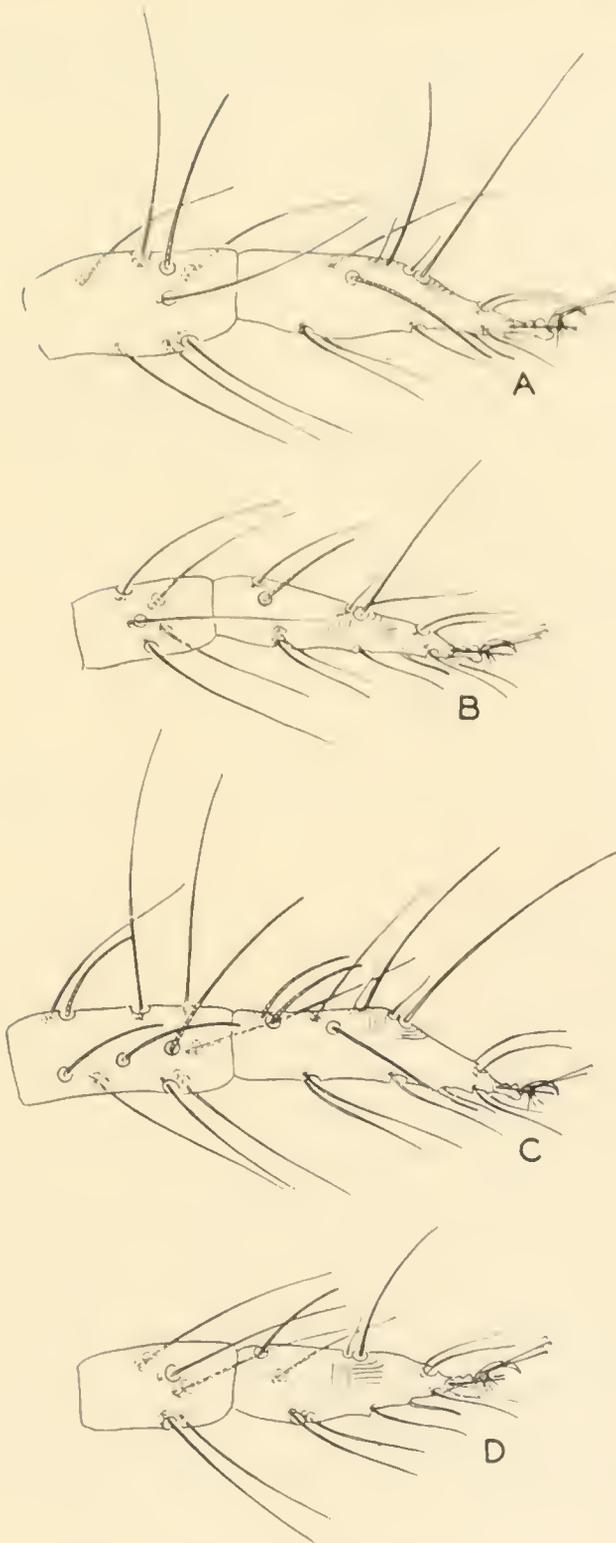


Fig. 283. *Oligonychus yothersi*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

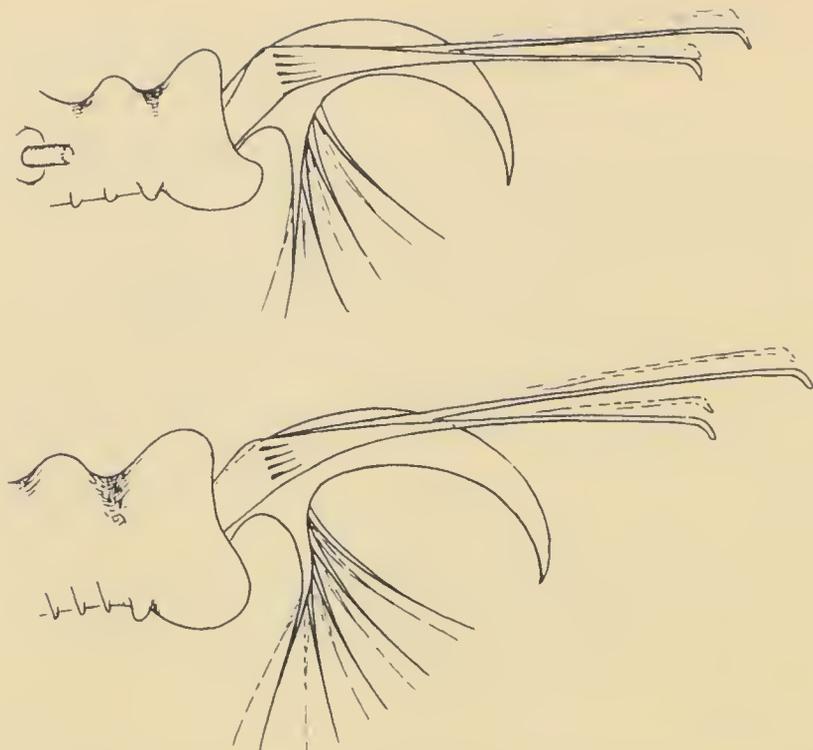


Fig. 284. *Oligonychus yothersi*: empodia of female.

McGregor, 1941, Proc. Ent. Soc. Wash., 43: 86; McGregor, 1950, Amer. Midl. Nat., 44: 358.

Oligonychus major Ewing, 1921, Proc. U. S. Natl. Mus., 59(2394): 660.

Types: males and females, Rockville, Maryland, on avocado; in the U. S. National Museum. *New synonymy*.

Females of *Oligonychus yothersi* are indistinguishable from other members of the Ununguis Subgroup—those having seven tactile setae on tibia I and four tactile setae proximal to the duplex setae on tarsus I. The number of sensory setae associated with these tactile setae is subject to considerable variation: from one to four on tibia I and from one to two on the proximal portion of tarsus I. Rarely only three tactile setae are found proximally on tarsus I.

The aedeagus is very distinctive in that the bent portion is as long as the dorsal part of the shaft and the distal one-half of the hook is long and slender and usually truncate at the tip (rarely pointed in Florida specimens).

The male bears seven tactile setae on tibia I and three tactile setae on the proximal portion of tarsus I, and the sensory setae vary in number as in the female: from one to three such setae on tibia I, and from one to four such setae on the proximal part of tarsus I.



Fig. 285. *Oligonychus yothersi*: aedeagus, Ecuador.

The specimens on the type slide of *yothersi* are all females and they represent two species, the other being that here identified as *Oligonychus coffeae*. These two species are found commonly associated in South America. McGregor's 1941 identification is accepted as that of the first reviser.

Oligonychus major is here considered to be a synonym of *Oligonychus yothersi*. The types are extremely deteriorated, but tarsus I of the female bears four setae proximad of the duplex setae. The types of *major* were from experimental avocado plots, and this is an important host of *yothersi*. Ewing referred to the aedeagus as being much larger and differently shaped in comparison with (*americanus*) = *ununguis*. The synonymy is probably correct.

Series studied by us in which males and females are associated are from Richmond, Florida (F. G. Butcher), on avocado; Fredonia,

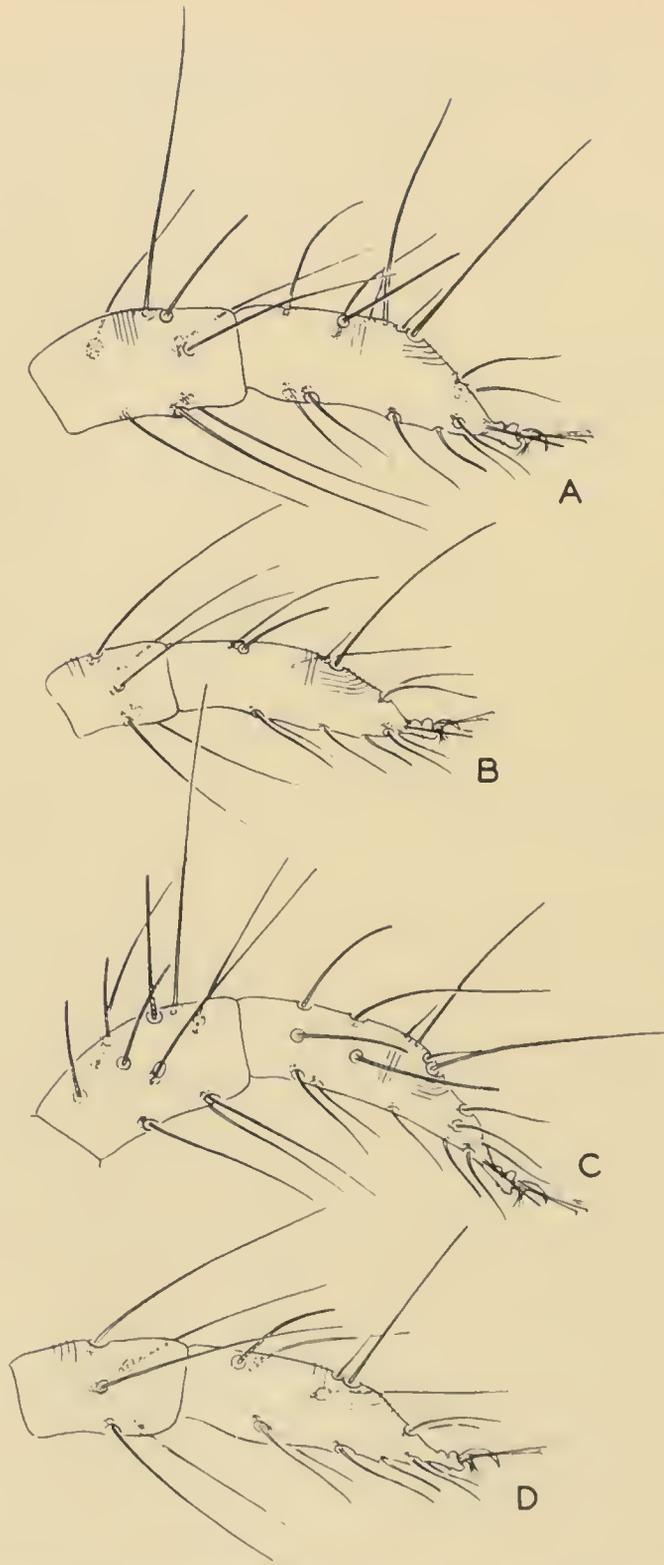


Fig. 286. *Oligonychus punicae*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male; all *coiti* types.

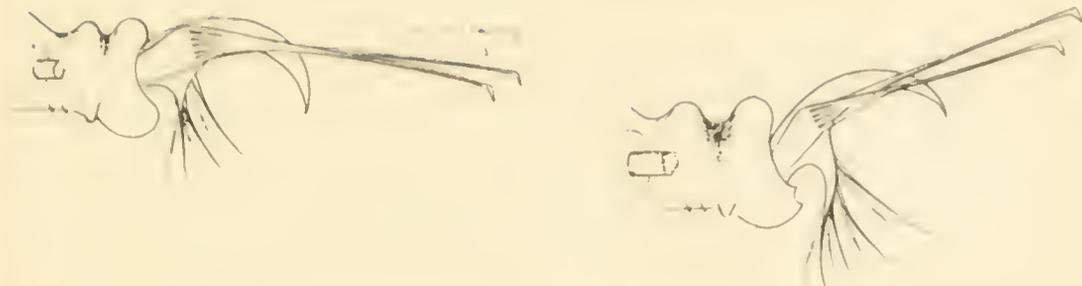


Fig. 287. *Oligonychus punicae*: left, empodium I of male; right, empodium I of female; *coiti* types.

Colombia (C. H. Ballou), on coffee; Pomasqui, Ecuador (H. R. Yust), on Capuli cherry; Guailabamba, Ecuador (H. R. Yust), on avocado; and Concordia, Argentina (L. C. Knorr), on *Salix alba*.

Females alone from Florida are from Richmond (F. G. Butcher), on avocado and mango; Sunland Groves (F. G. Butcher), on mango; Florida City (F. G. Butcher), on avocado; Coral Gables (F. G. Butcher), on mango; Perrine (F. G. Butcher), on mango, avocado, litchi, *Euphora longana*, and *Averrhoa carambola*; Homestead (D. O. Wolfenbarger), on mango and avocado; Orlando (L. C. Knorr), on camphor; and Gainesville (L. C. Kuitert), on camphor.

Oligonychus punicae (Hirst), new combination
(Figures 286, 287, 288)

Paratetranychus punicae Hirst, 1926, Proc. Zool. Soc. Lond., 1926: 830. *Types*: males and females, Coimbatore, South India, on pomegranate and grape; probably in the British Museum (Natural History).

Paratetranychus coiti McGregor, 1941, Proc. Ent. Soc. Wash., 43: 85; McGregor, 1950, Amer. Midl. Nat., 44: 337. *Types*: males and females, Chula Vista, California, on avocado; in the U. S. National Museum. *New synonymy*.

The female of *Oligonychus punicae* possesses seven tactile (and one sensory) setae on tibia I and four tactile (and one sensory) setae on tarsus I proximal to the duplex setae. This sex cannot be distinguished from females of *O. yothersi*, *O. mangiferus*, and *O. peronis*, all of which also occur on broad-leaved tropical plants.

The aedeagus is distinctive among this group of species in that the hook is rather broad and with the distal end abruptly narrowed to form a fingerlike projection.

The synonymy of *Oligonychus coiti* with *O. punicae* is based on the study of type material.

The only specimens, other than the types, examined by us might be considered topotypes of *coiti* in that they are from southern California (Walter Ebeling and Lee Jeppson) on avocado. Although formerly a serious pest of avocado in this area in the past, this species has seldom been encountered in recent years.

It is probable that this species is tropical Asian in origin, but it may have been introduced to California from Central America.

Oligonychus peronis Pritchard and Baker, new species

(Figures 289, 290, 291)

The female of *Oligonychus peronis* belongs to that subgroup having seven tactile setae on tibia I and four tactile setae on tarsus I proximal to the duplex setae. The aedeagus shows that this species is closely allied to *O. punicae*, but the distal fingerlike end of the aedeagus is extremely small and ventrally placed on the very bulbous enlargement.

This species is known only from Ecuador, on *Derris* sp.

Male.—Palpus with terminal sensillum no longer than fusiform peg of last palpal segment. Peritreme straight distally, scarcely enlarged at tip. Tibia I with seven tactile and four sensory setae; tarsus



Fig. 288. *Oligonychus punicae*: aedeagus; *coiti* type.

I with three tactile and three sensory setae proximal to duplexes and with a single tactile seta ventrally just beyond duplexes. Tibia II with five tactile setae. Empodial claw slightly longer than the four pairs of proximoventral hairs. Dorsal setae of body rather slender, tapering, longer than longitudinal intervals between them. Aedeagus forming a swollen bulb caudally above the ventrally directed, narrow and truncate distal end. Length of body 266 μ , including gnathosoma 320 μ , greatest width of body 133 μ .

Female.—Similar. Terminal sensillum of palpus considerably larger. Stylophore broadly rounded medio-anteriorly. Tibia I with seven tactile and one sensory setae; tarsus I with four tactile and one sensory setae proximal to duplexes. Integumental striae longitudinal immediately

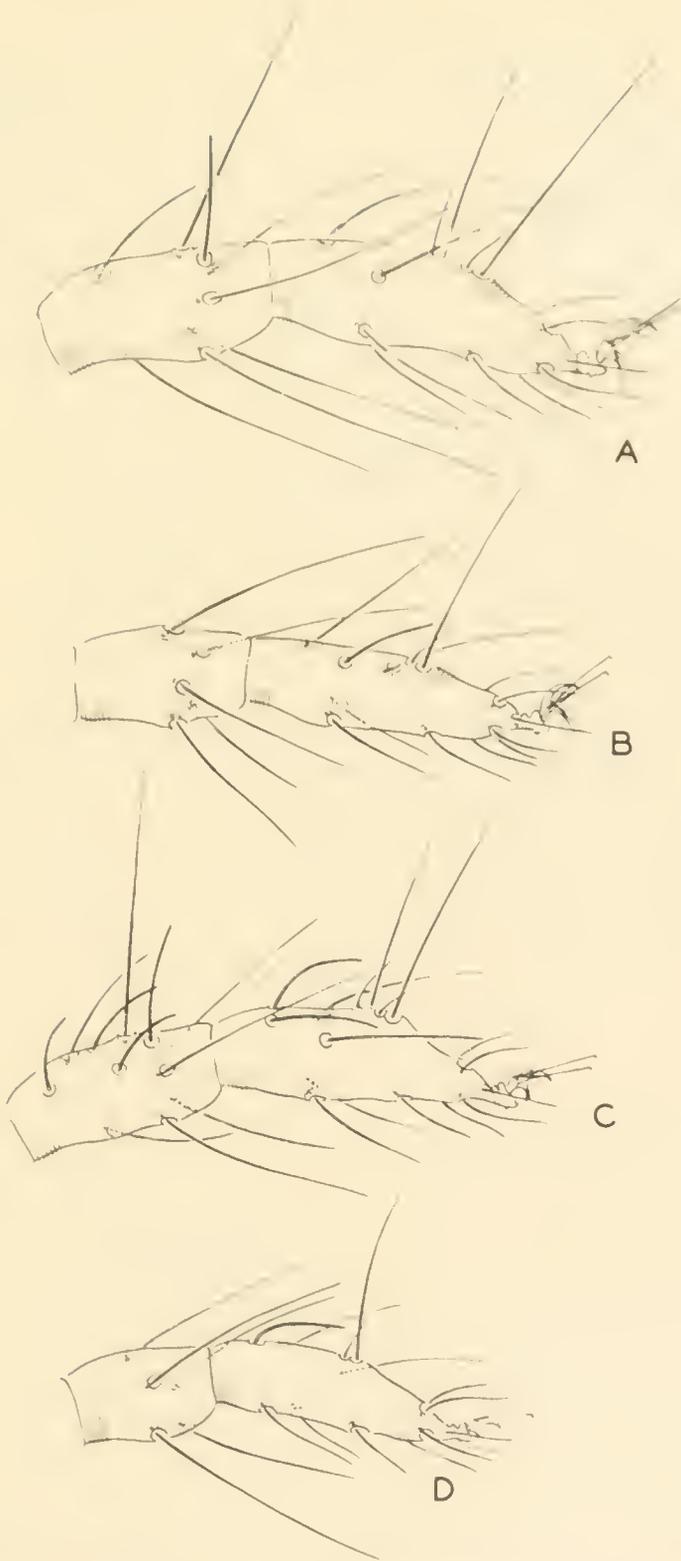


Fig. 289. *Oligonychus peronis*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

Spider Mites



Fig. 290. *Oligonychus peronis*: above, empodium I of male and terminal segment of palpus; below, empodium I of female and terminal sensillum of palpus.



Fig. 291. *Oligonychus peronis*: aedeagus.

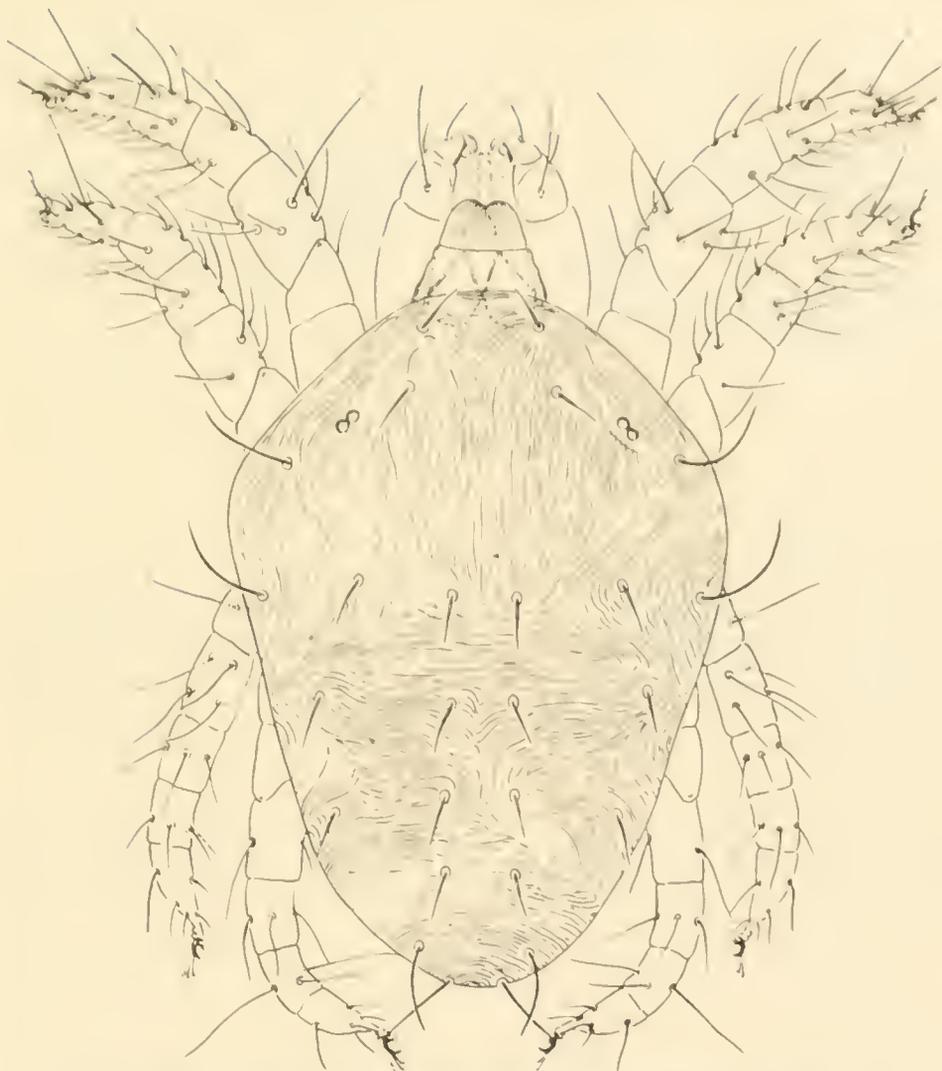


Fig. 292. *Oligonychus peruvianus*: dorsal aspect of female.

anterior to genital flap. Length of body $333\ \mu$, including gnathosoma $400\ \mu$; greatest width of body $250\ \mu$.

Holotype.—Male, Santo Domingo, Pichincha, Ecuador, November 27, 1952 (H. R. Yust), on *Derris* sp.; type no. 2144 in the U. S. National Museum. *Paratypes*.—Two males, 19 females, Santo Domingo, Pichincha, Ecuador, November 27, 1952 (H. R. Yust), on *Derris* sp.

Oligonychus primulae (Oudemans), new combination

Paratetranychus primulae Oudemans, 1931, Ent. Ber., 8(181): 291; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 35.
Types: eight females, Arnhem, Holland, on *Primulus obconica*;

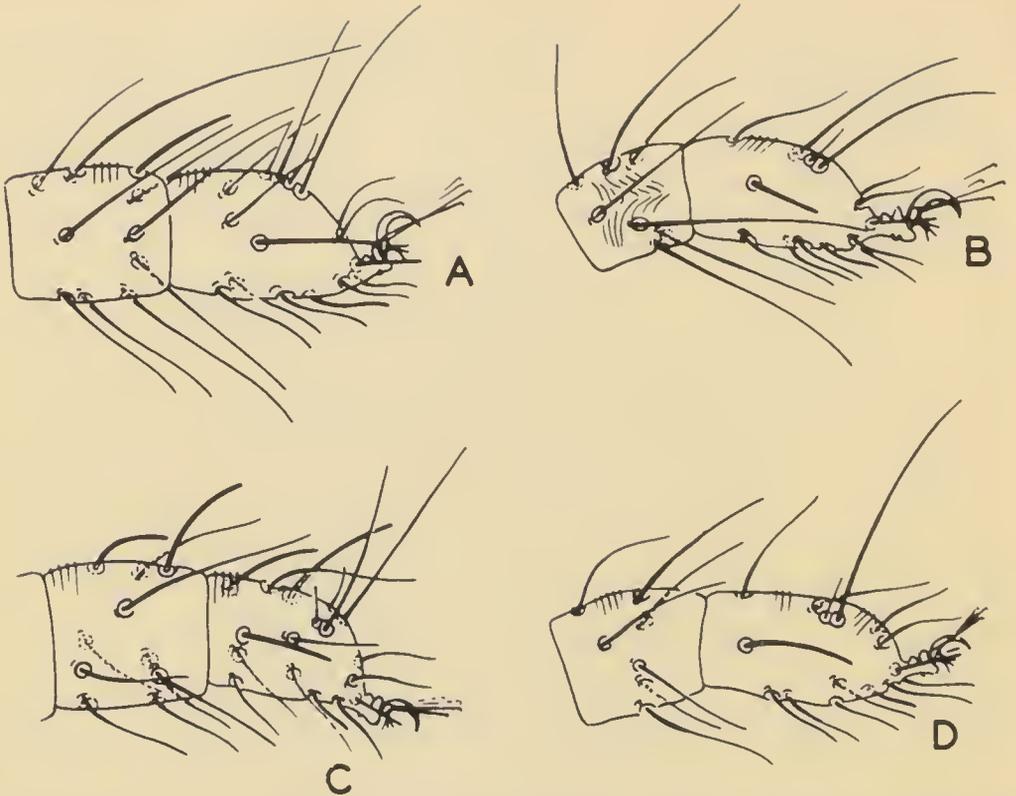


Fig. 293. *Oligonychus peruvianus*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

probably in the Rijksmuseum van Natuurlijke Historie, Leiden, Holland.

The rotund body, the five pairs of proximoventral empodial hairs, the long dorsal setae and the dorsal striae of the body (Geijskes, 1939) all indicate that *Oligonychus primulae* belongs to the Ununguis Group. Males are unknown, and the status of this species must remain in doubt.

Oligonychus nuptialis (Zacher), new combination

Paratetranychus nuptialis Zacher, 1932, Zool. Anz., 97(7/8): 13. Types: males and females, Einbeck, Germany, on "Myrthenstecklinge"; probably in the Zacher collection.

Zacher's description of *nuptialis* indicates, although by no means certainly, that this species belongs to the Ununguis Group. The yellowish-red color of the body, as described by him, is found only in this group, and his figure of the aedeagus indicates that it bends ventrad

Subfamily Tetranychinae Berlese

us in this group. The terminal enlargement of the aedeagus, as illustrated by Zacher, will distinguish this species from all species of the Ununguis Group.

Oligonychus kobachidzei (Reck), new combination

Paratetranychus kobachidzei Reck, 1947, Soobsh. Akad. Nauk Gruz. S.S.R., 8(7). Described from specimens from Georgia, S.S.R., on *Platanus occidentalis*.

We have not seen the description of this species.

Oligonychus mori (Yokoyama), new combination

Panonychus mori Yokoyama, 1929, Nippon Sangyô Gaichû Zensho (Tokyo), p. 531. Described from male and female, Japan, on mulberry.

Although Yokoyama credited this species to Kishida, no article by Kishida has been found in which the name was used. However, the name is validated by Yokoyama, and his description clearly indicates that this is a reddish species belonging to the Ununguis Group.

Oligonychus parva (Yokoyama), new combination

Tacebia parva Yokoyama, 1929, Nippon Sangyô Gaichû Zensho (Tokyo), p. 536. Described from female, Japan, on mulberry.

Yokoyama validated this species, even though it was credited to Kishida. No reference to publication of the name by Kishida has been found. *Parva* was described as being very similar to *mori*, but smaller in size.

Peruvianus Group

The Peruvianus Group is based on a single species that may be readily recognized by the shape of the dorsal setae of the body. These setae are short, lanceolate, and nearly nude.

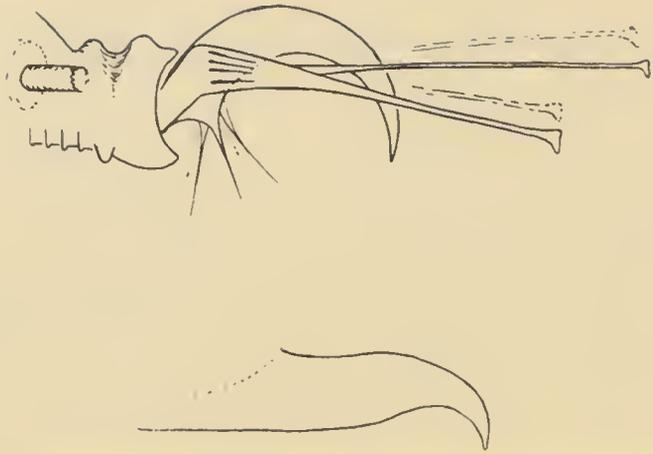


Fig. 294. *Oligonychus peruvianus*: tarsal appendages and aedeagus.

In common with the Ununguis Group the aedeagus bends ventrad and tarsus I bears a single tactile seta ventral to the duplexes. In common with the other groups, tibia I bears nine tactile setae and the empodium bears only three pairs of proximoventral hairs. Tibia I bears one sensory seta in the female, two sensory setae in the male. Tarsus I bears four tactile setae proximal to the duplexes, plus one sensory seta in the female and three sensory setae in the male. Tibia II possesses seven (rarely six) tactile setae.

The integumentary striae of the female are distinctive in that they are longitudinal between the third pair of dorsocentral hysterosomals.

Oligonychus peruvianus (McGregor), new combination
(Figures 292, 293, 294)

Tetranychus peruvianus McGregor, 1917, Proc. U. S. Natl. Mus., 51(2167): 581, 589. *Types*: males and females, La Legua, Peru, on willow; in the U. S. National Museum.

Paratetranychus peruvianus, McGregor, 1919, Proc. U. S. Natl. Mus., 56(2303): 667; McGregor, 1950, Amer. Midl. Nat., 44(2): 346; Baker and Pritchard, 1953, Hilgardia, 22(7): 209.

Paratetranychus trinitatis Hirst, 1922, Proc. Zool. Soc. Lond., 1921: 801. *Types*: males and females, Trinidad, on grape; probably in the British Museum (Natural History).

Oligonychus peruvianus has been recorded from Peru, Trinidad, and southern California, on willow, grape, carob, and cotton. The colonies are very restricted, being found on the undersides of the leaves.

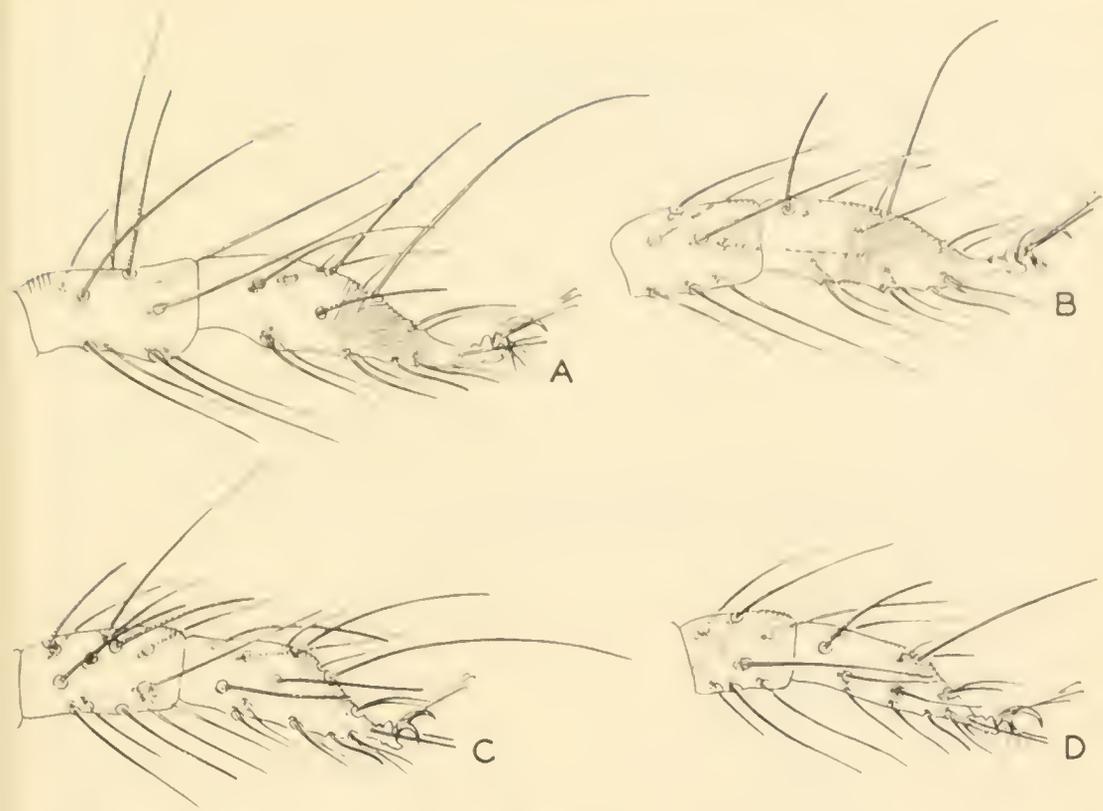


Fig. 295. *Oligonychus stickneyi*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

Pratensis Group

Mites that belong to the Pratensis Group are distinguished by having the proximoventral appendages of the male empodium I consisting of a single pair of spurs (each with a trace of the first and second proximoventral hairs).

The males are further recognizable in that the aedeagus bears a strong bend dorsad, with the distal end either sigmoid or with a rather compact distal enlargement.

Females are distinguishable as a group, but they cannot be differentiated as to species. Tibia I bears nine tactile setae. Tarsus I has four tactile setae proximad of the duplex setae, and the venter of tarsus I bears two tactile setae on the ventral surface (in the portion bearing longitudinal striations) just distal to the location of the duplexes. The dorsal striae of the females of the Pratensis Group are transverse between the dorsocentral hysterosomals, but they are longitudinal between the sacrales. Dorsolateral striae of the body are mostly transverse.

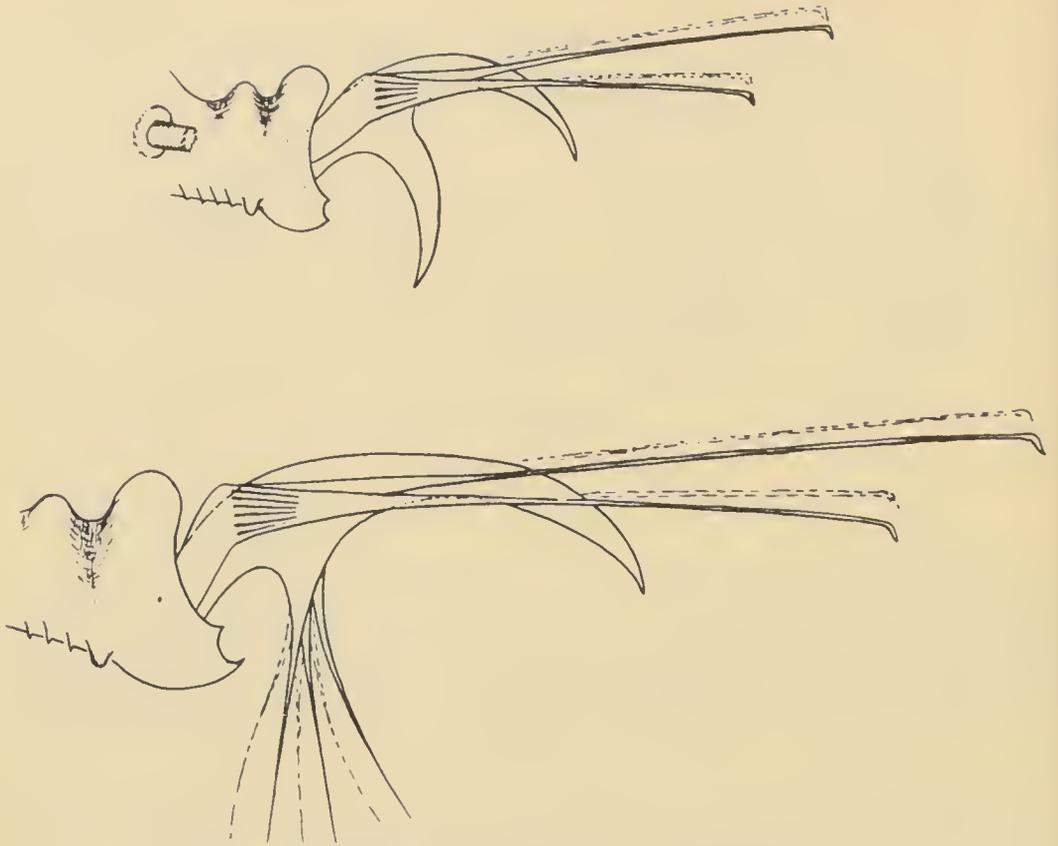


Fig. 296. *Oligonychus stickneyi*: above, empodium I of male; below, empodium I of female.

The peritreme is straight distally, ending in a simple bulb. There are three pairs of empodial hairs below the long and slender empodial claw. The duplex setae on tarsus I are more widely spaced on the dorsum of the segment than in other groups of *Oligonychus* except for the McGregori Group.

Mites belonging to the Pratensis Group feed characteristically on grasses, and they are often pests of such crops as sorghum, maize, sugar cane, and rice. Two species, ordinarily found on grasses, are serious pests of the fruit of date palms.

Adult females are very small, pale yellowish or straw-colored, and have dusky spots along each side.

Oligonychus stickneyi (McGregor), new combination
(Figures 295, 296, 297)

Paratetranychus stickneyi McGregor, 1919, Proc. Ent. Soc. Wash., 41: 253; McGregor, 1950, Amer. Midl. Nat., 44: 353. Types: males

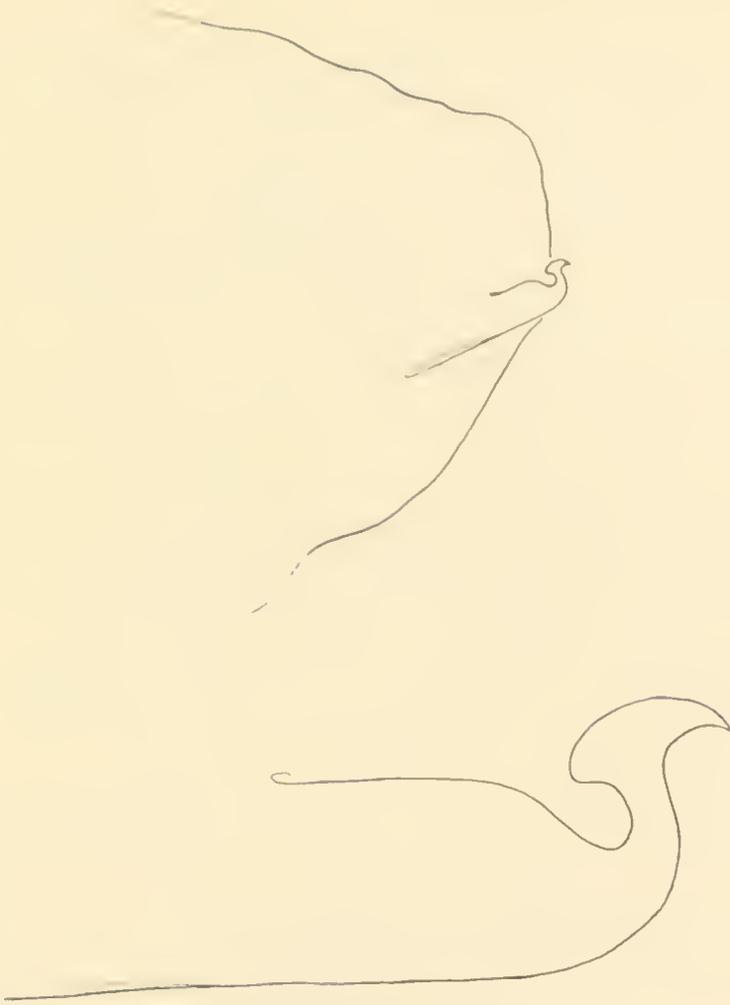


Fig. 297. *Oligonychus stickneyi*: aedeagus.

and females, Whittier, California, on Bermuda grass; in the U. S. National Museum.

The male of *Oligonychus stickneyi* may be recognized by having the terminal enlargement of the aedeagus very large, about one-third as long as the dorsal portion of the shaft, the anterior margin broadly rounded, the caudal end acutely angulate, and with the axis of the enlargement forming less than a 30 degree angle with the axis of the shaft. The shaft is sharply constricted just before the dorsal bend.

Specimens other than the types that have been studied are from Redlands, California (A. E. Pritchard), on Bermuda grass; Tulare County, California, on corn; Santa Barbara, California (A. E. Pritchard), on Bermuda grass; Riverside, California (Jack Hall), on Bermuda grass; Indio, California, on corn; Avondale, Arizona (M. H. Frost, Jr.), on maize; and Jalostoc, Morelos, Mexico (J. J. McKelvey), on maize.

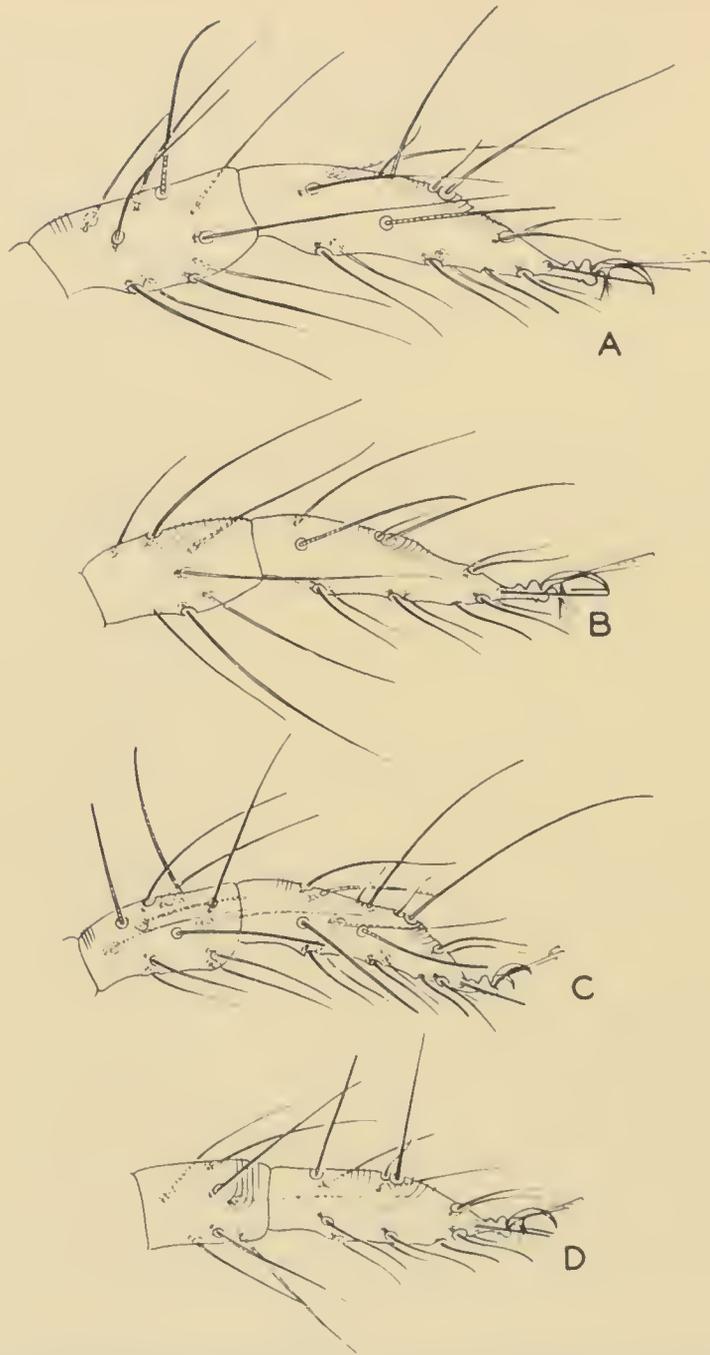


Fig. 298. *Oligonychus gramineus*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

Specimens from Windermere, Florida (O. D. Link), on maiden cane grass appear to be identical.

McGregor recorded the following genera of grasses as hosts: *Arundo*, *Bouteloa*, *Cenchrus*, *Chloris*, *Cynodon*, *Digitaria*, *Echinochloa*, *Eragrostis*, *Setaria*, *Sorghum*, and *Sporobolus*.

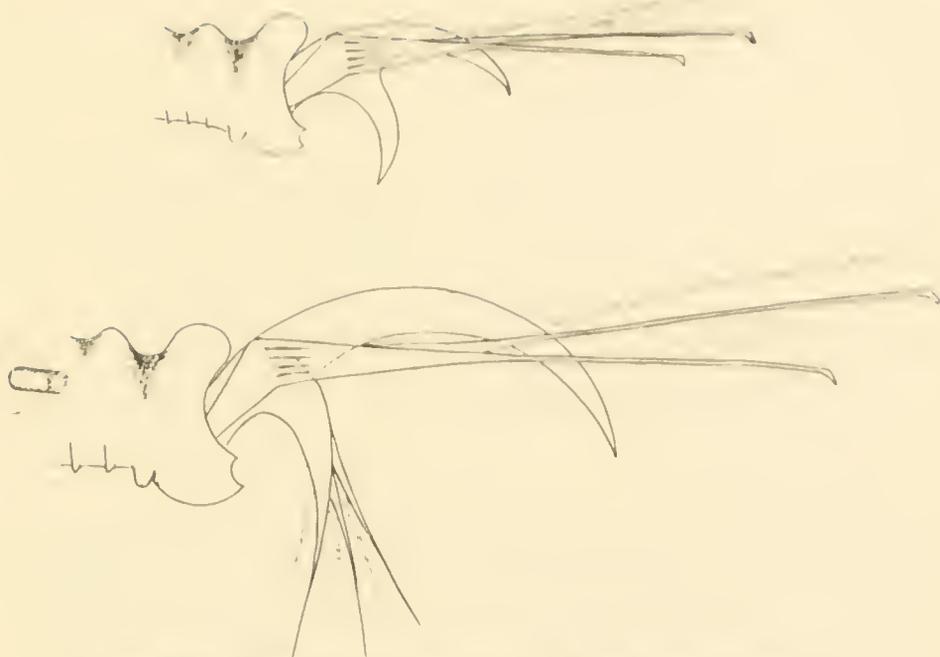


Fig. 299. *Oligonychus gramineus*: above, empodium I of male; below, empodium I of female.

Oligonychus gramineus (McGregor), new combination

(Figures 298, 299, 300)

Paratetranychus gramineus McGregor, 1950, Amer. Midl. Nat., 44: 339.

Types: males and females, Julian, California, on *Hordeum murinum*; in the U. S. National Museum.

Oligonychus gramineus is closely allied to *O. stickneyi*, but the distal enlargement of the aedeagus is narrower and the axis of the enlargement forms a 45 degree angle with the axis of the shaft.

This species has been known only from the very southern coastal area of California, from San Diego County to Los Angeles County. A more northern collection, from Davis, California (F. M. Summers), on rye, has been studied by us.

Oligonychus exsiccator (Zehntner), new combination

(Figure 301)

Tetranychus exsiccator Zehntner, 1897, Arch. Java-Suikerind., 5(1): 525; Zehntner, 1901, Arch. Java-Suikerind., 9(1): 193. Described from specimens from Java, on sugar cane.

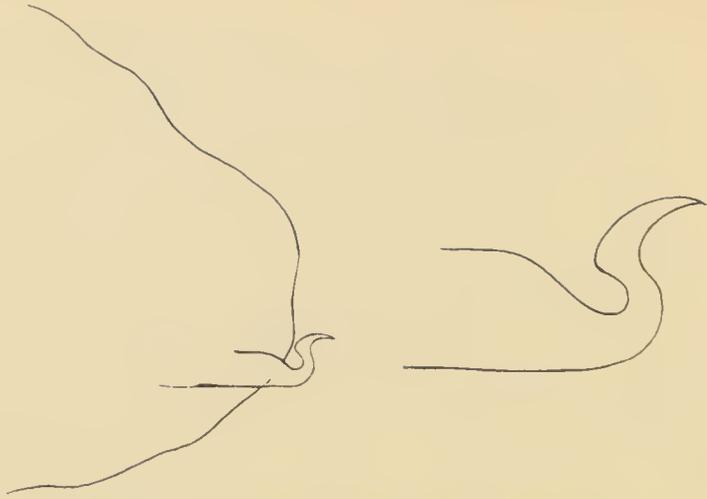


Fig. 300. *Oligonychus gramineus*: aedeagus.

The figures of the aedeagus that were presented by Zehntner (1901) indicate that this species belongs to the Pratensis Group and that it is closely related to *Oligonychus stickneyi*. However, the caudal projection of the aedeagal knob is rounded in Zehntner's figures.

Swezey (1922) and Williams (1931) regarded this species as a sugar cane pest in Hawaii, but their identification is in need of confirmation. We have not seen this species.

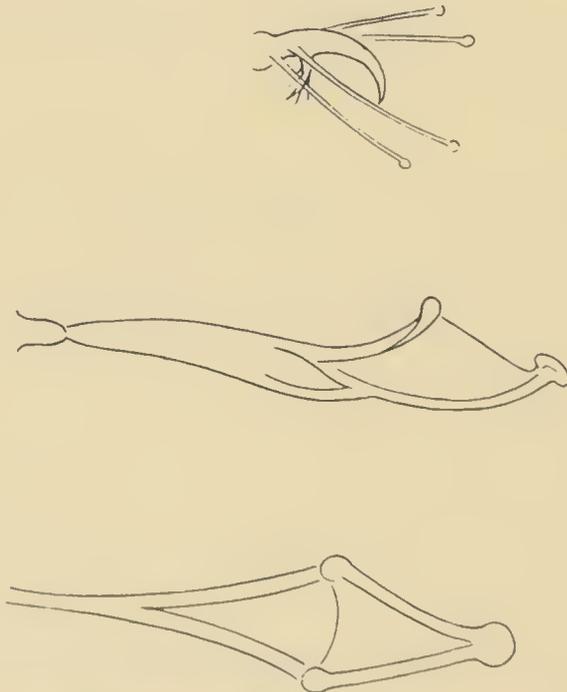


Fig. 301. *Oligonychus exsicicator*: empodium and aedeagus (after Zentner).



Fig. 302. *Oligonychus afrasiaticus*: aedeagus, type.

Oligonychus afrasiaticus (McGregor), new combination
(Figure 302)

Paratetranychus afrasiaticus McGregor, 1939, Proc. Ent. Soc. Wash., 41(9): 255; McGregor, 1950, Amer. Midl. Nat., 44(2): 331. *Types*: males and females, Biskra, Algeria, on dates; in the U. S. National Museum.

Oligonychus ?simplex, Hirst, 1920, Proc. Zool. Soc. Lond., 1920: 60; Buxton, 1921, Bul. Ent. Res., 11: 299. *Misidentification*.

Paratetranychus simplex, André, 1932, Bul. Soc. Hist. Nat. Afr. Nord., 23: 325. *Misidentification*.

The aedeagus of *Oligonychus afrasiaticus* has a moderately large terminal knob, about one-fifth as long as the dorsal portion of the shaft. The axis of the knob is parallel to that of the shaft; the anterior projection is broadly rounded, and the posterior angulation is deflexed at the tip, about as long as the anterior angulation. No sharp constriction is evident on the shaft.

This species is reported to be a serious pest of dates in Algeria and Iraq; and Buxton (1921) also recorded "khiadhrawi" trees as a host.

Oligonychus pratensis (Banks), new combination
(Figures 303, 304, 305, 306)

Tetranychus pratensis Banks, 1912, Proc. Ent. Soc. Wash., 14: 97; Ewing, 1913, Ann. Ent. Soc. Amer., 6: 459; *Types*: females, Pullman, Washington, on timothy; in the U. S. National Museum.

Paratetranychus pratensis, Banks, 1915, U. S. Dept. Agr. Rep., 108: 37; McGregor, 1919, Proc. U. S. Natl. Mus., 56(2303): 668; McGregor, 1950, Amer. Midl. Nat., 44: 350.

Tetranychus simplex Banks, 1914, Pomona Jour. Ent. and Zool., 6: 57.

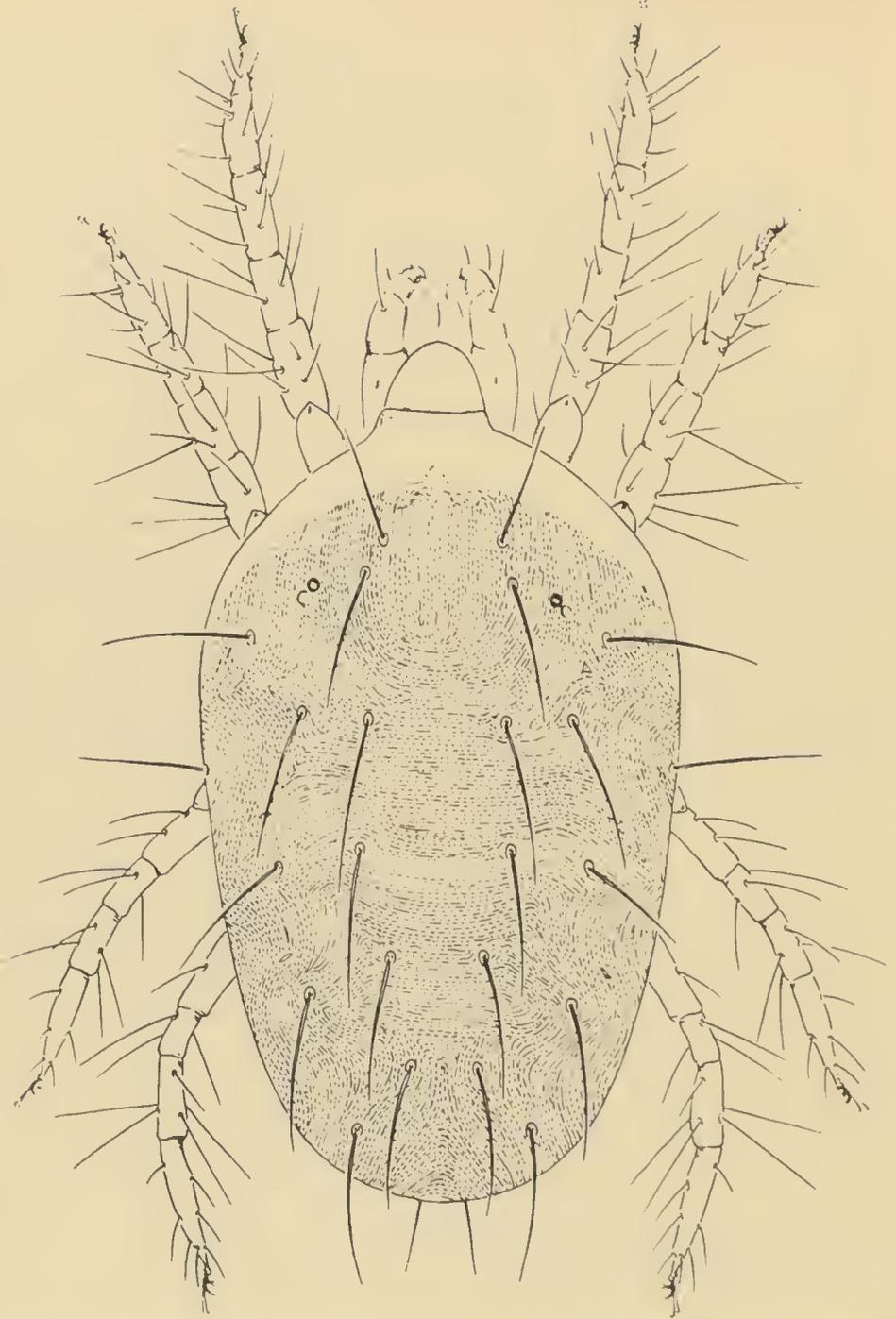


Fig. 303. *Oligonychus pratensis*: dorsal aspect of female, Le Grande, Oregon.

Types: described from specimens from El Centro, California, on date palm, in the Museum of Comparative Zoology, Cambridge, Massachusetts. *New synonymy*.

Paratetranychus simplex, Banks, 1915, U. S. Dept. Agr. Rep., 108: 37; McGregor, 1939, Proc. Ent. Soc. Wash., 41: 248; McGregor, 1950, Amer. Midl. Nat., 44: 352.

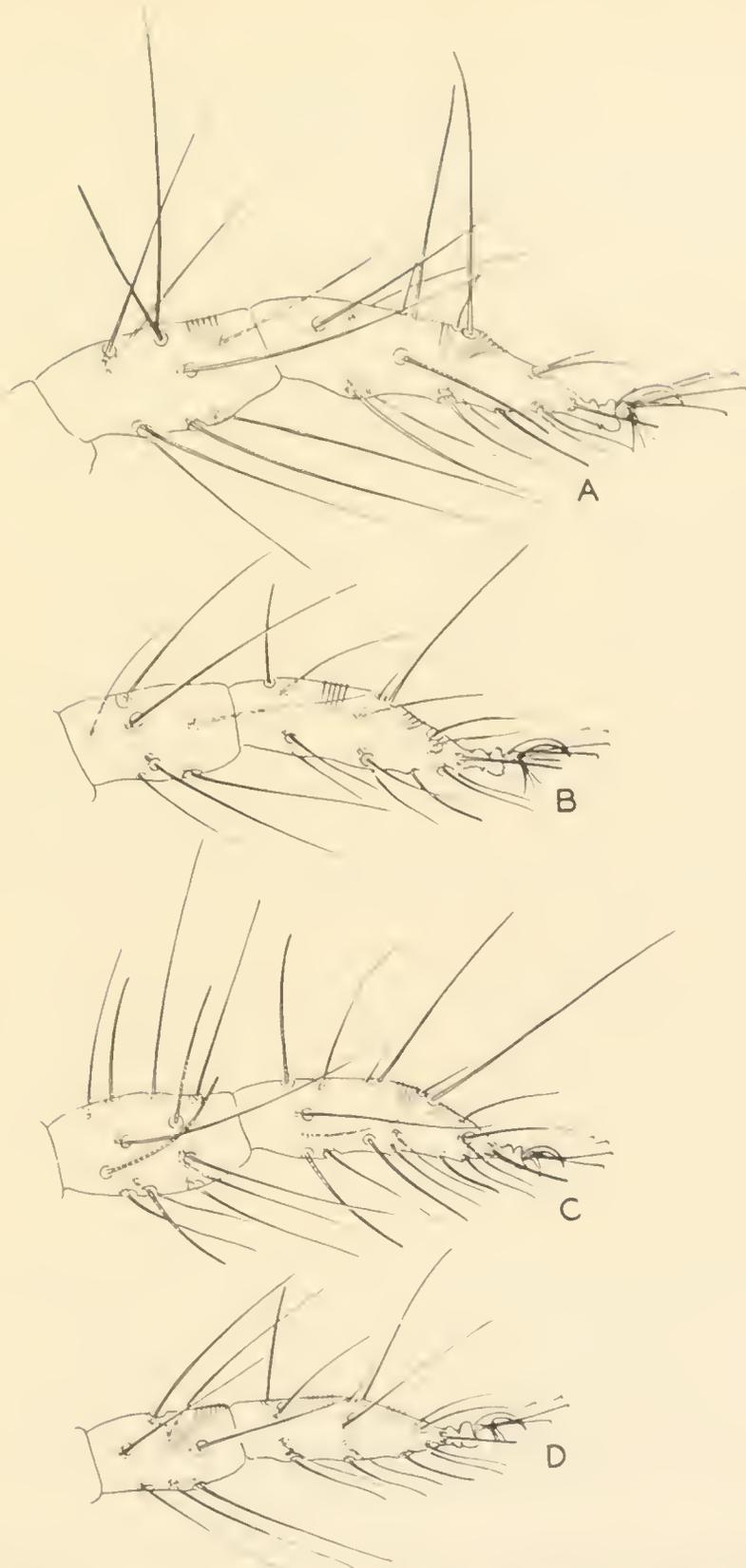


Fig. 304. *Oligonychus pratensis*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

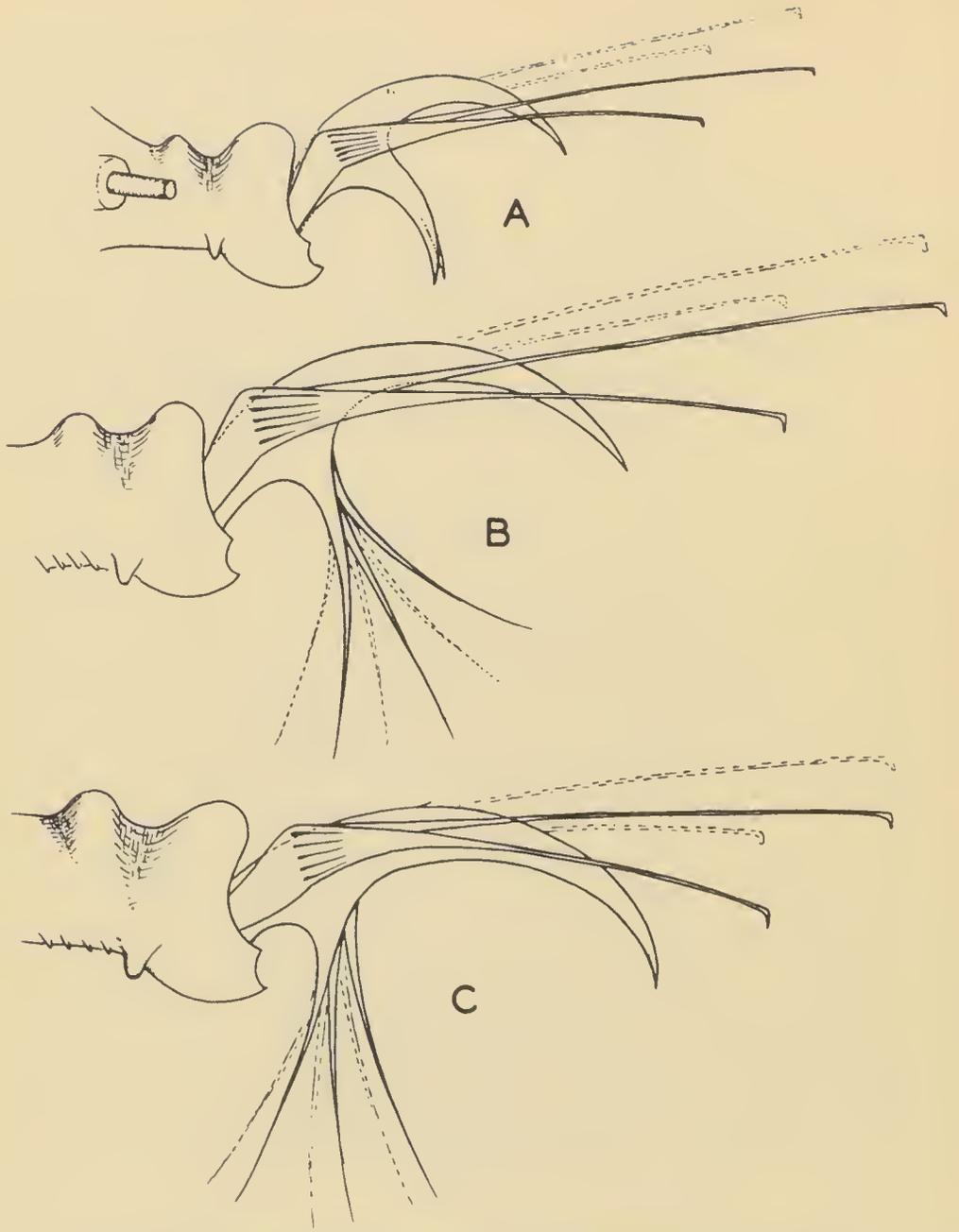


Fig. 305. *Oligonychus pratensis*: A.) empodium I of male; B.) empodium III of male; C.) empodium III of female.

Paratetranychus heteronychus Ewing, 1922, Proc. Ent. Soc. Wash., 24: 105. Types: males and females, Coachella Valley, California, on dates; in the U. S. National Museum. *New synonymy*.

The male of *Oligonychus pratensis* may be recognized by having the distal knob of the aedeagus about twice as wide as the stem of the knob, the axis of the knob forming a distinct angle with the axis

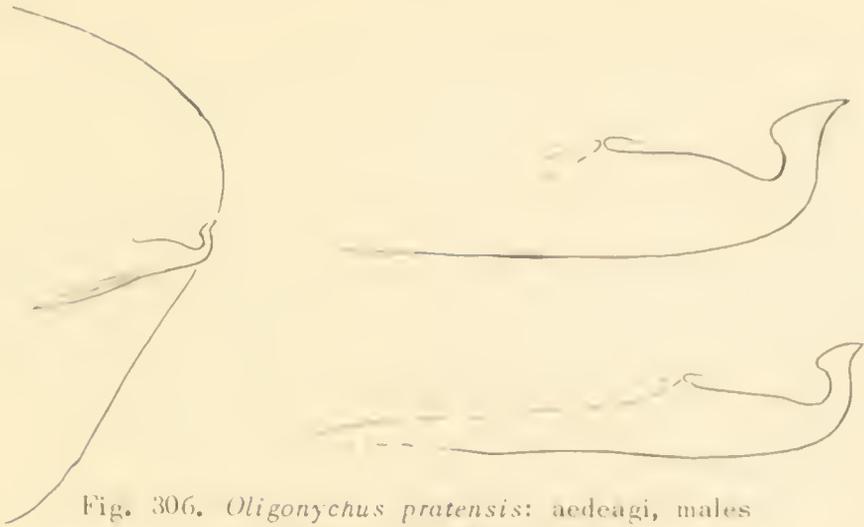


Fig. 306. *Oligonychus pratensis*: aedeagi, males from Oregon and Washington.

of the shaft. The dorsal margin of the knob may be nearly straight with the tip slightly down, or it is curved or angulate. The anterior projection of the knob is bluntly angulate, the posterior angulation acute. No constriction of the shaft is evident.

Oligonychus pratensis has been inadequately characterized due to the lack of males. An outbreak of this species on grasses and grains occurred in the Pacific Northwest in 1951, and specimens collected near Pullman, Washington, are regarded as topotypes. They represent the same species previously known as the date mite in southern California.

This species is common on grasses in the western United States. Specimens examined are from Pullman, Washington (H. S. Telford), on wheat; Dishman, Washington, on grass; La Grande, Oregon (B. G. Thompson), on wheat; La Grande, Oregon (R. W. Every), on grass; Pickleville, Utah (G. S. Knowlton), on aspen; Indio, California (L. R. Jeppson), on dates; and Riverside, California (Jack Hall), on Bermuda grass.

Specimens from the eastern and midwestern United States differ from specimens from the far West in that the knob of the aedeagus is more slender, the anterior angulation more acute, and the caudal angulation somewhat more deflexed. Such collections have been studied from Clovis, New Mexico (T. L. Harvey), on wheat; Garden City, Kansas (C. F. Henderson), on wheat; Curtis and Benton, Louisiana (L. D. Newsom), on *Panicum* sp.; Pelican Lake, Florida (D. D. Questal), on sugar cane; and Miami Beach, Florida (O. D. Link), on para grass.

In other males from Florida the aedeagal knob is somewhat smaller, approaching that of *Oligonychus indicus* but with the dorsally bent portion comparatively large in relation to the size of the shaft and the anterior angulation evident. These collections are from Belle

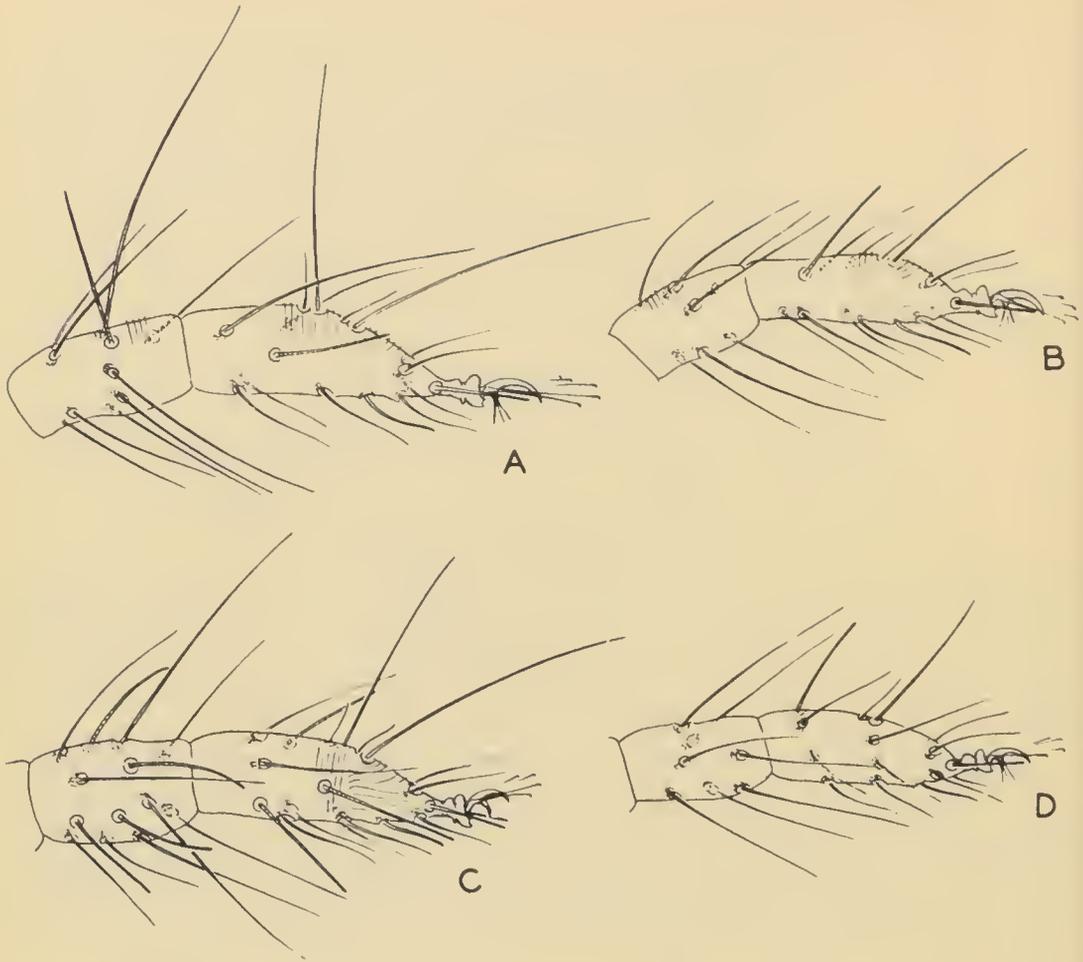


Fig. 307. *Oligonychus modestus*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

Glade, Florida (R. Mathes), on sugar cane; Miami Beach, Florida (O. D. Link), on smut grass; and Miami, Florida (O. D. Link), on broom grass.

Oligonychus indicus (Hirst), new combination

Paratetranychus indicus Hirst, 1923, Proc. Zool. Soc. Lond., 1923; 990; Rahman and Punjab, 1940, Proc. Ind. Acad. Sci. (ser B), 11: 189; Rahman and Sopra, 1940, Ind. Jour. Ent., 2: 201. *Types*: males and females, India, on sorghum; probably in the British Museum (Natural History).

Paratetranychus mexicanus McGregor and Ortega, 1953, Fol. Tec., 10: 3. *Types*: males and females, Chapingo, Mexico, on maize and Johnson grass; in the U. S. National Museum. *New synonymy*.



Fig. 308. *Oligonychus modestus*:
aedeagus.

Oligonychus indicus is closely allied to *O. pratensis*. Types of *O. mexicanus* (similar to the illustrated types of *indicus*) are distinctive in having the distal knob of the aedeagus very small, directed caudo-dorsally, and with the anterior angulation virtually absent. The bend of the aedeagus forms an acute angle with the axis of the shaft.

It is possible that the specimens discussed in the last paragraph under *Oligonychus pratensis* might be properly referred to *O. indicus*. The complex needs additional study.

Oligonychus modestus (Banks), new combination
(Figures 307, 308)

Tetranychus modestus Banks, 1900, U. S. Dept. Agr. Tech. Ser., 8: 73.
Types: males, Washington, D. C. on corn; in the U. S. National Museum.

Paratetranychus modestus, Banks, 1915, Dept. Agr. Rep., 108: 37;
McGregor, 1919, Proc. U. S. Natl. Mus., 56(2303): 670; McGregor,
1950, Amer. Midl. Nat., 44: 344.

The aedeagus of *Oligonychus modestus* is distinctive in that the distal end is scarcely enlarged, and the dorsal surface of the tiny knob is curved and parallel to the axis of the shaft. The distal bend is at a right or obtuse angle with the axis of the shaft.

In addition to the types from Washington, D. C. on corn, specimens have been examined from Washington, D. C. (F. A. McClure), on bamboo.

Oligonychus sacchari (McGregor), new combination
(Figures 309, 310, 311)

Paratetranychus sacchari McGregor, 1942, Jour. Univ. Puerto Rico, 26: 91; McGregor, 1950, Amer. Midl. Nat., 44: 351. Types: males and females, Mayagüez, Puerto Rico, on sugar cane; in the U. S. National Museum.

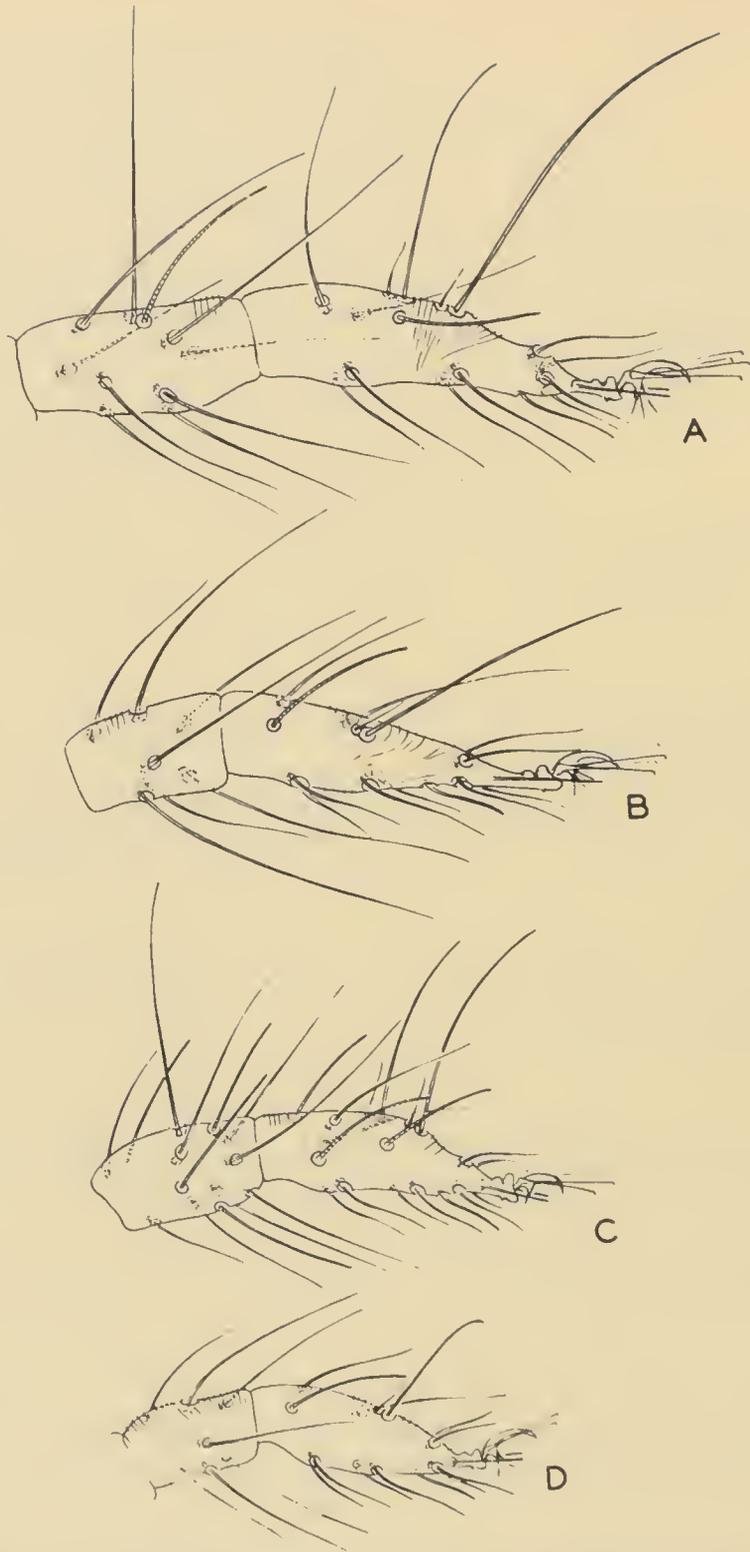


Fig. 309. *Oligonychus sacchari*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

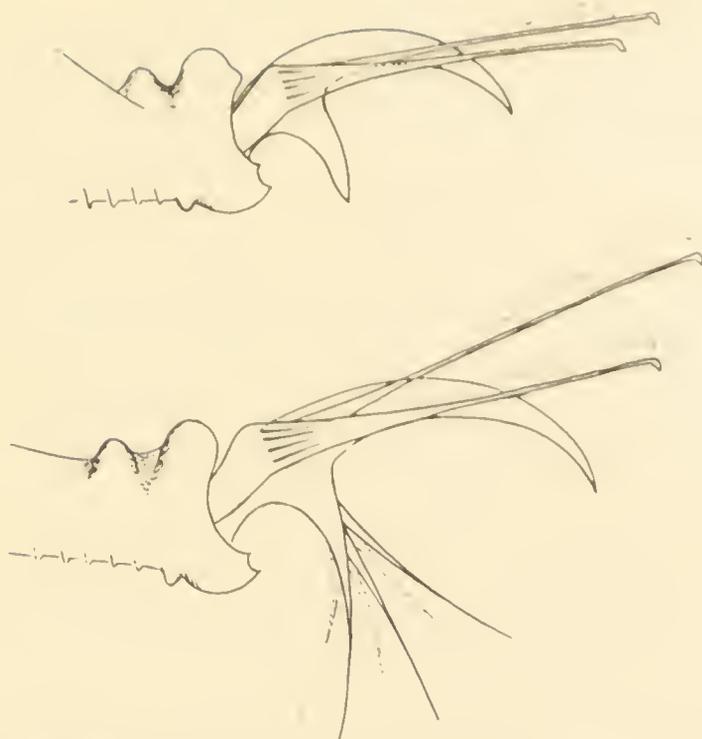


Fig. 310. *Oligonychus sacchari*: above, empodium I of male; below, empodium I of female.

The male of *Oligonychus sacchari* is distinctive in having the distal end of the aedeagus bent dorsad, tapering, strongly sigmoid, and with the tip turned down.

This species was originally known from specimens collected on sugar cane in western Puerto Rico, but McGregor later recorded specimens from the New Hebrides and Windward Islands, on dendrobium orchids and foxtail millet.

Oligonychus oryzae (Hirst), new combination

Paratetranychus oryzae Hirst, 1926, Proc. Zool. Soc. Lond., 1926: 830. Types: males, Coimbatore, India, on paddy leaves: probably in the British Museum (Natural History).

Oligonychus oryzae is closely related to *O. sacchari*, but Hirst's drawing of the aedeagus shows the tip of the slender, sigmoid distal end to be dorsally directed. The bent portion of the aedeagus is much longer than in *O. iseilemae*.

This species is known only from the types, from south India, on rice.

Oligonychus iseilemae (Hirst), new combination

Paratetranychus iseilemae Hirst, 1924, Ann. Mag. Nat. Hist. (ser. 9), 14: 524. Types: males and females, Coimbatore, South India, on *Iseilema laxum*; probably in the British Museum (Natural History).

Oligonychus iseilemae is a grass infesting mite. Hirst's figure indicates that the aedeagus bears a small, sigmoid, dorsal bend without any distal enlargement and with the tip directed upward. The peritreme is distinctive among the group inasmuch as the distal end is described as being U-shaped.

This species is known only from the types from South India.

Oligonychus stenoperitrematus (Ugarov and Nikolskii), new combination

Eurytetranychus stenoperitrematus Ugarov and Nikolskii, 1937, Sredneat. Stant. Zash. Rastenii, p. 36. Described from males and females, probably Tashkent, Russia, on corn, watermelon, cotton, and thistle.

Paratetranychus stenoperitrematus, Baker and Pritchard, 1953, Hilgardia 22(7): 209.

The description of *stenoperitrematus* and its position in Ugarov and Nikolskii's key indicate that the empodium is a simple claw with six ventral hairs. The peritreme is described as forming a simple, enlarged ultimate compartment. The description of the aedeagus (not illustrated) further indicates that this mite belongs to the Pratensis Group. No satisfactory identification of this spider mite can be made at the present.

McGregori Group

The McGregori Group is closely allied to the Pratensis Group. Females of the two groups bear similar patterns of dorsal striae on the idiosoma, the striae behind the inner sacrales being longitudinal and the dorsolateral striae being mostly transverse. Tibia I bears nine



Fig. 311. *Oligonychus sacchari*:
aedeagus.

tactile (and one sensory) setae; and tarsus I bears four tactile (and one sensory) setae proximal to the duplexes, and two tactile setae just distal to the duplexes on the ventral side. There are similarly only three pairs of proximoventral empodial hairs. However, the peritremes are strongly retrorse distally, and the duplex setae on tarsus I are more widely spaced. Moreover, members of the McGregori Group are not known to occur on grasses.

The aedeagi of the species referred to the McGregori Group are distinctive in that the distal end is bent dorsad and with a very long

and slender termination. The proximoventral appendages of empodium I of the male consist of three pairs of hairs.

Oligonychus mcgregori (Baker and Pritchard), new combination
(Figures 312, 313, 314)

Paratetranychus mcgregori Baker and Pritchard, 1953, *Hilgardia*, 22(7): 209. *Holotype*: male, Chinandega, Nicaragua, on cotton: in the U. S. National Museum.

The female of *Oligonychus mcgregori* may be recognized by the group characters. The very slender prolongation of the aedeagus is distinctive.

This species is known only from the types from Central America, on cotton.

Oligonychus gossypii (Zacher), new combination
(Figure 315)

Paratetranychus gossypii Zacher, 1920, *Zts. angew. Ent.*, 7: 183; Hirst, 1926, *Proc. Zool. Soc. Lond.*, 1926: 832; André, 1933,

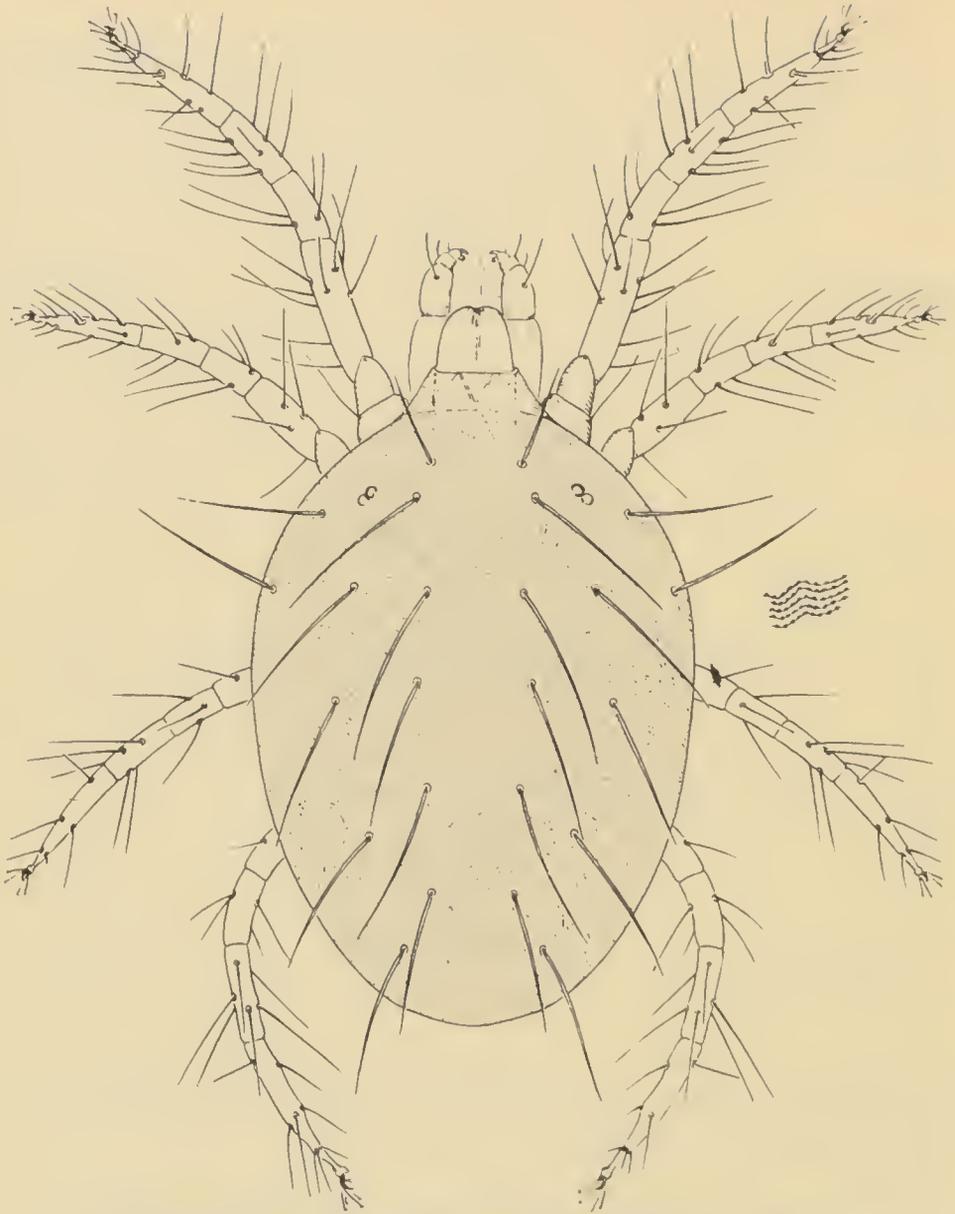


Fig. 312. *Oligonychus mcgregori*: dorsal aspect of female.

Bul. Mus. Hist. Nat. Paris (sér. 2), 5: 306. *Types*: males and females, Togo, Africa; probably in the Zacher collection.

Descriptions of *Oligonychus gossypii* will not definitely determine whether this species is referable to the Mcgregori Group. However, published figures of the aedeagus indicate that this species is either closely allied to *O. mcgregori*, or else it is worthy of a group of its own.

Hirst recorded this species from Sierra Leone, Africa, on cassava and beans; and from Portuguese West Africa, on papaya. It was originally described from cotton.

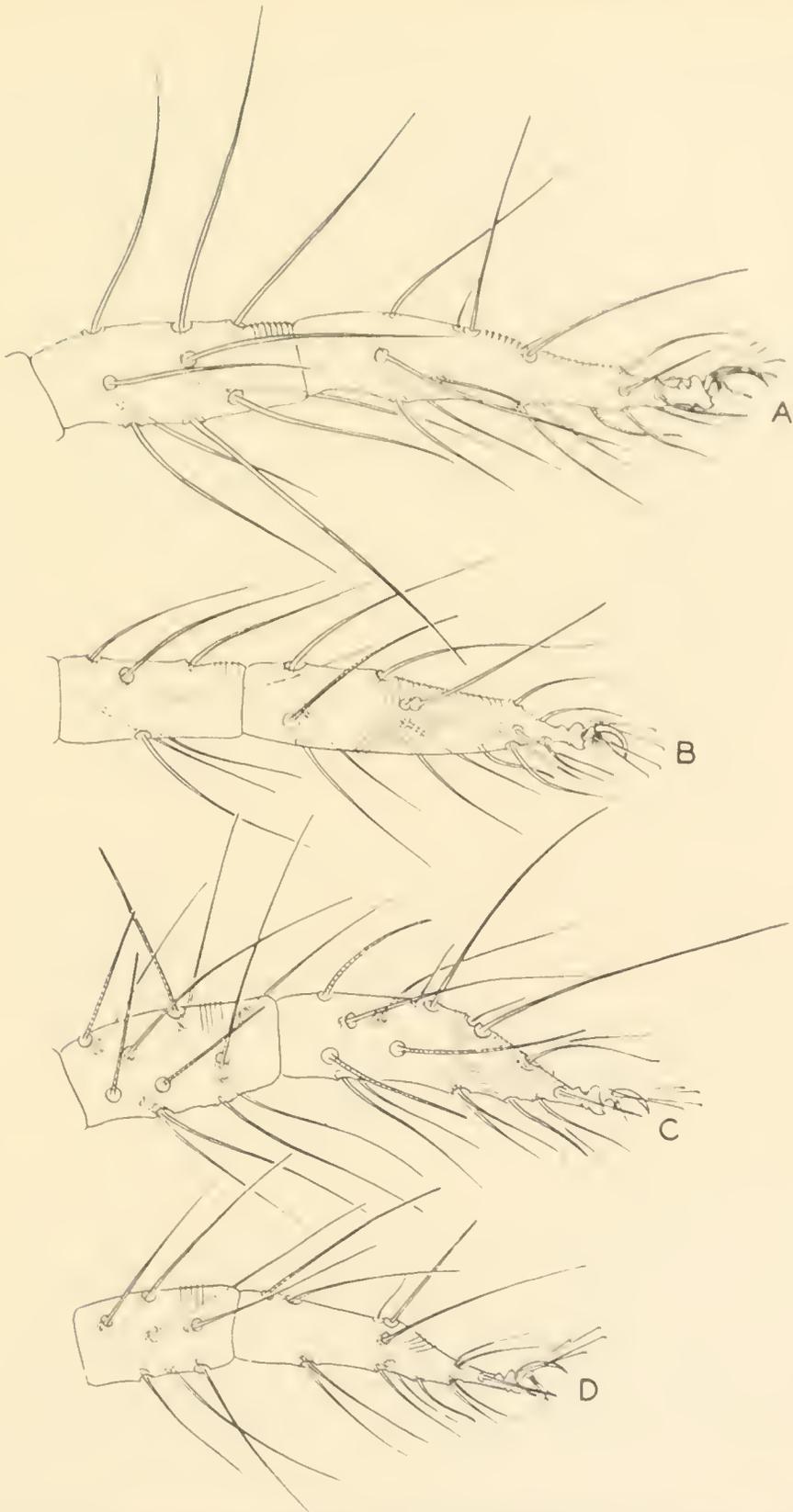


Fig. 313. *Oligonychus mcgregori*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

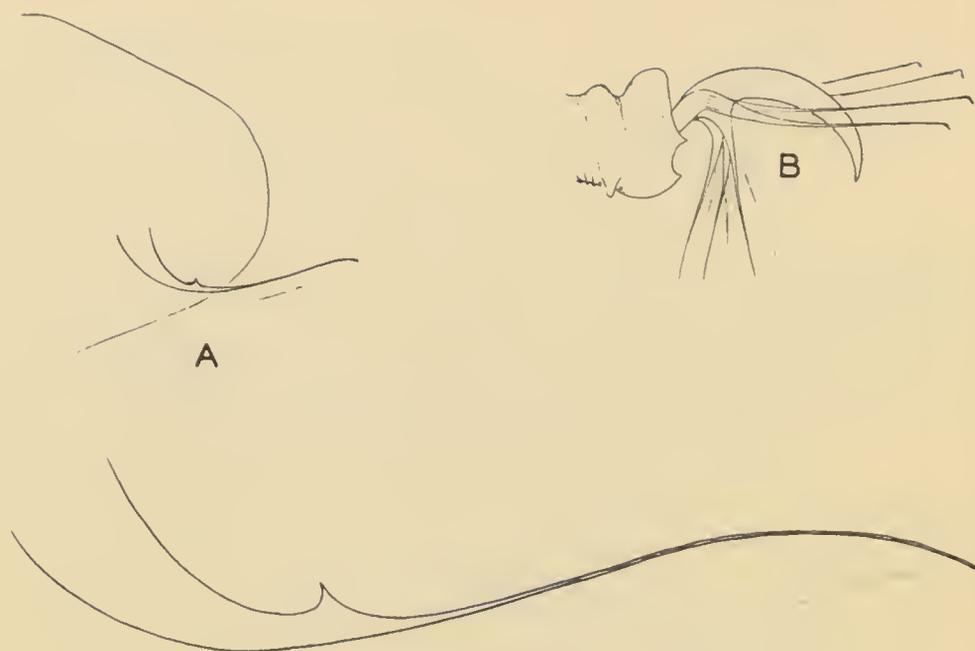


Fig. 314. *Oligonychus mcgregori*: A.) aedeagus;
B.) empodium II of female.



Fig. 315. *Oligonychus gossypii*: aedeagus.

Pritchardi Group

The Pritchardi Group of the genus *Oligonychus* is readily recognizable by the integumentary pattern of the striae on the dorsum of the female, the striae being transverse between the inner and outer sacra, together with the tibial chaetotaxy. The female bears nine tactile (and one sensory) setae on tibia I; four tactile (and one sensory) setae on tarsus I proximal to the duplexes; and two tactile setae disto-ventrad of the duplexes on tarsus I. There are only three pairs of proximoventral hairs on the empodium.

The male bears three pairs of short, proximoventral hairs on empodium



Fig. 316. *Oligonychus biharensis*: above, tibia and tarsus I of female; below, tibia and tarsus I of male.

I in contradistinction to the Pratensis Group. The form of the aedeagus is distinctive in that there is a short and broad curvature upward with a long distal knob; the distal end of the knob is drawn out and may be ventrally directed to give the aedeagus the appearance of a primary ventral bend.

Members of the Pritchardi Group are usually found on trees. They are very small mites, yellowish, and with parallel-sided bodies.

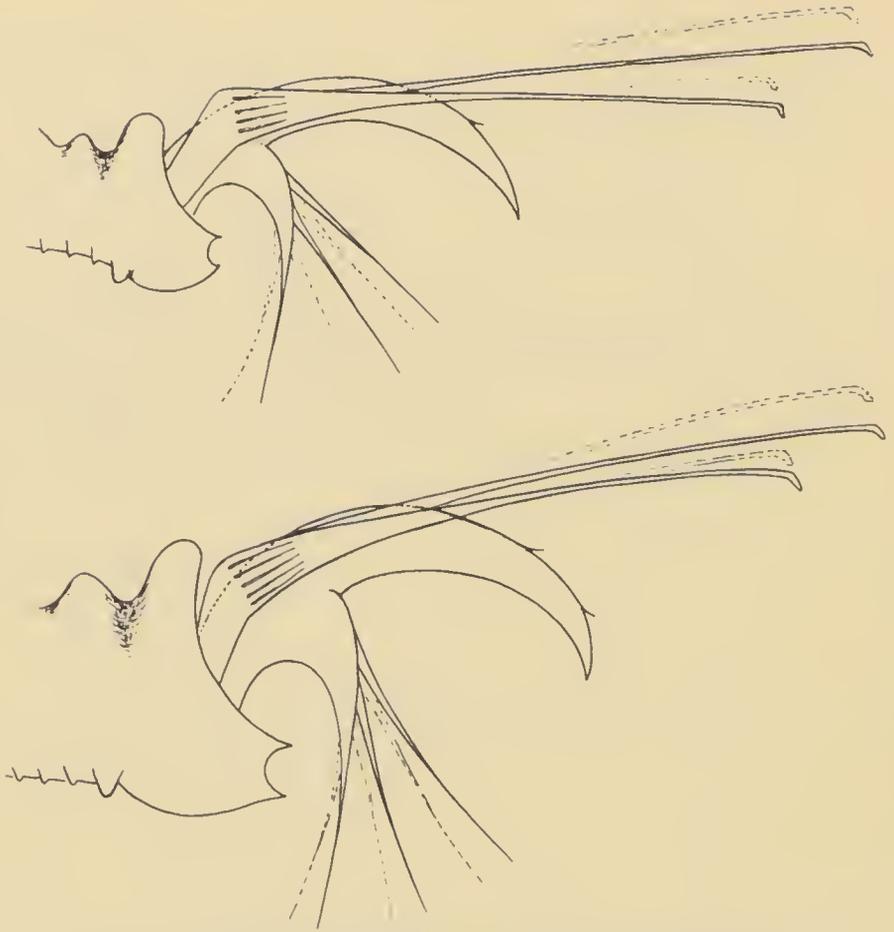


Fig. 317. *Oligonychus biharensis*: above, empodium I of female; below, empodium I of male.

Oligonychus biharensis (Hirst), new combination
(Figures 316, 317, 318)

Paratetranychus biharensis Hirst, 1925, Proc. Zool. Soc. Lond., 1925: 69. Types: males and females, Pusa, India, on rose; probably in the British Museum (Natural History).

Paratetranychus hawaiiensis McGregor, 1950, Amer. Midl. Nat., 44: 340. Types: males and females, Honolulu, Hawaii, on loquat; in the U. S. National Museum. *New synonymy*.

The figures of the aedeagi presented by Hirst and McGregor, together with a study of specimens having similar aedeagi, convince us that *hawaiiensis* is a synonym of *biharensis*.

Females are readily differentiated from other members of the group by having the peritremes retrorse distally.

Subfamily Tetranychinae Berlese

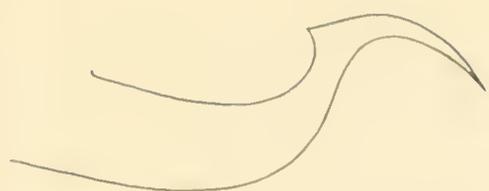


Fig. 318. *Oligonychus binarensis*:
aedeagus.

The male of this species may be recognized by having the distal enlargement of the aedeagus with the axis parallel to that of the shaft but with the dorsal margin convex and the tip bending downward.

Oligonychus binarensis is known from type specimens from South India, on rose; from Honolulu, Hawaii, on loquat; and from Antigua, on litchi. One female, Lingodalalli, Mysore, South India (M. Puttarudriah), on areca palm, is also referred to this species.

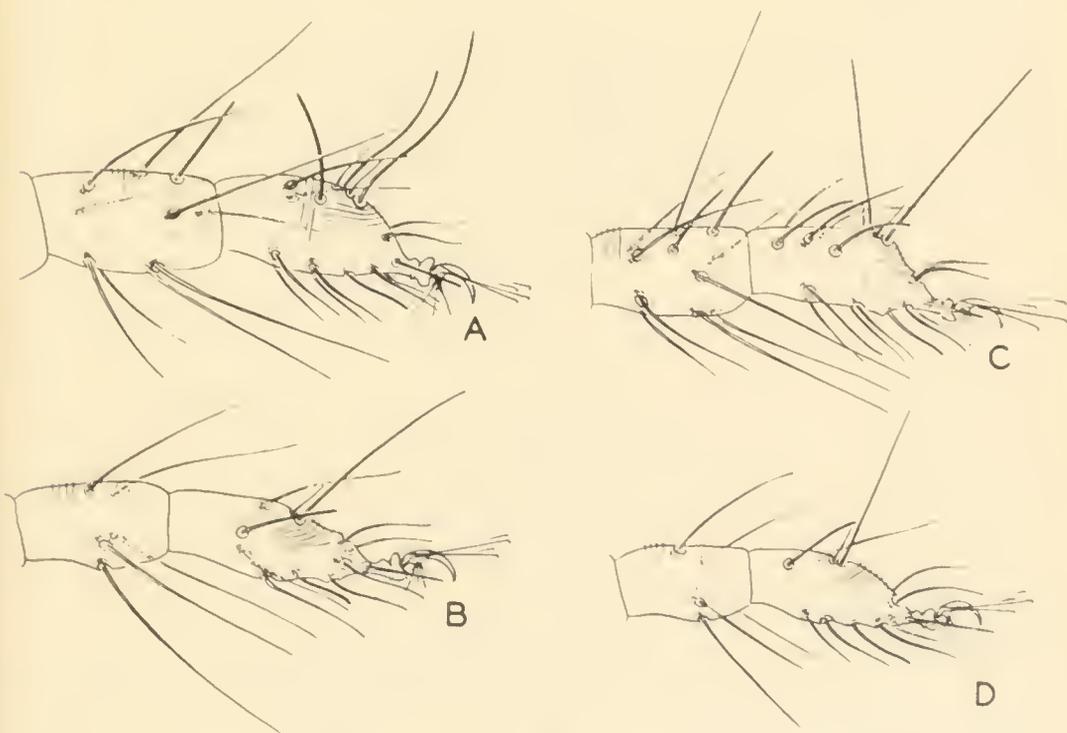


Fig. 319. *Oligonychus pritchardi*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

Oligonychus pritchardi (McGregor), new combination
(Figures 319, 320, 321)

Paratetranychus pritchardi McGregor, 1950. Amer. Midl. Nat., 44: 350.
Types: males and females, Berkeley, California, on valley oak:
in the U. S. National Museum.

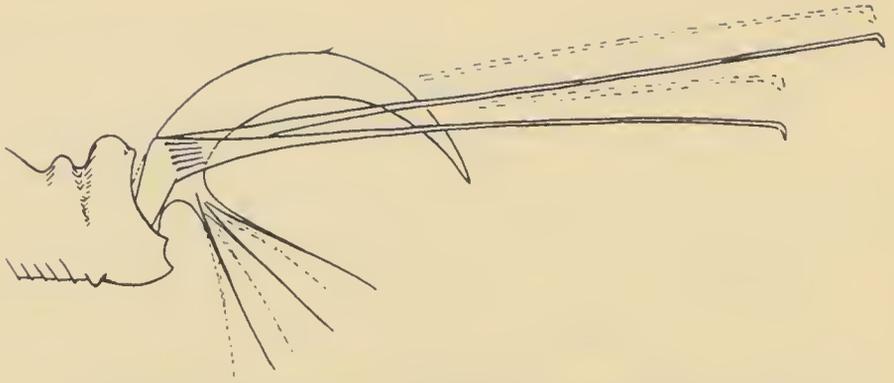


Fig. 320. *Oligonychus pritchardi*: empodium I of male.



Fig. 321. *Oligonychus pritchardi*:
aedeagus.

The male of *Oligonychus pritchardi* is distinctive in that the distal hook is nearly straight on the dorsal margin, except for the obtuse angulation. The tip of the aedeagus reaches a level of the axis of the shaft. The peritreme has a simple bulb distally.

The female is indistinguishable from *Oligonychus propetes*.

This species forms compact colonies that live under very dense canopies of webbing, either on the upper or lower sides of leaves of deciduous oaks. In this biological characteristic it differs considerably from that of other species of *Oligonychus*.

Oligonychus pritchardi was described from specimens from oak on

the University of California campus. We have studied specimens from Berkeley, California (A. E. Pritchard), on valley oak; Wiley City, Washington (E. J. Newcomer), on oak; Yakima, Washington (E. W. Baker), on oak; Oregon City, Oregon (E. W. Baker), on oak; and Hood River, Oregon (E. W. Baker), on oak.

Oligonychus propetes Pritchard and Baker, new species
(Figures 322, 323, 324)

The female of *Oligonychus propetes* resembles that of *O. pritchardi*. It differs from *O. biharensis* in that the peritreme is straight distally,

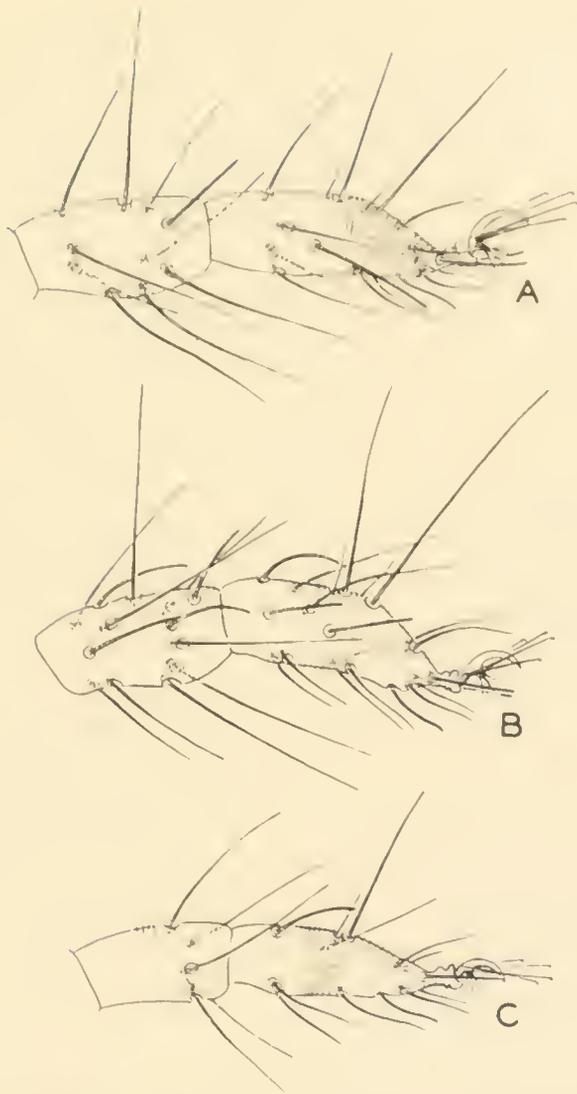


Fig. 322. *Oligonychus propetes*: A.) tibia and tarsus I of female; B.) tibia and tarsus I of male; C.) tibia and tarsus II of male.



Fig. 323. *Oligonychus propetes*: empodium I of male.



Fig. 324. *Oligonychus propetes*: aedeagus.

and from *O. hadrus* in that the members of each duplex are very unequal. The aedeagal barb is strongly convex on the dorsal margin with the acuminate tip directed ventrally, much as in *Oligonychus hadrus*.

This mite is apparently common on deciduous oaks in the eastern United States.

Male.—Palpus with terminal sensillum rudimentary. Peritreme straight distally, ending in a simple bulb. Tibia I with nine tactile and four sensory setae; tarsus I with four tactile and two (or three) sensory

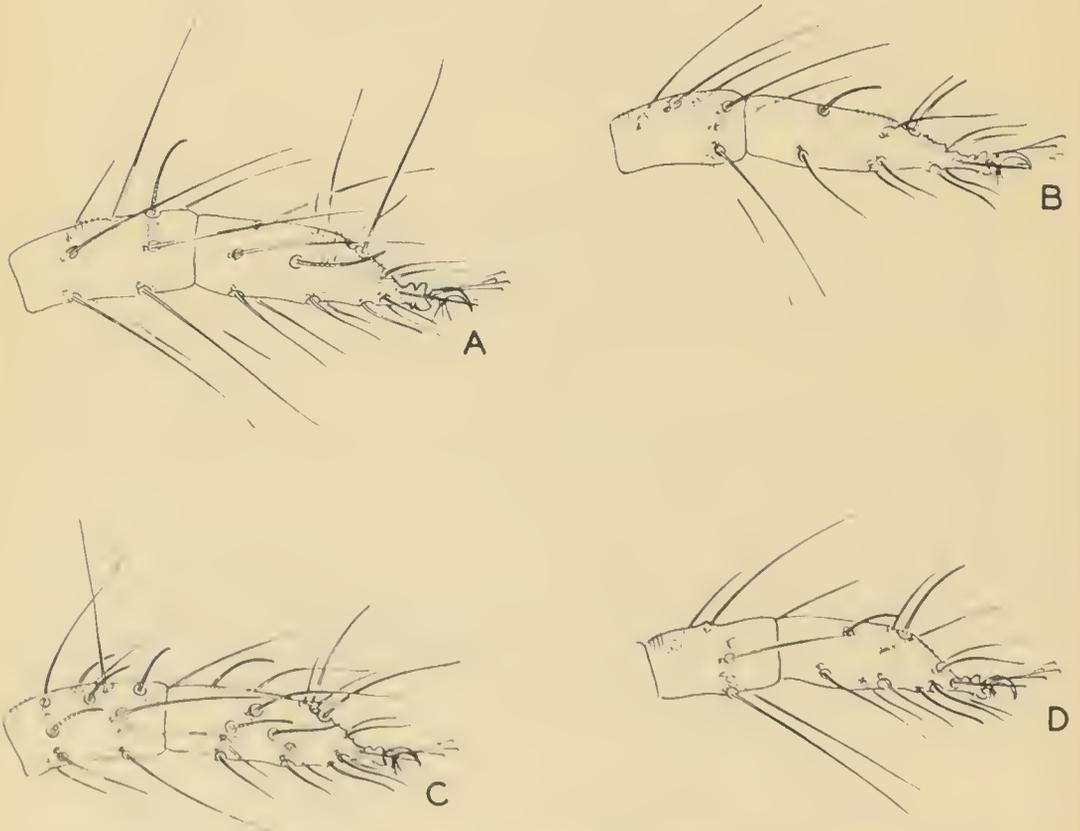


Fig. 325. *Oligonychus nadrus*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.



Fig. 326. *Oligonychus hadrus*: empodium I of female.

setae proximal to duplexes, with a pair of tactile setae ventrally at level of duplexes; duplexes each with proximal member very short; empodium I a hooked claw, longer than the three pairs of proximoventral hairs. Tibia II with five tactile setae. Dorsum of body with setae slender and tapering, longer than intervals between bases. Aedeagus curved dorsad but terminal enlargement large, with short proximodorsal angulation and with long caudoventrally curved terminal angulation. Length of body $266\ \mu$, including rostrum $340\ \mu$; greatest width of body $166\ \mu$.

Female.—Similar. Palpus with terminal sensillum large, three times as long as wide at base. Stylophore broadly convex cephalically. Tibia I with nine tactile and one sensory setae; tarsus I with four tactile and one sensory setae proximal to duplexes. Length of body $345\ \mu$, including gnathosoma $440\ \mu$; greatest width of body $200\ \mu$.

Holotype.—Male, Tyson's Corner, Virginia, July 24, 1951 (E. W. Baker), on oak; type no. 2145 in the U. S. National Museum. *Paratypes*.—Nineteen males, 35 females, Tyson's Corner, Virginia, July 11 and 24, 1951 (E. W. Baker), on oak; 8 males, 8 females, McLean, Virginia, August 18 and September 4, 1952 (E. W. Baker), on oak; 15 males, 35 females, Washington, D. C., July 4, 1953 (E. W. Baker), on oak; 2 males, 1 female, Durham, North Carolina, June 19, 1953 (A. E. Pritchard), on white oak.

Oligonychus hadrus Pritchard and Baker, new species
(Figures 325, 326, 327)

Adults of *Oligonychus hadrus* closely resemble those of *O. pritchardi* and *O. propetes*, but both sets of duplex setae on tarsus II are composed



Fig. 327. *Oligonychus hadrus*: aedeagus.

of members that are more or less similar in length, rather than having the proximal member of each duplex very short. Moreover, the distal sensory rod on the female palpus of *Oligonychus hadrus* females is very slender, over four times as long as wide.

The aedeagus of *Oligonychus hadrus* closely resembles that of *O. propetes*. The distal enlargement is strongly convex on the dorsal margin, and the acuminate tip is caudoventrally directed and reaching the level of the axis of the shaft.

Male.—Palpus with terminal sensillum rudimentary. Peritreme straight distally, ending in a simple bulb. Tibia I with nine tactile and four sensory setae; tarsus I with four tactile and three sensory setae proximal to duplexes; with a pair of tactile setae ventral to duplexes; duplexes each with the proximal member about two thirds as long as distal member; empodium I cultriform, longer than the three pairs of proximoventral hairs. Tibia II with six (or seven) tactile setae. Body with dorsal setae slender, tapering, longer than longitudinal intervals between them. Aedeagus with ventral surface curved dorsad, but the distal enlargement large, with a small anterior angulation and with a large, caudoventrally curved projection. Length of body 266 μ , including rostrum 320 μ .

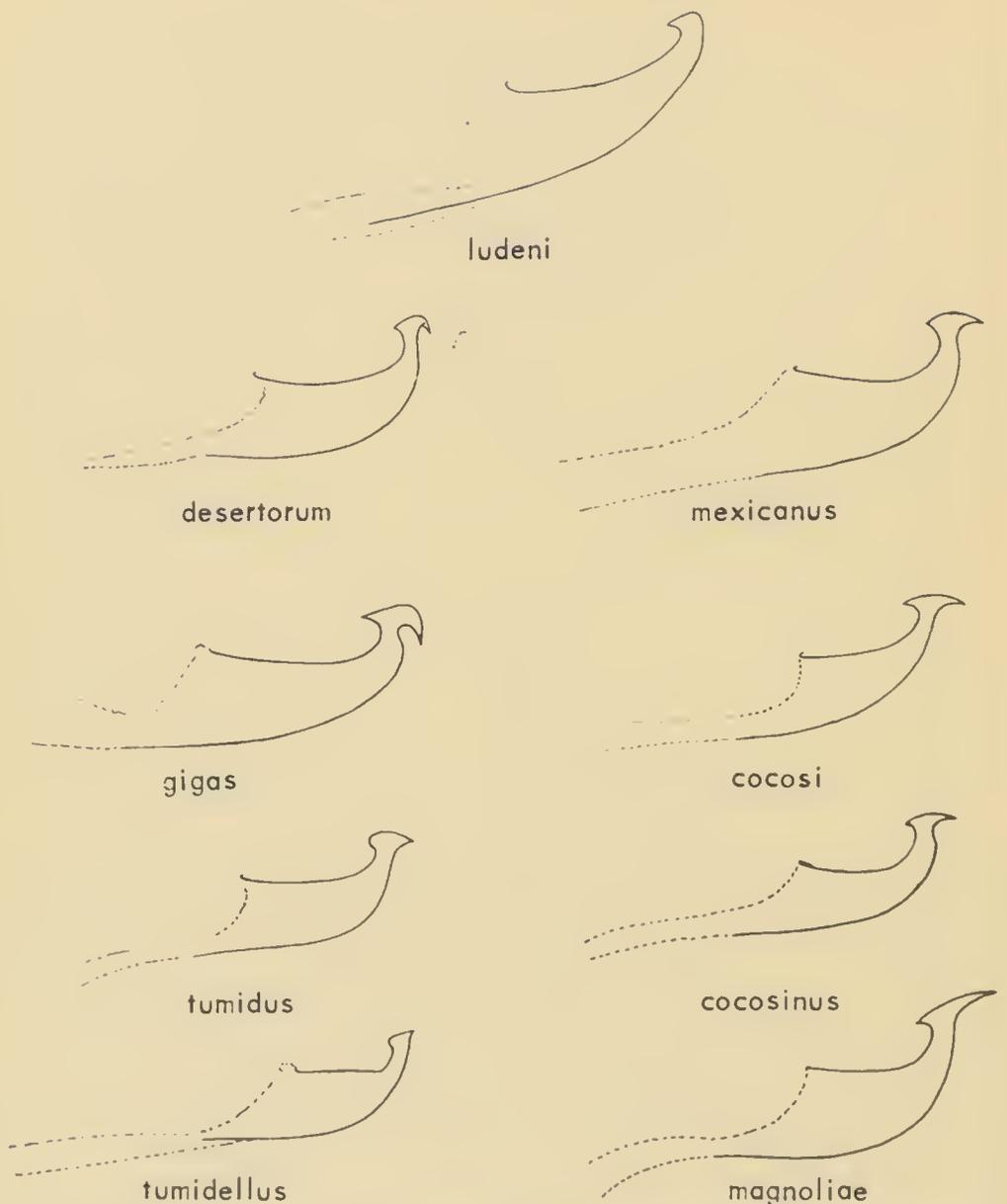


Fig. 329. *Tetranychus*, aedeagi of Desertorum and Tumidus Groups.

Oligonychus brevipodus (Targioni Tozzetti)

Heteronychus ? *brevipodus* Targioni Tozzetti, 1878, Ann. Agric., 1: 255.
Described from specimens from (probably Florence) Italy, on holly oak.

Oligonychus brevipodus, Berlese, 1886, Acari Dann. Piante Coltiv., p. 24; Canestrini, 1889, Atti Reale Ist. Veneto Sci. Let. Arti (ser. 6), 7: 534; Hirst, 1920, Proc. Zool. Soc. Lond., 1920: 60.

Oligonychus quercinus, Hirst, 1920, Proc. Zool. Soc. London, 1920: 59. Misidentification.

Subfamily Tetranychinae Berlese

Oligonychus minimus, Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 30. *Misidentification*.

Targioni Tozzetti originally emphasized that the empodium of *brevipodus* is clawlike, his description being based on a nymph. Berlese similarly appears to have figured a nymph as his identification of this species, but he does indicate, although inaccurately, that proximoventral hairs are present.

Examination of Hirst's *quercinus* from oaks in England shows that it is structurally related to *O. coffeae*, although the small size and pale color belong to the Pritchardi Group. However, we consider *quercinus* to be a synonym of *Eotetranychus aurantii*.

Hirst also pointed out the possibility that *Oligonychus brevipodus* Berlese, as well as *Tetranychus virescens* Berlese (apparently a manuscript name) might represent the same species.

The specific status of *Oligonychus brevipodus* must be based on topotype material.

GENUS TETRANYCHUS DUFOUR

Tetranychus Dufour, 1832, Ann. Sci. Nat. Paris, 25: 276; Koch, 1836, Deutsche Crust. Myr. Arach., fasc. 1, 10; Dugés, 1834, Ann. Sci. Nat. Paris (sér. 2), 1: 14; Koch, 1842, Uebers. Arach. Syst., 3: 58; Donnadieu, 1875, Ann. Soc. Linn. Lyon (n. ser.), 22: 147; Murray, 1877, Econ. Ent. Apt. p. 97; Canestrini and Fanzago, 1878, Atti reale Istit. Ven. Sci. Let. Arti (ser. 5), 4: 148; Canestrini, 1889, Atti Reale Istit. Ven. Sci. Let. Arti (ser. 6), 7: 494; Banks, 1900, U. S. Dept. Agr. Div. Ent. Tech. Ser., 8: 70; Banks, 1907, Proc. U. S. Natl. Mus., 32(1553): 598; Trägårdh, 1915, Zts. ang. Ent., 2: 163; Trägårdh, 1915, Meded. Centralanst. Försöks. Jordbruks. Ent. Avd., 20: 19; McGregor, 1919, Proc. U. S. Natl. Mus., 56(2303): 649; Hirst, 1920, Proc. Zool. Soc. Lond., 1920: 49; Vitzthum, 1929, Tierw. Mitteil., 3(7): 49; Oudemans, 1930, Ent. Ber. 8(175): 158; Oudemans, 1931, Ent. Ber., 8(177): 190; Oudemans, 1931, Ent. Ber., 8(178): 221; Oudemans, 1937, Krit. Hist. Overz. Acar., 3(C): 1012; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 35; Garman, 1940, Bul. Conn. Agr. Exp. Sta., 431: 80; Womersley, 1940, Trans. Roy. Soc. S. Australia, 64: 256; McGregor, 1950, Amer. Midl. Nat., 44(2): 277; Baker and Pritchard, 1953, Hilgardia, 22(7): 212.

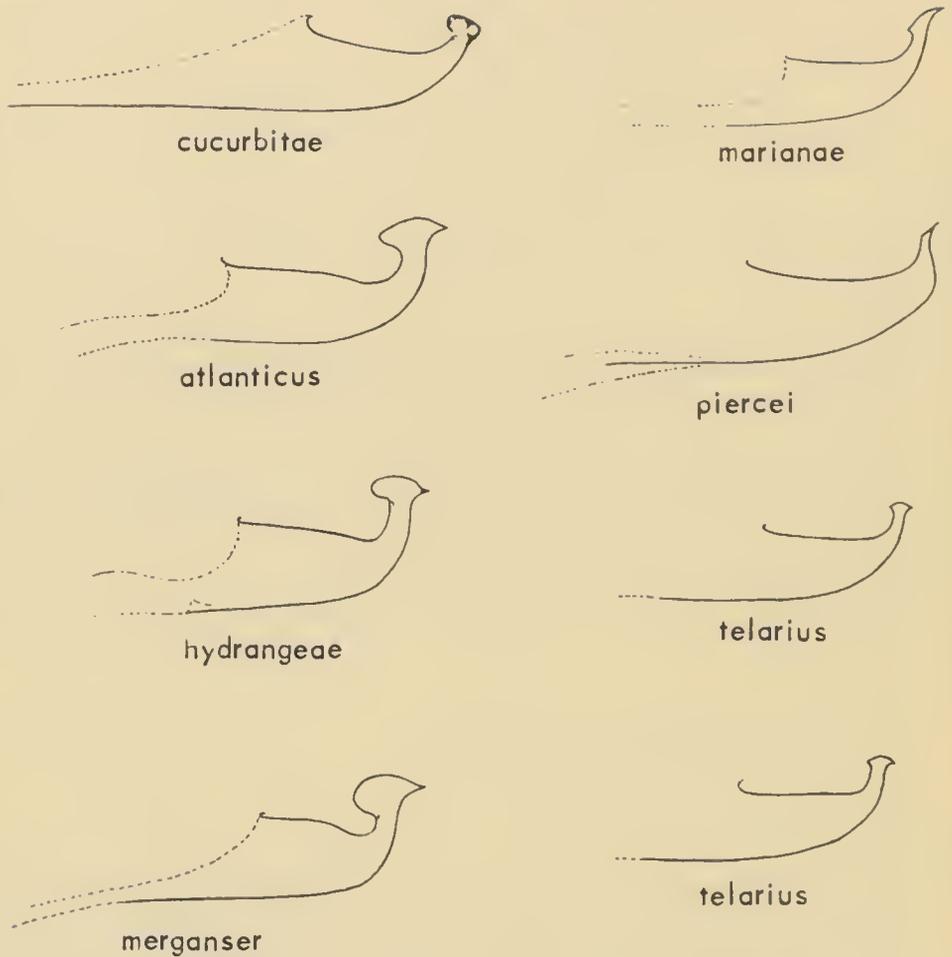


Fig. 330. *Tetranychus*, aedeagi of *Telarius* Group.

- Distigmatus* Donnadieu, 1876, Ann. Soc. Linn. Lyon (1875), 22: 146.
 Type of genus: (*Distigmatus pilosus* Donnadieu) *Tetranychus telarius* (Linnaeus); monobasic.
- Tetranychus* (*Epitetranychus*) Zacher, 1916, Mitt. kais. biol. Anst. Land-Forstw., 16: 22. Type of subgenus: (*Tetranychus altheae* Hanstein) = *T. telarius* (Linnaeus); by original designation.
- Epitetranychus*, Zacher, 1916, Mitt. kais. biol. Anst. Land-Forstw., 16: 24; Oudemans, 1931, Ent. Ber., 8(177): 193.
- Septanychus* McGregor, 1919, Proc. U. S. Natl. Mus., 56(2303):663; McGregor, 1950, Amer. Midl. Nat., 44(2):316. Type of genus: *Tetranychus tumidus* Banks, by subsequent designation of Baker and Pritchard (1953).
- Amphitetranychus* Oudemans, 1931, Ent. Ber., 8(178): 225; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 32. Type of genus: *Tetranychus viennensis* Zacher; by original designation and monobasic. New synonymy.

Subfamily *Tetranychinae* Berlese

Mites belonging to the genus *Tetranychus* feed on the underside of leaves of most of the angiospermous plants, usually forming colonies, at least to start with, and sometimes producing a great deal of webbing. The eggs are pearly, spherical, and without a dorsal stipe.

Adult females in the more northern climates are nearly always greenish or straw-colored, but those in the tropical areas are carmine in basic color. They overwinter, or enter a non-feeding phase, as orange females; elsewhere reproduction is continuous throughout the year.

The genus *Tetranychus* may be recognized by having only one pair of para-anal setae (the postanals being absent) and by having the empodium composed of three (only two in *T. fijiensis*) pairs of proximoventral hairs on the female, or on tarsi III and IV of the male, above which there is a rudimentary or small spur, much shorter than the ventrally directed hairs. The paired empodial hairs are all similar in length and width (except in *T. fijiensis*).

The end of the peritreme always bears a long, four or five chambered hook, rarely anastomosing. The duplex setae on tarsus I are widely separated on the dorsum on the tarsus, and this segment is long and gradually narrows distally. Empodium I of the male usually consists of a pair of short, tridigitate appendages with or without a mediodorsal spur, and tarsus II usually bears a short spur above the paired empodial hairs. The aedeagus bends sharply dorsad, and the development of the distal end is characteristic of the species. Dorsal setae of the body are long and slender, and they are not borne on tubercles.

Species Erroneously Referred to the Genus Tetranychus

Less than a century ago, some scientists believed that red-spider mites were the adult forms of chiggers or eriophyid mites. Related families of predaceous, prostigmatic mites were still not clearly differentiated. It is not surprising, therefore, that a few species have been described in or transferred to the genus *Tetranychus* although they properly belong to other families. The following list comprises such names known to us:

prunicolor Dugés, 1834	Raphignathidae
caudatus Dugés, 1834	Phytoptipalpidae
trombidinus Dugés, 1834	Stigmaeidae
major Dugés, 1834	Eupodidae
longipes Dugés, 1834	Eupodidae
celer Dugés, 1834	Tydeidae
glabrum Dugés, 1834	Stigmaeidae
salicis Koch, 1838	Tydeidae

tini Boisduval, 1867	Phytoptipalpidae
taxi Murray, 1875	Eriophyidae
molestissimus (Weyenberg), 1876	Trombiculidae
tlalsahuate (Murray), 1877	Trombiculidae
superba (Canestrini), 1888	Raphignathidae
longirostris Mola, 1907	Aphidae
vestitus Canestrini and Fanzago, 1876	Stigmaeidae

For a complete list of the tetranychids that have been referred to the genus *Tetranychus*, see the index.

The following names appear to be *nomina nuda*: *Tetranychus gibbus* Koch; and *T. brevipes* Koch. The original description of one other species has not been located. This is *Tetranychus ulicis* Jourdain, referred to by André (1933) and considered by him to be a synonym of the mite that we refer to as *Tetranychus telarius*.

Key to species of TETRANYCHUS

1. Empodium with two pairs of empodial hairs, the dorsal pair shorter than the ventral pair; mediodorsal spur of empodium nearly one-half as long as proximoventral hairs (Fijiensis Group) *fijiensis* (p. 382)
1. Empodium with three pairs of empodial hairs, all similar in length; mediodorsal spur of empodium not over one-third as long as proximoventral hairs 2
- 2.(1). Peritreme with distal end irregularly anastomosing (Viennensis Group) *viennensis* (p. 384)
- 2.(1). Peritreme with distal end forming a simple hook 3
- 3.(2). Tarsus I with proximal pair of duplex setae in line with most other proximal setae (Desertorum Group) 4
- 3.(2). Tarsus I with proximal pair of duplex setae distad of other proximal tactile setae 6
- 4.(3). Knob of aedeagus nearly one-third as long as dorsal margin of shaft *gigas* (p. 405)
- 4.(3). Knob of aedeagus not over one-fourth as long as dorsal margin of shaft 5
- 5.(4). Aedeagus with knob about one-fourth as long as dorsal margin of shaft *desertorum* (p. 403)
- 5.(4). Aedeagus with knob scarcely larger than stem and the caudal angulation absent *ludeni* (p. 405)
- 6.(3). Empodium with an obvious empodial spur (Tumidus Group) 7

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- 6.(3). Empodium (except for legs I and II of male) with the empodial spur very tiny or absent 12
- 7.(6). Empodial spur at least one-third as long as proximoventral hairs 8
- 7.(6). Empodial spur not over one-fourth as long as proximoventral hairs 11
- 8.(7). Knob of aedeagus with anterior projection broadly rounded *tumidus* (p. 408)
- 8.(7). Knob of aedeagus with anterior projection angulate 9
- 9.(8). Aedeagus with knob less than twice as wide as its stem, the angulations similar *tumidellus* (p. 409)
- 9.(8). Aedeagus with knob four times as wide as its stem, the caudal angulation much longer than the anterior angulation 10
- 10.(9). Axis of aedeagal knob parallel to axis of shaft
. *mexicanus* (p. 411)
- 10.(9). Axis of aedeagal knob forming an angle with axis of shaft
. *magnoliae* (p. 412)
- 11.(9). Palpus of male with terminal sensillum three times as long as broad at base; knob of aedeagus with posterior angulation but slightly longer than anterior angulation *cocosi* (p. 414)
- 11.(9). Palpus of male with terminal sensillum over four times as long as broad at base; knob of aedeagus with posterior angulation twice as long as anterior angulation *cocosinus* (p. 417)
- 12.(6). Female* with transverse (sometimes irregularly so) striae between the third pair of dorsocentral hysterosomals and in the area caudad of these setae (Pacificus Group) 13
- 12.(6). Female with longitudinal striae between the third pair of dorsocentral hysterosomals and with a diamond shaped pattern in the area caudad of these setae (Telarius Group) 19
- 13.(12). Female with transverse integumentary striae between inner sacral setae 14
- 13.(12). Female with longitudinal or irregular integumentary striae between inner sacral setae 15

* Males belonging to the Pacificus and Telarius Groups may be identified by reference to figures of the aedeagus, but it is exceedingly difficult to present a key to the shapes of the simple aedeagi without considering the integumentary striae of the females. Moreover, females are found more easily than the males and are nearly always present in any collection.

Spider Mites

- 14.(13). Aedeagus with bent portion sigmoid, with or without a small anterior angulation, the distal end being at a level of caudal end of bend *medanieli* (p. 386)
- 14.(13). Aedeagus with a long posterior angulation on distal knob, its tip reaching well beyond level of caudal end of bend
. *pacificus* (p. 388)
- 15.(13). Empodia I and II of male each with an obvious mediodorsal spur 16
- 15.(13). Empodia I and II of male each with mediodorsal spur rudimentary or absent. 18
- 16.(15). Posterior angulation of aedeagal knob over three times as long as anterior angulation *homorus* (p. 390)
- 16.(15). Posterior angulation of aedeagal knob not over twice as long as anterior angulation 17
- 17.(16). Aedeagus with distal knob strongly enlarged, about one-half as long as dorsal margin of shaft *schoenei* (p. 392)
- 17.(16). Aedeagus with distal knob smaller, about one-fourth as long as dorsal margin of shaft *canadensis* (p. 393)
- 18.(15). Knob of aedeagus over twice as wide as its stem, the anterior angulation acute and the posterior angulation slender . . .
. *lambi* (p. 399)
- 18.(15). Knob of aedeagus less than twice as wide as its stem, the anterior angulation obtuse and the posterior angulation very short *polys* (p. 396)
- 19.(12). Knob of aedeagus berry-like, the rounded anterior projection more strongly developed than the posterior convexity . . .
. *cucurbitae* (p. 419)
- 19.(12). Knob of aedeagus not globular, the caudal projection angulate 20
- 20.(19). Aedeagal knob comparatively large, about one-third or one-fourth as wide as the dorsal margin of the shaft 21
- 20.(19). Aedeagal knob very small, not over one-sixth as long as dorsal margin of shaft 23
- 21.(20). Knob of aedeagus with dorsal margin obtusely angulate; female greenish *atlanticus* (p. 424)
- 21.(20). Knob of aedeagus with dorsal margin broadly convex; female carmine 22
- 22.(21). Anterior projection of aedeagal knob much broader than base of posterior angulation *merganser* (p. 429)

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- 22.(21). Anterior projection of aedeagal knob similar in width to base of posterior angulation *hydrangeae* (p. 425)
- 23.(20). Axis of knob of aedeagus forming a strong angle with axis of shaft, the posterior angulation obviously longer than the tiny anterior angulation 24
- 23.(20). Axis of knob of aedeagus parallel or forming a small angle with axis of shaft, the posterior angulation no longer than anterior angulation *telarius* (p. 432)
- 24.(23). Knob of aedeagus wider than base of its stem
 *marianae* (p. 429)
- 24.(23). Knob of aedeagus much smaller than base of its stem
 *piercei* (p. 431)

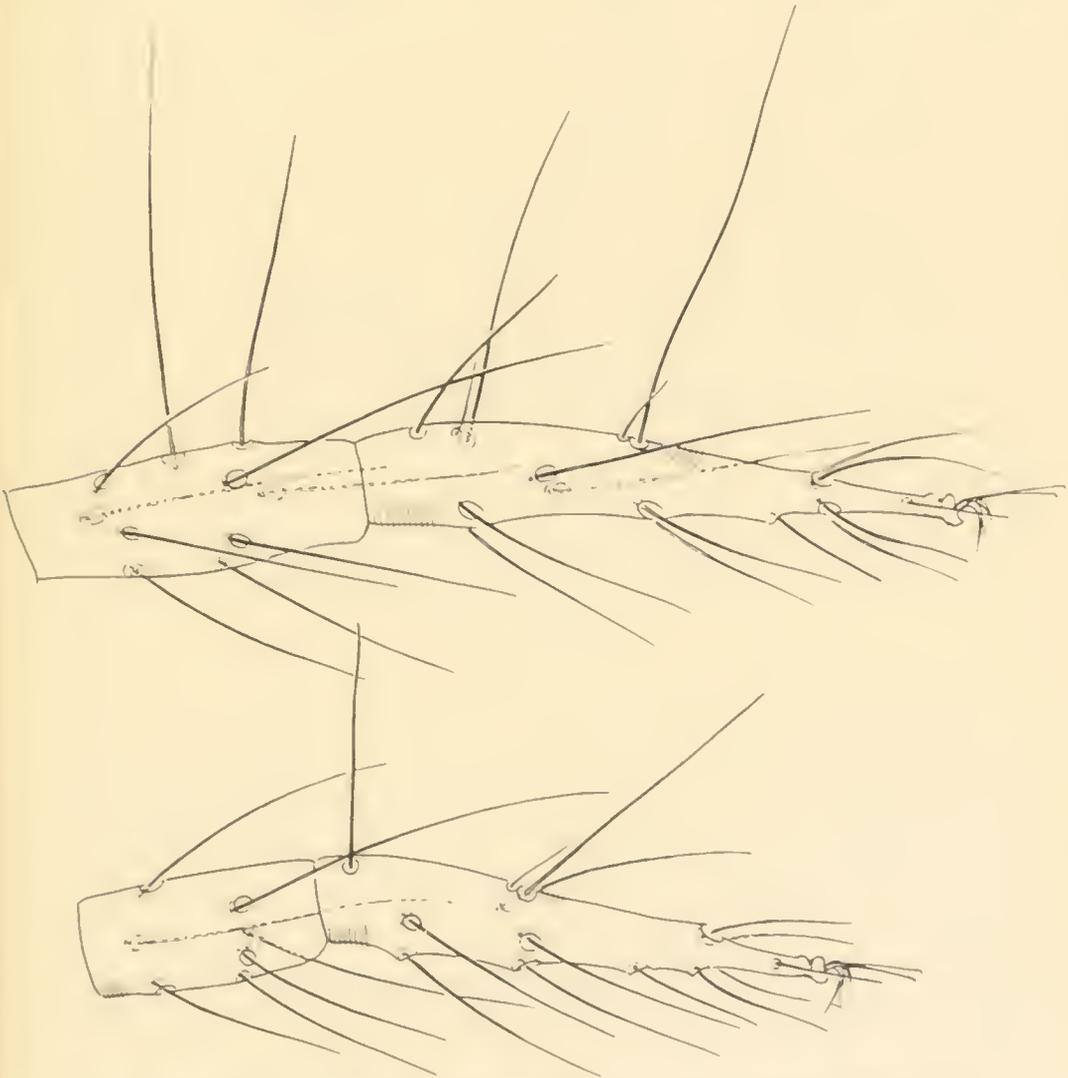


Fig. 331. *Tetranychus fijiensis*: above, tibia and tarsus I of female; below, tibia and tarsus II of female.

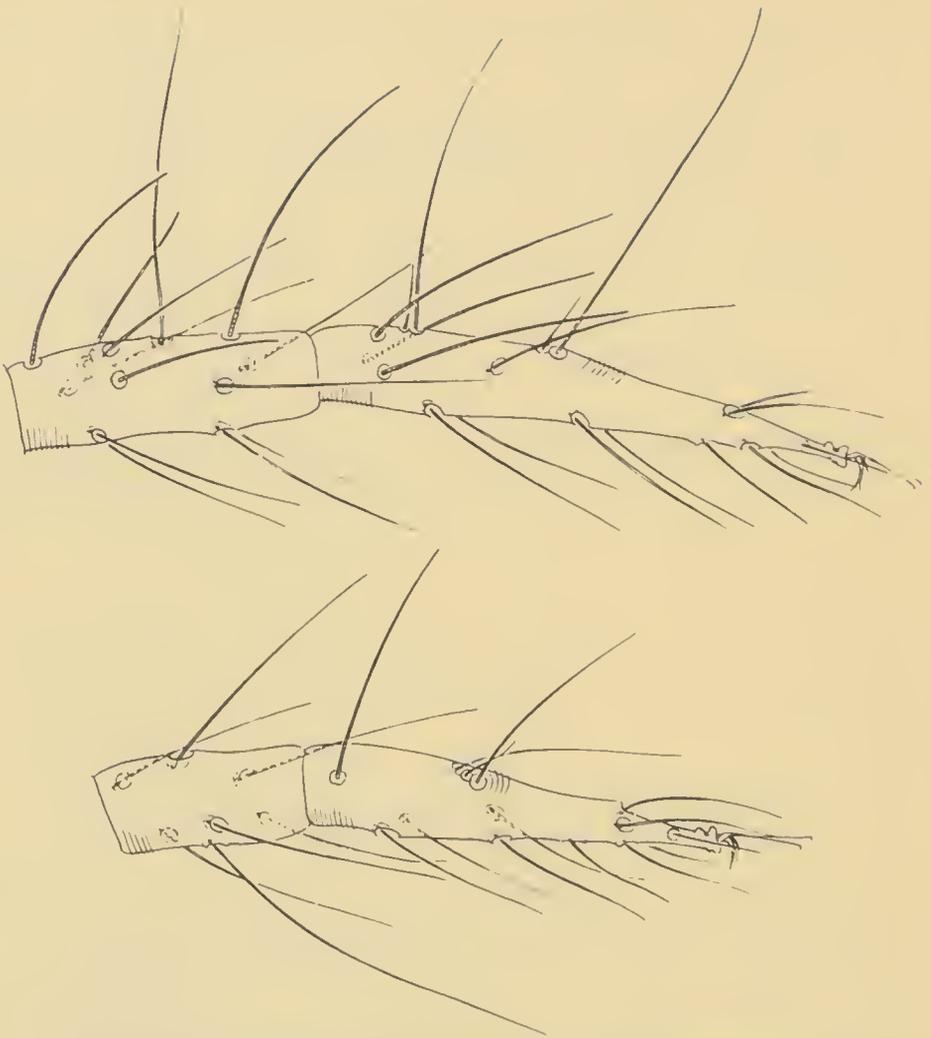


Fig. 332. *Tetranychus fijiensis*: above, tibia and tarsus I of male; below, tibia and tarsus II of male.

Fijiensis Group

The empodium of the single species on which the Fijiensis Group is based departs strongly from others in the tribe Tetranychini in that there are only two pairs of proximoventral hairs, and the dorsal pair is considerably smaller than the ventral pair. The mediodorsal spur of the empodium is strong, about one-half as long as the longer pair of proximal hairs. Such tarsal appendages suggest that this species is derived from a form similar to *Allonychus braziliensis*.

There is a single pair of para-anal setae. Tarsus I is attenuated and with the duplex setae widely spaced. The peritreme is strongly U-shaped distally. The integumentary striae on the hysterosoma between

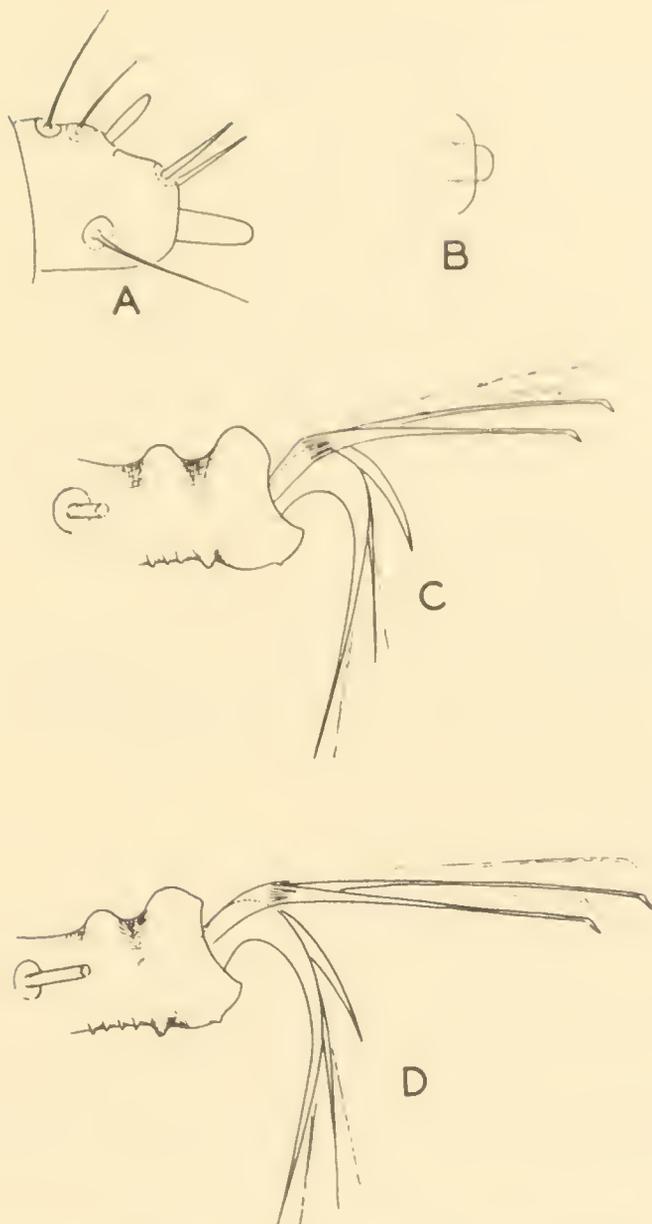


Fig. 333. *Tetranychus fijiensis*: A.) terminal segment of palpus of male; B.) terminal sensillum of palpus of female; C.) empodium I of female; D.) empodium I of male.

the third pair of dorsocentrals and the inner sacrals form a diamond-shaped pattern.

Empodium I of the male is similar to the others, except that the proximoventral hairs are nearly equal in length. The aedeagus also departs strongly from other members of the genus *Tetranychus* in that it is very slender and tapering, curved dorsad.

The group may be worthy of subgeneric or generic standing.

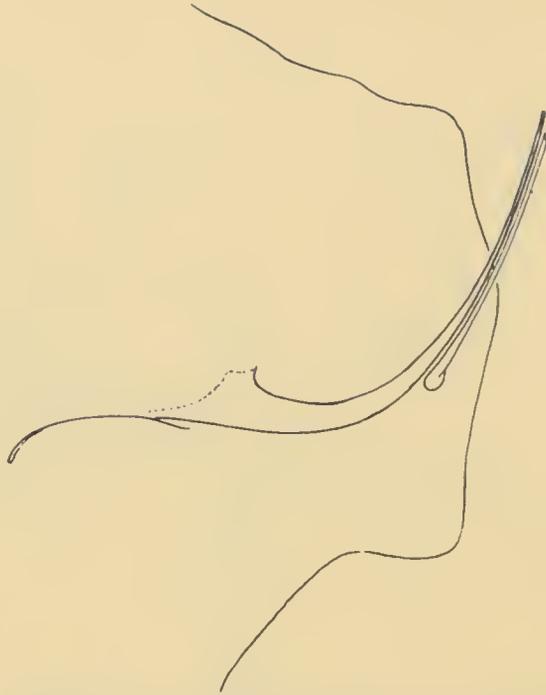


Fig. 334. *Tetranychus fijiensis*: aedeagus.

Tetranychus fijiensis Hirst

(Figures 331, 332, 333, 334)

Tetranychus fijiensis Hirst, 1924, Ann. Mag. Nat. Hist. (ser. 9), 14: 523. Types: male and female, Ovalau, Fiji, on coconut; probably in the British Museum (Natural History).

Specimens examined by us are from: Fiji (H. W. Simmonds), on coconut; Nakuoro Island, Micronesia (Townes), on *Cyrtosperma chamissonis*; and Likiep Island, Micronesia (Oakley), on coconut.

Viennensis Group

The irregularly anastomosing termination of the peritreme is characteristic of this group. The proximal pair of duplex setae on tarsus I is distal to the other proximal setae; and the empodial spur is rudimentary or absent.

The actively feeding female is described as being greenish-yellow in color (Dosse, 1953). Integumentary striae of the female are transverse between the third pair of dorsocentral hysterosomals and also the inner sacra. The distal portion of the aedeagus is very long and slender.

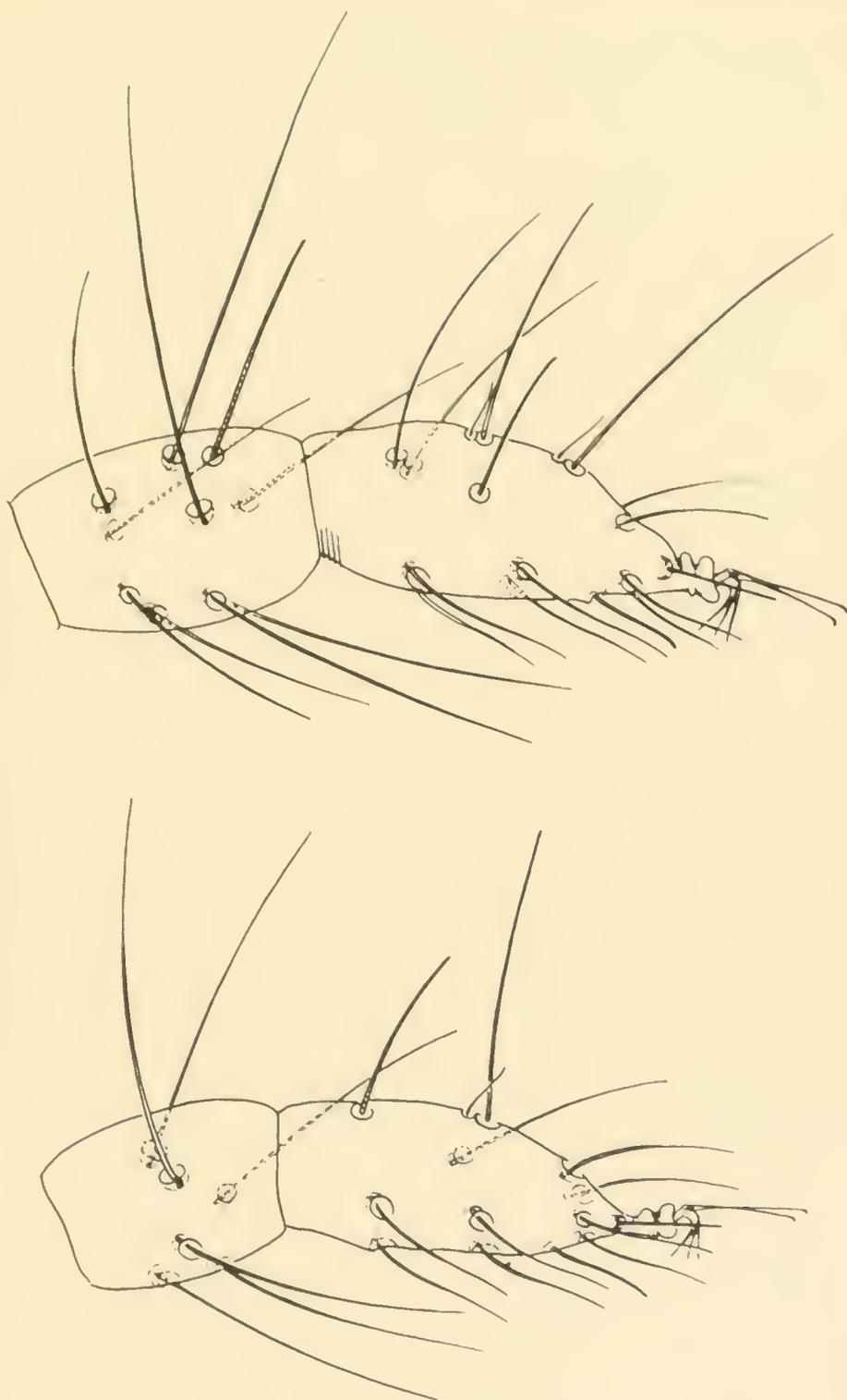


Fig. 335. *Tetranychus viennensis*: above, tibia and tarsus I of female; below, tibia and tarsus II of female.

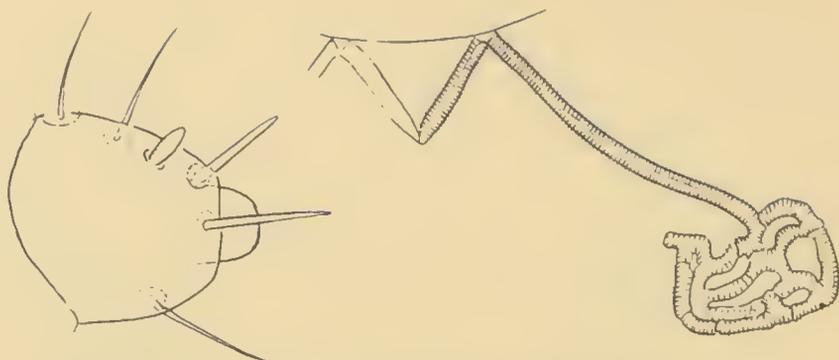


Fig. 336. *Tetranychus viennensis*: terminal segment of palpus of female and peritreme.

Tetranychus viennensis Zacher

(Figures 335, 336)

Tetranychus (*Epitetranychus*) *viennensis* Zacher, May 1920, Vorl. Diag. neuer Spinnmilb., p. 1; Zacher, 1921, Zts. ang. Ent., 7: 186.

Types: male and female, Wien, Austria, and Berlin-Dahlem, Germany, on apple, pear, sour cherry, and sweet cherry; possibly in the Zacher collection.

Tetranychus viennensis, Reck, 1950, Trudy Inst. Zool. Akad. Nauk. Gruz. S.S.R., 9: 127.

Amphitetranychus viennensis, Oudemans, 1931, Ent. Ber., 8(178): 225; Geijskes, 1929, Meded. Landbouwh. Wageningen, 42(4): 32.

Tetranychus erataegi Hirst, 1920, Proc. Zool. Soc. Lond., July 1920: p. 51; Hirst, 1923, Proc. Zool. Soc. Lond., 1923: 991. *Types*: male and female, Salisbury, Wilts, England, on hawthorn; probably in the British Museum (Natural History).

Apotetranychus longipenis Ugarov and Nikolskii, 1937, Trudy Sreadneaz. Stan. Zash. Rast., p. 34. Described from male and female specimens, Tashkent, Russia, on apple. *New synonymy*.

According to the recommendations of the International Commission on Zoological Nomenclature (Bul. Zool. Nom., 4: 217: 1950), the privately published (mimeographed) paper by Zacher (1920) constitutes publication. *Tetranychus viennensis*, therefore, has priority over *T. crataegi*.

The aedeagus of *Tetranychus viennensis* is bent sharply dorsad, and the distal knob is modified as a small anterior angulation near the base of the bent portion, with the caudal angulation very attenuated and tapering.

Subfamily *Tetranychinae* Berlese

This species has been recorded from England, on hawthorn; from Germany and Austria on apple, pear, and both sweet and sour cherry; and from Georgia, S.S.R., on apple, pear, prune, cherry, blackthorn, and oak. We have studied a series of females transmitted by courtesy of F. Zacher.

Tetranychus virginis (Ugarov), new combination

Apotetranychus virginis Ugarov, probably 1937, Vuipisha iz otcheta za 1936g, No. 465: 1-4. (reference in Zool. Record); 1937, Inst. Zashch. rast. za 1936g, 11 (reference in Reek, 1952a).

The article in which this species was described has not been seen. The generic transfer here is based on Ugarov's conception of the genus *Apotetranychus* in the paper in which "*Apotetranychus*" *longipenis* was described.

Pacificus Group

The Pacificus Group is defined principally on the basis of females. In this sex the integumentary striae are transverse (sometimes irregularly so) between the third pair of dorsocentral hysterosomals, and they are also transverse in the area between these setae and the inner sacrals. The area between the inner sacrals may bear either transverse or longitudinal striae.

The distal end of the peritreme consists of a simple hook. The proximal pair of duplex setae on tarsus I is distad of the other proximal setae, and the empodial spur is rudimentary or absent. The distal end of the aedeagus varies from being sigmoid to having a very large knob.

In life the actively feeding adult females are greenish, with a pair of dark medially and a pair of dark spots caudally. Species in this group are found in temperate zones.



Fig. 337. *Tetranychus riedanteli*: aedeagi.

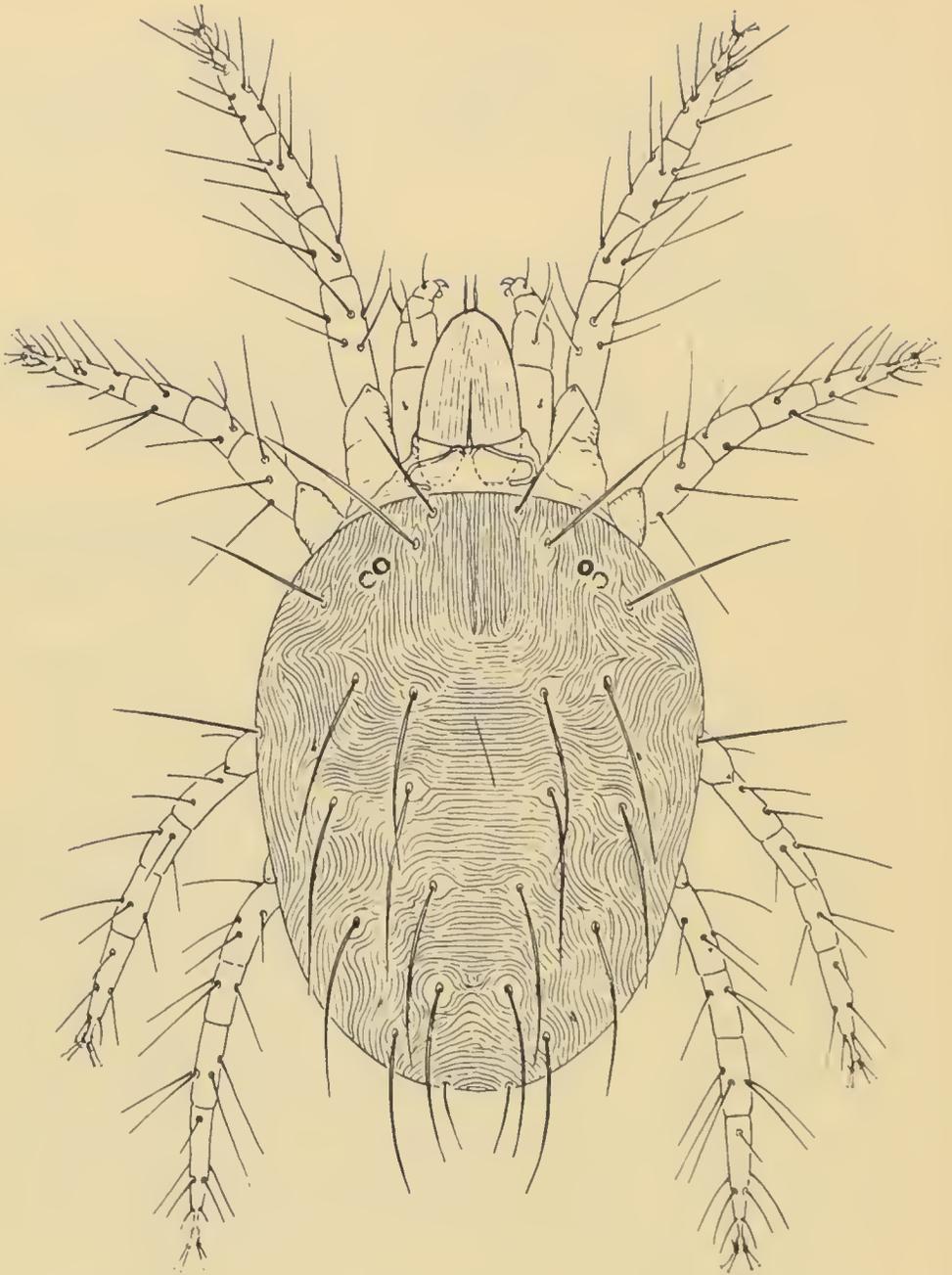


Fig. 338. *Tetranychus pacificus*: dorsal aspect of female.

Tetranychus mcdanieli McGregor

(Figure 337)

Tetranychus mcdanieli McGregor, 1931, Proc. Ent. Soc. Wash., 33: 193; McGregor, 1950, Amer. Midl. Nat., 44(2): 292; Pritchard and Baker, 1952, Hilgardia, 21(9): 266. *Types*: males and females, Bridgman, Michigan, on raspberry; in the U. S. National Museum.



Fig. 339. *Tetranychus pacificus*: female showing body markings when feeding.



Fig. 340. *Tetranychus pacificus*: aedeagi.

Tetranychus mcdanieli may be recognized by having the dorsally directed bend of the aedeagus sigmoid, the distal end being directed dorsocaudad at about a 45° angle and terminating at a level of the posterior margin of the bend. The bent portion may narrow gradually or there is often a small, obtuse, anterior angulation.

The female resembles that of *Tetranychus pacificus* in that the integumentary striae are transverse between the third pair of dorsocentral hysterosomals and also between the inner sacrals.

For many years this species was known only from the type series from Michigan. However, it is now known to be a serious pest of deciduous fruit trees in the northwestern United States. Collections have been studied from British Columbia, Washington, Utah, California, Montana, North Dakota, Michigan, and New York; on apple, plum, prune, and raspberry.

Tetranychus pacificus McGregor

(Figures 338, 339, 340)

Tetranychus pacificus McGregor, 1919, Proc. U. S. Natl. Mus., 96(2303): 657; Heriot, 1941, Canad. Ent., 73(1): 1; McGregor, 1950, Amer. Midl. Nat., 44(2): 296; Pritchard and Baker, 1952, Hilgardia, 21(9): 265; Baker and Pritchard, 1953, Hilgardia, 22(7): 215. Types: males and females, Portland, Oregon, on *Philadelphicus gordonianus*, *Vicia* sp., and *Ribes* sp., and Tracy, California, on chinaberry; in the U. S. National Museum.

Tetranychus pacificus may be recognized by having the integumentary striae transverse between both the third pair of dorsocentral hysterosomals and the inner sacrals of the female (as in *T. mcdanieli*), together with having the knob of the aedeagus directed slightly dorsad and with the terminal angulation ending well beyond the level of the bend.

This species is an important pest of agriculture in the far western United States. It is known to occur in Idaho, Oregon, and California.

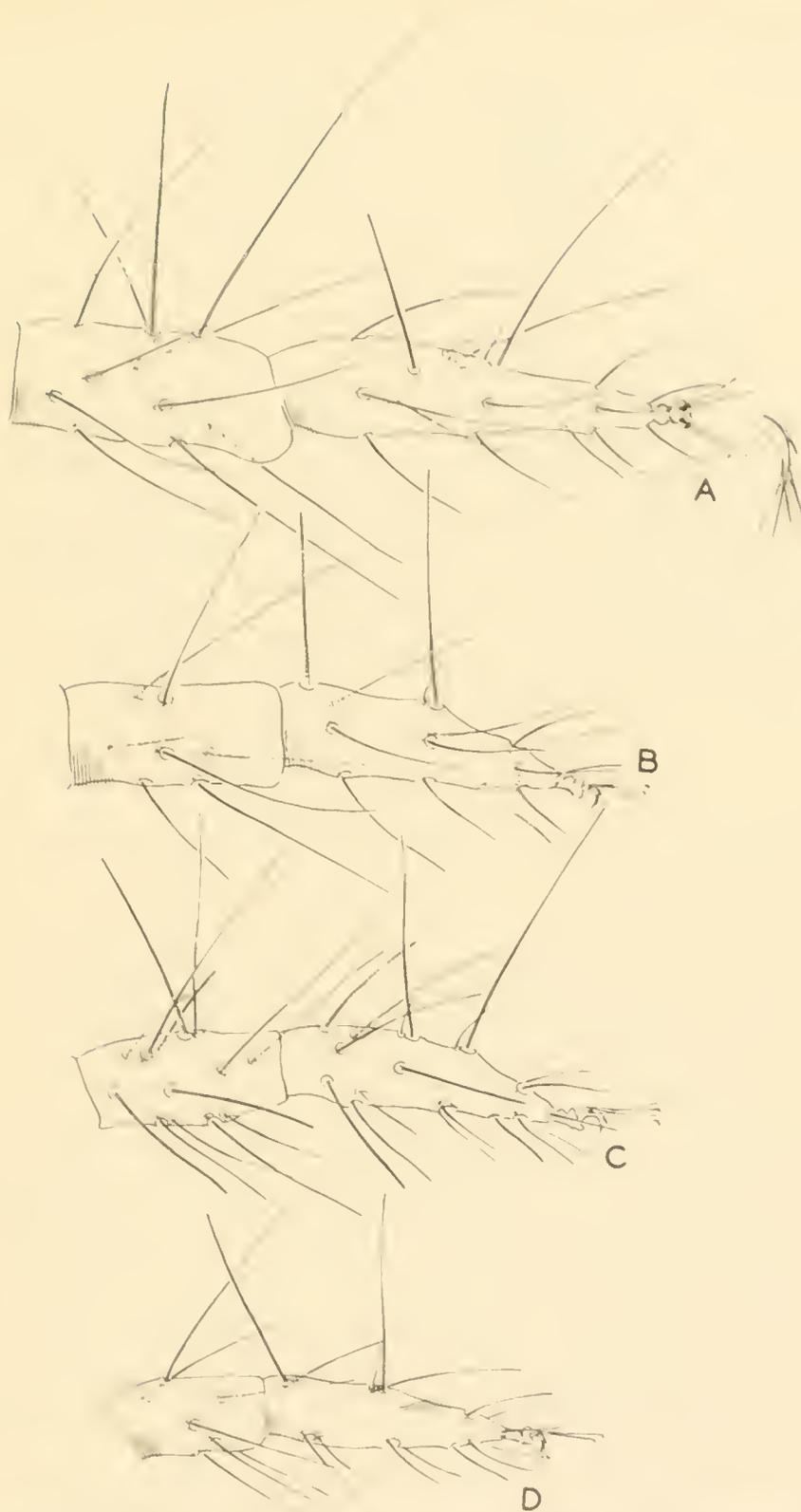


Fig. 34I. *Tetranychus homorus*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

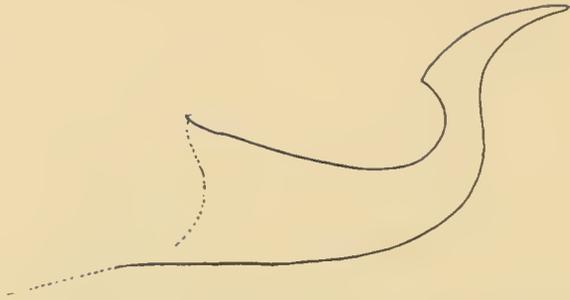


Fig. 342. *Tetranychus homorus*: aedeagus.

Crops that are subject to severe infestation include cotton, deciduous fruit trees and walnuts, grapes, melons, beans, berries, alfalfa, clover, and vetch. Shade trees such as elm and black locust, ornamental shrubs such as cotoneaster, and wild plants such as garrya, ceanothus, sunflower, tarweed, morning glory, California poppy, milkweed, salvia, and pigweed are also hosts.

No thorough investigation of the biology of *Tetranychus pacificus* has been published.

Tetranychus homorus Pritchard and Baker, new species
(Figures 341, 342)

The aedeagus of *Tetranychus homorus* resembles that of *T. pacificus* very closely. However, specimens are known only from the far eastern United States, and the integumentary striae of the female are longitudinal between the inner sacral setae. *T. homorus* may represent a sub species of *T. pacificus*.

Male.—Palpus with terminal sensillum slender, about four times as long as wide. Peritreme with long hook at distal end. Empodium I a pair of trifid plates but slightly longer than the strong mediodorsal spur; empodium II with obvious mediodorsal spur; empodia III and IV each with the spur tiny but evident. Aedeagus with knob forming a distinct angle with axis of shaft, slender, about three times as long as neck of stem, the anterior angulation short, the caudal angulation slender, tapering and reaching well beyond level of bend. Length of body 300 μ , including rostrum 370 μ .

Female.—Palpus with terminal sensillum less than three times as long as broad. Tarsus I with proximal duplex well distad of four tactile setae. Empodia with mediodorsal spur rudimentary. Hysterosoma with transverse striae dorsally except for longitudinal striae between inner

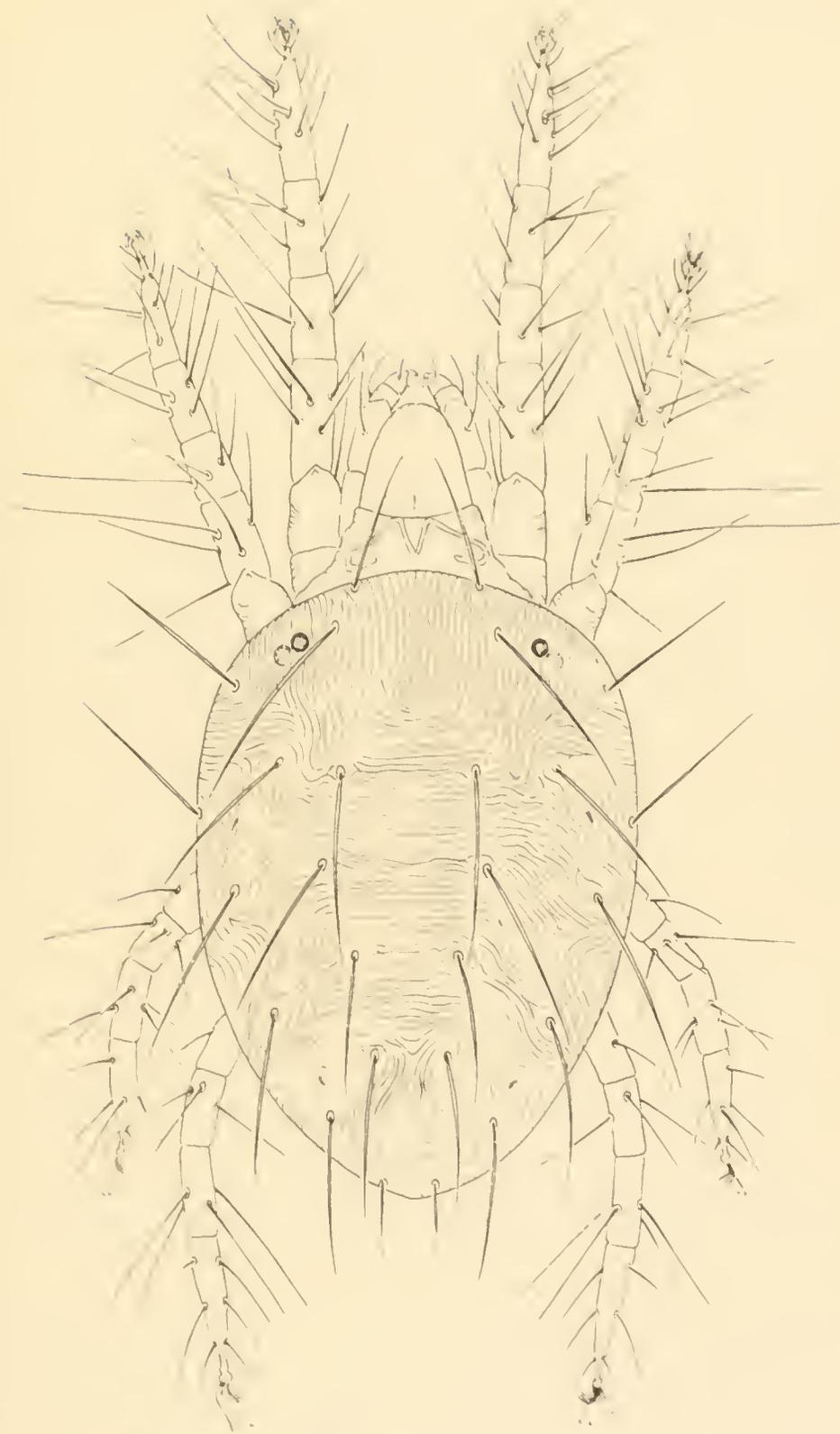


Fig. 343. *Tetranychus schoeni*: dorsal aspect of female.



Fig. 344. *Tetranychus schoenei*: aedeagi.

sacrals. Area immediately anterior to genital flap with longitudinal striae. Length of body $430\ \mu$, including rostrum $500\ \mu$; greatest width of body $290\ \mu$.

Holotype.—Male, Durham, North Carolina, June 18, 1953 (A. E. Pritchard), on hickory; type no. 2182 in the U. S. National Museum.

Paratypes.—Two males, 4 females, Durham, North Carolina, June 18, 1953 (A. E. Pritchard), on hickory; 5 males, 7 females, Durham, North Carolina, June 18, 1953 (A. E. Pritchard and Harvey Goldstein), on ash.

Tetranychus schoenei McGregor

(Figures 343, 344)

Tetranychus schoenei McGregor, 1941, Proc. Ent. Soc. Wash., 43: 223; Pritchard and Baker, 1952, Hilgardia, 21(9): 266; Baker and Pritchard, 1953, Hilgardia, 22(7): 216. *Types*: males and females, Winchester, Virginia, on apple; in the U. S. National Museum.

Septanychus schoenei, McGregor, 1950, Amer. Midl. Nat., 44(2): 324.

The aedeagus of *schoenei* is distinctive among species of the genus *Tetranychus* in that the distal knob is very large, about one-half as long as the dorsal margin of the external shaft. The anterior angulation of the knob is more or less broadly rounded, and the caudal angulation is acute. The mediadorsal spur on empodium I (and II) of the male is obvious.

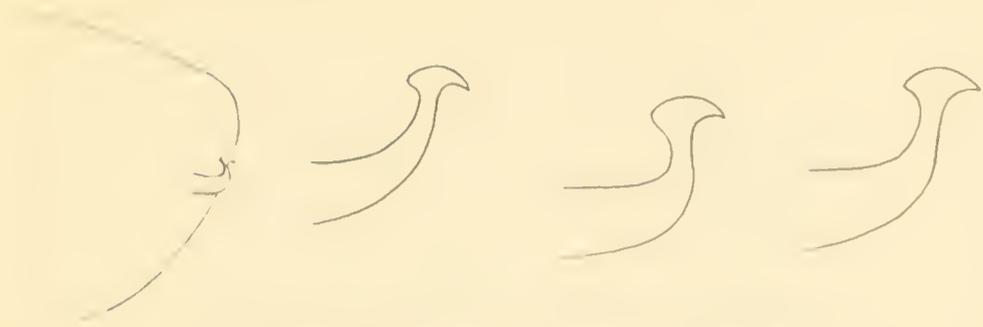


Fig. 345. *Tetranychus canadensis*: aedeagi.

The female resembles most other species of the Pacificus Group in that the integumentary striae between the inner sacral setae are longitudinal.

Tetranychus schoenei is widely distributed over the eastern and southwestern United States. Specimens have been studied from Maryland, Virginia, West Virginia, Pennsylvania, Georgia, Alabama, Mississippi, Louisiana, Missouri, and Oklahoma.

This species is sometimes a serious pest of apple, cotton, and shade trees such as elm and black locust. Bean, bramble, raspberry, wild plum, and buckberry are other hosts on which it has been taken. Cagle (1943) presented an excellent study on the biology of this species.

Tetranychus canadensis (McGregor)

(Figure 345)

Septanychus canadensis McGregor, 1950, Amer. Midl. Nat., 44(2): 319.

Types: males and females, Ontario, Canada, on apple; in the U. S. National Museum.

Tetranychus canadensis, Pritchard and Baker, 1952, Hilgardia, 21(9):

267; Baker and Pritchard, 1953, Hilgardia, 22(7): 221.

The knob of the aedeagus of *Tetranychus canadensis* is a rather miniature replica of *T. schoenei*. It is about one-third as long as the

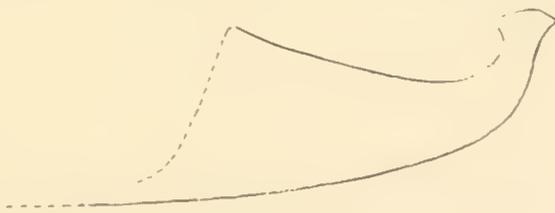


Fig. 346. *Tetranychus polys*: aedeagus.

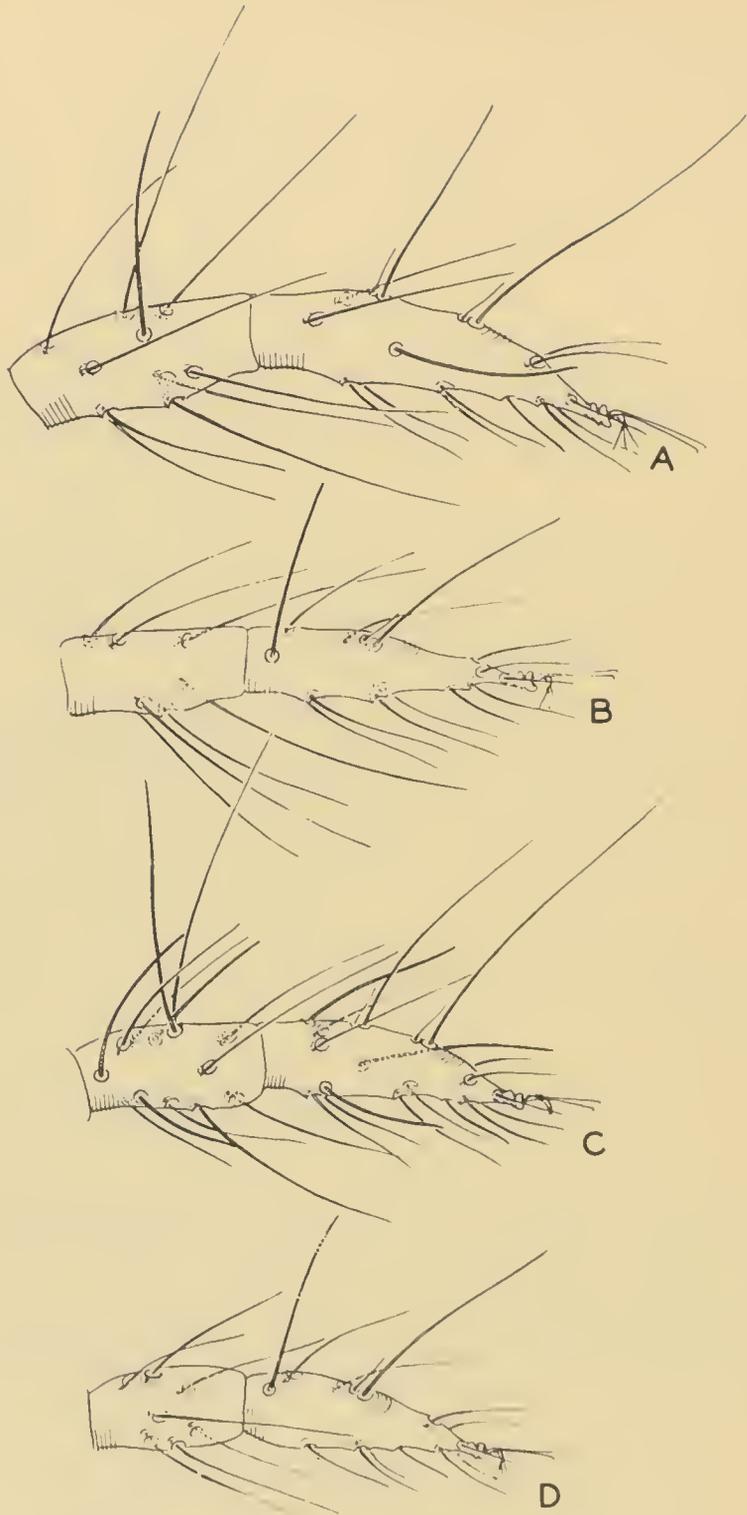


Fig. 347. *Tetranychus lambi*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

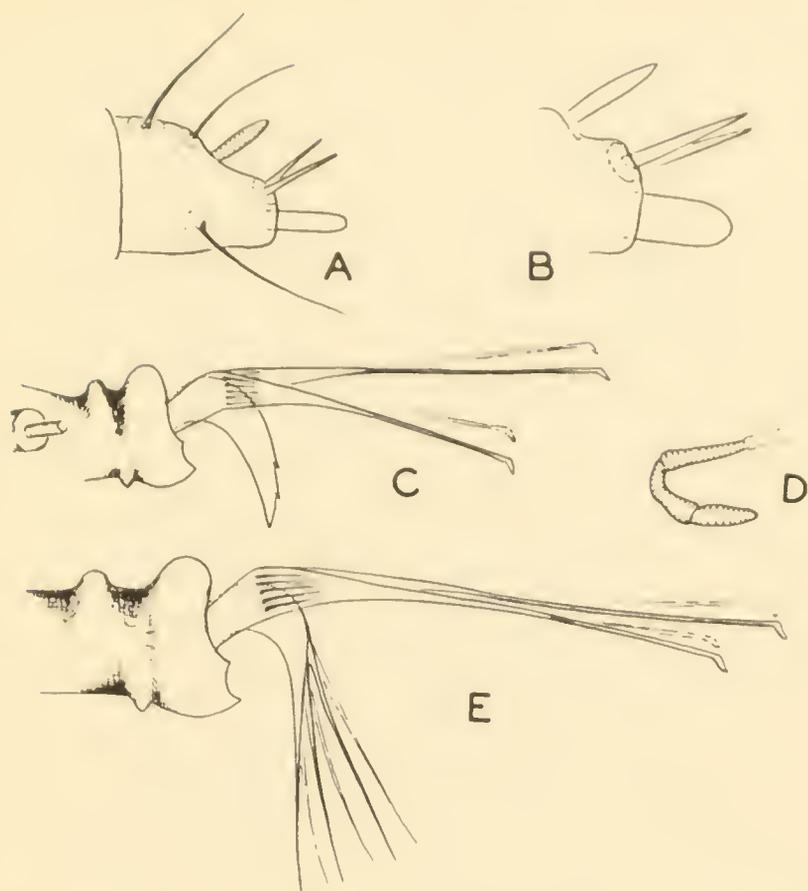


Fig. 348. *Tetranychus lambi*: A.) terminal segment of palpus of male; B.) terminal segment of palpus of female; C.) empodium I of male; D.) termination of peritreme; E.) empodium IV of male.

dorsal margin of the external shaft, the anterior projection being rounded or somewhat angulate and the caudal projection forming an acute angle. Empodia I and II of the male each possesses an obvious mediodorsal spur.

The female bears longitudinal striae between the inner sacral setae, and it is indistinguishable from other members of the Pacificus Group with similar striae.

This species is widespread throughout the eastern and southwestern United States and southeastern Canada. Specimens studied, other than the types from Ontario, Canada, are from Connecticut, New York, New Jersey, Washington, D. C., Maryland, Virginia, Indiana, Ohio, Louisiana, Mississippi, Tennessee, Kansas, Texas, and Arizona.

This species is sometimes of economic importance on apple, plum, and cotton. Other hosts are elm, linden, horse chestnut, Osage orange, poplar, rose, and umbrella tree. The only biological notes of this species were published by Lienk and Chapman (1951).



Fig. 349. *Tetranychus lambi*: aedeagus.

Tetranychus polys Pritchard and Baker, new species
(Figure 346)

The aedeagus of *Tetranychus polys* resembles that of *T. canadensis* except that it is smaller, about twice as wide as the stem. Moreover, the empodium on tarsus I (and II) of the male does not possess a medio-dorsal spur. The female bears more or less longitudinal striae on the integument between the inner sacral setae, thus resembling the females of *T. schoenei*, *T. canadensis*, and *T. lambi*, but there is considerable variation in these striae.

This species is known only from the Mojave Desert, in California.

Male.—Palpus with terminal sensillum slender, about four times as long as broad. Peritreme with a short hook (or elbow) terminally. Empodium I with stem about one-half as long as the pair of trifid divisions terminally, the teeth slender and the mediadorsal spur absent; empodia III to IV without mediadorsal spur. Aedeagus with distal knob very small, less than twice as wide as its stem, the anterior angulation somewhat broader than the acute posterior angulation. Length of body 266 μ , including rostrum 345 μ .

Female.—Palpus with terminal sensillum about three times as long as wide. Tarsus I with proximal duplex well beyond four tactile setae.

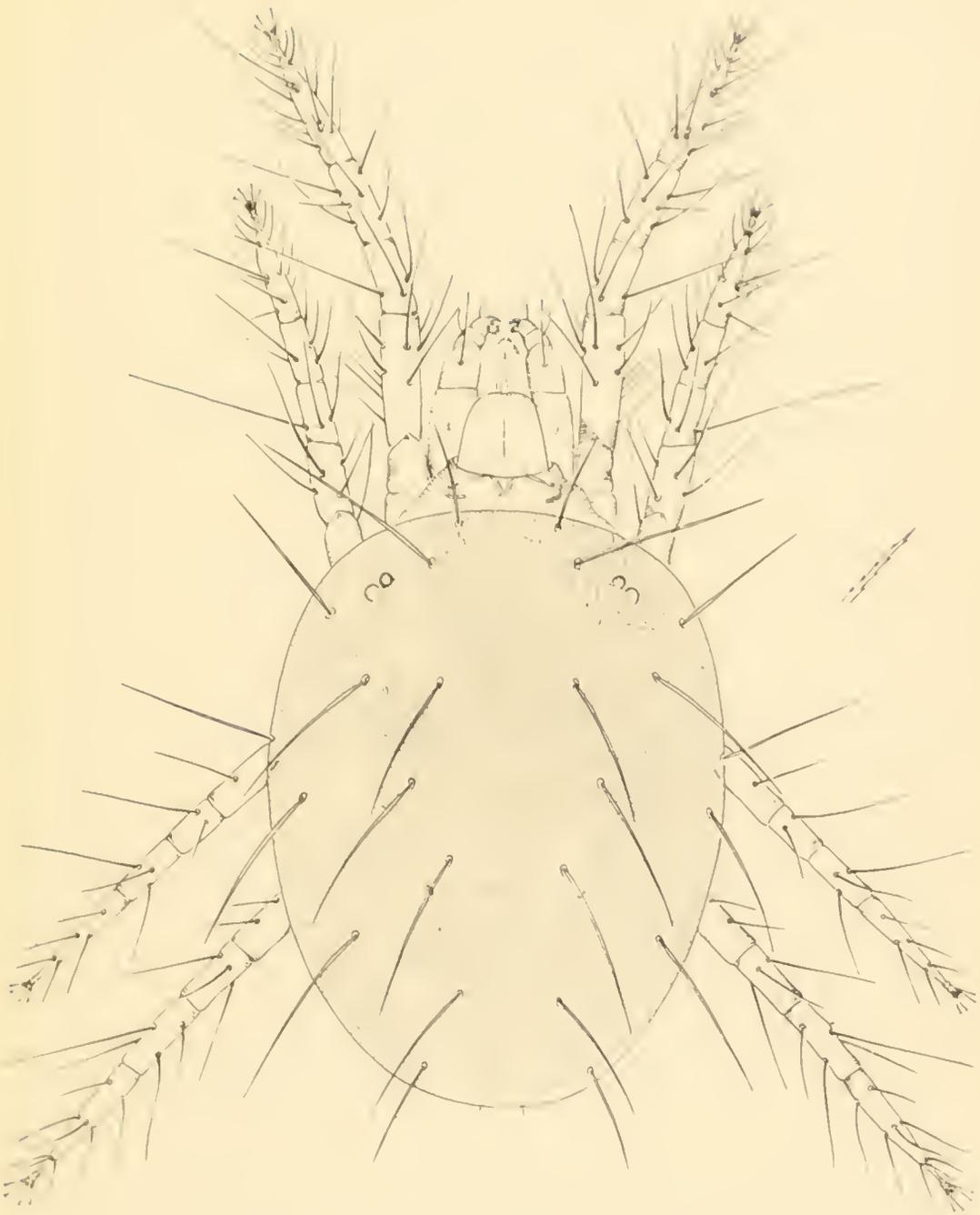


Fig. 350. *Tetranychus desertorum*: dorsal aspect of female.

Empodium without mediodorsal spur. Hysterosoma with transverse striae across median line except for caudally directed angulations in area arising between inner sacrals. Area immediately anterior to genital flap with longitudinal striae. Length of body $300\ \mu$, including rostrum $400\ \mu$; greatest width of body $233\ \mu$.

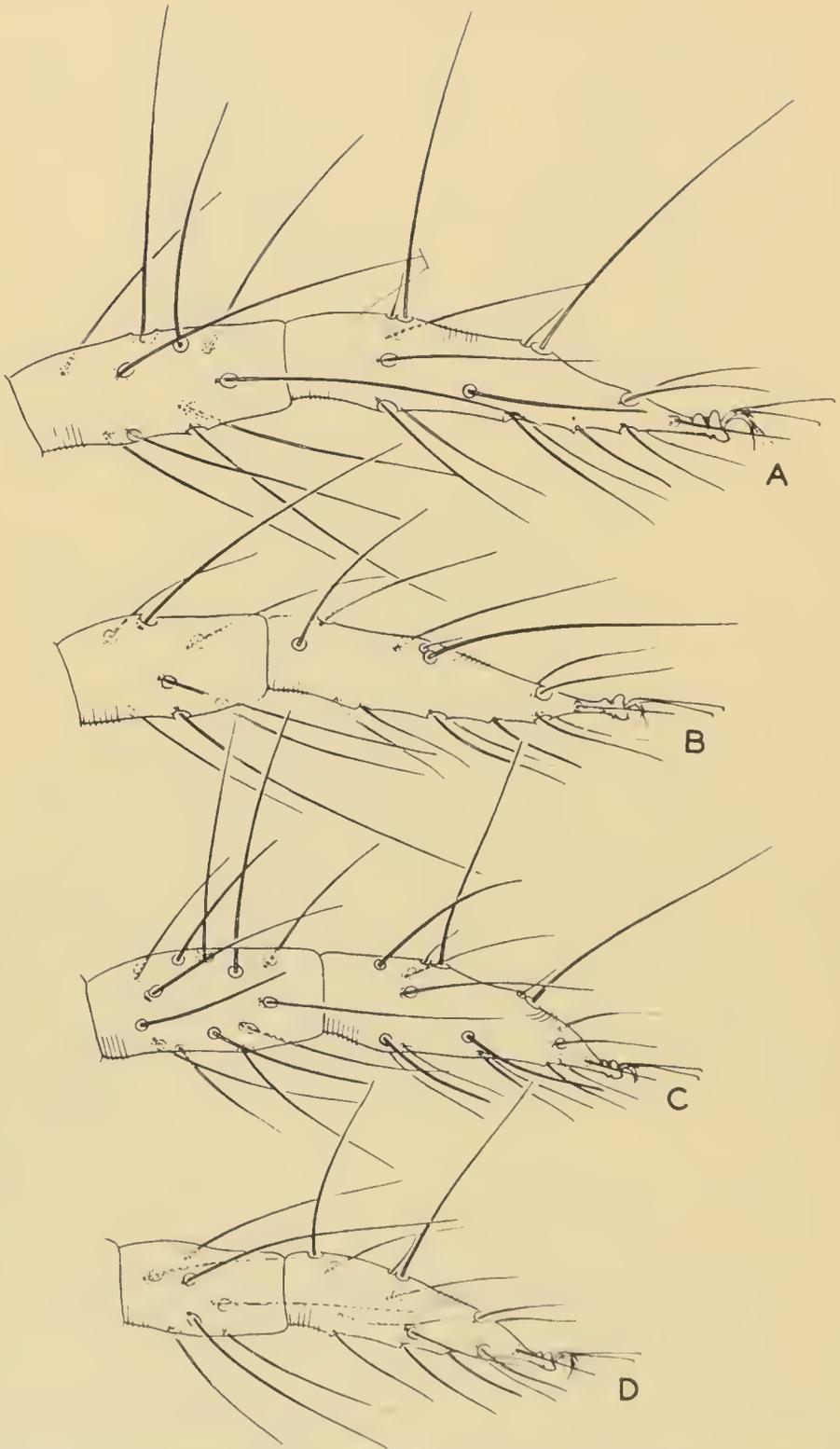


Fig. 351. *Tetranychus desertorum*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus of male.

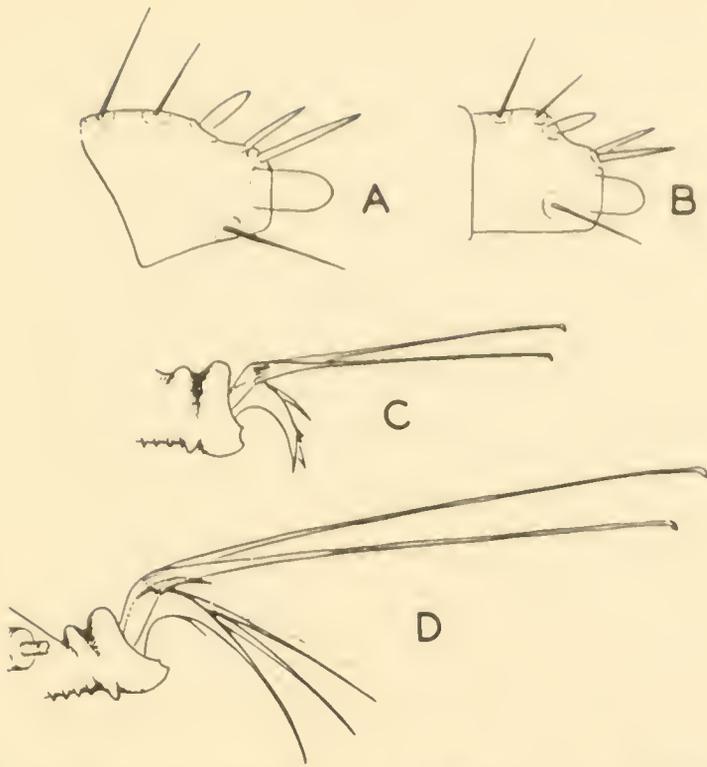


Fig. 352. *Tetranychus desertorum*: A.) terminal palpal segment of male; B.) terminal palpal segment of female; C.) empodium I of male; D.) empodium I of female.

Holotype.—Male, Mojave, California, August 11, 1945 (A. E. Pritchard), on *Atriplex* sp.; type no. 2183 in the U. S. National Museum.
Paratypes.—Ten males, 39 females, Mojave, California, August 11, 1945 (A. E. Pritchard), on *Atriplex* sp.

Tetranychus lambi Pritchard and Baker, new species
 (Figures 347, 348, 349)

The aedeagus of *Tetranychus lambi* is distinctive in that the distal knob of the aedeagus is scarcely widened dorsoventrally, but the anterior, and particularly the posterior, angulation is pronounced. Empodium I of the male consists only of two, almost amalgamated, trifold appendages, the mediodorsal spur being absent as in *T. polys*, and empodium II similarly lacks a mediodorsal spur. The female resembles other members of the Pacificus Group that have longitudinal striae between the inner sacral setae.

This species is known only from New Zealand.



Fig. 353. *Tetranychus desertorum*: aedeagus.

Male.—Palpus with terminal sensillum about four times as long as broad. Peritreme with distal end strongly hooked. Empodium I consisting of two pairs of nearly united, trifid plates, the mediodorsal spur absent; empodia II to IV without median spurs. Aedeagus with axis of knob parallel to axis of shaft, slender, the anterior angulation acute and pronounced, the caudal angulation very slender and acute. Length of body 246μ , including rostrum 313μ .

Female.—Distal sensillum of palpus about twice as long as wide. Tarsus I with proximal duplex distal of four tactile setae. Empodia each with mediodorsal spur absent. Hysterosoma mediodorsally with transverse striae except for longitudinal striae between and caudad of inner sacrae. Area immediately anterior to genital flap, as well as



Fig. 354. *Tetranychus gigas*: aedeagus.



Fig. 355. *Tetranychus deviatarsus*: above, tibia and tarsus I of female; below, tibia and tarsus II of female.

anterior portion of flap, with longitudinal striae. Length of body $320\ \mu$, including rostrum $410\ \mu$; greatest width of body $233\ \mu$.

Holotype.—Male. Oratia, Auckland, New Zealand, March 11, 1953 (K. P. Lamb), on apple; type no. 2184, in the U. S. National Museum. *Paratypes*.—Five males, four females. Oratia, Auckland, New Zealand, March 11, 1953 (K. P. Lamb), on apple; 3 males, 5 females, Owairaka, New Zealand, August 28, 1948 (K. P. Lamb), on strawberries in greenhouse.

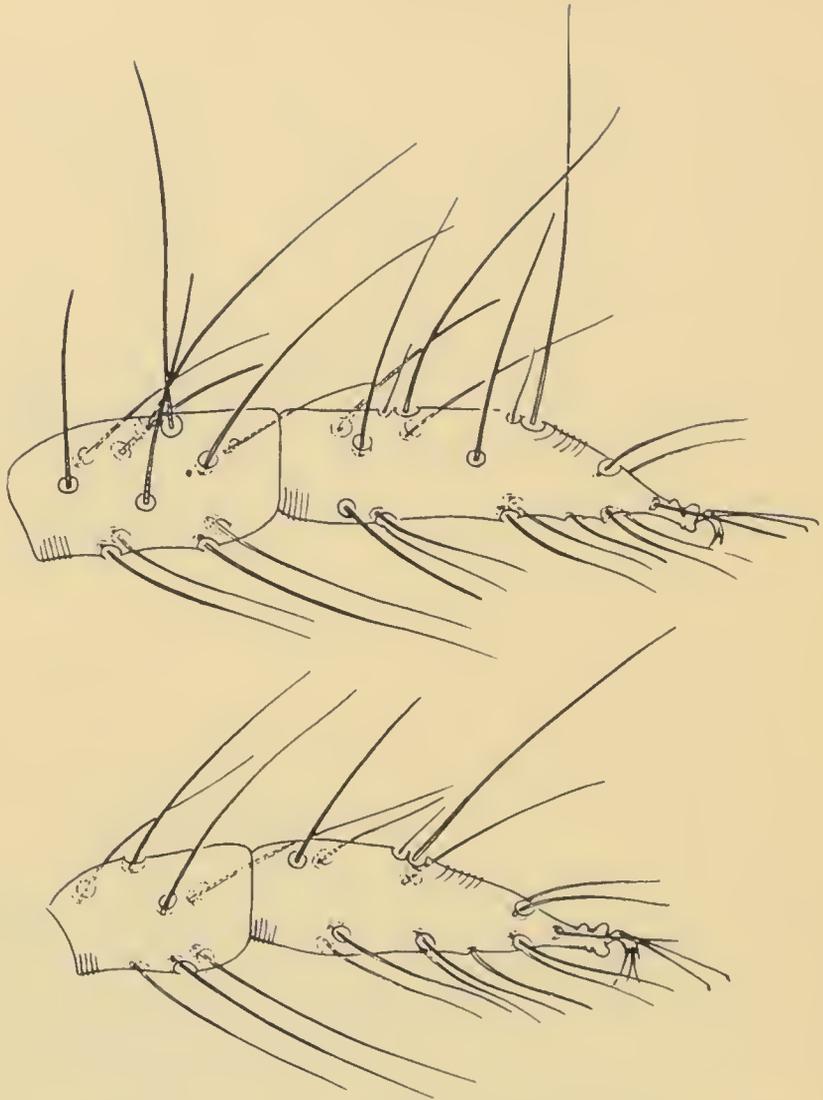


Fig. 356. *Tetranychus deviatarsus*: above, tibia and tarsus I of male; below, tibia and tarsus II of male.

This species is named in honor of K. P. Lamb, the collector and an entomologist keenly interested in the plant-feeding mites of New Zealand.

Desertorum Group

The Desertorum Group is based on species that exhibit a migration of the proximal pair of duplex setae into line with the four tactile setae on tarsus I. The peritreme ends in a simple hook, and the dorsal striae of the female hysterosoma form a broad triangle between the third pair

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of dorsocentrals and the inner sacrals, the striae being longitudinal between these setae. The mediodorsal spur of the empodium may be rudimentary or apparent, but it is not as obvious as in most of the Tumidus Group.

Females of species in this group are carmine, and tropical or subtropical in distribution. They are indistinguishable.

The three species assigned to this group are all similar except with regard to the comparative enlargement of the distal knob of the aedeagus. Females that belong to this group have been received from Transvaal, Africa, on cotton, and from New Zealand, on greenhouse tomatoes and strawberry. Males must be observed before their specific identity can be ascertained.

Tetranychus desertorum Banks

(Figures 350, 351, 352, 353)

Tetranychus desertorum Banks, 1900, Tech. Bul. U. S. Dept. Agr. Div. Ent., 8: 76; Baker and Pritchard, 1953, Hilgardia, 22(7): 229, *Types*: males and females, Mesilla Park, New Mexico, on *Larrea tridentata* and *Phacelia crenulata*; in the U. S. National Museum.

Tetranychus opuntiae Banks, 1908, Proc. Ent. Soc. Wash., 10: 36. *Types*: females, San Antonio, Texas, on *Opuntia* sp.; in the U. S. National Museum.

Tetranychus thermophilus Ewing, 1926, Ent. News, 37: 142. *Types*: males, and females, Furnace Creek, Death Valley, California, on (*Covillea*) = *Larrea* sp., in the U. S. National Museum.

Septanychus argentinus McGregor, 1943, Proc. Ent. Soc. Wash., 45: 176; McGregor, 1950, Amer. Midl. Nat., 44(2): 317. *Types*: males and females, Argentina (at New York, Quarantine), on pear; in the U. S. National Museum.

Septanychus deserticola McGregor, 1950, Amer. Midl. Nat., 44(2): 321. *Types*: males and females, Palm Springs, California, on creosote bush; in the U. S. National Museum.

Septanychus texazona McGregor, 1950, Amer. Midl. Nat., 44(2): 328. *Types*: males and females, College Station, Texas, on turnip; in the U. S. National Museum.

The aedeagus of *Tetranychus desertorum* is typical of the Desertorum Group in that the dorsal margin of the knob of the aedeagus is sigmoid,

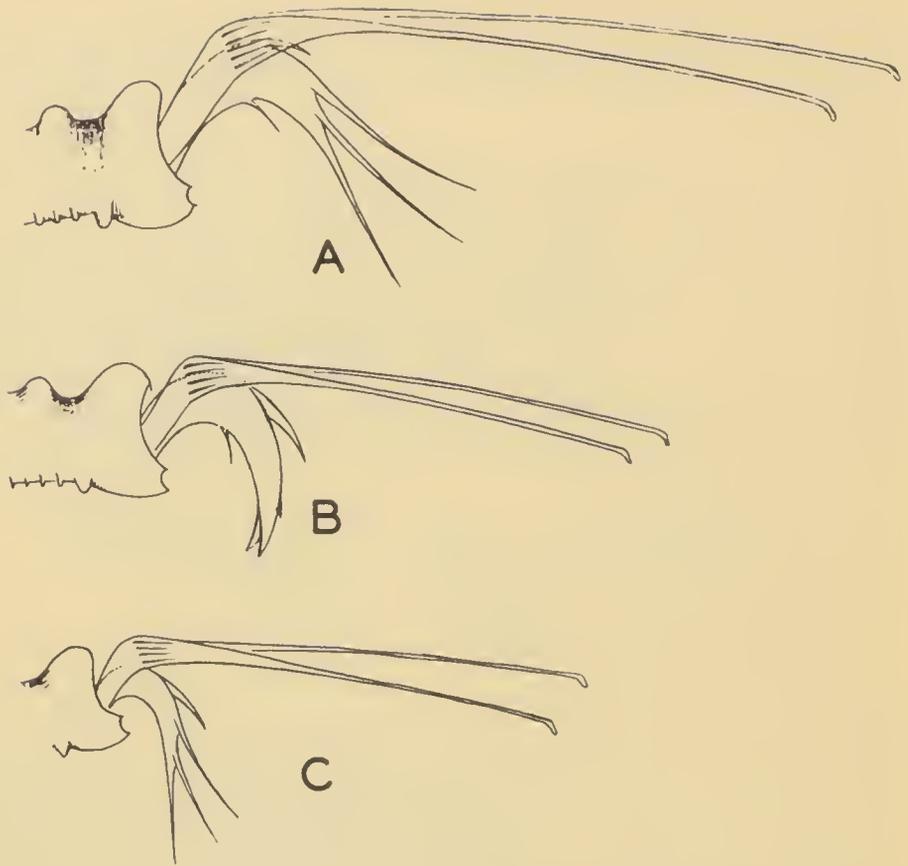


Fig. 357. *Tetranychus deviatarsus*: A.) empodium I of female; B.) empodium I of male; C.) empodium II of male.

the anterior angulation being small and acute and the posterior angulation being acute and curved ventrad to a variable extent. The width of the aedeagal knob is not more than one-fourth as long as the dorsal margin of the aedeagal shaft. The female is similar to that of other females in the Desertorum Group.

This species is an important pest of cotton in Texas, and it is widespread, although apparently only of local importance, throughout other parts of the southern United States. Specimens have been received from California, Arizona, New Mexico, Texas, Oklahoma, Louisiana, Mississippi, Georgia, Florida, South Carolina, and North Carolina in the United States, as well as from Tamaulipas and Coahuila in Mexico. Collections from South America are from Peru and Argentina.

In addition to cotton, crops such as melons, cantaloupe, cucumber, celery, carrots, turnips, and alfalfa are known to be subject to infestation. Other records are from creosote bush, grass, wild tomatoes (Peru), *Stillingia* sp., *Opuntia* sp., monkey flower, puncture vine, *Eriodictyon* sp., sunflower, horseweed, and gladiolus.

Tetranychus gigas Pritchard and Baker, new species
(Figure 354)

The aedeagus of *Tetranychus gigas* resembles that of *T. desertorum* except that the distal knob is considerably enlarged, being nearly one-third as long as the dorsal margin of the shaft. Otherwise the characters of both the male and female are as in *T. desertorum*.

To date, this species is known only from western Texas and Arizona, on cotton.

Male.—Terminal sensillum of palpus about three times as long as wide. Peritreme very strongly retrorse distally. Empodium I with a strong proximoventral, tapering tooth proximoventrally on each side and with a pair of finer, more medial teeth on each side, the mediodorsal spur strong and nearly as long as the trifid appendages; empodium II with mediodorsal spur strongly developed; empodia III and IV each with the mediodorsal spur small but obvious. Aedeagus with knob about one-third as long as dorsal margin of shaft, the anterior angulation acute and the caudal angulation acutely curved ventrad. Length of body 293 μ , including rostrum 366 μ .

Female.—Terminal sensillum of palpus about twice as long as wide. Tarsus I with proximal duplex located level with the four tactile setae. Empodia may have minute mediodorsal spur. Hysterosoma with striae forming a broad triangle between the third pair of dorsocentrals and the inner sacrals, the striae being longitudinal between these striae. Length of body 445 μ , including rostrum 566 μ ; greatest width of body 280 μ .

Holotype.—Male, Sahuarita, Arizona, July 8, 1953, on cotton: type no. 2185, in the U. S. National Museum. *Paratypes*.—One male, 6 females, Sahuarita, Arizona, July 8, 1953, on cotton; 12 males, 36 females, Crosby County, Texas, July 9-20, 1953, on cotton.

Tetranychus ludeni Zacher
(Figures 355, 356, 357, 358)

Tetranychus ludeni Zacher, 1913, Mitt. kais. biol. Anst. Land-Forstw., 14: 40; Zacher, 1921, Zts. ang. Ent., 7: 187; McGregor, 1919, Proc. U. S. Natl. Mus., 56(2303): 653; Hardouin, 1934, Bul. Soc. Ent. France, 39: 123. Described from specimens from St. Cloud, near Paris, France, on *Salvia splendens*, *Solanum melongena*, and *Cucurbita* sp.

Spider Mites

Tetranychus (*Epitetranychus*) *ludeni*, Zacher, 1921, Zts. ang. Ent., 7: 187; Hardouin, 1934, Bul. Soc. Ent. France, 39: 123, André, 1934, Bul. Hist. Nat. Paris (sér. 2), 6(40): 348.

Tetranychus salviae Oudemans, 1931, Ent. Ber., 8(177): 230. Types: 3 females, possibly from Paris, France, on *Salvia splendens*; possibly in the Rijksmuseum van Natuurlijke Historie, Leiden, Holland. *New synonymy*.

Septanychus deviatarsus McGregor, 1950, Amer. Midl. Nat., 44(2): 322. Types: males and females, Anaheim, California, on castor bean; in the U. S. National Museum.



Fig. 358. *Tetranychus deviatarsus*:
aedeagus.

The aedeagus of *Tetranychus ludeni* resembles that of *T. desertorum* except that the distal knob of the aedeagus is very small, scarcely larger than the stem, and the posterior angulation is absent. The female is indistinguishable from other members of the Desertorum Group.

This species is encountered occasionally out of doors in the southern United States, collections being from southern California and Louisiana. Specimens have also been found in greenhouses in northern California and in Missouri. Zacher's specimens were from greenhouses near Paris, France, on several different hosts.

The Louisiana material, collected by H. Bruce Boudreaux, is from cotton. Outdoor collections from southern California are from Carlsbad (A. E. Pritchard), on lantana, Los Angeles (C. A. Hanson); on Kentucky wonder beans; and Santa Paula (C. A. Fleschner), on castor

bean. Collections from the San Francisco Bay region, California, are from greenhouses (A. E. Pritchard), on lantana and *Datura* sp. South American specimens studied are from Catema, Chile (A. E. Michelbacher), on castor bean; Concordia, Argentina (J. R. King), on kudzu; San Salvador,

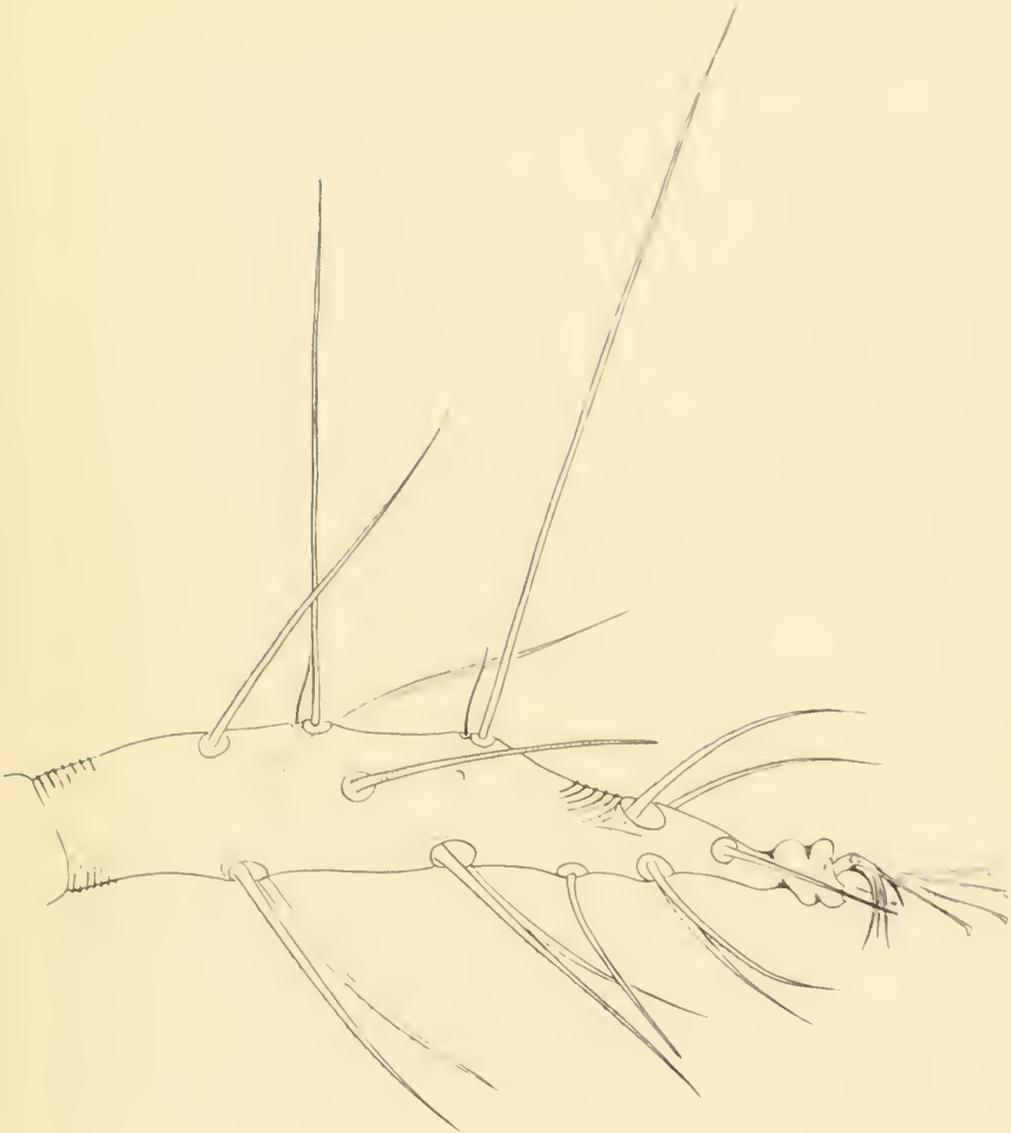


Fig. 359. *Tetranychus tumidus*: tarsus I of female.

El Salvador (Ross), on *Cosmos* sp. Still other collections have been received from Taringo, Australia (E. H. Derrick), on *Convolvulus* sp.; and Australia (Maehler and Ross, at Hawaiian quarantine), on celery.

On one of Zacher's slides that Oudemans studied, three out of 21 specimens were larger and with longer legs, longer setae, and larger eyes. These specimens formed the basis for *Tetranychus salviae* Oudemans, but we are unable to appreciate the differentiation from *T. ludeni*.

The placing of *deviatarisus* into synonymy with *ludeni* is based upon the study of one of Zacher's slides from the Oudemans' collection loaned us through the courtesy of Dr. H. Boschma.

Tumidus Group

Mites belonging to the Tumidus Group may be recognized by having an obvious mediodorsal spur on the empodium and the proximal pair of duplex setae on tarsus I placed distad of the proximal tactile setae. In *Tetranychus cocosi* and *T. cocosinus* the empodial spur is considerably smaller than in the other species, but it is easily seen. These species are included in the Tumidus Group because the aedeagus resembles that of certain species belonging to this group and they are apparently very closely related.

The hysterosoma of the female bears a diamond-shaped pattern in the area between the third pair of dorsocentrals and the inner sacrals, the striae being longitudinal in the interval between each of these pairs of setae. Adult females are carmine, and they are for the most part indistinguishable.

The species are tropical or subtropical in distribution.

Tetranychus tumidus Banks

(Figures 359, 360)

- Tetranychus tumidus* Banks, 1900, U. S. Dept. Agr. Tech. Ser., 8: 73; Baker and Pritchard, 1953, Hilgardia, 22(7): 232. *Types*: females, Eustis, Florida, on water hyacinth; in the U. S. National Museum.
- Septanychus tumidus*, McGregor, 1919, Proc. U. S. Natl. Mus., 56(2303): 664; McGregor, 1950, Amer. Midl. Nat., 44(2): 326.
- Tetranychus gloveri* Banks, 1900, U. S. Dept. Agr. Tech. Ser., 8: 76. *Types*: females, Baton Rouge, Louisiana, on cotton; in the U. S. National Museum.
- Tetranychus quinquenychus* McGregor, 1914, Ann. Ent. Soc. Amer., 7(4): 358. *Types*: females, Orlando, Florida, on castor-bean; in the U. S. National Museum.
- Septanychus quinquenychus*, McGregor, 1919, Proc. U. S. Natl. Mus., 56(2303): 664.
- Tetranychus antillarum* Banks, 1917, Ent. News, 28: 194. *Types*: females, Rio Piedras, Puerto Rico, on *Leonotis nepetaefolia* and *Asclepias curassavica*; in the U. S. National Museum.

The male of *Tetranychus tumidus* may be recognized by having the anterior development of the aedeagal knob broadly rounded, together with having an obvious empodial spur on tarsi III and IV. The caudal development of the aedeagal knob is short and acutely angulate.



Fig. 360. *Tetranychus tumidus*: aedeagus.

Tetranychus tumidus is found commonly in the southeastern United States, and collections have been studied from Florida, Georgia, South Carolina, Louisiana, and southeastern Texas. It also occurs in Puerto Rico, and McGregor (1950) recorded specimens from Guam. In California, this species is often a greenhouse pest (Pritchard, 1949).

This species is a serious pest of cotton (Rousel et al., 1952) as well as vegetable crops such as celery, beans, eggplant, beets, okra, peas, and sweet potato. It is also very destructive to commercial crops of potted ornamentals such as palms, maranta, and bamboranta. We have accumulated a long list of other low-growing plants that serve as hosts.

Tetranychus tumidellus Pritchard and Baker, new species
(Figures 361, 362, 363)

Tetranychus tumidellus is closely allied to *T. tumidus* from which it differs only by having the terminal knob of the aedeagus very tiny. This species is known only from the southeastern United States.

Male.—Palpus with terminal sensillum about three times as long as broad. Peritreme with a long distal hook. Empodium I with a pair of trifid plates, the teeth minute, and with a mediodorsal spur nearly as long as the appendages; empodia II-IV each with the dorsal spur nearly one-half as long as the proximal hairs. Aedeagus with ventral margin gradually curved dorsad, the terminal knob only slightly wider than its stem and with posterior and anterior angulations similar, acute. Length of body 300 μ , including rostrum 390 μ .

Female.—Similar. Terminal sensillum of palpus about twice as long as wide. Tarsus I with proximal duplex located distad of the four tactile setae. Empodia each with mediodorsal spur nearly one-half as long as proximoventral hairs. Hysterosoma with longitudinal striae between both the third pair of dorsocentrals and the inner sacrals. Anterior portion of genital flap and area immediately anterior to genital flap with longitudinal striae. Length of body 366 μ , including rostrum 433 μ ; greatest width of body 280 μ .

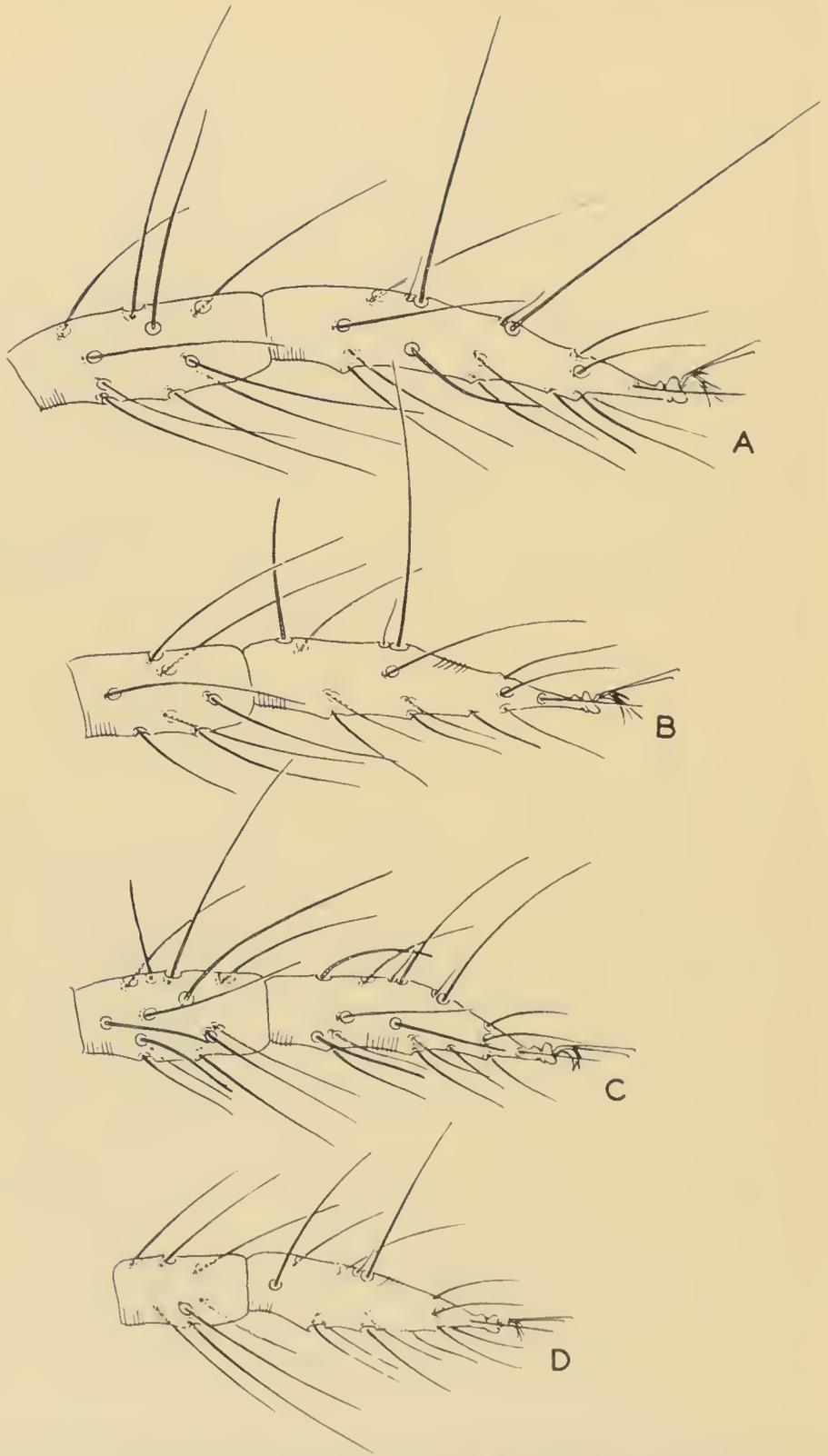


Fig. 361. *Tetranychus tumidellus*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

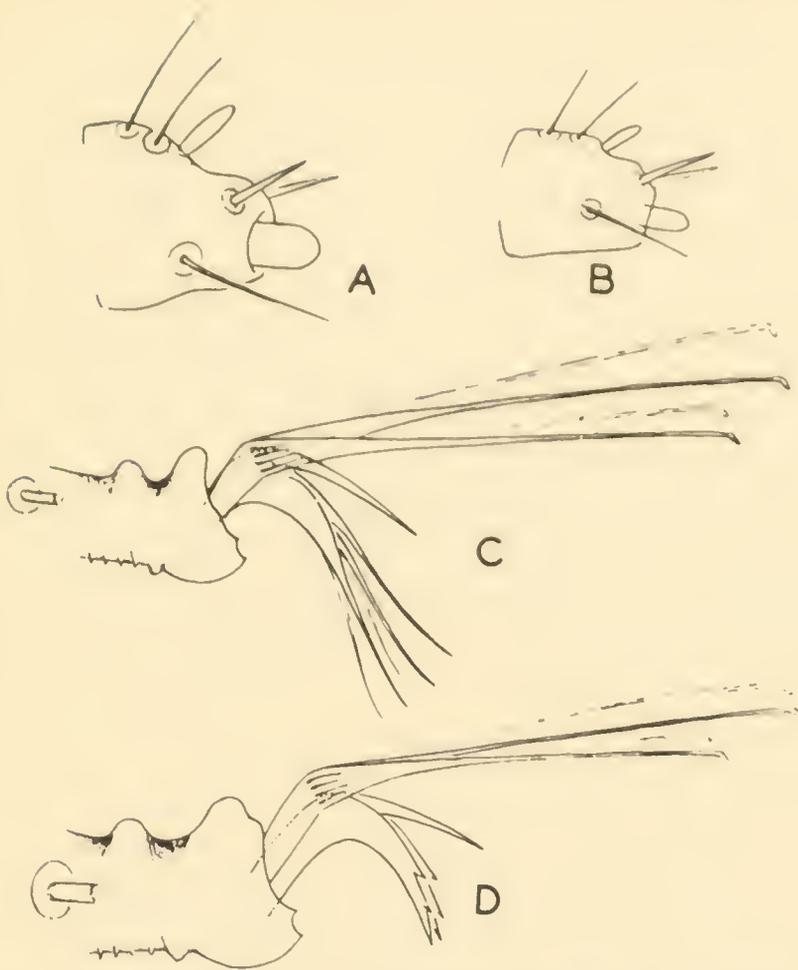


Fig. 362. *Tetranychus tumidellus*: A.) terminal segment of palpus of female; B.) terminal segment of palpus of male; C.) empodium I of female; D.) empodium I of male.

Holotype.—Male, Tift County, Georgia, July 23, 1948 (P. W. Gilmer), on peanut vines; type no. 2186 in the U. S. National Museum. *Paratypes*.—Forty males, 93 females, Tift County, Georgia, July 23, 1948 (P. W. Gilmer), on peanut; 9 males, 49 females, Union Springs, Alabama, August 23, 1949 (F. S. Arant), on peanut; 2 males, 8 females, Bullock County, Alabama, September 15, 1949 (F. S. Arant), on peanut.

Tetranychus mexicanus (McGregor), new combination
(Figures 364, 365, 366, 367)

Septanychus mexicanus McGregor, 1950, Amer. Midl. Nat., 44(2): 323.
Types: males and females, Mexico (at Laredo, Texas, quarantine), on orange; in the U. S. National Museum.



Fig. 365. *Tetranychus tumidellus*: aedeagus.

The male of *Tetranychus mexicanus* may be differentiated from other members of the *Tumidus* Group that have a large empodial spur by having the axis of the knob of the aedeagus parallel to the axis of the shaft, and with the anterior angulation short and acutely angulate and the posterior angulation considerably longer and acutely angulate.

This species is known from the type specimens found on orange being shipped from Mexico; Valles, Mexico (H. D. Smith), on citrus; Monte Alto, Texas (H. A. Dean), on lemon; and Concordia, Argentina (J. King), on citrus.

Tetranychus magnoliae Boudreaux
(Figures 368, 369)

Tetranychus magnoliae Boudreaux, 1954, Pan-Pac. Ent., 30: 184.
Holotype: male, Baton Rouge, Louisiana, on *Magnolia grandiflora*;
in the U. S. National Museum.

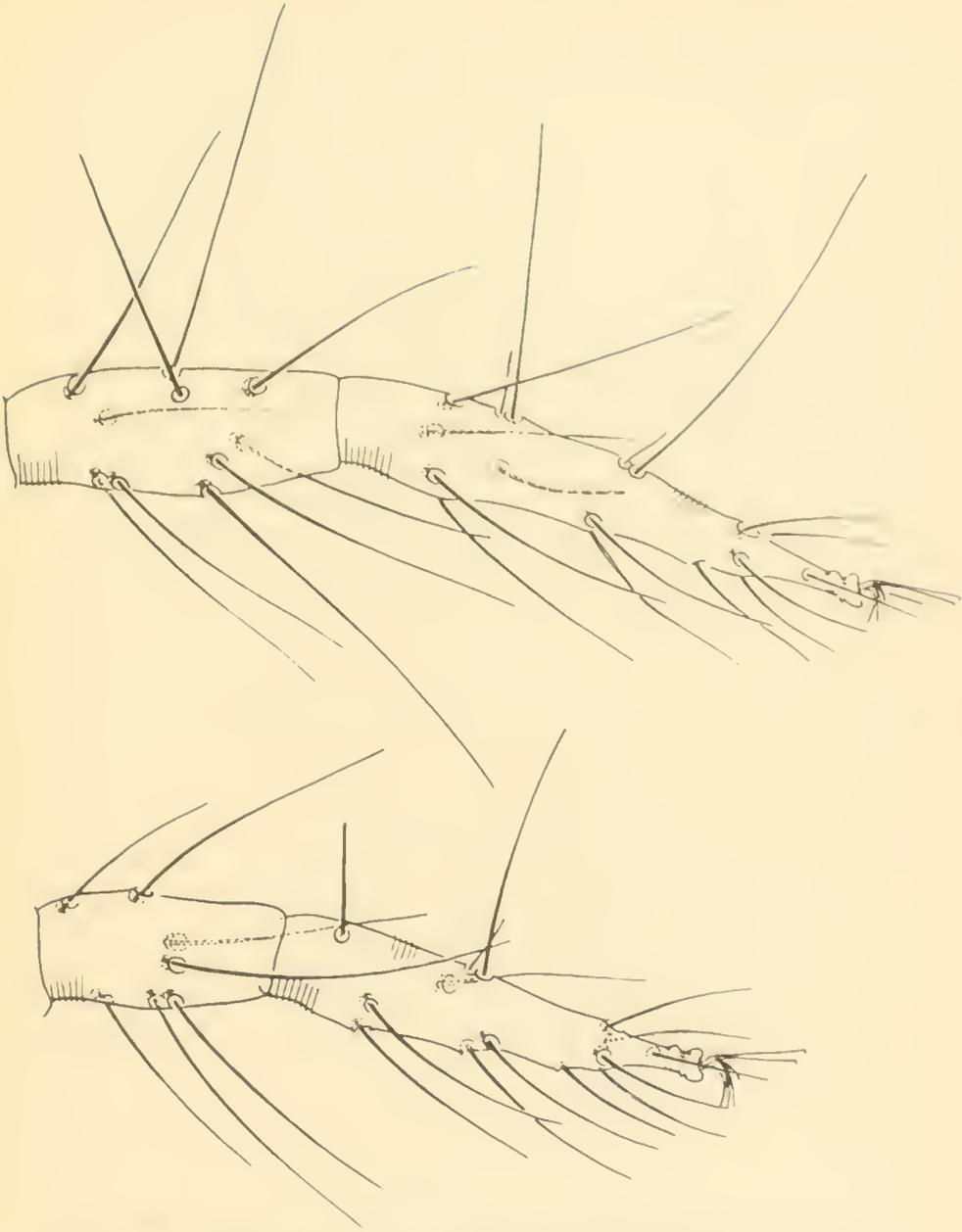


Fig. 364. *Tetranychus mexicanus*: above, tibia and tarsus I of female; below, tibia and tarsus II of female.

Tetranychus magnoliae is closely allied to *T. mexicanus* from which it differs in having the axis of the knob of the aedeagus forming an angle with the axis of the shaft. The terminal angulation of the knob is slenderer and longer than in *T. mexicanus*.

This species is known only from southern Louisiana on magnolia and tulip tree. Adult females are carmine. They spin dense webbing on the upper surface of magnolia leaves but inhabit both surfaces of the tulip tree leaf.

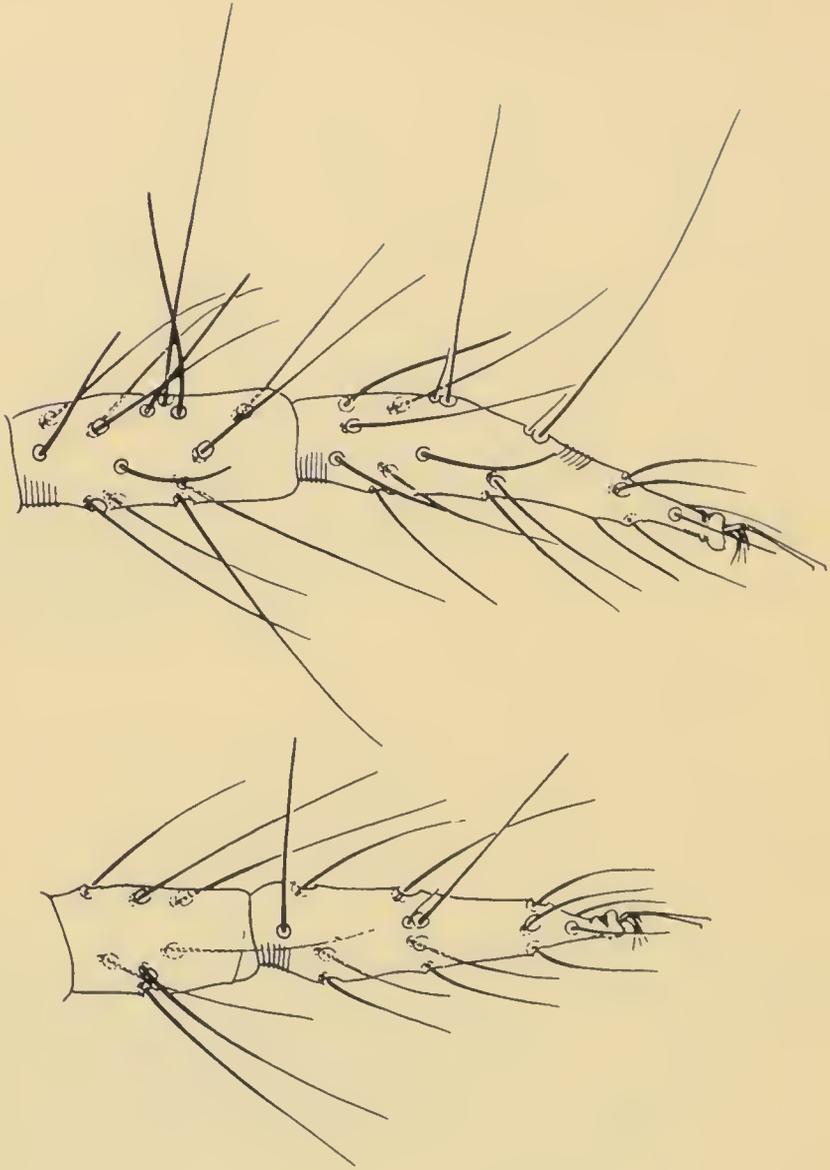


Fig. 365. *Tetranychus mexicanus*: above, tibia and tarsus I of male; below, tibia and tarsus II of male.

Tetranychus cocosi (McGregor), new combination
(Figures 370, 371, 372)

Septanychus cocosi McGregor, 1950, Amer. Midl. Nat., 44(2): 320.
Types: males and females, Whittier, California, on royal palm;
in the U. S. National Museum.

The aedeagus of *Tetranychus cocosi* resembles that of *T. mexicanus* in that the aedeagal knob, with an axis parallel to the axis of the



Fig. 366. *Tetranychus mexicanus*: above, empodium IV of female; below, empodium I of female.



Fig. 367. *Tetranychus mexicanus*: aedeagus.

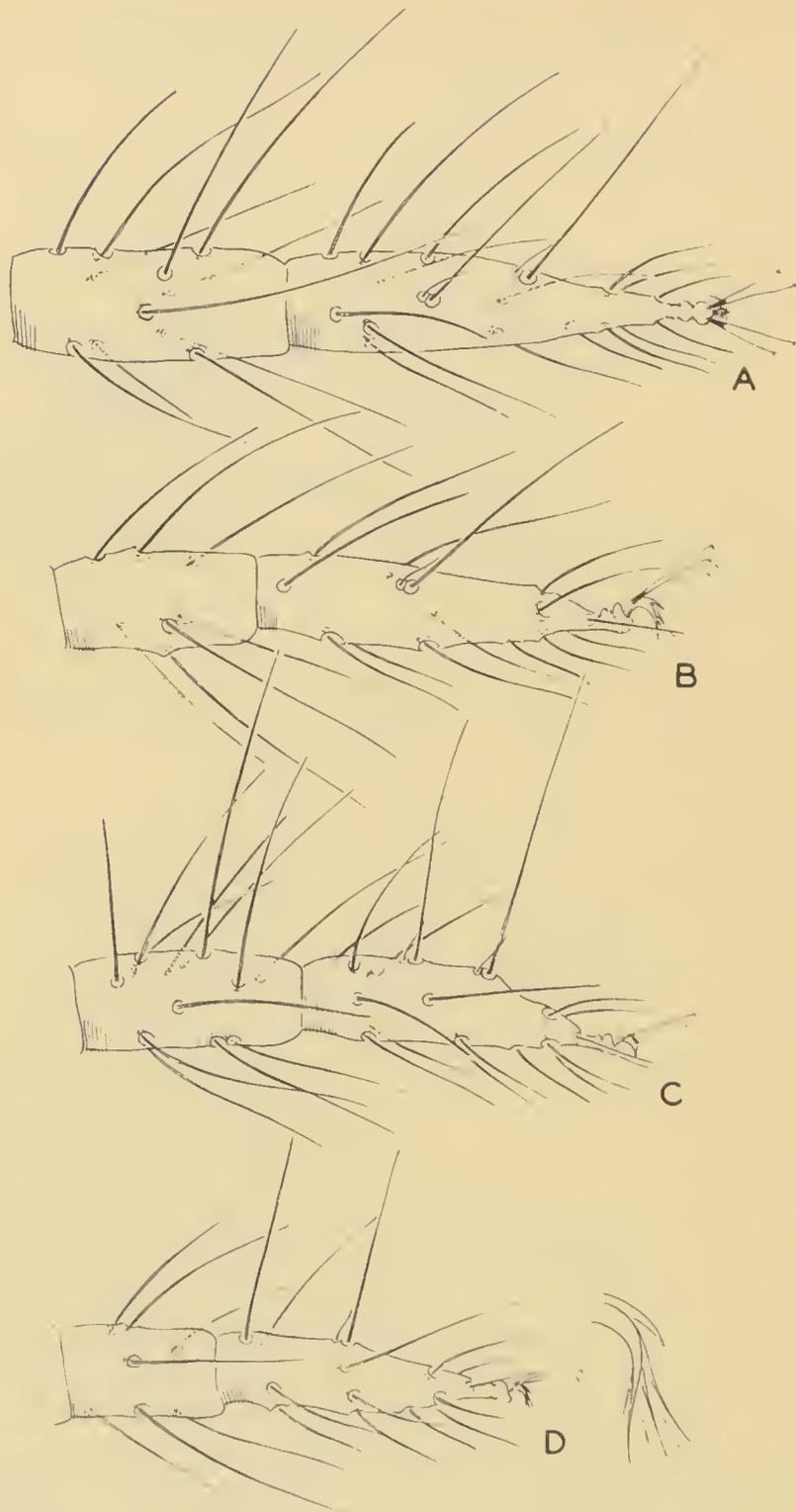


Fig. 368. *Tetranychus magnoliae*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

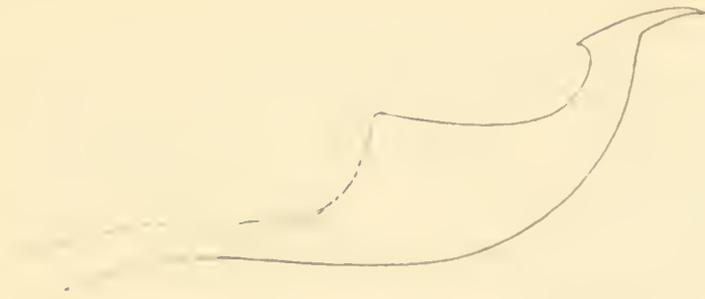


Fig. 369. *Tetranychus magnoliae*: aedeagus.

shaft, bears slender angulations both anteriorly and posteriorly. The caudal angulation is somewhat the longer. The terminal sensillum on the palpus of the male is parallel-sided, about three times as long as wide at the base. The mediodorsal empodial spur of both sexes is small but quite evident, and in this respect, *Tetranychus cocosi* is rather intermediate between the Tumidus and Telarius Groups. The adult female is carmine.

This species is known only from southern California. Recently collected material is from Fullerton, California (A. E. Pritchard), on royal palm; San Diego, California (A. E. Pritchard), on royal palm; and Coronado, California (A. E. Pritchard), on bamboo.

Tetranychus cocosinus Boudreaux
(Figures 373, 374)

Tetranychus cocosinus Boudreaux, 1954, Pan-Pac. Ent., 30: 182.
Holotype: male, Port Allen, Louisiana, on *Celtis* sp.: in the U. S. National Museum.

This species is closely allied to *Tetranychus cocosi*, similarly having the knob of the aedeagus parallel to that of the shaft and with both the anterior and posterior angulations slender. However, the posterior angulation is twice as long as the anterior angulation. Moreover, the terminal sensillum on the palpus of the male is somewhat clavate and nearly five times as long as the proximal width. The female is dark purple in life.

Tetranychus cocosinus is known only from the types from southern Louisiana, on brambles, hackberry, rose, and American elm.

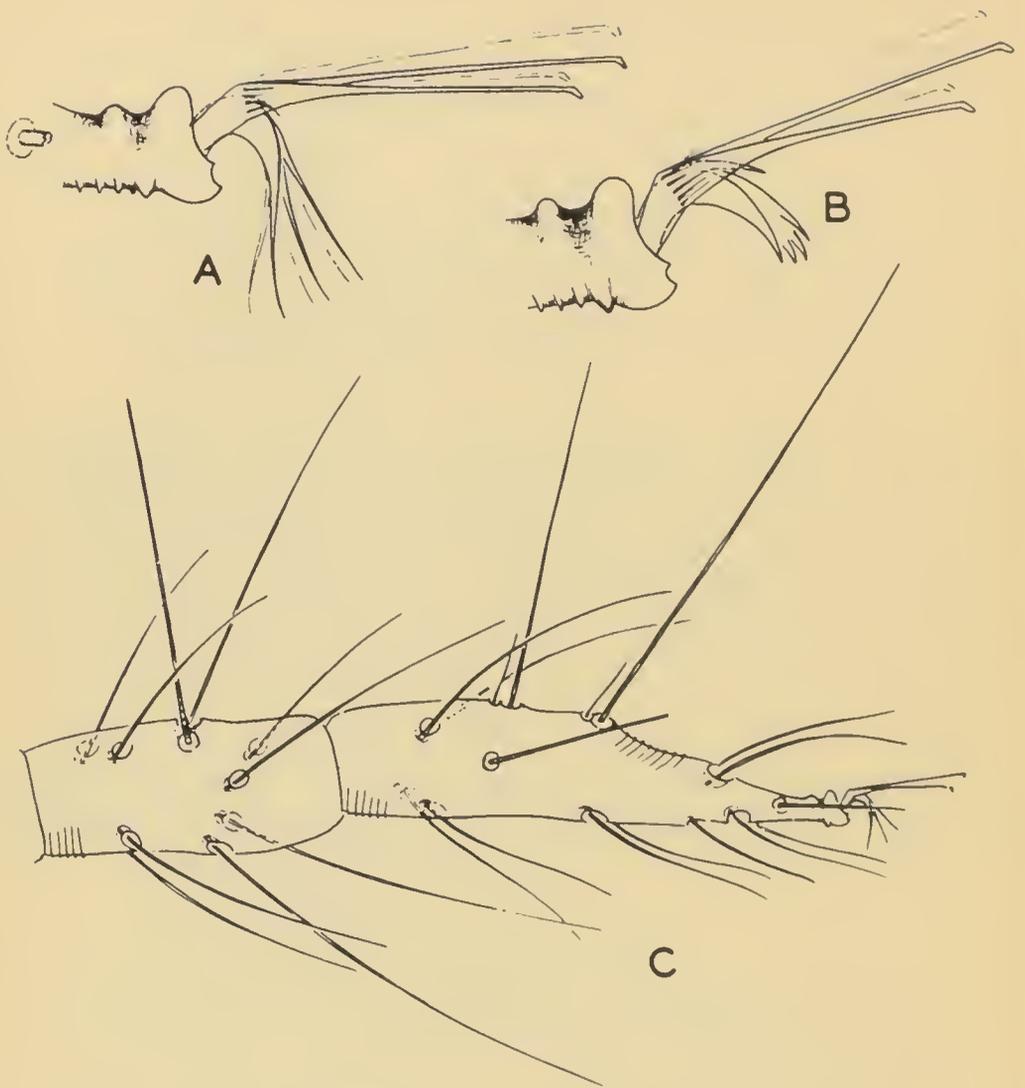


Fig. 370. *Tetranychus cocosi*: A.) empodium of female; B.) empodium I of male; C.) tibia and tarsus I of female.

Telarius Group

Mites belonging to the Telarius Group of the genus *Tetranychus* have the mediodorsal spur of the empodium tiny or absent; and the proximal pair of duplex setae on tarsus I is distal to the four tactile setae at the base of the segment. The female has longitudinal striae on the integument between the third pair of dorsocentral hysterosomials and also the inner sacrales, and a diamond-shaped figure is formed in the area between these setae.

Adult feeding females occurring naturally in the temperate zones are greenish. However, most of the species are found in tropical or subtropical areas, and their females are carnine.

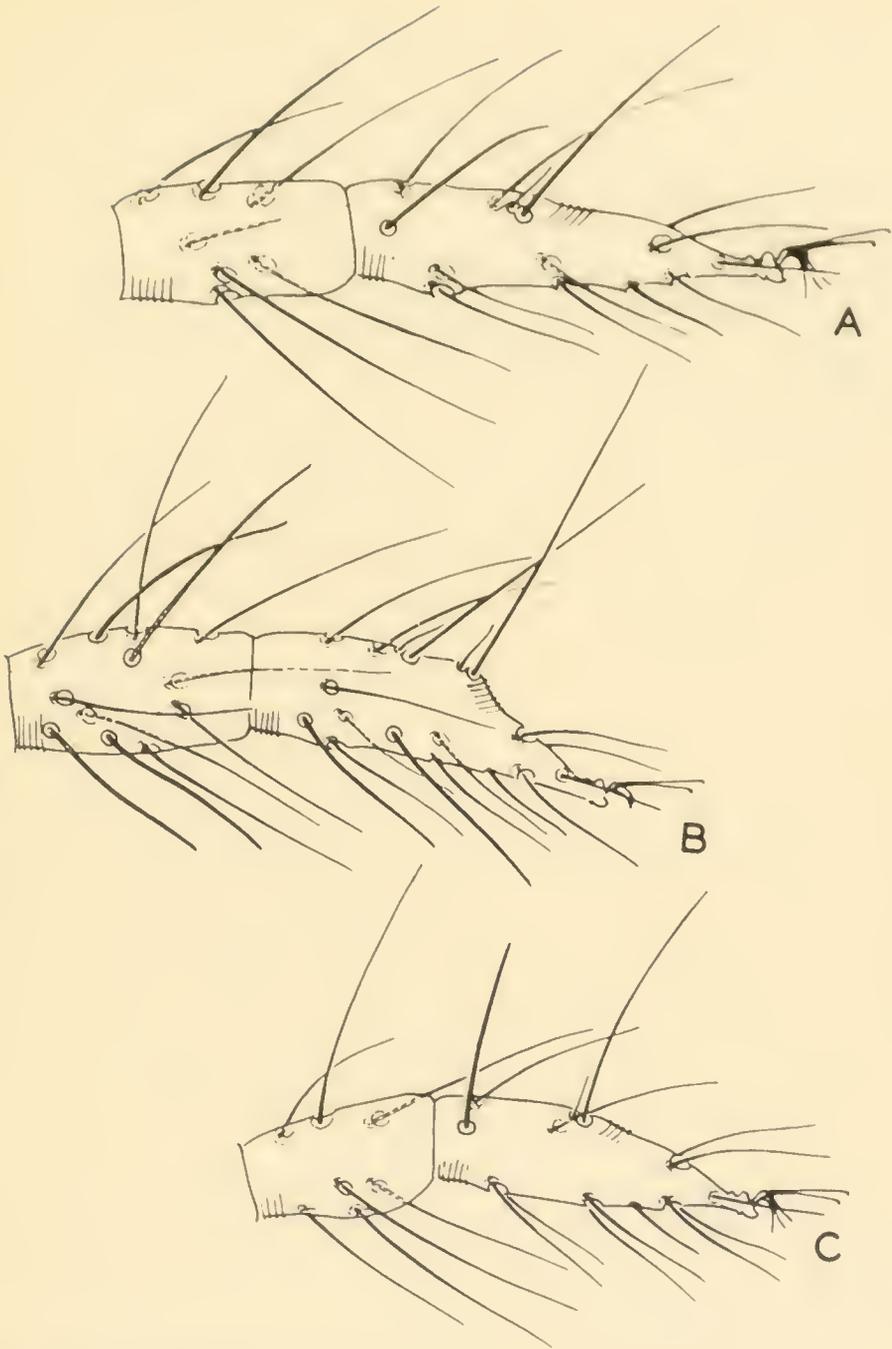


Fig. 371. *Tetranychus cocosi*: A.) tibia and tarsus II of female: B.) tibia and tarsus I of male: C.) tibia and tarsus II of male.

Tetranychus cucurbitae Rahman and Punjab
(Figures 375, 376, 377)

Tetranychus cucurbitae Rahman and Punjab, 1940, Proc. Indian Acad. Sci. (ser. B), 11: 179; Rahman and Sapra, 1946, Indian Jour.

Spider Mites

Agr. Sci., 15(3): 124. *Types*: males and females, Lyallpur, India, on pumpkins (*Cucurbita maxima*, *C. pepo*, and *C. moschata*), *Citrullus vulgaris* var. *fistulosus*, *Luffa aegyptica*, cabbage (*Brassica oleracea*), tomato (*Lycopersicon esculentum*), and hollyhock (*Althaea rosea*), as well as many others, totaling about sixty different plants.

Tetranychus equatorius McGregor, 1950, Amer. Midl. Nat., 44(2): 285. *Types*: males and females, Waipahu School, Oahu, Hawaiian Islands, on string beans; in the U. S. National Museum. *New synonymy*.



Fig. 372. *Tetranychus cocosi*:
aedeagus.

Tetranychus cucurbitae may be readily recognized by the aedeagal knob, which is berrylike with the anterior curvature more strongly developed than the posterior convexity. The adult female is carmine.

Specimens from India have been studied that are undoubtedly referable to this species. They are the same as *Tetranychus equatorius*.

McGregor recorded this species from several of the Hawaiian Islands, the Fiji Islands, Venezuela, and Puerto Rico. Recorded hosts are *Cinchona* sp., *Cracca vogeli*, *Grammatophyllum* sp., peanut, string bean, water hyacinth, and watermelon.

New collections studied by us are from Honolulu, Oahu, Territory of Hawaii (F. S. Morishita), on mango; Bahamas (at Hoboken, New Jersey quarantine; McMaster), on *Codiaeum* sp.; Coral Gables, Florida

(F. G. Butcher and A. E. Pritchard), on papaya and *Bauhinia alba*; Ft. Lauderdale, Florida (O. D. Link), on *Buddleia asiatica*; Ft. Lauderdale, Florida (C. Poucher), on *Maranta* sp.; Geneva, Florida (O. D. Link), on Chinaberry; Northport, Long Island, New York (G. V. Johnson), on sweet potato in greenhouse; South America (at Honolulu, quarantine; Yokoyama), on *Cynoches* sp.; and Mysore, India (M. Puttarudriah), on bean.

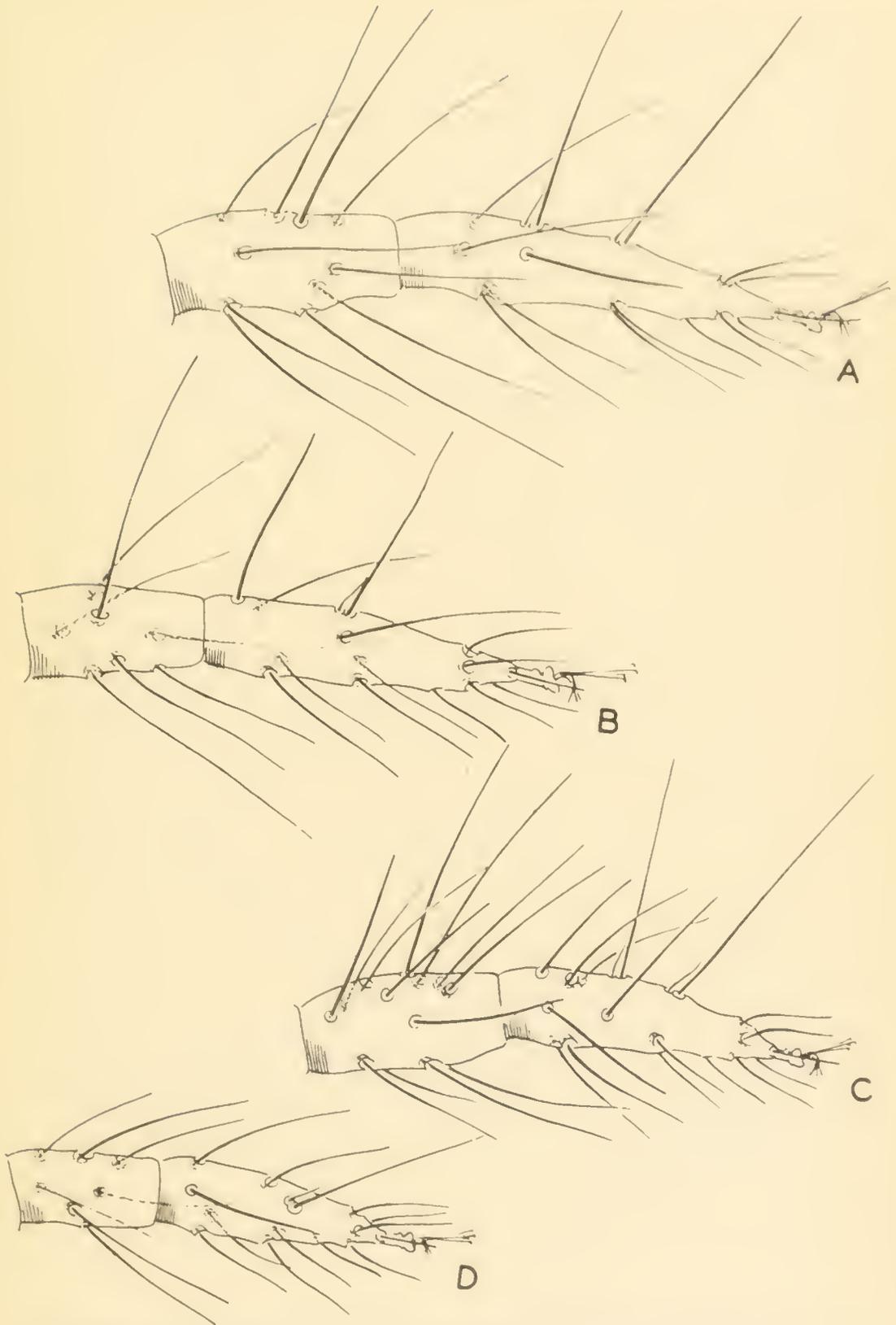


Fig. 373. *Tetranychus cocosinus*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

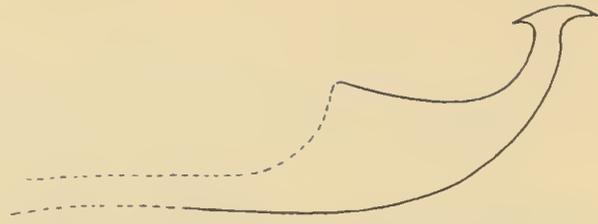


Fig. 374. *Tetranychus cocosinus*: aedeagus.

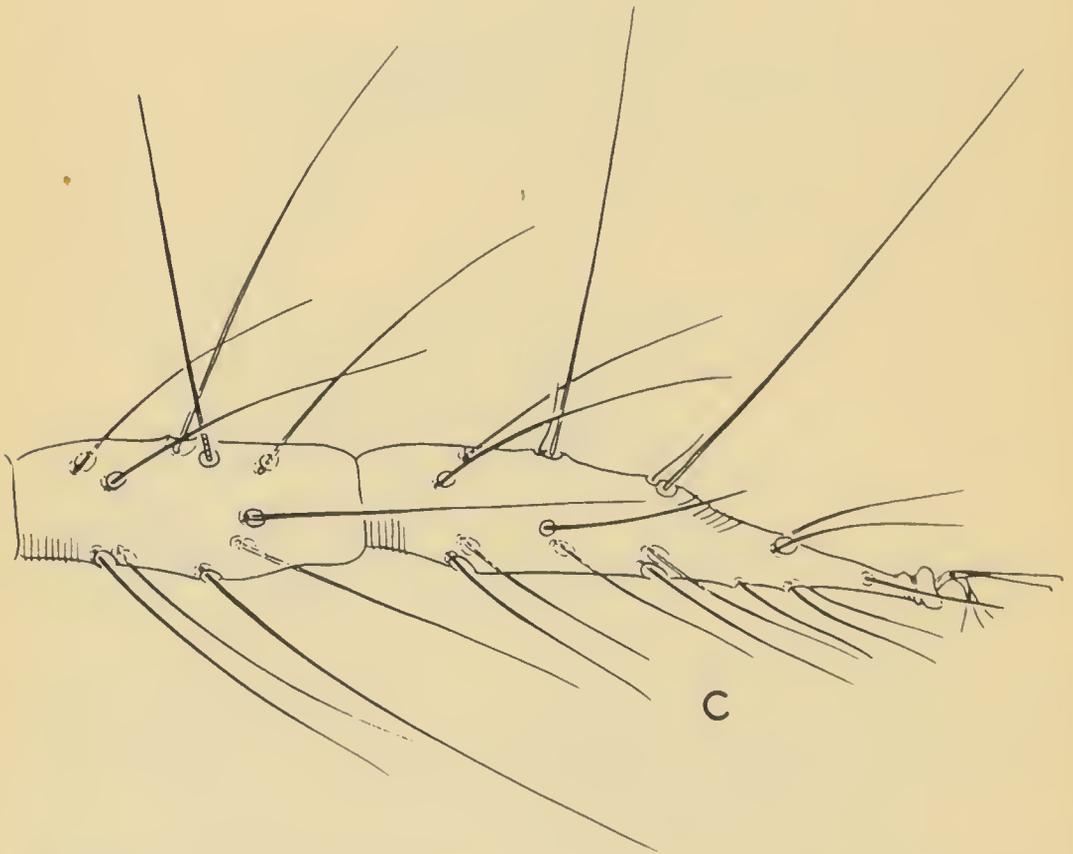
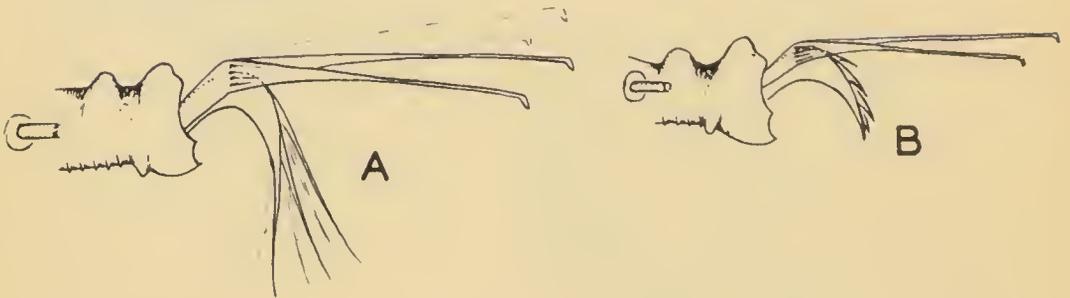


Fig. 375. *Tetranychus cucurbitae*: A.) empodium I of female; B.) empodium I of male; C.) tibia and tarsus I of female.

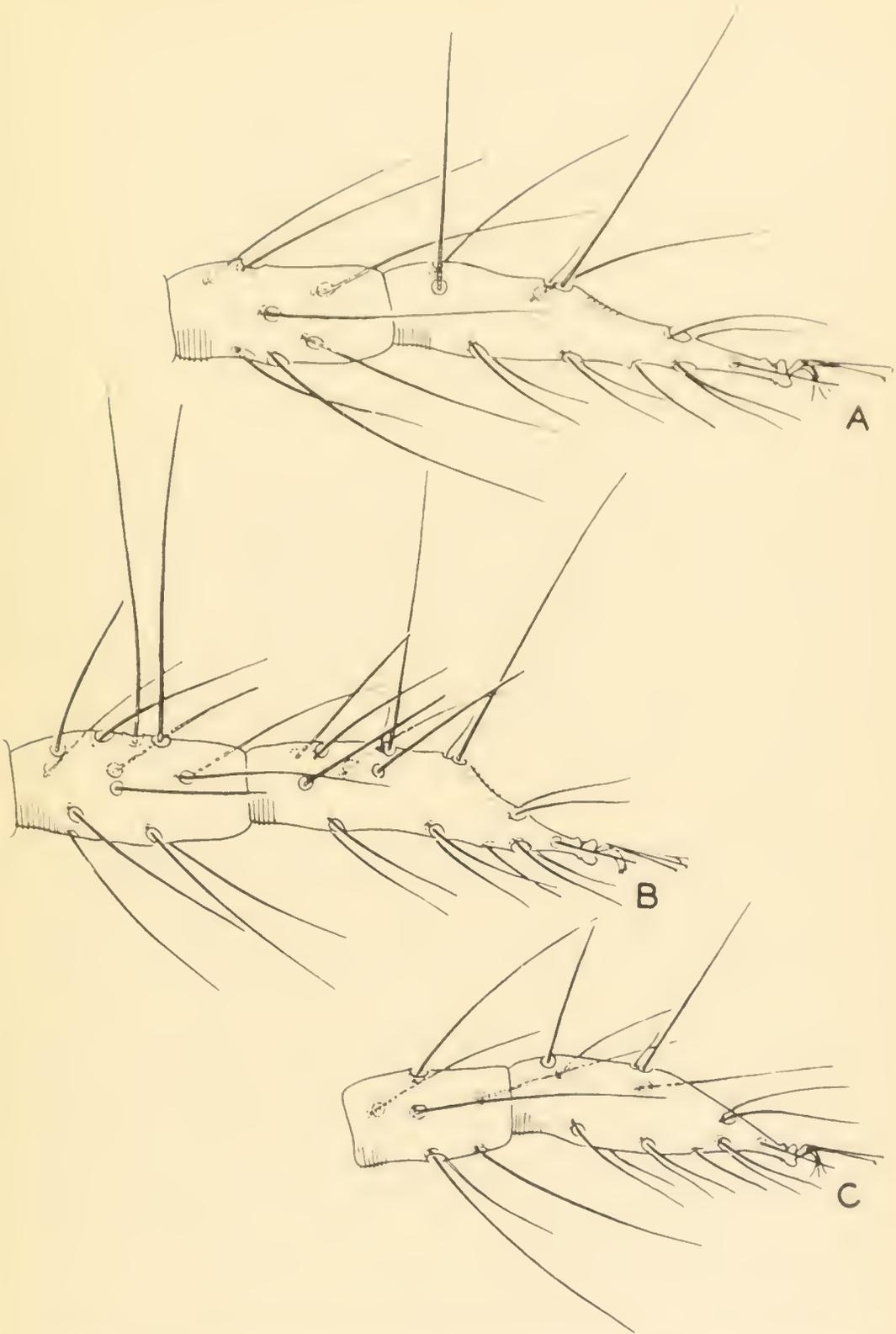


Fig. 376. *Tetranychus cucurbitae*: A.) tibia and tarsus II of female; B.) tibia and tarsus I of male; C.) tibia and tarsus II of male.



Fig. 377. *Tetranychus cucurbitae*: aedeagus.

Tetranychus atlanticus McGregor
(Figure 378)

Tetranychus atlanticus McGregor, 1941, Proc. Ent. Soc. Wash., 43: 26; McGregor, 1950, Amer. Midl. Nat., 44(2): 280; Pritchard and Baker, 1952, Hilgardia, 21(9): 271; Baker and Pritchard, 1953, Hilgardia, 22(7): 227. *Types*: males and females, Chadburn, North Carolina, on strawberry; in the U. S. National Museum.

Tetranychus atlanticus may be recognized by having the distal knob of the aedeagus moderately enlarged, about one-fourth as long as the dorsal margin of the shaft, and with the dorsal margin of the knob obtusely angulate. The anterior projection of the knob is broad and narrowly rounded, and the posterior angulation is small and acute. The axis of the knob usually forms an angle with the axis of the shaft. Actively feeding females are strawcolored or greenish with a pair of large black spots near the middle of the body.

This spider mite is found throughout most of the United States, but it appears to reach greatest abundance in the West. Records are from New York, Connecticut, Maryland, Delaware, Virginia, South

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Fig. 378. *Tetranychus atlanticus*: aedeagi.

Carolina, Kentucky, Georgia, Florida, Alabama, Mississippi, Louisiana, Ohio, Wisconsin, Utah, Idaho, Oregon, and California.

Tetranychus atlanticus is found primarily on low-growing plants. It is a serious pest of cotton, alfalfa, beans, melon, clover, strawberry, parsley, and eggplant. Many weeds serve as hosts. Occasional collections are taken on pear, peach, apple, walnut, and lemon.

One collection was forwarded from Ankara, Turkey (Zeliha Düzgünes), on apple; and another collection from Okitsu, Shiznoka, Japan (Jiro Fukuda), on apple.

Tetranychus hydrangeae Pritchard and Baker, new species
(Figure 379)

The knob of the aedeagus of *Tetranychus hydrangeae* is moderately enlarged as in *T. atlanticus* but the dorsal margin of the knob is convex, not angulate. The anterior, rounded projection of the knob is about as wide as the base of the acute posterior angulation, and the axis of the knob is parallel to that of the shaft.

Fig. 379. *Tetranychus hydrangeae*: aedeagus.

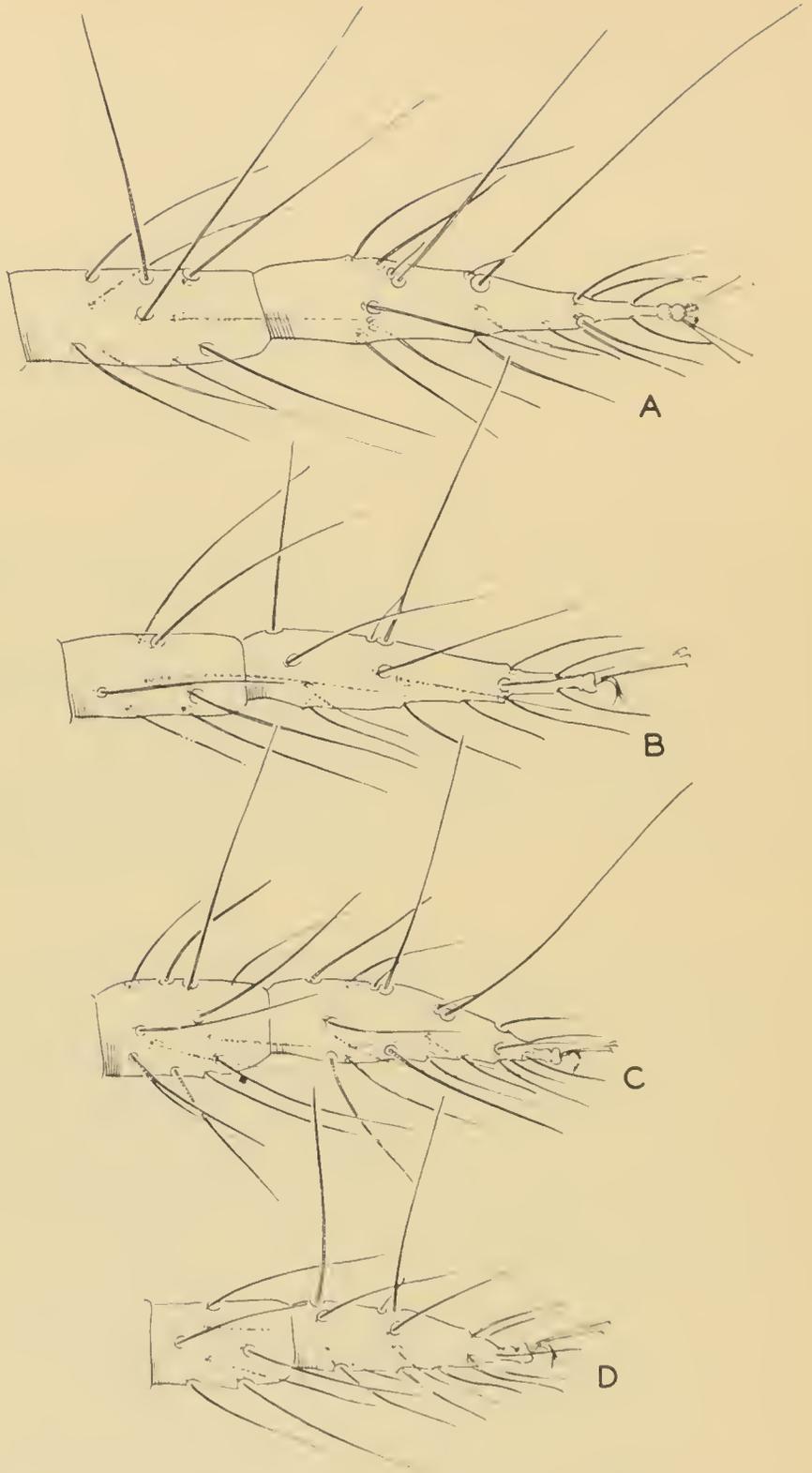


Fig. 380. *Tetranychus mer_ganser*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.

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Fig. 381. *Tetranychus merganser*: aedeagus.

The adult female, and also the male, is carmine in color, and hydrangea is the most important host.

Male.—Palpus with terminal sensillum subclavate, nearly five times as long as broad at base. Peritreme strongly retrorse distally. Empodium I with two trifid appendages having slender digits, the mediadorsal spur strong; empodium II with mediadorsal spur strong; empodia III and IV each with tiny but apparent spur. Aedeagus with dorsal bend at nearly right angle; knob about one-fifth as long as shaft, its axis parallel to that of shaft, the anterior projection rounded and no wider at base than base of the acute posterior projection. Length of body 330 μ , including rostrum 450 μ .

Female.—Similar. Terminal sensillum of palpus about three times as long as wide at base. Tarsus I with proximal duplex distal to four proximal tactile setae. Empodia with tiny mediadorsal spur. Hysterosoma with longitudinal striae between third pair of dorsocentrals and between inner clunals. Area immediately anterior to genital flap with longitudinal striae. Length of body 375 μ , including rostrum 500 μ ; greatest width of body 300 μ .

Holotype.—Male, Los Angeles, California, February 15, 1952 (R. N. Jefferson), on bean; type no. 2187 in the U. S. National Museum. *Paratypes*.—Twenty-four males, 12 females, San Francisco, California, October 22, 1949 (A. E. Pritchard), on hydrangea in greenhouses; 1 male, 1 female, December 15, 1951 (A. E. Pritchard), on poinsettia in greenhouse; 4 males, 5 females, Los Angeles, California, July 18, 1949 (R. N. Jefferson), on *Maranta* sp. in greenhouse; Los Angeles, California, February 14, 1952 (R. N. Jefferson), on beans.

This species is an important pest of hydrangeas, particularly potted plants grown commercially in greenhouses. Davis (1952), by transfers in the laboratory, showed that the mites could live and reproduce on bean, strawberry, and violets, but are unable to survive on banana squash. Poinsettia is not a favorable host, the colonies remaining very small and often disappearing under warm greenhouse conditions.

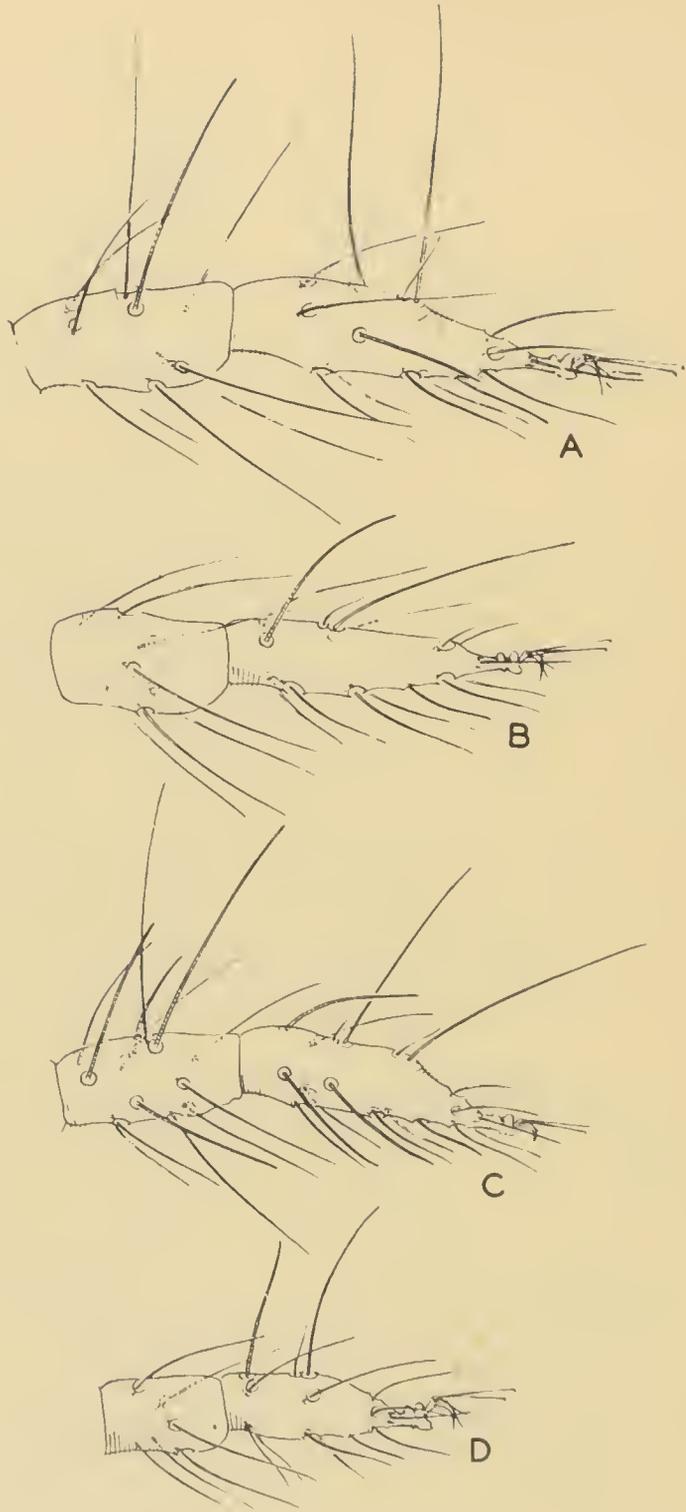


Fig. 382. *Tetranychus marianae*: A.) tibia and tarsus I of female; B.) tibia and tarsus II of female; C.) tibia and tarsus I of male; D.) tibia and tarsus II of male.



Fig. 383. *Tetranychus marianae*: above, empodium I of male; below, empodium I of female.

Tetranychus merganser Boudreaux
(Figures 380, 381)

Tetranychus merganser Boudreaux, 1954, Pan-Pac. Ent., 30: 181.
Holotype: male, Baton Rouge, Louisiana, on *Ligustrum vulgare*;
in the U. S. National Museum.

The knob of the aedeagus is moderately enlarged with the dorsal margin convex, thus resembling *Tetranychus hydrangeae*. However, the evenly rounded anterior projection of the aedeagal knob of *T. merganser* is very broad in comparison with the acute caudal angulation.

The female is carmine. In contrast to *Tetranychus hydrangeae* and *T. atlanticus*, the anterior portion of the genital flap bears longitudinal striae.

This species is known only from Louisiana, on privet.

Tetranychus marianae McGregor
(Figures 382, 383, 384)

Tetranychus marianae McGregor, 1950, Amer. Midl. Nat., 44(2): 291;
Baker and Pritchard, 1953, Hilgardia, 22(7): 229. *Types*: males
and females, Mt. Lasso, Tinian Island, Mariana Group, on
Passiflora foetida: in the U. S. National Museum.



Fig. 384. *Tetranychus marianae*: aedeagus.

Tetranychus marianae may be recognized by the aedeagus, the axis of the terminal knob forming a definite angle with the axis of the shaft, with a small anterior angulation and with a longer, dorso-caudally directed angulation. The knob is obviously longer than the stem. Adult females are carmine in life.

McGregor recorded this species from Saipan, and the Tinian Islands on castor bean, passion flower, and *Melanolepis multiglandulosa*. Additional specimens studied by us are from Iwo-Arno Atoll (R. L. Usinger), on *Wedelia* sp.; Concordia, Argentina (J. R. King), on nightshade; Chinandega, Nicaragua (R. B. Swain), on cotton; Managua, Nicaragua (R. Pinell), on cotton; Key West, Florida (E. W. Baker), on wild lavender; and Miami, Florida (O. D. Link), on *Triumfetta semitriloba*.

Tetranychus neocaledonicus André

Tetranychus neocaledonicus André, 1933, Bul. Mus. Hist. Nat. Paris (ser. 2), 5: 302. Types: females, New Caledonia, on cotton; probably in the Museum d' Histoire Naturelle de Paris.

André's description of *Tetranychus neocaledonicus* is based on the female alone, and F. Colic, the entomologist of the island, has been unable to find topotype males on which we might base determination of the species. The original host, cotton, is no longer a commercial crop on the island.



Fig. 385. *Tetranychus piercei*: aedeagus.

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Our knowledge to date indicates that this name preoccupies that of either *Tetranychus marianae* or *T. cucurbitae*.

Tetranychus piercei McGregor

(Figure 385)

Tetranychus piercei McGregor, 1950, Amer. Midl. Nat., 44(2): 299.

Type: male, Victorias Occ. Negros, Philippine Islands, on *Clitoria ternata*; in the U. S. National Museum.

Tetranychus piercei appears to be closely related to *T. marianae*, but the aedeagal knob is diminutive and much smaller than the base of the stem that supports it. The only male is in very poor condition, and this species may prove to be a synonym of *T. marianae*. Only the type from the Philippine Islands is known.

Tetranychus dugesii Cano y Alcacio

Tetranychus dugesii Cano y Alcacio, 1886, Naturaleza, 7(12): 197.

Described from specimens from Hacienda Escuela (probably near Mexico City), Mexico, on *Medicago denticulata*.

The reddish coloration of the female indicates that this species belongs to the genus *Tetranychus*, even though Cano y Alcacio's figure of the empodial appendages is more suggestive of *Schizotetranychus*. Identification will have to be based on topotype material.

Tetranychus kanzawai Yokoyama

Tetranychus kanzawai Yokoyama, 1927, Zool. Mag., 39(460): 105. Described from male and female, Japan, on mulberry.

The aedeagus of *Tetranychus kanzawai*, as figured by Yokoyama, is distinctive. The distal knob is about one-third as long as the shaft, with a small, dorsally projecting angulation on the anterior, rounded development, and with the caudal angulation acute.



Fig. 386. *Tetranychus telarius*: female with indications of body markings when feeding.

Tetranychus telarius (Linnaeus)
(Figures 386, 387, 388, 389, 390, 391)

Acarus telarius Linnaeus, 1758, Syst. Nat., 10: 616; Oudemans, 1931, Ent. Ber., 8(177): 221. Described from specimens from Sweden, on various hosts and *Tilia* sp.

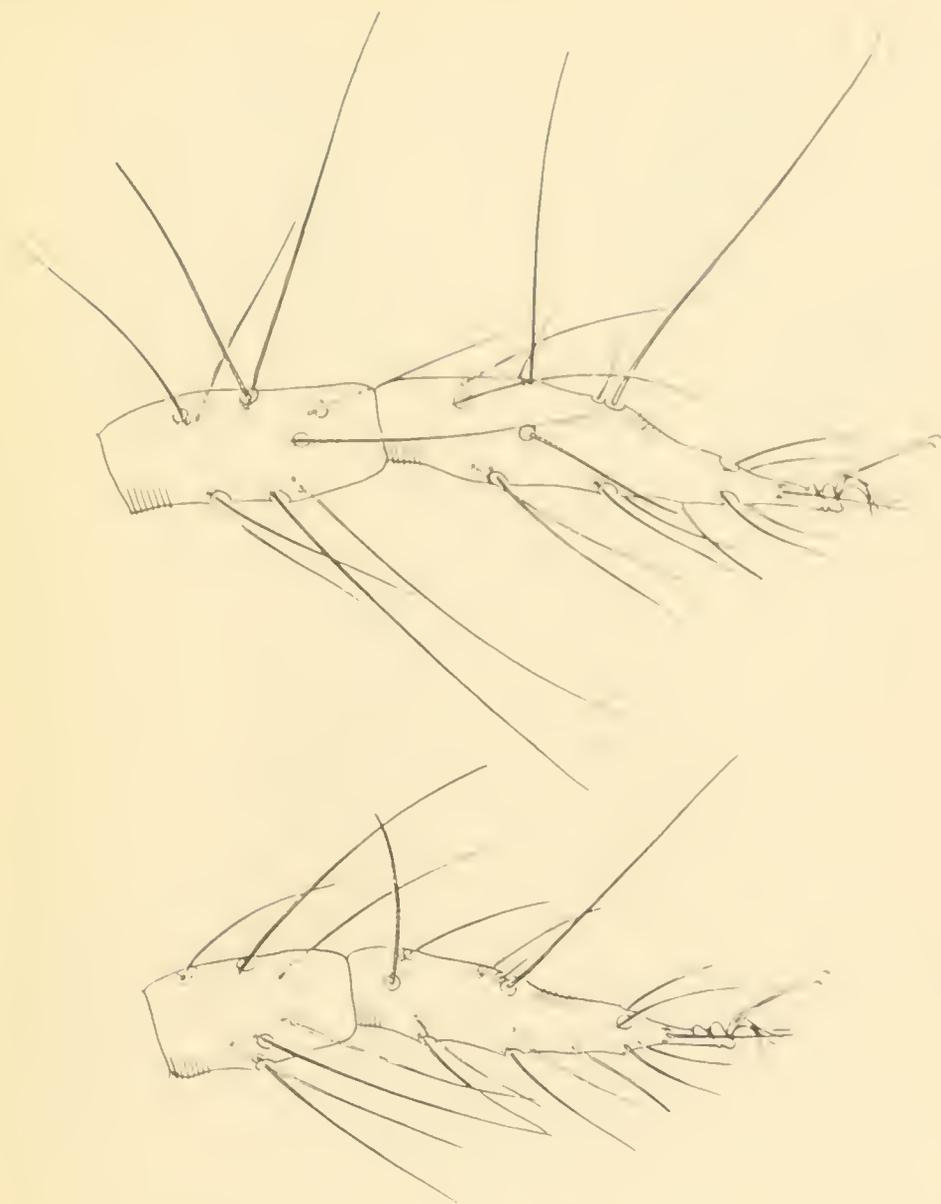


Fig. 387. *Tetranychus telarius*: dorsal aspect of non-feeding female.

Tetranychus telarius, Dugés, 1834, Ann. Sci. Nat. Paris (sér. 2), 1: 15; Donnadieu, 1875, Ann. Soc. Linn. Lyon (n. sér.), 22: 151; Murray, 1877, Econ. Ent. Apt., p. 97; Canestrini, 1889, Atti Reale Ist. Ven. Sci. Let. Arti (ser. 6), 7: 497; Banks, 1900, U. S. Dept. Agric. Div. Ent. Tech. Ser., 8: 75; Ewing, 1914, Bul. Oreg. Agr. Expt. Sta., 121: 1; Trägårdh, 1915, Meded. Centralanst. försöks jordbruks. Ent. avd., 20: 40; McGregor, 1917, U. S. Dept. Agric. Farm. Bul., 831: 3, 40; McGregor, 1919, Proc. U. S. Natl. Mus., 56(2303): 650; Hirst, 1920, Proc. Zool. Soc. Lond., 1920: 49; Hirst, 1924, Ann. Mag. Nat. Hist. (ser. 9), 14: 621.

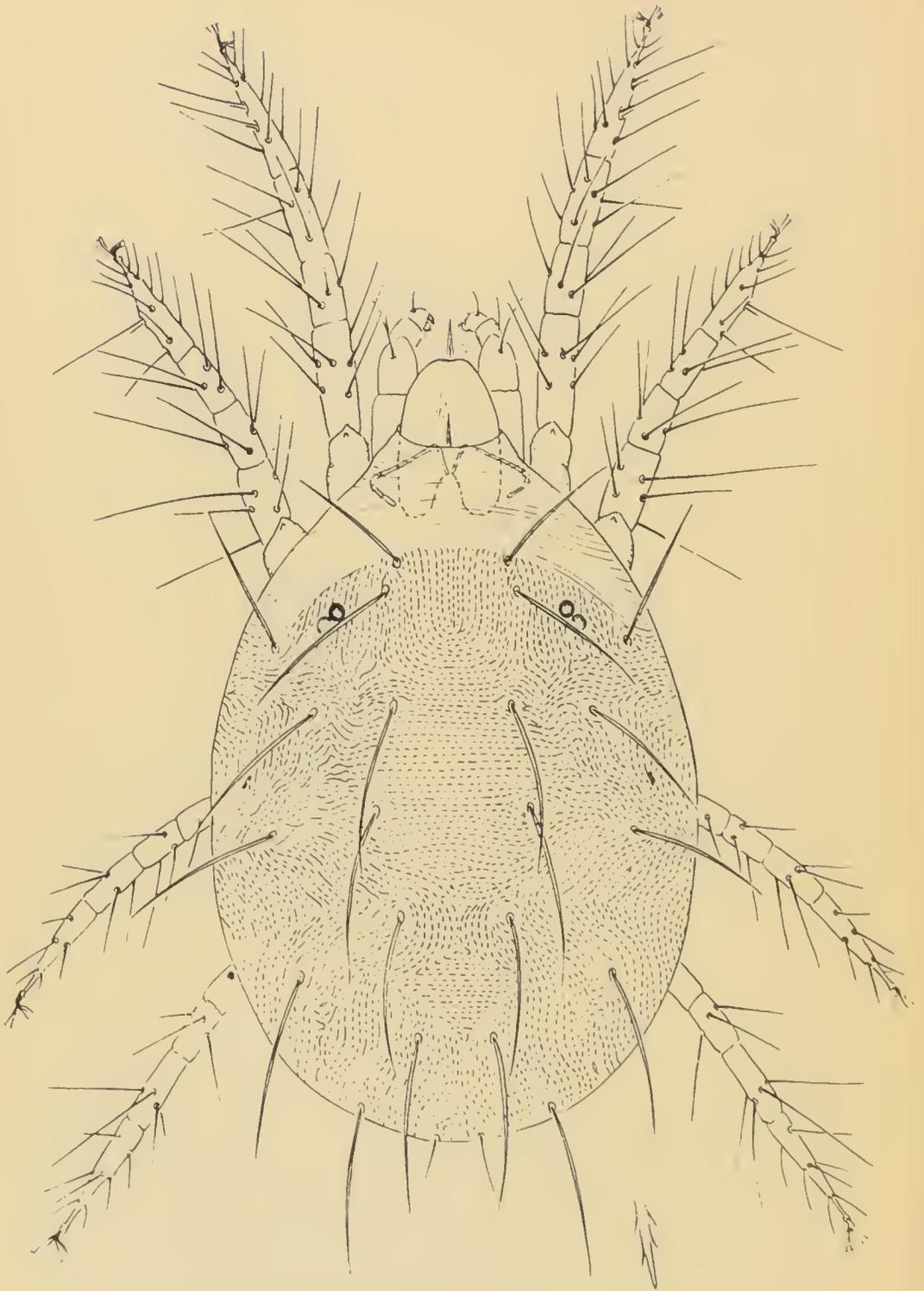


Fig. 388. *Tetranychus telarius*: dorsal aspect of actively feeding female.

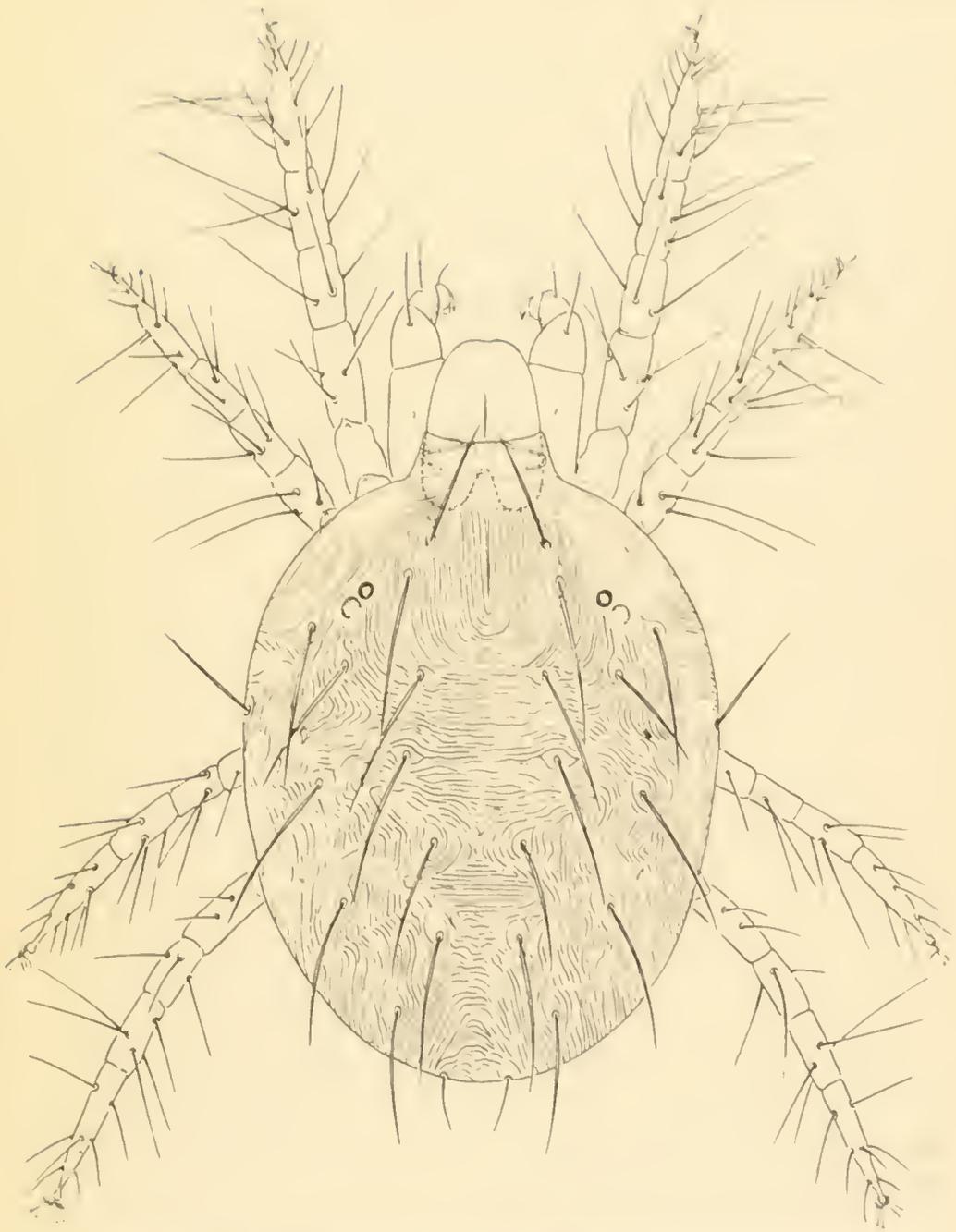


Fig. 389. *Tetranychus telarius*: above, tibia and tarsus I of female; below, tibia and tarsus II of female.

Acarus sambuci Schrank, 1781, Enum. Ins. Austr., p. 521. Described from specimens from Germany, on *Sambucus*.

Tetranychus sambuci, Koch, 1842, Ueber Arachn. Syst. Fam. 3, p. 37; Oudemans, 1930, Ent. Ber., 8(176): 168; Oudemans, 1937, Krit. Hist. Overz. Acar., 3(C): 1043; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 37.

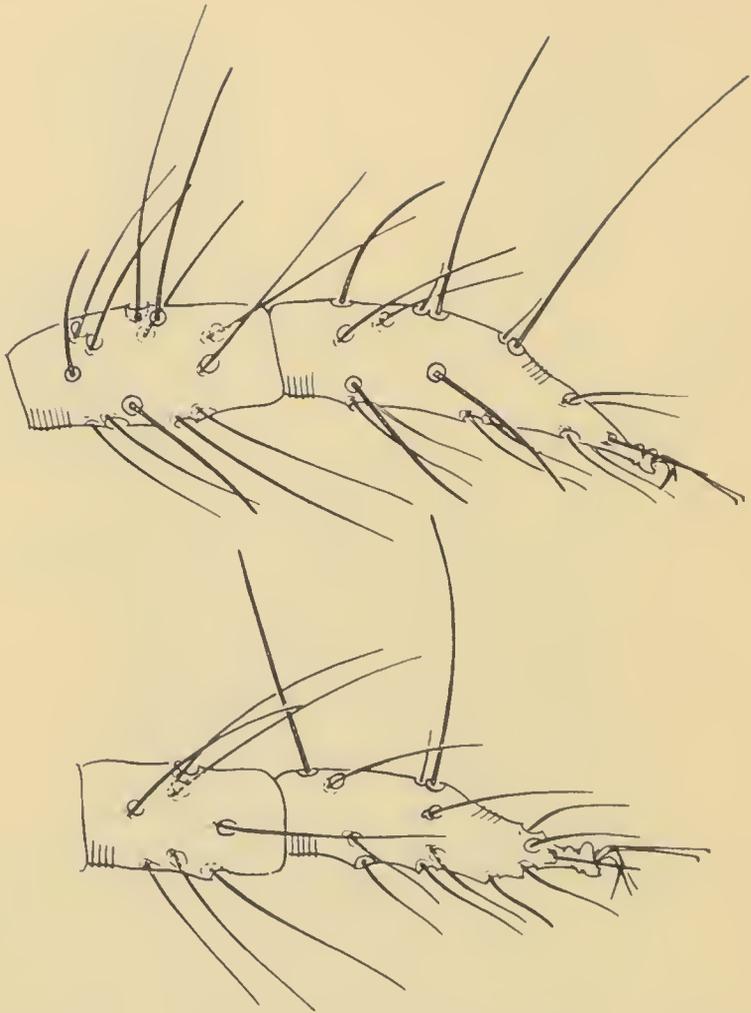


Fig. 390. *Tetranychus telarius*: above, tibia and tarsus I of male; below, tibia and tarsus II of male.

Epitetranynchus sambuci, Oudemans, 1931, Ent. Ber., 8(177): 194.

Acarus textor Fourcroy, 1785, Ent. Paris, 2: 530. Described from specimens from France, on bark of tree.

Tetranychus textor, Oudemans, 1929, Krit. Hist. Overz. Acar., 2: 276.

Tetranychus lintcaricus Dufour, 1832, Ann. Sci. Nat. Paris, 25: 276—also spelled as *lintearius* on p. 281; Canestrini and Fanzago, 1878, Atti Reale Istit. Ven. Sci. Let. Arti (ser. 5), 4: 148; Ilirst 1920, Proc. Zool. Soc. Lond., 1920: 56; Oudemans, 1931, Ent. Ber., 8(177): 196; Oudemans, 1937, Krit. Hist. Overz. Acar., 3(C): 1038. Described from specimens from Saint-Sever, France, on *Ulex europaeas*.

Tetranychus urticae Koch, 1836, Den. Crust. Myr. Arach., 1: 10; Oudemans, 1931, Ent. Ber., 8(177): 231; Oudemans, 1931, Ent.

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- Ber., 8(180): 276; Geijskes, 1939, Meded. Landbouwl. Wageningen, 42(4): 36; Womersley, 1940, Trans. Roy. Soc. S. Australia, 64: 256; Reck, 1950, Trudy Inst. Zool. Akad. Nauk Gruz. S.S.R., 9: 127. Described from specimens from Regensburg, Germany, on nettle.
- Tetranychus urticae dianthica* Dosse, 1952, Höfchen-Briefe, 5: 250. Described from specimens from Germany, in greenhouse, on carnation. *New synonymy*.
- Tetranychus russeolus* Koch, 1838, Deu. Crust. Myr. Arach., 17: 15; Oudemans, 1937, Krit. Hist. Overz. Acar., 3(C): 1042. Described from specimens from Germany, on nettle.
- Tetranychus viburni* Koch, 1838, Deu. Crust. Myr. Arach., 17: 17. Described from specimens from Germany, on *Viburnum opulus*.
- Schizotetranychus viburni*, Oudemans, 1937, Krit. Hist. Overz. Acar., 3(C): 1061.
- Tetranychus fervidus* Koch, 1841, Deu. Crust. Myr. Arach., 37: 21; Oudemans, 1937, Krit. Hist. Overz. Acar., 3(C): 1037. Described from specimens from Germany, in moss.
- Acarus cucumeris* Boisduval, 1867, Ent. Hort., p. 84. Described from specimens from France, on cucumber.
- Tetranychus cucumeris*, Murray, 1877, Econ. Ent. Apt., p. 102.
- Acarus rosarum* Boisduval, 1867, Ent. Hort., p. 84. Described from specimens from France, on rose.
- Tetranychus rosarum*, Murray, 1877, Econ. Ent. Apt., p. 102.
- Acarus cinnabarinus* Boisduval, 1867, Ent. Hort., p. 88. Described from specimens from France, in greenhouse on *Dracaena*.
- Acarus haematodes* Boisduval, 1867, Ent. Hort., p. 88. Described from specimens from France, on castorbean.
- Tetranychus telarius haematodes*, Murray, 1877, Econ. Ent. Apt., p. 101.
- Acarus ferrugineus* Boisduval, 1867, Ent. Hort., p. 90. Described from specimens from France, in greenhouse on cyclamen.
- Tetranychus ferrugineus* Murray, 1877, Econ. Ent. Apt. p. 103.
- Acarus vitis* Boisduval, 1867, Ent. Hort., p. 92. Described from specimens from France, on grape.
- Tetranychus vitis*, Murray, 1877, Econ. Ent., Apt. p. 103.
- Distigmatus pilosus* Donnadieu, 1875, Rech. Serv. Hist. Tetr., p. 118. Described from specimens from France, on prune, peach, and other rosaceous trees.
- Tetranychus major* Donnadieu, 1875, (not Dugés, 1834), Rech. Serv. Hist. Tetr., p. 120. Described from specimens from France, on vegetation, particularly trees.
- Tetranychus piger* Donnadieu, 1875, Rech. Serv. Hist. Tetr., p. 121.

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Described from specimens from France, on elm and paper-mulberry.

Tetranychus minor Donnadieu, 1875, Rech. Serv. Hist. Tetr., p. 121.

Described from specimens from France; no host given.

Tetranychus longitarsus Donnadieu, 1875, Rech. Serv. Hist. Tetr., p. 122. Described from specimens from France; no host given.

Tetranychus plumistoma Donnadieu, 1875, Rech. Serv. Hist. Tetr., p. 122. Described from specimens from France, on herbaceous plants. *New synonymy.*

Tetranychus fici Murray, 1877, Econ. Ent. Apt., p. 107. Described from specimens from near London, on fig. *New synonymy.*

Tetranychus eriostemi Murray, 1877, Econ. Ent. Apt., p. 109. Described from specimens from England, in greenhouse, on *Eriostemon veriifolium*. *New synonymy.*

Tetranychus inaequalis Targioni Tozzetti, 1878, Ann. Agr., 1: 251.

Described from specimens from Italy, on many greenhouse plants.

Tetranychus bimaculatus Harvey, 1893, Ann. Rep. Maine Agr. Exp. Sta. 1892: 133; McGregor, 1912, U. S. Dept. Agr. Circ., 150: 1; McGregor, 1917, U. S. Dept. Agr. Bul., 416: 3; McGregor, 1919, Proc. U. S. Nat. Mus., 56(2303): 654; Garman, 1940, Conn. Agr. Exp. Sta. Bul., 431: 81; McGregor, 1942, Proc. Ent. Soc. Wash., 44: 28; McGregor, 1950, Amer. Midl. Nat., 44(2): 281; Pritchard and Baker, 1940, 1952, Hilgardia, 21(9): 268; Baker and Pritchard, 1953, Hilgardia, 22(7): 221. Described from specimens from Orono, Maine, on numerous hosts.

Tetranychus althaeae von Hanstein, 1901, Zts. wiss. Zool., 70: 74; Trägårdh, 1915, Midd. Centralanst. försöks jordbruks, Ent. avd., 109(20): 36; Oudemans, 1930, Ent. Ber., 8(175): 163.

Epitettranychus althaeae, Zacher, 1916, Mitt. kaiserl. biol. Anst. Land-Forstw., 16: 23; Oudemans, 1931, Ent. Ber., 8(177): 193.

Epitettranychus hamatus Zacher, 1916, Mitt. kaiserl. biol. Anst. Land-Forstw., 16: 25. Described from male and female specimens from Germany, on *Euphorbia*; possibly in the Zacher collection. *New synonymy.*

Epitettranychus aequans Zacher, 1916, Mitt. kaiserl. biol. Anst. Land-Forstw., 16: 25. Described from male and female specimens from Germany, on mint; possibly in the Zacher collection. *New synonymy.*

Epitettranychus alceae Oudemans, 1928, Ent. Ber., 7(159): 290. Described, and erroneously accredited to Linnaeus, 1758, not 1746, from specimens from Holland, on *Althea rosea*. *New synonymy.*

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- Tetranychus reinwardtiae* Oudemans, 1930, Ent. Ber., 8(175): 170. Types: male and female, Stockholm, Sweden, in greenhouse on *Reinwardtia tetragyna*; probably in the Rijksmuseum van Natuurlijke Historie, Leiden, Holland. *New synonymy*.
- Epitetanychus reinwardtiae*, Oudemans, 1931, Ent. Ber., 8(177): 194.
- Epitetanychus caldarii* Oudemans, 1931, Ent. Ber., 8(177): 194. Types: female, Stockholm, Sweden, in greenhouse, on unknown host; probably in the Rijksmuseum van Natuurlijke Historie, Leiden, Holland. *New synonymy*.
- Tetranychus (Epitetanychus) caldarii*, Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 40.
- Tetranychus fragariae* Oudemans, 1931, Ent. Ber., 8(178): 226; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 37. Types: male and female, Holland, on *Fragaria vesca*; probably in the Rijksmuseum van Natuurlijke Historie, Leiden, Holland. *New synonymy*.
- Tetranychus franscnni* Oudemans, 1931, Ent. Ber., 8(178): 227; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 38. Types: female, Wageningen, Holland, in greenhouse, on unnamed host; probably in the Rijksmuseum van Natuurlijke Historie, Leiden, Holland. *New synonymy*.
- Tetranychus aspidistrae* Oudemans, 1931, Ent. Ber., 8(179): 258; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 39. Types: male and female, Halfweg, Holland, on *Aspidistra elatiae*; probably in the Rijksmuseum van Natuurlijke Historie, Leiden, Holland. *New synonymy*.
- Tetranychus choisyae* Oudemans, 1931, Ent. Ber., 8(180): 274; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 38. Types: male, female, and nymph, Apeldoorn, Holland, on *Choisya ternata*; probably in the Rijksmuseum van Natuurlijke Historie, Leiden, Holland. *New synonymy*.
- Tetranychus stellariae* Oudemans, 1931, Ent. Ber., 8(180): 275; Geijskes, 1939, Meded. Landbouwh. Wageningen, 42(4): 39. Types: female and nymph, Arnhem, Holland, on *Stellaria media*; probably in the Rijksmuseum van Natuurlijke Historie, Leiden, Holland. *New synonymy*.
- Tetranychus violae* Oudemans, 1931, Ent. Ber., 8(180): 277. Type: one male, Naarden, Holland, on *Viola tricolor*; probably in the Rijksmuseum van Natuurlijke Historie, Leiden, Holland. *New synonymy*.
- Tetranychus manihotis* Oudemans, 1931, Ent. Ber., 8(181): 289. Types: male, female, nymph, and larva, Berlin-Dahlem, Germany, on *Manihot utillissima*; probably in the Rijksmuseum van Natuurlijke Historie, Leiden, Holland. *New synonymy*.

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- Eotetranychus inexpectatus* André, 1933, Bul. Mus. Natl. Hist. Nat. Paris, 5: 131. *Types*: males and females, Paris, France, in greenhouse, on *Acalypha* spp. and *Salvia splendens*; probably in the Museum d'Histoire Naturelle de Paris. *New synonymy*.
- Tetranychus dahliae* Oudemans, 1937, Krit. Hist. Overz. Acar., 3(C): 1022. Based on descriptions of specimens from Europe, on dahlia. *New synonymy*.
- Eotetranychus turkestanii* Ugarov and Nikolskii, 1937, Sredneaz. Stant. Zashch. Rastenii, p. 28. Described from specimens from Tashkent, Russia, on many hosts.
- Tetranychus turkestanii*, Baker and Pritchard, 1953, Hilgardia, 22(7): 213.
- Eotetranychus scabrisetus* Ugarov and Nikolskii, 1937, Trudy Sredneaz. Stan. Zashch. Rast., p. 33. Described from male and female specimens from Tashkent, Russia, on grass. *New synonymy*.
- Eotetranychus cucurbitacearum* Sayed, 1946, Bul. Soc. Fouad Ier Ent., 30: 90. *Types*: males and females, Egypt, on weeds, shrubs, and trees; probably in the collection of M. T. Sayed. *New synonymy*.
- Tetranychus multisetis* McGregor, 1950, Amer. Midl. Nat., 44(2): 294; Davis, 1952, Pan-Pac. Ent., 28: 1; Keh, 1952, Jour. Econ. Ent., 45: 308. *Types*: males and females, Riverside, California, on bean; in the U. S. National Museum.

There is no doubt that the name *Tetranychus telarius* as employed here represents a polytypic species represented by at least several subspecies or species.

Differences have been noted from samples taken in many parts of the world with regard to the comparative development of the mediodorsal spur of the empodium as well as the length of the empodial digits on leg I of the male and the comparative development of the empodial spur, especially on leg II, but also legs III and IV of the male. There is rarely some variance in the comparative length of the terminal sensillum of the male palpus. The knob of the aedeagus is always small, but its axis sometimes forms a small angle with the axis of the shaft; and the dorsal margin of the knob as well as the development of each of its angular projections varies considerably. In some cases (particularly in Ceylon) the proximal pair of duplex setae on tarsus I is set more proximally than usual. We have been unable to correlate these differences, even though some populations appear to be amply distinct on a local basis.

Actively feeding females in the more temperate zones of each hemisphere are greenish in basic color, and typically with a large internal

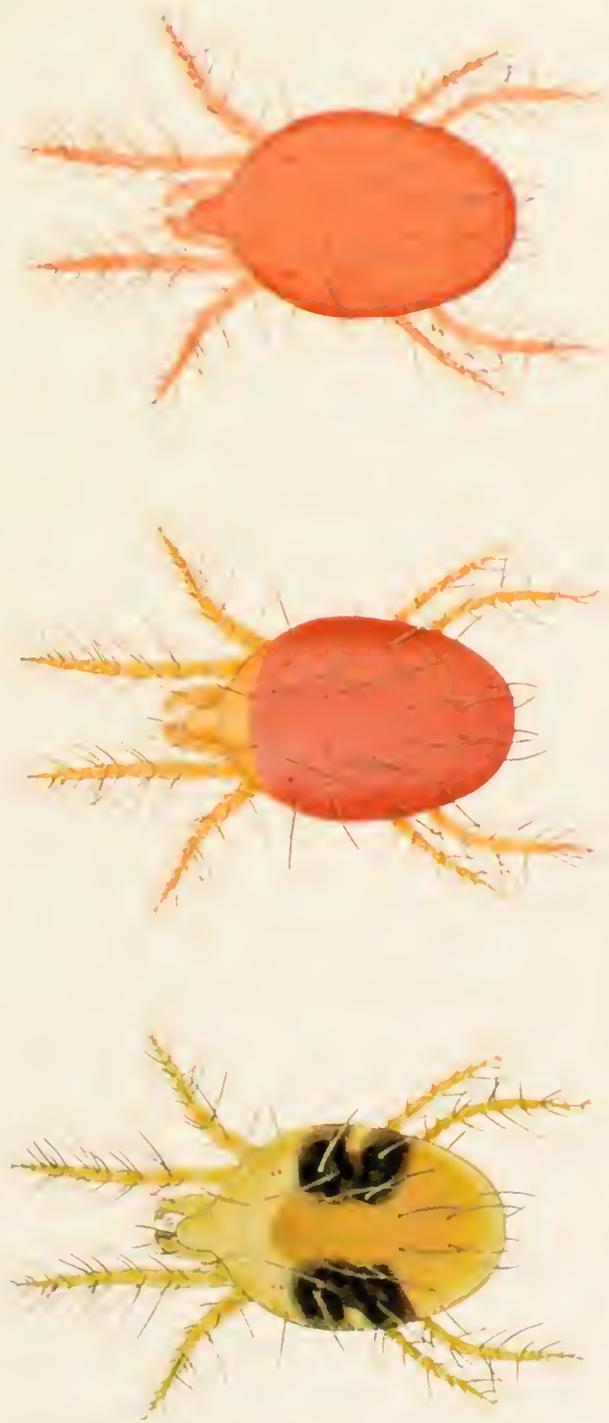


Plate I. *Tetranychus telarius* females; the green color form; the carmine color form; and the non-feeding color form.



Fig. 391. *Tetranychus telarius*: aedeagi.

dark, trifold spot on each side of the body. This form represents typical *telarius*. In the tropics and often in northern greenhouses, the females are carmine in basic color, typically with darker internal markings along each side of the body. Most of the morphological differences exhibited in specimens that we have studied are in forms from the tropics of subtropics, presumably carmine in color.

One of these carmine forms sometimes exhibits in the female two (or one) sensory setae in addition to the four tactile setae that typically are found proximal to the proximal duplex setae as in the male. Davis (1952) showed that females with the extra setae breed freely with carmine males lacking such setae, the chaetotaxy of the offspring resembling the mother. This morphological distinction is, therefore, of no value for characterizing one of the carmine forms.

However, when Keh (1952) crossed the green form with the carmine form, reproductive isolation was evident in most cases in which the first generation was inbred; and subspecies or species rank was indicated for the two color forms used in his experiments.

Boudreaux (*in litt.*) has suggested that rearing experiments indicate that the green form, *T. telarius*, is a distinct species, as is the red form, *T. cinnabarinus*, with *T. multisetis* (the red form with the extra tarsal I setae) a subspecies or variety of *T. cinnabarinus*.

Tetranychus telarius (Linnaeus) has been accepted by the great majority of acarologists as the scientific name of the common spinning mite of Europe—the two-spotted spider mite of North America.

Linnaeus (1758) described *Acarus telarius*, the only tetranychid among the 38 species of mites included in his tenth edition of "Systema Naturae." It is relevant that Linnaeus previously (1746) in his "Fauna Suecica," referred to two such mites: *Acarus alceae* and *Acarus viridialbicans foliorum tiliae*. Both of these concepts were united in the 1758 publication, inasmuch as Linnaeus referred to *A. telarius* as being a spinning mite on European plants, also found in greenhouses ("*caldario inclusis*") and on *Tilia* (linden).

Twentieth century acarologists decided that Linnaeus included two or three species in his description of *Acarus telarius*: 1) the common outdoor spinning mite of Europe, 2) a species that is more or less confined to the linden tree in Europe, and 3) a greenhouse species closely allied to the common spinning mite.

Trägårdh (1915), who might be considered the first modern reviser (see *Eotetranychus tiliarium*) first made such a distinction obvious, and he referred to the common outdoor mite as *Tetranychus telarius*, the greenhouse form being *T. altheae*. Oudemans (1931) maintained that *telarius* should be used for the linden mite, and he substituted the name *T. urticae* for the common spinning mite indoors and outdoors. Zacher (1916) followed Oudemans in restricting *telarius* to the linden tree mite, but he used the specific name *altheae* for the common spinning mite of Europe. André (1933) followed a combination of these ideas, *T. telarius* being the linden mite, *T. urticae* the common spinning mite outdoors, and *T. ludeni* being the greenhouse relative.

Hirst (1920, 1924) argued strongly that *telarius* should be retained for the common spinning mite of Europe. And in North America, Banks and Ewing continued to apply this name to the similar species in this country.

McGregor (1944) followed Zacher in restricting *telarius* to the linden mite, and he employed the specific name *altheae* for the common spinning mite of Europe. McGregor at that time considered *altheae* to be present in North America; but he later (1950) restricted American specimens to *Tetranychus bimaculatus*, a name that has been used by economic entomologists in this country during the past few years.

In most of the voluminous literature dealing with the common spinning mite of Europe or the two-spotted spider mite, the name *Tetranychus telarius* has been used; and it is best to preserve this Linnaean name for the common species.

It is true that an entirely different species is often found on linden in Europe, but so is the common spinning mite. More recent European workers who could definitely separate the two species have testified to this, and we have seen linden defoliated by the two-spotted spider mite in California.

The synonymy here included under the name *Tetranychus telarius* is undoubtedly subject to further scrutiny. Most of the synonymy of older names is not new, and most of the names were proposed long ago in Europe when the taxonomy of tetranychids was, indeed, little understood. No attempt has been made to include references to other than names of zoological standing and references that may have a direct (and usually modern) bearing on the interpretation of these names.

Undoubtedly, a careful, modern study of the tetranychoid and allied mites of Europe would enable new interpretations of some of the descriptions.

We have attempted to give reasonable interpretations to the European descriptions, and we have believed it best in many cases to place a name in synonymy with the common or two-spotted spider mite of Europe rather than let the name dangle, perhaps forever, as a *nomen dubium*.

The first of such names is *Acarus sambuci* Schrank. It is probable that modern acarologists were correct in considering this mite to be an overwintering or else the carmine form of the two-spotted spider mite; but it could also have represented some predaceous prostigmatid.

Hirst (1920) maintained that a single male that he had examined representing *Acarus lintearius* Dufour, 1832, from England on gorse, was distinct with regard to the aedeagal termination from the two-spotted spider mite. Oudemans (1931) did not agree with Hirst; and we have studied two collections from England, on gorse, transmitted by courtesy of A. M. Masee, that are indistinguishable from the two-spotted mite. *Tetranychus lintearius* is, therefore, considered to be a synonym.

Tetranychus urticae Koch, the name commonly used in Europe and British territories during recent years, undoubtedly represents the same species. *T. fervidus* Koch probably represents the hibernating color form of the same species. However, *T. viburni* Koch could be an *Eotetranychus*.

Boisduval (1867) as well as Donnadieu (1875) introduced a number of new names based primarily on color characters, host, and size. Most of these names are considered to be based on variants, but *Tetranychus rosarum* might well represent an entirely different type of mite.

Murray (1877) had an unusual understanding of the tetranychid and other mites at the time of his work, and *Tetranychus eriostemi*, therefore, must represent the two-spotted spider mite. *T. fici* was regarded as an imported species, and we are unable to evaluate this possibility: the fig is known to be a host of the two-spotted spider mite.

Tetranychus altheae von Hanstein (1901), was promulgated by Trägårdh (1915) as a name for the greenhouse two-spotted spider mite as differentiated from the outdoor form in Europe. If *T. altheae* had been restricted to the carmine females, the differentiation would have been more valid. However, Trägårdh's distinction has not been acceptable, and *T. altheae*, as far as the literature is concerned, is another name used in the *telarius* complex.

During 1930-37, Oudemans described a number of new species of *Tetranychus* from Europe, each based on differences of characters that we are not able to appreciate: integumentary striae of the female solid

or dotted (now known to be a seasonal character—see Pritchard and Baker, 1952); width of the diamond-shaped figure formed by the striae between the third pair of dorsocentral hysterosomals and the inner sacrales; basic color of the female in life; and other variations such as the number of chambers at the distal end of the peritreme, the development of the empodial spur on legs III and IV of the male, the apparent length of the terminal sensillum on the palpus of the female, and the comparative length of the dorsal propodosomals.

It is possible that Oudemans has validated names for several different species, but this is not apparent from his descriptions nor from the Oudemans drawings that were published by Geijskes. Consequently, nearly all of these names are here considered to be synonyms. The aedeagus of each species, when known to Oudemans, was simply referred to as the lamate type, thus confirming only the generic placement.

There is no justification for the obvious belief of Oudemans that the spider mites on introduced greenhouse plants were imported from the native country of the plants.

André (1933) described as *Eotetranychus inexpectatus* a greenhouse form (with greenish females) that he considered to be distinct by possessing four pairs of proximoventral hairs on the empodium. Cotype specimens kindly loaned by Dr. André are indistinguishable from the two-spotted spider mite. The aedeagus of *inexpectatus* as figured by André has the terminal knob decidedly enlarged. The male loaned to us for study was mounted with the aedeagus oriented dorsoventrally, but it appeared to present no differences from the two-spotted spider mite.

Reck (1950) considered *turkestani* to be a synonym of the common spider mite of Europe. *Scabrisetus* is here considered also to be a synonym; its aedeagus (figured only from a dorsal aspect) was described as being similar to that of *turkestani*, although the peritreme was regarded as being straight, not hooked distally.

The earliest trinomial for the earmine form appears to be *Tetranychus telarius cinnabarinus* Boisduval. Most of the older students, as well as many modern workers, have referred to the orange, non-feeding phase as "red" (hence, the name "red-spiders"), and the synonymy of this form is difficult to determine. Our lack of knowledge of the outdoor occurrence of the earmine form in Europe adds to the problem. Among more recent names, however, *T. cucurbitacearum* Sayed (in part), *T. multisctis* McGregor, and *T. urticae dianthica* Dosse are more certain to represent this form. We have compared live material of carmine, "resistant" mites from greenhouse carnations in England with similar specimens in California.

Subfamily Tetranychinae Berlese

Numerous collections of this species complex have been studied from throughout the United States and Hawaii, Europe, the Middle East, South Africa, Peru, New Zealand, Western Australia, and Ceylon. The plant host list is exceedingly large.



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