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THE GENUS STIGMAEUS (Acarina: Stigmaeidae)

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CONTENTS

Introduction	491
Recognition of species	492
Terminology	493
Genus <i>Stigmaeus</i> Koch	495
Key to female of <i>Stigmaeus</i>	496
Species	499
<i>S. clitellus</i> n. sp.	499
<i>S. comatus</i> n. sp.	502
<i>S. scaber</i> n. sp.	502
<i>S. sphagnetii</i> (Hull)	503
<i>S. sectisetus</i> n. sp.	504
<i>S. glypticus</i> n. sp.	505
<i>S. glabrisetus</i> n. sp.	505
<i>S. microtuberculatus</i> n. sp.	506
<i>S. parmatius</i> n. sp.	507
<i>S. antrodes</i> Berlese	507
<i>S. echinopus</i> n. sp.	508
<i>S. pricei</i> n. sp.	508
<i>S. crobylus</i> n. sp.	509
<i>S. obtectus</i> n. sp.	510
<i>S. mimus</i> n. sp.	511
<i>S. eutrichus</i> Berlese	511
<i>S. fusus</i> n. sp.	512
<i>S. callunae</i> Evans	513
<i>S. rhodomelas</i> Berlese	514
<i>S. lucaris</i> n. sp.	514
<i>S. purpurascens</i> n. sp.	515
<i>S. luteus</i> n. sp.	516
<i>S. raneyi</i> n. sp.	517
<i>S. constrictus</i> n. sp.	518
<i>S. uncus</i> n. sp.	519
<i>S. gracilimus</i> n. sp.	520
<i>S. fissuricola</i> Halbert	521
<i>S. youngi</i> (Hirst)	521
<i>S. smithi</i> (Mitra and Mitra)	521
<i>S. anomalus</i> Willmann	522
<i>S. insectus</i> Willmann	522
Other species of <i>Stigmaeus</i>	522
Figures (1-55)	524
Acknowledgments	536
Literature cited	536

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THE GENUS *STIGMAEUS* (Acarina: Stigmaeidae)¹

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INTRODUCTION

Contemporary acarologists accept *Stigmaeus* Koch, 1836, in the restricted sense first used by Berlese (1910).³ There is, however, a problem involved in this usage. *Stigmaeus* was one of the three genera originally included in the Raphignathidae. Neither the first reviewer of this family (Berlese, 1910) nor the second (Oudemans, 1923) was acquainted with the type species of *Stigmaeus*. During the period 1836–1841 Koch proposed five species in *Stigmaeus* of which the first two, *cruentus* and *megacephalus*, appeared in successive numbers of the same fascicle (1836). He did not designate a type species. It appears that no one specifically referred to *S. cruentus* K. as the genotype until Berlese did so (1910, p. 205). This species was known to Berlese only by Koch's description, and others since that time have been unable to identify it. Berlese (1910) attempted to rectify the matter by proposing a new species of his own authorship, *S. rhodomelas* Berlese, 1910, as type species of a subgenus *Stigmaeus* (*Stigmaeus*).

It is desirable to conserve this generic name because it has been perpetuated in the coinage of the family name, Stigmaeidae Ouds., 1931, and in a number of other generic names. The characters ascribed to *Stigmaeus* by Berlese (1910) are compatible with the general features of Koch's illustrations of *cruentus* (1836, fig. 4.9; 1842, fig. 26). The expedient adopted for present purposes is to recognize *cruentus* as the nominal type species and to follow the definition of the genus proposed by Berlese (1910) and later by Oudemans (1923, 1927).

Most of the species of *Stigmaeus* examined by the present writer are undescribed species recovered from soil samples taken mostly in the western United States. Only three of these are recognized as species previously described from Europe: *eutrichus* Berl., *antrodes* Berl., and *sphagneti* (Hull). The identification of *sphagneti* (Hull) rests upon tenuous clues afforded by

¹ Submitted for publication April 24, 1962.

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³ See "Literature Cited" for citations referred to in the text by author and date.

the original description, and it is the writer's choice to conserve the species. Another European species, *callunae* Evans, is illustrated from a borrowed topotype.

Included also are synoptic characterizations of six additional described species: *rhodomelas* Berlese, *youngi* (Hirst), *smithi* (Mitra & Mitra), *insectus* Willmann, *anomalus* Willmann and *fissuricola* Halbert. The attributes of these are sufficiently indicated in original texts or illustrations to provide distinguishing characters. Accordingly, they are incorporated in the key to species.

All of Koch's species of *Stigmaeus* and the early ones described by Berlese are briefly characterized and poorly understood. Oudemans dealt with them as best he could from their descriptions. In order to complete the list of species described in or subsequently referred to *Stigmaeus*, these are indicated as *Species Inquirendae* (p. 523).

RECOGNITION OF SPECIES

There is no great wealth of anatomical detail by which species of *Stigmaeus* may be differentiated. The variations in ornamentation and arrangements of body plates, the kinds, numbers and size interrelations of setae are useful characters. The taxonomist involved with a heterogeneous collection of preserved stigmaeids is presented with the dilemma of having to arbitrate between intraspecific and phyletic differences as they are manifested by the setae and plate patterns. A few of the species dealt with have been troublesome in this respect and perhaps may become disputed or confused species when additional variants are found.

One of the interesting variations encountered within this generic taxon is the tendency of the setae to fork. This tendency shows among those species which possess stout, coarsely barbed setae. Although setae are characteristically monaxial within most species, individuals occasionally show incipient forking while still not revealing a regular or symmetrical pattern among pairs. In other species, the forked condition is revealed patternwise. Incomplete, unequal branching of seven pairs of dorsal setae on the hysterosoma of *sectisetus* n. sp. is taken to be a good spot character for that species (figs. 15-16). The extreme condition so far encountered occurs in *youngi* (Hirst) and *smithi* (Mitra & Mitra). In these insect-associated species the preocular setae *be* are trifurcate and all of the hysterosomals are essentially double setae.

The species examined in this study may be sorted into two general and fairly clear-cut groups. One group includes the robust, broad-bodied types which resemble *antrodes* Berl. and which deviate but little from one another in respect to numbers of setae on the genital parts and leg segments. *Stigmaeus rhodomelas* Berl., *eutrichus* Berl., and *callunae* Evans are allied to this group but are fusiform transitional species. The second group includes only fusiform species which have three pairs of suranal setae and greater than usual numbers of setae on the genital parts. Species within this group

also have a single median zonal plate instead of a pair of plates in this position.

A tentative decision to create a new genus for some or all of the fusiform species was ultimately abandoned because all are satisfactorily accommodated in the presently constituted genus and because there is no transcending reason to make a split. This tentative decision originated because it was thought that all of the slender-bodied types possessed atypical empodia. The premise was that the *antrodes*-like species have a characteristic empodium, with three primary rami each of which subdivides into a pair of pointed raylets (fig. 32). In the fusiform species the six empodial raylets are short, capitate, and with members of each pair originating directly from the central axis. A re-study of this feature provided at least a viewpoint if not a conclusion—namely, that the two types of empodia are modifications of one basic structural plan. The manner of origin of the raylets is subject to interpretation in many cases; some species have empodia clearly of the first type, some the second type and others are intermediate or indeterminate in this respect. All of the fusiform species examined have demonstrably capitate raylets. But at least two of the *antrodes*-like species (*microtuberculatus* n. sp. and *obtectus* n. sp.), also have capitate raylets.

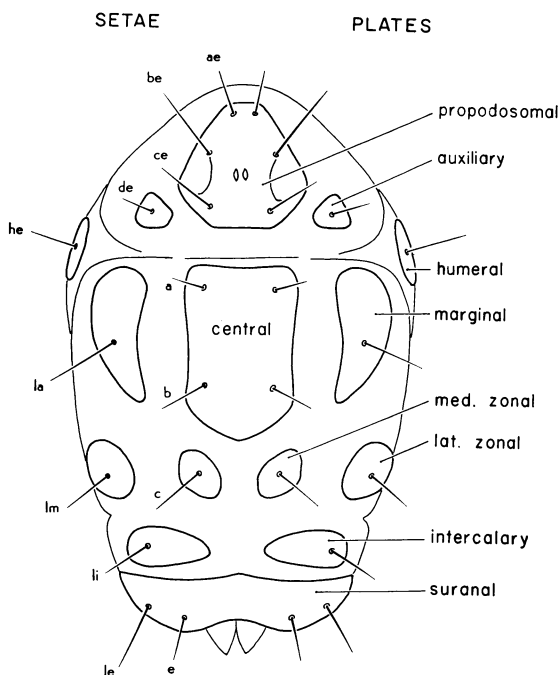
TERMINOLOGY

A simple terminology is introduced to designate several of the dorsal plates. Some of these already bear useful names: *propodosomal*, *humeral*, *intercalary* and *suranal* plates (see text-figure 1). Four adjectival names are coined to indicate additional plates: *auxiliary*, *central*, *marginal*, and *zonal*. The lateral plates (or platelets) on the propodosoma are referred to as *auxiliary* plates. They are rarely integral with the propodosomal plate (i.e., the median propodosomal plate). The name *central plate* is used in lieu of median metapodosomal plate. In one group of species, this plate incorporates a part of the opisthosomal plating and is therefore no longer confined to the metapodosoma. The central plate is commonly flanked by a pair of lateral metapodosomal plates which are to be called *marginal* plates. Behind a weak suleus which separates metapodosoma and opisthosoma there is, in a majority of species, a transverse row of four small plates referred to as *zonal* plates. These occur in pairs, lateral and median zonals.

The status of the median zonal plates varies between species. Two pairs of zonals—four separate plates—is the conventional pattern. The median zonals may join to form a single, composite median zonal plate (as in fig. 49), or the two median zonals and the central plate may form one composite plate (fig. 2). There is no intent to indicate evolutionary trend by such words as “joined,” “united,” “fused,” “separate,” etc., as applicable to the condition of this cluster of plates.

For descriptive convenience the central plate is referred to as *type II* or *type III*.

Type II designates a central plate which bears two pairs of dorsomedian



Text-fig. 1. Identification of dorsal plates and dorsal setae of *Stigmaeus*.

setae, *a* and *b* (see fig. 17). The median zonals are not joined to the central plate in this type of arrangement. Also included in the type II category are the few instances wherein setae *a* or *b* are actually borne on platelets which appear to be isolated from the main plate (fig. 41).

Type III designates a central plate which is integrated with the pair of median zonals and therefore bears three pairs of setae *a*, *b*, and *c*. An exceptional type III arrangement is described for the species *anomalus* Willmann.

Individual plates of the intercalary pair are generally small and widely spaced. These plates fuse to form an arch over the opisthosoma in only 4 out of the 31 species considered. In one of these, *clitellus* n. sp., approximately 100 specimens taken from numerous locality samples are uniform in this respect. In another, *scaber* n. sp., this character is variable among two specimens at hand. In one specimen the intercalaries are joined, in the other specimen they are separate. Additional specimens are required to show the central tendency for the species.

Grandjean's nomenclature (1944) is employed to designate the setae of body and leg segments. One exception is the pair of dorsals *li* situated on the intercalary plates. In *Apostigmaeus navicella*, Grandjean described a pair *d* in the series of dorsomedians *a*, *b*, *c*, *d*, *e*, and a pair *lr* in the marginal series.

One of these has no homologue in *Stigmaeus*. The writer believes that Grandjean's seta *d* of *Apostigmaeus* is the intercalary seta of *Stigmaeus* and that, if the notion of "row-ness" applies, this seta of *Stigmaeus* is best aligned with the marginal row or series, hence lateral intercalary seta *li* (text-fig. 1).

Descriptive terms, such as preocular setae *be*, postocular setae *ce*, macroseta IV (*d* on tibia IV), are thought to assist in pinpointing setae often referred to. Attention is given to length measurements for 10 of the 13 to 14 dorsal setae. Those not usually mentioned, (*ae*, *b*, *c*), have so rarely aided in distinguishing species that only the exceptional cases are described. The dorsomedians *a*, *b*, and *c* are normally alike and one pair suffices to represent all.

The numbers given for setae counted on the various segments of legs I-IV include the "common" or "tactile" setae and the structurally specialized setae or sensilla, such as solenidia and eupathids. Counts for tibiae I-IV are omitted from the descriptions because the numbers 7-6-6-6 are constant within the genus. Several items referred to repeatedly are symbolized or abbreviated, as follows:

w I—solenidion *w* on the tarsus of leg I, *w* II on tarsus II.

k I—spine *k* on the genu of leg I, *k* II on leg II.

♀, ♂—sex symbols also used for plural in lieu of ♀♀, ♂♂.

Macroseta IV/*l'*—ratio of length of distal seta *d* on dorsal aspect of tibia IV to length of opposite seta *l'* on its inner (posterior) surface (labeled on fig. 22).

USNM—United States National Museum, Washington 25, D.C.

BM(NH)—British Museum (Natural History), Cromwell Road, London S.W. 7.

(D.W.P.)—In collection data, collector's full name cited on first mention, initials only for subsequent citations in the same paragraph.

The length of the idiosoma was measured as the distance from the vertical setae *ae* to the tip of the opisthosoma, or to the tips of the anal covers, whichever was greater.

GENUS STIGMAEUS KOCH

Stigmaeus C. L. Koch, 1836. Deutschlands Crustaceen, Myriapoden und Arachniden, fasc. 4, n.9.

Stigmaeodes G. Canestrini, 1889. Atti d. reale Ist. Ven. d. Sci., Lettre ed Arti (Ser. 6), 7:512-13.

Stigmaeus (*Stigmaeus*) Berlese, 1910. Redia 6:205.

Stigmaeodes, Oudemans, 1923. Ent. Ber. Nederl. Ent. Ver. 6:140.

Stigmaeus (*Stigmaeus*), Oudemans, 1923. Ent. Ber. Nederl. Ent. Ver. 6:142.

Chelicerae incompletely retractile, right and left members independent. Dorsal plating of idiosoma comprises 10 to 16 plates, dimpled or reticulated in most species. Median propodosomal plate coextensive with area bounded by three or four pairs of setae, its surface ornamentation modified or absent

over semitransparent ocular fenestrae; separate auxiliary platelets bearing posterolateral setae *de* may occur near each shoulder margin. Dorsal hysterosomal skeleton comprises two large unpaired plates (central, suranal) and three to five pairs of small, usually paired plates (humeral, marginal, median zonals, lateral zonals, intercalaries). Individual plates of median zonal and intercalary pairs may unite to form composite plates. At least one pair of eyes evident in some species, though not in others. Dorsal setae 13 to 14 pairs, rarely smooth in entirety, usually barbed, sometimes forked or triramous; preocular, humeral, intercalary setae often conspicuously longer than other dorsals. Two pairs of eupathid setae on tarsus I, setae of both pairs characteristically recurved. Numbers of setae on podomeres I-IV variable among species, except tibiae uniformly 7-6-6-6. Empodia with three pairs of raylets, capitate or pointed.

Type species: *Stigmaeus cruentus* Koch, 1836, designated by Berlese (1910).

Recognition features: Central plate bears only two to three pairs of dorsomedian setae. Reversely curved eupathids on tarsi I are helpful but not wholly reliable (see fig. 19).

KEY TO FEMALES OF *STIGMAEUS*

1. (a) Central plate type III on which are borne dorsomedian setae *a*, *b*, and *c* or, exceptionally *b* and *c* only 2
- (b) Central plate type II on which are borne dorsomedian setae *a* and *b** 10
2. (a) Intercalary plate single, not paired 3
- (b) Intercalary plates paired 6
3. (a) Numbers of setae on genua I-IV: 4-4-1-1.....
.....*scaber* Summers (figs. 8-11)
- (b) Numbers of setae on genua I-IV: 4-3-0-1..... 4
4. (a) Dorsomedian setae *a*, *b*, *c* much shorter than dorsolaterals *la*, *lm*, *li*; eyes evident.....*clitellus* Summers (figs. 1-3)
- (b) Dorsomedian setae *a*, *b*, *c* approximately as long as dorsolaterals *la*, *lm*, *li*; eyes not evident..... 5
5. (a) Most pairs hysterosomal setae asymmetrically forked at distal third.....*sectisetus* Summers (figs. 15-16)
- (b) All hysterosomal setae monaxial.....*comatus* Summers (figs. 4-5)
6. (a) All hysterosomal setae subequal 7
- (b) One or more pairs ultralong setae on hysterosoma..... 8
7. (a) With at least one pair of eyes well-defined.....
.....*sphagneti* (Hull) (figs. 12-14)
- (b) Eyes not evident.....*scaber* Summers (figs. 8-11)

* This character is clear-cut except in two species. *S. luteus* n. sp. does not enter the genus or the key until its delicately sclerotized, striated plates are noticed. In *S. fusus* n.sp. and occasionally in related forms, seta *a* and *b* originate on minute platelets which lie close to, but are not integral with, the central plate proper.

8. (a) Dorsomedian setae *b* and *c* on central plate proper, pair *a* on isolated platelets *anomalus* Willmann
- (b) Dorsomedian setae *a*, *b*, and *c* on central plate proper..... 9
9. (a) Large, robust species; plates emphatically reticulated; setae *be* and *de* ultralong, *be* slightly longer than *de*.....
..... *glypticus* Summers (figs. 6-7)
- (b) Slender, fusiform species; plates not ornamented; setae *be* ultralong, at least four times longer than *de*.....
..... *eutrichus* Berlese (figs. 42-43)
10. (a) One median zonal plate (not a pair)..... 11
- (b) Two median zonal plates (a pair)..... 16
11. (a) Two pairs setae on suranal plate..... *fissuricola* Halbert
- (b) Three pairs setae on suranal plate..... 12
12. (a) Four setae on femur I; five pairs setae on anogenital covers.....
..... *raneyi* Summers (figs. 52-53)
- (b) Six setae on femur I; six pairs setae on anogenital covers..... 13
13. (a) Microtuberculate striae in front of propodosomal plate..... 14
- (b) Plain striae in front of propodosomal plate..... 15
14. (a) Propodosomal plate not reticulated; marginal plates well-defined, nearly as long and half as wide as central plate; lateral zonal plates as large as intercalary plates.. *gracilimus* Summers (fig. 51)
- (b) Propodosomal plate reticulated in middle part; marginal and lateral zonal plates obscure or absent.. *luteus* Summers (figs. 44-45)
15. (a) Femora 6-6-3-2; genua 6-5-3-3; central plate with dimples and interlaced longitudinal striae..... *uncus* Summers (fig. 55)
- (b) Femora 6-4-3-2; genua 6-4-2-3; central plate with longitudinal furrows, not dimpled..... *constrictus* Summers (fig. 49)
16. (a) One intercalary plate (not a pair).... *mimus* Summers (figs. 19-20)
- (b) Two intercalary plates (a pair)..... 17
17. (a) At least one pair of eyes clearly evident..... 18
- (b) No eyes apparent 22
18. (a) Dorsal setae relatively uniform in length, no one seta exceeds twice the length of any other..... 19
- (b) Two pairs setae, *be* and *he*, conspicuously longer than all others, these more than twice the length of shortest dorsals..... 20
19. (a) Central and marginal plates almost isodiametric, length not much greater than width; dorsal setae long, flexible, their lengths greater than distances to setae next behind; auxiliary and propodosomal plates integral..... *crobylus* Summers (figs. 30-34)
- (b) Central and marginal plates elongate, lengths exceed twice diameters; dorsal setae short, lengths less than distances to setae next behind; auxiliary and propodosomal plates separate.....
..... *rhodomelas* Berlese

20. (a) Marginal plates minute; central plate an inverted pentagon with apex intruding between median zonal plates. *fusus* Summers (fig. 41)
- (b) Marginal plates of substantial size; central plate rounded or truncate behind, not intruding between median zonals. 21
21. (a) Relative lengths *be:ce* approximates 10:1. *insectus* Willmann
- (b) Relative lengths *be:ce* approximates 4:1. *callunae* Evans (figs. 39–40)
22. (a) Setae *be* trifurcate, other dorsal setae symmetrically biaxial; associated with sandflies of India. 23
- (b) Setae *be* monaxial, other dorsals also monaxial or some asymmetrically forked near distal ends; not known to be insect associates. 24
23. (a) Symmetrically bifurcate, plumose setae on dorsum of femora I–IV, genu I, tibiae II–IV. *youngi* (Hirst)
- (b) Symmetrically bifurcate, plumose setae on dorsum of femur I; dorsals on femora II–IV asymmetrically forked near tips but not plumose; tibiae II–IV with monaxial setae on dorsum. *smithi* (Mitra & Mitra)
24. (a) Femora 4-4-3-2; genua 6-5-2-2; five pairs setae on anogenital covers. 25
- (b) Femora 6-5-3-2; genua 4-4-1-1; four pairs setae on anogenital covers. 26
25. (a) Three pairs of genital setae; seta *be* longer than *de*. *lucaris* Summers (figs. 46–48)
- (b) Four pairs of genital setae; seta *be* equal to *de*. *purpurascens* Summers (fig. 50)
26. (a) Propodosomal plate emphatically reticulate to all margins; transparent ocular fenestrae reduced and enclosed by ornamented plating; dorsal setae with truncated, jagged tips. *obtectus* Summers (figs. 35–36)
- (b) Propodosomal plate without obvious surface ornamentation, or with pattern of ornamentation interrupted to accommodate large ocular fenestrae not entirely surrounded by reticulated plating; setae not as above. 27
27. (a) Microtuberculate striae on integument in front of propodosomal plate. 28
- (b) Smooth striae on integument in front of propodosomal plate. 29
28. (a) Lateral zonal seta *lm* much longer than either *la* or *li*, this seta smooth, very sharply pointed; macroseta IV not long enough to overreach pretarsus. *glabrisetus* Summers (figs. 25–28)
- (b) Seta *lm* not noticeably longer or different than *la* or *lm*; macroseta IV ultralong, long enough to overreach pretarsus. *microtuberculatus* Summers (fig. 29)

29. (a) Relatively long dorsomedian hysterosomal setae; length of dorsomedian *a* closely approximates distance between *a* and *a*; likewise for seta *b*..... 30
- (b) Relatively short dorsomedian hysterosomals; length of *a* not more than three fourths the distance between *a* and *a*; this also is true for *b* 31
30. (a) Spine *k* on genu I one half as long as overlying dorsal seta; marginal seta *la* seven tenths as long as *lm*.....
.....*parmatius* Summers (figs. 37-38)
- (b) Spine *k* on genu I equals length of overlying dorsal seta; marginal seta *la* nine tenths as long as *lm*.....*pricei* Summers (figs. 17-18)
31. (a) Spine *k* on genu I not longer than overlying dorsal seta; ratio *be/ce* = 1.9; macroseta IV 43 μ ; leg segments with pronounced reinforcing bars of reticulum.....*echinopus* Summers (figs. 23-24)
- (b) Spine *k* on genu I noticeably longer than dorsal seta above; ratio *be/ce* = 2.3; macroseta IV 77 μ ; leg segments with reticulum incompletely developed.....*antrodes* Berlese (figs. 21-22)

SPECIES

Stigmaeus clitellus n. sp.

(Pl. 1, figs. 1-3)

Female. Central plate type III; single intercalary plate arched over opisthosoma. Plates of dorsal skeleton coarsely reticulated, cells of shadow-like reticulum of uniform dimensions throughout; a dimple or depression with thin, wrinkled membrane centered in each cell of reticulum; pattern of dimpling and reticulation distorted as though compressed in a line across central plate between dorsomedian setae *b*, *c*; line of distortion coincides with line of separation between adjacent marginal and zonal plates. Ventral plates and leg segments faintly reticulated. Eyes: one pair, imperfectly defined in some specimens, in transparent ocular fenestrae, close behind alveoli of setae *be*. Marginal setae of hysterosoma taper to extremely fine, sharp tips, almost smooth, with few inconspicuous barbs spaced along midportions of shafts. Preocular setae *be* clearly longer than all other dorsals; propodosomals *de*, humerals *he*, dorsolaterals *la*, *lm*, *li* subequal, longer than dorsomedians. Postocular setae *ce* shortest of dorsals, blunt-tipped, barbed, approximately three fourths as long as dorsomedians *a*. Ratio *be/ce* = 3.5. Dorsomedians *a*, *b*, *c* equal in length, shafts essentially smooth, with few minute barbs, tips brushlike or tufted with five to eight subequal spinules. Plates and setae of venter as illustrated for *glabrisetus* (fig. 25). Inclusive counts of setae and sensilla on legs I-IV: femora 6-5-3-2, genua 4-3-0-1, tarsi 14-10-8-8. Solenidion *w* I 20 μ ; *k* I setiform, 32 μ , equal to dorsal seta just above and distinguishable from it only by inferior position; *k* II very short, 7 μ , thorn-like, slender. Macroseta IV sparsely barbed, 61 μ ; macroseta IV/*l'* = 1.6 Empodial raylets pointed. Average measurements in microns (*n* = 14 specimens): length

idiosoma (vertical setae to anus) 341; setae *be* 119, *ce* 35, *de* 88, *he* 82, *a* 51, *la* 79, *lm* 89, *li* 90, *le* 60, *e* 66.

Male. Approximately three fourths the size of female. Central plate type II, median zonal plates paired, distinctly separated from each other and from central plate (fig. 1). Dorsomedian hysterosomal setae *a*, *b*, *c* acicular, barbed distally but without terminal tuft of spinules; these setae are nearly two thirds as long as humerals and dorsolaterals *la*, *lm*. Appendages and podosoma otherwise resemble female. Organization of opisthosoma as in males of other species examined; aedeagus, associated sclerites not exhaustively studied. One well-developed solenidion *w* ♂ originates proximally on each tarsus; length of this special sensillum equals length of tarsal segment on which it originates.

Types. Holotype ♀, 5 mi. north Brookings, Oregon, Oct. 1, 1959 (J. D. Roth) *ex* mulch of *Sequoia*, *Umbellularia*, *Lithocarpus*. Deposited in USNM. Paratypes: 11♀, 1♂, same series; one paratype in BM(NH), others retained by author.

Collection Data. Contra Costa Co., Calif.: 3♀, Oakland, Feb. 18, 1953 (W. C. Bentink) *ex* oak litter; 3♀, 2n, Mount Diablo, May 26, 1959 (L. M. Smith, R. O. Schuster) *ex* soil and moss beneath oak and laurel. Humboldt Co., Calif.: 1♀, Prairie Creek, Redwood State Park, Sept. 8, 1958 (L. M. S.) *ex* redwood mulch; 3♀, 5 mi. S. Scotia, Oct. 1, 1959 (V. D. Roth) *ex* redwood mulch; 2♀, 9 mi. E. Carlotta, Oct. 1, 1959 (V. D. R.) *ex* redwood mulch. Lake Co., Calif.: 1♀, 1n, Cobb Mountain, May 21, 1951 (S. F. Bailey) *ex* oak and pine leaf mold. Marin Co., Calif.: 8♀, Bolinas, Mar. 24, 1960 (R. O. S.) *ex* *Umbellularia* litter; 3♀, Inverness, Jul. 14, 1960 (S. F. Bailey, L. Stange) *ex* oak leaf mold; 1♀, Inverness, Sept. 14, 1960 (W. F. Iltis) *ex* soil; 2♀, 2 mi. E. Point Reyes Station, Dec. 19, 1960 (J. S. Buckett) *ex* soil; 3♀, Water Dog Lake, Belmont, Dec. 26, 1960 (R. O. S.) *ex* moss and oak leaf litter. Mendocino Co., Calif.: 4♀, 1♂, McKerricher State Park, Oct. 25, 1960 (D. W. Price) *ex* mulch, pine forest; 2♀, 2♂, Talmadge, Jul. 7, 1959 (L. M. S., R. O. S.) *ex* soil litter. Monterey Co., Calif.: 2♀, 1n, Crest Road, Pebble Beach, Sept. 9, 1959 (L. M. S.) *ex* mulch, live oak. Napa Co., Calif.: 4♀, 10 mi. N. St. Helena, Apr. 31, 1960 (F. C. Raney) *ex* leaf mold. San Mateo Co., Calif.: 1♀, 1 mi. S. Pillaritos Lake, Nov. 12, 1956 (D. W. P.) *ex* mulch from Douglas fir forest; 5♀, 1.5 mi. E. La Honda, Dec. 26, 1956 (D. W. P.) *ex* soil, redwood and tanbark oak; 2♀, 1♂, 3 mi. N. Sharp Park, Dec. 16, 1956 (D. W. P.) *ex* chaparral; 5♀, Kings Mountain, Nov. 23, 1957 (D. W. P.) *ex* soil, Douglas fir; 6♀, 5 mi. N. La Honda, Dec. 1, 1957 (D. W. P.) *ex* redwood leaf mold; 6♀, Belmont, Mar. 5, 1961 (R. O. S.) *ex* mulch. Santa Clara Co., Calif.: 2♀, Stevens Creek, June 2, 1957 (R. O. S.) *ex* topsoil; 1♀, Mount Madonna State Park, Feb. 8, 1959 (D. Burdick) *ex* tanbark and redwood leaf mold. Sonoma Co., Calif.: 9♀, Cypress Hill Cemetery, Petaluma, Jun. 20, 1959 (J. S. B.) *ex* soil; 1♀, 3 mi. W. Grafton, Feb. 20, 1960 (C. Judson) *ex* soil; 2♀, Guerneville, May 30, 1960 (C. J.) *ex* humus by river bank; 1♀, 3 mi. E. Guerneville, Aug. 21, 1960 (C. J.) *ex* decaying leaves, *Umbellularia*; 2♀, 3 mi. W. Sonoma, Nov. 1, 1960

(W. H. Lange) *ex Umbellularia* litter, pasture; 1♀, Petaluma, Dec. 18, 1960 (J. S. B.) *ex* soil beneath *Rhododendron*; 2♀, 3 mi. W. Sonoma, Nov. 1, 1961 (W. H. L.) *ex* topsoil. Yolo Co., Calif.: 4♀, 3 mi. N. Woodland, 1958 (D. W. P.) *ex* oak mulch; 3♀, 5.4 mi. S. W. Winters, May 29, 1959 (F. C. R., R. O. S.) *ex* soil nr. creek bank.

S. clitellus appears to be the species of *Stigmaeus* most frequently encountered in woodland soil litter and mulch of conifer or oak leaves. Although it has been collected many times in northern California and is known to occur in Oregon, its real range of distribution is unknown, since the collection of specimens has been confined mostly to leaf mold samples in this limited area of the United States.

The criteria by which the species is defined have to be considered judiciously because the limits of variation in the attributes of its structure have not been rigidly fixed. Slide-mounted specimens of *clitellus* are routinely distinguished by these features: central plate of female type III; one intercalary; genua 4-3-0-1; long, sharply-tipped dorsolateral setae and short dorso-medians *a*, *b*, *c* having a small number of barbs grouped in a terminal cluster as illustrated. Some of the variations observed in specimens representing different locality populations may be troublesome for determinations. The variations described below are regarded as variations within and between populations of the species.

A few specimens among many examined have dorsolateral hysterosomal setae which are barbed more profusely than those illustrated and, in this respect, resemble those of *comatus* (fig. 4). In such cases, however, the dorso-medians of the hysterosoma retain their *clitellus* form. The tufted condition of the dorsomedians *a*, *b*, *c* may be exaggerated by the presence of additional barbs, or one or more of these may split unequally near the tip to resemble the setae of *sectisetus* (fig. 16). Setae of the dorsolateral pairs (*la*, *lm*, *li*, *le*) have not been observed to fork in this species. The central tendency for the species is to have the length of spine *k* equal to the length of dorsal seta *d* on genu I. In about 2 per cent of the specimens, this equality is lost, and $k > d$ or, conversely $k < d$ in ratios as great as 4:3. Two additional variations have been encountered only once each. Two intercalary plates occur on one adult in a sample of two specimens. The type series includes one individual having two proximoventral setae on both tarsi II instead of the normal one seta. According to Grandjean's (1944) terminology, the superfluous seta is *vs''*.

No attempt is made to describe the anatomy of the venter of this or a number of the species to follow. With few exceptions, taxonomically useful characters have not been noticed on the ventral surface. The exceptions will be pointed out. Otherwise, those species which have two pairs of setae on the suranal plate and with 4-4-1-1 or 4-3-0-1 formulae for setae on genua I-IV also have a fairly constant shape to the genital plate, three pairs of genital setae and four pairs of setae on the anogenital covers. The illustration given for *glabrisetus* is the general condition (fig. 25).

Stigmaeus comatus n. sp.

(Pl. 1, figs. 4-5)

Female. Central plate type III, its posterior margin with shallow, median notch which indicates incomplete union of median zonal plates. Intercalary plate single, arched strap-like over opisthosoma. Plates of dorsum with very faint reticulum, each cell contains a thin-walled dimple; dimples of uniform size, evenly spaced; ventral plates without obvious surface ornamentation. Reticulum distorted as though compressed in a line across central plate, between setae *b*, *c*; line of distortion appears to mark location of a transverse sulcus between metapodosoma and opisthosoma. Eyes not clearly evident. Preocular setae *be* not significantly longer than dorsolateral hysterosomals. Ratio $be/ce = 2.3$. Dorsomedians *a*, *b*, *c* comparatively long, nearly as long as dorsolaterals *la*, *lm*, *li*. All dorsal setae sharply tipped, obviously barbed for most of length but not split or tufted. Femora 6-5-3-2, genua 4-3-0-1, tarsi 14-10-8-8. Solenidion *w* I 20μ ; *k* I seta-like, 42μ , 50% longer than adjacent dorsal, barbed seta (holotype) or not greater than length of dorsal seta when the latter appears to be without barbs. Macroseta IV barbed, 55μ ; macroseta IV/*v* = 2.0. Empodial raylets pointed. Average measurements in microns ($n = 3$): length idiosoma 352; setae *be* 101, *ce* 44, *de* 77, *he* 75, *a* 73, *la* 79, *lm* 89, *li* 96, *le* 65, *e* 79.

Types. Holotype ♀, Cajon Pass Summit (5.4 mi. S.) San Bernardino County, California, Mar. 31, 1959 (F. C. Raney) *ex* soil under silk tassel, *Garrya*. Deposited in USNM. One paratype ♀, Glendale, Calif. Dec. 26, 1951 (E. I. Schlinger) *ex* oak leaf mold; 1 paratype ♀, Caliente (11 mi. N.E.), Kern Co., Calif. (F. C. R.) *ex* digger pine leaf mold.

Collection Data. Two ♀, 1 mi. S. jet. Marsh Creek and Morgan Terrace Roads, Contra Costa Co., Calif. (L. M. Smith, R. O. Schuster) *ex* oak mulch.

Stigmaeus scaber n. sp.

(Pl. 2, figs. 8-11)

Female. Central plate type III; intercalary plate single or divided into paired elements. Dorsal plates reticulated as shown, with pattern distorted across posterior third of central plate. Eyes not evident. All dorsal setae similar in form, conservatively barbed on distal halves, tapered to pointed tips. Ratio $be/ce = 1.7$. Setae *de*, *he*, *a*, *la* approximately equal in length; dorsolaterals *lm*, *li*, slightly longer than *la*. Ventral plates faintly reticulated. Femora 6-5-3-2, genua 4-4-1-1, tarsi 14-10-8 (or 9)-8. Accessory claw on palptibia seta-like rather than usual stubby spine, half as long as main claw, bifid at tip in one specimen. Solenidion *w* I 35μ ; *k* I extremely long, 62μ , 1.3 times longer than barbed dorsal seta above. Macroseta IV barbed, 59μ ; macroseta IV/*v* = 1.3. Empodial raylets pointed. Measurements in microns (holotype): length idiosoma 480; setae *be* 109, *ce* 66, *de* 78, *he* 82, *a* 74, *la* 74, *lm* 90, *li* 94, *le* 70, *e* 78.

Types. Holotype ♀, Silverton, Colorado, Aug. 27, 1958 (D. W. Price) *ex* soil under willow, alpine meadow; 1 paratype ♀, same collection. Both specimens retained by author.

This species is difficult to define except by combinations of characters. The only two specimens so far identified differ from each other in several respects. The holotype, a relatively large specimen, possesses an additional ventral seta on tarsi III, a single intercalary plate, and a bifid accessory claw on the palptibia. The paratype is somewhat smaller (idiosoma 398μ), has a pair of intercalary plates, and lacks the extra seta on tarsi III. The accessory claw on the palptibia is long and seta-like, but whether or not it is bifid at the tip cannot be determined on the paratype ♀.

The unusually long *k* spine on genu I may prove to be a useful spot character.

The fusion and pairing of the intercalary plates within species has been anticipated, though actually encountered seldom in the genus. Since there is only one of each variant, it is not now possible to know the central tendency for the species. A similar situation prevails in respect to the number of setae on tarsus III.

***Stigmaeus sphagneti* (Hull), n. comb.**

(Pl. 3, figs. 12-14)

Raphignathus sphagneti Hull, 1918. Trans. Nat. Hist. Soc. Northumberland, Durham and Newcastle-upon-Tyne, N. S., 5:30, figs. 70-2.

Ledermülleria sphagneti, Oudemans, 1923. Ent. Ber. Nederl. Ent. Ver. 6:152.

Female. Central plate type III; two large intercalary plates. Reticulation of plates coarse, uniform, thin-lined; dimples show plainly as deep invaginations. A peculiarity in pattern of propodosomal reticulum occurs in a median position, at intersection of imaginary diagonals connecting base of each preocular seta *be* with base of each postocular *ce* on opposite side: one or two of the large latticework cells in this location is flanked by a pair of apodemal markings around which adjacent cells tend to be radially disposed (fig. 13). One pair sharply outlined eyes. Preocular setae longer than all others of dorsum but comparatively short in relation to other species. Ratio *be/ce* = 1.8. Dorsal setae of hysterosoma all similar in form and length, each with shaft smooth on basal half, abundantly barbed on distal half (fig. 12). Median suranals *e* not longer than lateral suranals *le*. Ventral plates, leg segments reticulated; cells of reticulum on genital plate clustered in rosette fashion at apex of genital slit. Femora 6-5-3-2, genua 4-4-1-1, tarsi 14-10-8-8. Spine *k* I 20μ , much smaller in diameter and one half as long as barbed dorsal seta above. Macrosetae IV profusely barbed, 35μ ; macroseta IV/*l'* = 0.9. Empodial raylets pointed. Average measurements (*n* = 3 specimens, Connecticut series): length idiosoma 370; setae *be* 73, *ce* 41, *de* 48, *he* 52, *a* 39, *la* 37, *lm* 39, *li* 43, *le* 44, *e* 44.

Collection Data. Three ♀, Somers, Connecticut, Oct. 21, 1956 (H. Hurl-

butt) *ex* orchard soil; 6♀, Durango, Colorado, Aug. 28, 1958 (D. W. Price) *ex* soil.

The re-description given for the species is based on specimens taken from orchard sod in Connecticut. One specimen of a later series collected from soil in Colorado cannot be distinguished from those of the Connecticut sample, but five others of the Colorado sample are slightly larger in all dimensions and distinguishable in respect to two pairs of setae. Setae *de* and *he* of the Colorado specimens are conspicuously longer than any of the hysterosomals. Setae *de* are three fourths as long as the preoculars *be* and are sparsely barbed. Humeral setae *he* are slightly longer than *de*, taper to very finely pointed tips, and bear so few barbs that they appear to be smooth. Insofar as the specimens from the two collections agree closely in other anatomical features, the variations noted are regarded as intraspecific.

This is a somewhat arbitrary identification of the species named by Hull. The original description comprises thirty-three words and three figures. Type specimens are not known to exist. However, among the various species collected in the United States, the species described above most nearly fits the illustrations made by Hull. His drawings depict a central plate type III, coarse reticulation, hysterosomal setae moderately barbed and approximately equal in length. Since Hull failed to show the lateral zonal plates of the hysterosoma as separate elements, it may be inferred that he also did not see or else failed to illustrate the intercalaries as a pair of plates.

Stigmaeus sectisetus n. sp.

(Pl. 3, figs. 15-16)

Female. Central plate type III, with median notch on posterior margin. One intercalary plate. Eyes not clearly evident. All setae on hysterosoma except external suranals *le* forked asymmetrically near distal ends; main part of shaft of each seta is sharply bent; a shorter branch originates at bend and continues shaft in a straight line to sharp or jagged point; straight ramus sparsely barbed, longer ramus profusely barbed (fig. 16). Dorsolateral and dorsomedian setae on hysterosoma very close to equal in length; pairs *be*, *de*, *he* nearly straight, finely pointed, with few faintly developed barbs. Pair *li* shorter than *lm*; *le* longer than *e*. Ratio $be/ce = 2.4$. Femora 6-5-3-2, genua 4-3-0-1, tarsi 14-10-8-8. Solenidion *w* I 18μ ; *k* I 22μ , equal to or slightly shorter than companion seta in dorsal position. Macroseta IV barbed, 40μ ; macroseta IV/*l'* = 1.5. Empodial raylets pointed. Average measurements in microns ($n = 4$): length idiosoma 295; setae *be* 84, *ce* 35, *de* 66, *he* 65, *a* 48, *la* 51, *lm* 49, *li* 45, *le* 57, *e* 45.

Types. Holotype ♀, 3 paratype ♀, Westport (11 mi. E.), Calaveras County, California, Nov. 6, 1960 (A. Menke, L. Stange) *ex* soil. Holotype in USNM; one paratype in BM(NH).

Collection Data. One ♀, Soda Springs Resort, Placer Co., Calif., May 19, 1959 (F. C. Raney) *ex* pine duff; 1♀, Yosemite Valley, Yosemite National Park, Calif., June 1958 (D. W. Price) *ex* pine duff.

The form of the hysterosomal setae best characterizes the species. However, this feature may be troublesome among divers populations because the small straight ramus is reduced on some of the setae of individuals examined. In such instances it appears to be scarcely more than a robust barb of the more usual type.

***Stigmaeus glypticus* n. sp.**

(Pl. 2, figs. 6-7)

Female. A large, bizarre species. Central plate type III; intercalaries paired. Reticulation of dorsal plates heavy, emphatically embossed, thick-barred; dimples deeply invaginated, membranous. Propodosomal plate reticulated between bases of setae *ae*, *be*, *ce*, with smaller latticework bordering mesal periphery of ocular fenestrae. Auxiliary platelets well separated from propodosomal plate, wedge-shaped, inner halves definitely reticulated, outer halves obscurely ornamented or plain. Basis capituli, ventral plates, three proximal leg segments reticulated; palp trochanter displays a single row of rectangular cells of reticulum around its circumference (as in *obtectus*); more distal segments of palps not reticulated but with very fine punctuations. No eyes apparent. Dorsal setae stout, dissimilar; *be*, *de*, *lm* ultralong, sparsely barbed, gradually tapered to extremely fine tips; other hysterosomals shorter, with barbs more numerous, ends irregularly pointed; pair *lm* on zonal plates longest, *be* next longest, *de* shortest of this group; humerals intermediate in form and length; remainder of dorsals coarse, relatively short. Dorsomedian setae on central plate unusual in that $b > a > c$. Setae $la > li$; $le = e$. Ratio $be/ce = 3.2$. Solenidion *w* I 31μ , comparatively small, almost straight; *k* I 82μ , 1.3 times longer than barbed dorsal setae above. Macroseta IV 90μ , barbed; macroseta IV/*l'* = 1.4. Empodial raylets pointed. Averaged measurements in microns ($n = 2$): length idiosoma 536; setae *be* 225, *ce* 80, *de* 221, *he* 148, *a* 129, *la* 137, *lm* 281, *li* 118, *le* 91, *e* 88.

Male. One badly preserved specimen examined. Gnathosoma, podosoma with characters ascribed to female, opisthosoma crushed.

Types. Holotype ♀, 1 paratype ♀, 1♂, Amherst, Massachusetts, May 13, 1953 (Miss M. Parsons) *ex* stump. Holotype in USNM.

S. glypticus is readily separated from other described species by its three pairs of excessively long setae of which *lm* is the longest, and by the inequality among three pairs of dorsomedian setae, viz., $b > a > c$.

***Stigmaeus glabrisetus* n. sp.**

(Pl. 6, figs. 25-28)

Female. Body size, arrangement and ornamentation of idiosomal plates, numbers of setae on leg segments as described for *antrodes*. A pair of dot-like apodomal markings situated just in front of setae *be*. Striae traversing integument in front of propodosomal plate microtuberculate, especially in small areas above coxae II. Eyes not evident. Three pairs dorsal setae *be*, *he*,

lm very long, equal in length, smooth; all other dorsals much shorter, smooth for most of length but with two to six barbs close to distal ends. Ratio $be/ce = 3.0$. Setae *a*, *b*, *c*, *de*, *la*, *e* approximately equal; *li*, *e* preceptibly longer, equal; $le > e$. Venter illustrated (fig. 25). Solenidion *w* on tarsus I 13μ , unusually short relative to other species. Spine-like sensillum (palpostigmatic organ) of maxillicoxa abnormally long, 8μ . Spine *k* I 27μ , equal to dorsal seta above, indistinguishable from it except by position. Macroseta IV acicular, smooth, very long, 90μ ; macroseta IV/ $l' = 2.6$. Empodial raylets pointed. Average measurements in microns ($n = 4$): length idiosoma 398; setae *be* 92, *ce* 31, *de* 42, *he* 89, *a* 38, *la* 45, *lm* 88, *li* 51, *le* 57, *e* 48.

Male. Plate arrangement, size relations, setae on podosoma as described for female; opisthosoma modified as normal for males of *Stigmaeus*. Solenidion *w* ♂ diminutive, only 1.5 times longer than solenidion *w* of both sexes.

Types. Holotype ♀, Green Valley, Solano County, California, Jul. 23, 1950 (H. E. Cott) *ex* beetle frass from fallen oak. Deposited in USNM. Three paratype ♀, 1 ♂, same collection. One paratype in BM(NH), other retained by author.

A combination of characters is required to distinguish this species from its near relatives. Short, almost smooth dorsomedian setae and the long intercalary seta *li* are differentiating characters.

***Stigmaeus microtuberculatus* n. sp.**

(Pl. 6, fig. 29)

Female. Central plate type II; intercalary plates paired. Propodosomal plate with extensive ocular fenestrae covered with thick-barred, fine-mesh reticulum (visible with medium phase contrast microscopy, not noticeable with conventional optics); general surface reticulation faint; a cluster of small, indistinct reticular cells midway between ocular fenestrae disrupt surrounding pattern of coarse reticulation. Two pairs well-defined apodemal marks on propodosomal plate: one pair, dot-like apodemal marks in front of setae *be*; one pair comma-shaped apodemal marks adjoin inner, posterior margins of ocular fenestrae. Transverse striae with distinct microtubercles on arthrodial membrane joining gnathosoma and propodosoma; plain striae elsewhere. No semblance of eyes. Two pairs dorsal setae *be*, *he*, very long, acicular, smooth, approximately equal in length; all other dorsals comparatively short, minutely barbed on distal halves, one barb often subterminal. Ratio $be/ce = 2.9$ Pairs *lm*, *li*, *le* equal. Spine-like sensillum on maxillicoxa well-developed, 8μ . Numbers of setae on leg segments same as *antrodes*. Solenidion *w* I short, 15μ ; *k* I slender, 13μ , one half times as long as dorsal seta above. Macroseta IV long, 92μ , smooth; macroseta IV/ $l' = 3.0$. Empodial raylets capitate. Average measurements in microns ($n = 3$): length idiosoma 372; setae *be* 103, *ce* 36, *de* 47, *he* 100, *a* 40, *la* 45, *lm* 55, *li* 56, *le* 55, *e* 53.

Types. Holotype ♀, Soda Springs, Nevada County, California, May 19, 1959 (F. C. Raney) *ex* pine duff. Deposited in USNM. Two paratype ♀,

Eagle Creek, Trinity Co., Calif., Jun. 2, 1951 (A. T. McClay) *ex* leaf trash under wild grape. One paratype in BM(NH).

Two recognitional features of *microtuberculatus* are the modified pattern of reticulation over the very large ocular fenestrae and the distinct microtubercles on the striae of the propodosoma.

***Stigmaeus parmatum* n. sp.**

(Pl. 8, figs. 37-38)

Female. A very large, generalized form; mouthparts, appendages appear to be short in relation to massive idiosoma. Central plate type II; intercalary plates paired. Reticulum delicately embossed, coarse mesh, excavated behind preocular setae to outline mesal margins of ocular fenestrae. Propodosomal plate with a pair of aberrant cells—apodemal markings—in reticular pattern midway between postocular setae *ce*; posterior margin of this plate also bears an additional pair of apodemal pits, each pit in line with rows of dorsomedian hysterosomal setae. Auxiliary plates oval in outline, indented to accommodate shape of propodosomal plate. Eyes not identifiable in adult; one pair clearly visible in protonymph. Central plate almost square in shape. Dorsal setae slender, with fine barbs sparsely distributed along shafts; no pair exceeds twice length of shortest pair; pairs *be*, *he*, *lm*, *li* approximately equal, drawn to very fine points; pairs *a*, *b*, *c*, *la*, *le*, also approximately equal, with one or two tiny barbs on or near tips; $e > le$. Ratio $be/ce = 2.0$. Femora 6-5-3-2, genua 4-4-1-1, tarsi 14-10-8-8. Solenidion *w* I 30μ ; *k* I 29μ , comparatively slender, half as long as dorsal seta above. Macroseta IV 105μ , very sparsely barbed; macroseta IV/*v* = 1.6. Empodial raylets pointed. Average measurements in microns ($n = 3$): length idiosoma 682; setae *be* 165, *ce* 82, *de* 148, *he* 159, *a* 101, *la* 112, *lm* 160, *li* 152, *le* 100, *e* 117.

Types. Holotype ♀, 2 paratype ♀, 2 protonymphs, Point Barrow, Alaska, Aug. 16, 1953 (P. D. Hurd, Jr.) *ex* marshland. Holotype in USNM.

Examples of this species were collected by Dr. P. D. Hurd under the auspices of the Arctic Institute of North America, Project O.N.R.-173: Analysis of Soil Invertebrate Samples from Barrow, Alaska.

***Stigmaeus antrodes* Berlese**

(Pl. 5, figs. 21-22)

Stigmaeus antrodes Berlese, 1910. Redia 6:206, fig. 26.

Female. Central plate type II; intercalary plates paired. All plates, most leg segments coarsely reticulated without noteworthy peculiarities of pattern; reticulum on propodosoma extensively interrupted between setae *ce*, *de* to form large ocular fenestrae; a pair of small apodemal marks occur in front of setae *be*. Eyes not discernible. Two pairs dorsal setae, *be* and *he*, conspicuously longer than others, *be* slightly longer than *he*, both with so few faint barbs as to appear smooth. Postoculars *ce* well-barbed. Ratio $be/ce = 2.3$. Hysterosomal setae relatively short, subequal, appreciably barbed near distal

ends; setae *a*, *b*, *c*, *la*, equal among themselves; setae *lm*, *li*, *le*, *e*, also equal among themselves but all slightly longer than those of first group. Femora 6-5-3-2, genua 4-4-1-1, tarsi 14-10-8-8. Solenidion *w* I 25μ ; *k* I 44μ , longer than dorsal seta above. Macroseta IV 77μ , not obviously barbed; macroseta IV/*l'* = 1.7. Empodial raylets pointed. Average measurements in microns ($n = 7$): length idiosoma 394; setae *be* 96, *ce* 41, *de* 60, *he* 82, *a* 57, *la* 55, *lm* 62, *li* 66, *le* 60, *e* 62.

Collection Data. One ♀, Farmington, Utah, Nov. 1, 1952 (G. F. Knowlton) *ex* old tomatoes; 1♀, Farmington, Utah, Nov. 13, 1952 (G. F. K.) *ex* decayed tomatoes; 4♀, Providence, Utah, Nov. 18, 1952 (G. F. K.) *ex* pea ensilage; 4♀, 1♂, Buenos Aires, ARGENTINA, Sept. 15, 1960 (O. de Ferrariis) *ex* soil.

Berlese showed this species as having the suranal plate divided into platelets, of which a median pair with setae *e* are shown.

***Stigmaeus echinopus* n. sp.**

(Pl. 5, figs. 23-24)

Female. Central plate type II; intercalary plates paired. Propodosomal plate with reticulum obscure in small area midway between ocular fenestrae; ventral plates, all leg segments with pronounced reticulation, the bars of which show in optical section as thick, internal reinforcing trabeculae. No eyes apparent. Setae *be*, *he* slightly longer than other dorsals, acicular, sharp-tipped, with five or six faint barbs distributed on middle third of shafts. Size relations of setae approximately $a = b = c = la < lm = li = le = e$. Ratio *be/ce* = 1.9. Femora 6-5-3-2, genua 4-4-1-1, tarsi 14-10-8-8. Solenidion *w* I 19μ , not much longer than distance between its alveolus and alveoli of distal eupathids *tc* (see fig. 31 for location); *k* I 25μ , as long as barbed dorsal seta above. Macroseta IV barbed, comparatively short, 43μ , macroseta IV/*l'* = 1.8. Empodial raylets pointed. Average measurements in microns ($n = 7$): length idiosoma 326; setae *be* 69, *ce* 37, *de* 48, *he* 62, *a* 43, *la* 43, *lm* 48, *li* 48, *le* 48, *e* 47.

Types. Holotype ♀, 6 paratype ♀, Old Dairy Barn, University of California, Davis, California (R. O. Schuster, D. W. Price) *ex* floor trash. Holotype in USNM, 1 paratype in BM(NH).

This species is difficult to distinguish from that identified as *antrodes* Berl. in this study. Side by side comparisons show that *echinopus* is a smaller form, more emphatically reticulated, and with a number of other features which differ quantitatively from Berlese's classical species. No one criterion adequately assures the separation. There is also a superficial resemblance between *echinopus* and *sphagneti*; the latter has a central plate type III and well-defined eyes.

***Stigmaeus pricei* n. sp.**

(Pl. 4, figs. 17-18)

Female. Central plate type II; intercalary plates paired. Plating shows impressed dimples and thick-barred reticulum; this ornamentation appears on

ventral plates and on leg segments to tarsi; mesal margins of ocular fenestrae sharply outlined by bordering cells of reticulum; an irregularity of pattern occurs in mid-dorsal line, between ocular fenestrae: several juxtaposed cells coalesce, lines of reticulum between them obscure. No eyes discernible. Dorsal setae uniform in structure; comparatively long, slender, most of them finely drawn to exquisitely sharp points; all with minute, thin barbs sparsely distributed along entire shaft. Ratio $be/ce = 2.0$. Pairs *be*, *he*, *la*, *lm*, *li* relatively long, approximately equal; dorsomedians *a*, *b*, *c* almost as long as dorso-laterals; suranals *le*, *e* subequal. Femora 6-5-3-2, genua 4-4-1-1, tarsi 14-10-8-8. Solenidion *w* I 27μ , surpasses bases of distal eupathids *tc*; *k* I 37μ , equal to dorsal seta above. Macroseta IV smooth, 67μ ; macroseta IV/ $l' = 1.7$. Empodial raylets pointed. Average measurements in microns ($n = 4$): length idiosoma 372; setae *be* 103, *ce* 50, *de* 86, *he* 95, *a* 82, *la* 93, *lm* 105, *li* 98, *le* 73, *e* 77.

Types. Holotype ♀, 3 paratype ♀, Silverton, Colorado, Aug. 27, 1958 (D. W. Price) *ex* soil under aspen. Holotype in USNM, 1 paratype in BM (NH).

***Stigmaeus croblyus* n. sp.**

(Pl. 7, figs. 30-34)

Female. Central plate type II; intercalary plates paired. Propodosomal plate deeply concave on posterior margin; auxiliary platelets bearing setae *de* not separate from main plate. Central plate somewhat rounded in shape, almost isodiametric. Median zonal plates considerably smaller than lateral zonals. All plates delicately reticulated, dimples not demonstrable; reticular lines do not clearly outline ocular fenestrae on propodosoma. Eyes: possibly two pairs; smaller anterior pair circular in outline; only a part of perimeter of larger, posterior pair sharply defined. At least eight pairs of minute apodemal markings occur on idiosoma, viz.: one pair in front of setae *be*; one pair on propodosomal plate between setae *ce*, in location of aberrant reticular cells of other species; one pair on posterolateral margins of propodosomal plate; one pair on integument between humeral and central plates; one pair adnexed to lateral margins of central plate; one pair on integument just mesad of lateral zonal plates; one pair on anterior margins of median zonal plates; one pair on anteromesal margins of intercalary plates; one pair on anterior rim of suranal plate. Genital plate a narrow, crescentic sclerite partly encircling anogenital slit; anterior setae of genital plate situated close in front of anteriormost anogenitals; length of one anterior genital setae exceeds distances from its own base to bases of three nearest setae, i.e., anterior genital of opposite side, middle genital and anterior anogenital of same side. Dorsal setae uniform in structure, all stout, relatively long, recurved, sharply pointed, faintly barbed for most of length except near tips. Setae *be*, *de*, *he*, *a*, *b*, *c*, *lm*, *li* subequal. Setae *e* > *le*. Ratio $be/ce = 1.5$. Femora 6-5-3-2, genua 4-4-1-1, tarsi 14-10-8-8. Solenidion *w* I 32μ , projects beyond bases of distal eupathids *tc*; *k* I 49μ , equal to adjacent dorsal seta. Macroseta IV 63μ , barbed;

macroseta IV/ l' = 1.2. Empodial raylets pointed. Average measurements in microns ($n = 10$): length idiosoma 415; setae *be* 118, *ce* 78, *de* 118, *he* 111, *a* 118, *la* 121, *lm* 124, *li* 111, *le* 83, *e* 93.

Male. Plates of propodosoma, leg chaetotoxy, length ratios of dorsal setae essentially as described or illustrated for female—with these exceptions: all dimensions somewhat reduced, ornamentation of plates faint or obsolete; dorsomedian setae *c* shorter than *a*, *b*. Opisthosoma conical, setae *e* reduced to half length of *le*. Anogenital setae diminutive, three pairs only, all grouped on paired paranal papillae. Aedeagus not noteworthy in dorsal view. Solenidion $w\sigma$ on tarsus I 53μ ; when extended forward to lie parallel with solenidion *w*, tips of both end at same level, both reach almost to pretarsus.

Types. Holotype ♀, 16 paratype ♀, 2♂, Bastrop, Texas, Sept. 3, 1960 (L. Stange) *ex* oak leaf mold. Holotype in USNM, 1 paratype in BM(NH).

The female of this species can be distinguished from allied species by these characters: absence of separate auxiliary platelets; two pairs of eyes; crescentic, abbreviated genital plate; long, curved dorsal setae, seven pairs of which—including preoculars—are equal in length and barbellation.

Stigmaeus obtectus n. sp.

(Pl. 8, figs. 35–36)

Female. Central plate type II; intercalary plates paired. Reticulum appears as a thick-barred lattice in which minute secondary diffracting cells occur where bars of mesh intersect. Propodosomal plate wholly reticulated except over ocular fenestrae; cells of reticulum large in mid-dorsal region of this plate, graduated to smaller cells in extensive areas completely surrounding each fenestra. Reticular sculpturing on propodosomal plate disrupted by three pairs irregularly shaped apodemal markings: one pair centrally located on a line between setae *ce*; second pair widely spaced marks on its posterior margin; one pair apodemal markings apparent on lateral margins of central plate. Reticulum covers ventral plates, leg, and palp segments of tarsi; palptrochanter has a single row of rectangular cells around its circumference. No eyes apparent. Dorsal setae (except humerals) rigid, straight, barbed only near tips; all terminate abruptly in jagged splinters as though broken or chopped; those on hysterosoma tend to split near ends (fig. 36). Humeral setae entirely smooth, sharply pointed, longest pair on idiosoma. Dorso-laterals and dorsomedians on hysterosoma nearly equal in length. Ratio $be/ce = 1.6$. Femora 6-5-3-2, genua 4-4-1-1, tarsi 14-10-8-8. Solenidion *w* I 29μ ; *k* I 40μ , its length equals dorsal seta above. Macroseta IV 84μ , lightly barbed, macroseta IV/ l' = 1.8. Empodial rays capitate. Measurements in microns (holotype): length idiosoma 561; setae *be* 74, *ce* 47, *de* 62, *he* 102, *a* 51, *la* 59, *lm* 55, *li* 66, *le* 62, *e* 62.

Type. Holotype ♀, Silverton, Colorado, Aug. 27, 1958 (D. W. Price) *ex* soil under aspen. Retained by author.

The reticulation of the propodosomal plate in its entirety and the enclosure

of the ocular fenestrae by the reticulum is diagnostic. Additionally, the humeral setae are the longest setae on the idiosoma and the remainder are abruptly chopped at the tips.

***Stigmaeus mimus* n. sp.**

(Pl. 4, figs. 19-20)

Female. Central plate type II; one intercalary plate. Reticulation on dorsal plates obvious but without distinctive features of pattern; this ornamentation also covers ventral plates, all leg segments. Eyes not apparent. Dorsal setae relatively short, with stout shafts, coarse barbs on distal halves; at least two pairs, *c*, *li*, forked (fig. 20); no single pair much longer than any other, approximately of equal lengths in two size ranges: $ae = be = he = lm = li = e$, and $ce = de = a = b = c = la = le$. Ratio $be/ce = 1.2$. Femora 6-5-3-2, genua 4-4-1-1, tarsi 14-10-8-8. Solenidion *w* I 34μ , robust, curves forward between and beyond bases of eupathids *tc*; *k* I 50μ , longest seta on segment, 1.3 times longer than barbed dorsal seta above. Macroseta IV 34μ , heavily barbed, not longer than adjacent seta *l'*. Empodial rays pointed. Measurements in microns (holotype): length idiosoma 398; setae *be* 67, *ce* 55, *de* 55, *he* 74, *a* 51, *la* 51, *lm* 67, *li* 74, *le* 59, *e* 74.

Type. Holotype ♀, Fort Huachuca, Cochise County, Arizona, Mar. 30, 1961 (F. C. Raney) *ex* litter under *Juglans rupestris*. Type retained by author.

S. mimus resembles *sphagneti* in respect to character and size relations of its dorsal setae. The two species are easily separated. *S. mimus* has a central plate type II, one intercalary plate, a very long *k* spine on genu I, suranal *e* longer than *le*, and no obvious eyes.

***Stigmaeus eutrichus* Berlese**

(Pl. 9, figs. 42-43)

Stigmaeus eutrichus Berlese, 1910. Redia 5:206, fig. 27.

Female. Idiosoma fusiform, approximately two times longer than wide. Central plate type III; two intercalary plates. Dimpling or reticulation of body plating not apparent. Propodosomal plate roughly pentagonal, mid-section raised, posterolateral extensions depressed; auxiliary plates separate. Eyes: one pair, close behind bases of long preocular setae, with protruding corneas. Hysterosomal plates widely separated by extensive areas of striated integument. Marginal plates narrow, elongate; humeral, lateral zonal and intercalary plates small, ovoid. Ventral plating restricted in genital region: one pair of minute platelets bear anterior pair of genital setae; a narrow, inverted U-shaped plate straddles anogenital covers, middle and posterior pairs of genital setae arise on this plate (fig. 42). Two pairs of apodemal markings appear on propodosomal plate: one pair midway between vertical and preocular setae, one pair close to its posterior margin far behind postocular setae *ce*. Dorsal setae of two types: three pairs, *be*, *he*, *lm*, ultralong, flexible,

entirely smooth, very finely pointed; 10 pairs very short, rigid, with blunt tips and few incipient barbs well spaced on shafts. Preoculars *be* much longer, postoculars *ce* much shorter than all other dorsal setae. Ratio $be/ce = 11.2$. Lateral suranals $le > e$. Setae on coxae II unusually close to each other, 10μ apart: bases of those on one coxa II align with bases of those on opposite coxa to form a straight line; none of setae on coxae I and II noticeably longer than setae on coxae III and IV. Femora 6-5-3-2, genua 4-2-0-1, tarsi 14-9-8-8. Solenidion *w* I 12μ . Basal solenidion on tibia I 27μ long, greater than length of tibial segment. Spine *k* on genu I a very small hook, 5μ . Macroseta IV 42μ , smooth; macroseta IV/*v* = 1.2. Empodial raylets capitate. Average measurements in microns ($n = 2$): length idiosoma 327; setae *be* 135, *ce* 12, *de* 29, *he* 92, *a* 20, *la* 20, *lm* 96, *li* 27, *le* 41, *e* 29.

Collection Data. Two ♀, Logan Canyon, Logan, Utah, Apr. 20, 1949 (G. F. Knowlton, Shi-Chun Ma) *ex* dogwood leaves.

There is a possible synonymy for this species which may best be decided by someone who can examine specimens in the Berlese collection. *Stigmaeodes* was established by Canestrini (1889) as a monotypic genus based on *Stigmaeus elongatus* Berl., 1886. In this paper, Canestrini described only *Stigmaeodes elongatus* var. *longipilis*. Berlese's illustration of *Stigmaeus elongatus* and Canestrini's illustration of *Stigmaeodes elongatus* var. *longipilis* do not appear to show closely related mites. But Berlese (1910) later described *Stigmaeus eutrichus* which may be Canestrini's variety. Therefore the name *longipilis* Can. is possibly a prior name for *eutrichus* Berl.

Stigmaeus fusus n. sp.

(Pl. 9, fig. 41)

Female. Idiosoma fusiform. Central plate type II (imperfect); intercalary plates paired. Propodosomal plate nearly pentagonal, central area raised, posterolateral corners depressed; with two pairs apodemal markings as described for *eutrichus*; otherwise body plates without dimpling or reticulation. Eyes: one pair well defined, with protruding corneas. Central plate tapered behind to intrude between median tertiary plates; invaded by striae on lateral margins so that dorsomedian setae *a* originate on small detached platelets; separate platelets for dorsocentrals *b* also may be detached on one side or both. Marginal plates very small, scarcely larger than areas around which integumental striae diverge to accommodate alveoli of setae *la*. Lateral zonal plates also very small, much smaller than median zonals; the latter may be imperfectly joined with central plate on one side or both. Genital plate a narrow, inverted V-shape, snugly fitted around ventral part of anogenital covers, entire or with anterior pair of genital setae on isolated platelets on one side or both. Two pairs dorsal setae, *be*, *he*, quite long, smooth, finely pointed; all others relatively short, blunt, with incipient barbs. Ratio $be/ce = 4.6$. Setae on coxa II 15μ apart, bases of those on one coxa II align with those on opposed coxa to form a straight line; posterior setae of coxa I and anterior

seta of coxa II very long, 45μ , the latter long enough to reach the base of the former. Dorsalmost pair of setae on anogenital covers unusually long, length of this pair $> le > e$. Femora 6-4-3-2, genua 4-3-0-1, tarsi 14-10-8-8. Solenidion w on tarsus I 17μ . Proximal solenidion $\phi\rho$ (see fig. 31 for location) on tibiae I-IV unusually long; on tibia I it is at least as long as tibial segment. Spine k I diminutive, 7μ . Macroseta IV 67μ , smooth; macroseta IV/ v' = 2.0. Empodial raylets capitate. Average measurements in microns ($n = 8$ specimens, type series): length idiosoma 335; setae be 97, ce 21, de 32, he 73, a 24, la 27, lm 29, li 31, le 43, e 31.

Types. Holotype ♀, 7 paratype ♀, Cobb Mountain, Lake County, California, May 10, 1951 (W. J. Wall, S. F. Bailey) *ex* oak and pine leaf mold. Holotype in USNM, 1 paratype in BM(NH).

Collection Data. Six ♀, Mt. St. Helena, Napa Co., Calif., May 10, 1951 (S. F. Bailey) *ex* manzanita leaf mold; 13♀, Colfax, Placer Co., Calif., Apr. 11, 1957 (S.F.B.) *ex* manzanita leaf mold; 2♀, Lake Pillsbury, Napa Co., Calif., Nov. 12, 1957 (D. W. Price) *ex* pine mulch; 5♀, Sweeney Ridge, 3 mi. S. San Francisco County Jail, San Mateo Co., Calif., Oct. 2, 1960 (D.W.P.) *ex* chaparral mulch; 6♀, Woods Lake, Alpine Co., Calif., Jul. 17, 1960 (R. O. Schuster) *ex* pine duff.

S. fusus closely resembles *eutrichus*. The former may be distinguished from the latter in these respects: median zonal plates separate or imperfectly united with central plate; only two pairs of ultralong setae, be and he ; setae lm are not ultralong; ratio $be/ce = 4.6$; marginal and lateral zonal plates diminutive.

Stigmaeus callunae Evans

(Pl. 9, figs. 39-40)

Stigmaeus callunae Evans, 1954. Proc. Zool. Soc. London 123:802, figs. 18-22.

Female. A small, semi-fusiform species. Central plate type II; intercalary plates paired. Two long dorsal setae be , he , smooth, sharply pointed; other dorsals comparatively short, smooth or nearly so. One pair of eyes. Central plate invaded by striae on sides so that setae a may originate on detached platelets. Marginal plates of substantial size; setae la situated on this pair of plates closer to pair b than to pair a . Median zonal plates larger than lateral zonals. Suranal setae $le > e$. Setae on coxae I-II as described for *fuscus*. Dorsalmost pair of setae on anogenital covers shorter than le . Femora 6-4-3-2, genua 4-4-1-1, tarsi not determined. Macroseta IV 54μ ; macroseta IV/ v' = 2.0. Empodial raylets capitate. Measurements in microns (1 specimen): length idiosoma 288; setae be 66 (Evans), ce 18, de 31, he 63, a 16, la 16, lm 20, li 23, le 39, e 23.

S. callunae has not been identified from material collected in America for this study. A topotype specimen, loaned by the British Museum, has served to reveal a number of specific differences between *callunae* and *fuscus*. Evans' species is included here to augment the roster of illustrated species and to

add supplementary details to the description. The type II central plate and short setae *lm* distinguish *callunae* from *eutrichus*. *S. callunae* differs from *fusus* in each of these respects: small size, large marginal plates with setae *la* almost aligned in a transverse row with dorsocentrals *b*; genua 4-4-1-1; and suranals *le* longer than the dorsalmost pair of setae on the anogenital covers.

The key to species sifts *callunae* Evans and *insectus* Willmann together into a terminating couplet. The basis employed for separating these two species is less decisive than desired because Willmann's description of *insectus* is fairly general.

Stigmaeus rhodomelas Berlese

Stigmaeus rhodomelas Berlese, 1910. Redia 6:205, pl. 18, fig. 24.

Berlese's *rhodomelas* most nearly resembles *lucaris* as next described. The best distinction which can be made at this time is that *rhodomelas* possesses eyes and a finely punctate, smooth propodosomal plate. Berlese's figure of *rhodomelas* also shows a divided suranal plate with two pairs of setae. In *lucaris*, the suranal plate is integral and is likely to bear three pairs of setae, or two pairs plus one seta.

Stigmaeus lucaris n. sp.

(Pl. 10, figs. 46-47; Pl. 11, fig. 48)

Female. A relatively large fusiform species. Central plate type II; intercalary plates paired. Outlines of idiosomal plates vague because small longitudinal ridges on their surfaces resemble striae of less sclerotized integument. Propodosomal plate a rounded pentagon with several patterns of surface ornamentation: mid-section between setae *ae*, *be*, *ce*, faintly shows a coarse reticulum of large polygonal cells and an irregularly anastomosing meshwork of finer trabeculae which subdivides each of the larger meshes into a lace-like meshwork (fig. 46). Reticulum in midline, near center of propodosomal plate, forms a rosette-like pattern of cells radially grouped around an apodemal depression. This complex pattern of reticulation becomes disarranged on posterior midsection of the plate, and there is a transition from reticulum to sinuous, linear ridges. Outlying areas of propodosomal plate provided only with linear ridges. Other paired apodemal markings occur on propodosomal plate as follows: one pair small dots in front of setae *be*; one pair small dots between setae *ce*; a third pair on its posterior margin adjoining humeral sulcus. Auxiliary platelets with setae *de* appear to be independent of propodosomal plate. Integument in front of propodosomal plate with transverse striae microtuberculate. Central plate elongate, tapers to a point between median zonal plates, its margins ill-defined; ornamented only with longitudinal ridges or with reticulum faintly evident between setae *a*, *b*. Marginal plates of substantial size, irregularly ridged on surfaces,

with setae *la* closer to *b* than to *a*. Median zonal plates larger than lateral zonals, the latter located in a more anterior position than the former; setae *c* and *lm* not aligned in a straight crossrow. Genital plating consists of one pair of small plates, one on each side of anogenital aperture. Three pairs of genital setae; one pair considerably anterior to apex of genital slit, their alveoli appear to originate on minute platelets; middle and posterior pairs distant from first pair, grouped close together both on small genital plates (fig. 48). Dorsal setae short, smooth or nearly so, none excessively longer than others; relative lengths as follows: $be = le > he > de = e > ce = li > a = la = lm$. Ratio $be/ce = 1.4$. Suranal plate with four, five or six setae. Anogenital covers bear five pairs of setae. Femora 4-4-3-2, genua 6-5-2-2, tarsi 14-10-8-8. Solenidion *w* I 17 μ ; *k* I minute, 7 μ . Macroseta IV acicular, smooth, 74 μ ; macroseta IV/*l'* = 2.6. Empodial raylets capitate. Average measurements in microns ($n = 10$): length idiosoma 404; setae *be* 42, *ce* 29, *de* 35, *he* 39, *a* 27, *la* 25, *lm* 24, *li* 31, *le* 42, *e* 34.

Types. Holotype ♀, 12 paratype ♀, Alturas, Modoc County, California, Oct. 11, 1952 (E. I. Schlinger) *ex juniper duff*. Holotype in USNM, 1 paratype in BM(NH).

Collection Data. One ♀, Altadena, Los Angeles Co., Calif., Dec. 26, 1951 (E. I. Schlinger) *ex mulch Quercus agrifolia*; 1♀, 2.6 mi. E. Nimbus Dam, Sacramento Co., Calif., Mar., 1959 (F. C. Raney) *ex soil beneath Rhus* sp., *Echinocystis* sp.

The numbers of setae on the suranal plate vary within the type series. Out of thirteen specimens, one individual has two pairs (*le*, *e*), five have three complete pairs, and seven individuals have five setae. The extra seta, here designated as *lx*, occurs on right or left sides in the ratio 3:4 among seven specimens.

S. rhodomelas Berlese, *lucaris* and *purpurascens* comprise a phyletic subgroup of species. Each has a small, compact gnathosoma in relation to total body size. The chelicerae are slender, the palps short, and the rostrum broad and stubby. *S. rhodomelas* is the smallest of the three species; it has one pair of eyes and a smooth or finely punctate propodosomal plate.

***Stigmaeus purpurascens* n. sp.**

(Pl. 11, fig. 50)

This species so closely resembles *lucaris* that a detailed description would be repetitious. Only the features by which *purpurascens* is distinguishable from *lucaris* are listed.

Female. Reticulate ornamentation of propodosomal plate as described for *lucaris* is repeated in faint relief on all hysterosomal plates. Linear surface ridges absent on central and marginal plates except that five or six coarse striae invade anterolateral margins of central plate to isolate small platelets on which setae *a* originate. Setae $le > he > be$. Ratio $be/ce = 1.1$. Macroseta IV 92 μ , macroseta IV/*l'* = 2.8. Four pairs genital setae in two groups, viz.:

two anterior pair on one pair genital plates, two posterior pair on a second pair of genital plates (fig. 50). Measurements in microns (holotype): length idiosoma 495; setae *be* 35, *ce* 31, *de* 35, *he* 39, *a* 27, *la* 27, *lm* 27, *li* 31, *le* 47, *e* 35.

Holotype: Durango, Colorado, Aug. 28, 1958 (D. W. Price) *ex* leaf mold. Retained by author.

***Stigmaeus luteus* n. sp.**

(Pl. 10, figs. 44–45; Pl. 12, fig. 54)

Female. Idiosoma fusiform with strong constriction at humeral sulcus. A second sulcus occurs on dorsum, separating central and median zonal plates. Dorsal plates partly or entirely striated; striae not essentially different than those of body integument, plate areas imperfectly delimited. Areas referred to as plates scarcely more than slightly raised portions of integument. Propodosomal plate partly reticulated; reticulum consists of four or five rows of polygonal cells longitudinally disposed between setae *ae*, *be*, *ce*; striae overlie parts of reticulum. A short, narrow, highly refringent bar or apodemal mark originates in middle of propodosomal plate. Transverse microtuberculate striae occur anterior to propodosomal plate. No eyes. Central and marginal plate areas entirely striated, so thinly sclerotized that identification as plates subject to interpretation. Median zonal plate appears to form a unit area on which striae converge to a posterior point; setae *c*, *lm* aligned in a transverse row. Intercalary plates recognizable as small, separate elements. Suranal plate with three pairs setae. Dorsal setae short, pointed, very finely barbed; three pairs appreciably longer than others; size relations as follows: $he > be > de > le > li > ce = e > a > la = lm$. Ratio $be/ce = 1.9$. Dorsalmost anogenital setae slightly longer than suranals *le*. Coxae very heavily sclerotized, with unusually thickened articular facet on coxae I beneath anterior (internal) setae. Mesal ends of coxae I excavated to accommodate ventral setae of propodosoma (fig. 54). Genital plate integral, subtriangular, with four (or five) pairs setae arranged in two groups (fig. 44). Anal and genital covers appear to be separated structures but with external slit continuous; six pairs anogenital setae, three pairs on each section of covers. Femora 6-6-3-2, genua 6-5-3-3, tarsi 14-9-8-8. Solenidion *w* I bulbous, with constricted pedicel, 8μ ; *k* I setiform, 8μ . Macroseta IV slender, smooth, 59μ ; macroseta IV/ $l' = 2.3$. Empodial rays capitate. Average measurements in microns ($n = 10$): length idiosoma 384; setae *be* 51, *ce* 27, *de* 44, *he* 57, *a* 22, *la* 16, *lm* 17, *li* 31, *le* 39, *e* 28.

Male. Smaller but with characters of female except on conical opisthosoma. Phallic structures consist of at least three complex sclerites: a long tubular aedeagus; two S-shaped, harpes-like elements two thirds as long as aedeagus. Internal ends of accessory elements slightly distended, anchored within phallocrypt; these taper and bend to sharp, bifid, protrusible tips. Setae *le*, *e* present on suranal plate. Two dorsalmost pairs setae on anal covers reduced to short, curved spines.

Types. Holotype ♀, Old Dairy Barn, University Campus, Davis, Yolo County, California, Nov. 9, 1960 (D. W. Price, R. O. Schuster) *ex* floor trash. Holotype in USNM, 1 paratype in BM(NH).

Collection Data. Two ♀, Grizzly Island, Solano Co., Calif., Jul. 8, 1960 (R. O. Schuster) *ex* soil around roots of *Salicornia* sp.; 1♀, 2.2 mi. S. W. Guinda, Yolo Co., Jan. 2, 1961 (H. K. Court) *ex* humus on creek bank; 3♀, 2 mi. W. Springville, Tulare Co., Calif., May 13, 1959 (R. O. S., L. M. Smith) *ex* soil; 1♀, Tala, PHILIPPINE ISLANDS, Aug. 8, 1957 (H. Delfinado) *ex* (?); 1♀, F. Varela, Buenos Aires Province, ARGENTINA, June, 1960 (O. de Ferrariis) *ex* (?).

The specimen from Argentina is identical with females of the type series except the numbers of setae on femora I–IV are 6-4-3-2. Also the setae on genua II of the Argentine example shows bilateral variation, five setae on one side, four on the other. Since there is otherwise such close agreement between the several samples, these variations are classed as intraspecific.

***Stigmaeus raneyi* n. sp.**

(Pl. 12, figs. 52–53)

Female. Idiosoma fusiform, deeply incised at humeral sulcus, with additional transverse sulci on opisthosoma. Dorsal plating uniformly ornamented with clear, membranous dimples and faint-lined reticulation. Propodosomal plate extensive, ornamented to margins except anteriormost projection hyaline in front of setae *ae*; lateral margins excavated near preocular setae *be* to accommodate paired lenticular bodies (eyes?); its posterior margin notched and provided with transverse microtuberculate striae which cover a part of interseutal membrane of sulcus; a small apodemal mark in center of this plate is faint, granular, not noticeably refractile. Auxiliary plates represented by minute sclerites on which setae *de* originate. Humeral plates comparatively large, displaced ventrally to occupy extensive area between coxal groups. Central plate type II. Single median zonal plate separated from central plate by a shallow furrow. Lateral zonal plates much reduced, their setae *lm* not aligned with setae *c* in a transverse row. Intercalary plates small, widely separated. Suranal plate divided into right and left halves, with three pairs setae: pairs *le*, *e* long; *lx* short. Integumental striae normal, smooth over most of intersegmental membrane; patches of microtuberculate striae occur in three restricted regions: around front part of propodosomal plate; in humeral sulcus across dorsum and between coxae II–III across venter; in ventrolateral integument behind coxae IV. Dorsal setae acicular, sharply pointed, straight or slightly recurved, so faintly barbed that appearance is smooth; all within four size groups: $be = he > le > ce = de = li = e > a = la = lm$. Ratio $be/ce = 1.3$. Genital plate of substantial size, divided into right and left elements, with four pairs setae of equal lengths (fig. 52). Anogenital covers with five pairs setae: two pairs comparatively short setae on genital portion of covers, three pairs longer setae on covers of anal por-

tion. Setae on coxae II as in *luteus*. Femora 4-4-3-2, genua 6-5-2-2, tarsi 14-9-8-8. Solenidion *w* I moderately long, 15μ , tapered; *k* I thornlike, short, 7μ . Macroseta IV smooth, 40μ ; macroseta IV/*l'* = 1.7. Empodial raylets capitate. Average measurements in microns ($n = 10$): length idiosoma 319; setae *be* 36, *ce* 27, *de* 28, *he* 34, *a* 22, *la* 21, *lm* 22, *li* 26, *le* 31, *e* 28.

Types. Holotype ♀, 6 paratype ♀, Warner Springs (Highway 79), San Diego County, California, Mar. 3, 1959 (F. C. Raney) *ex* fallen leaves of *Adenostoma sparsifolia*. Holotype in USNM, 1 paratype in BM(NH).

Collection Data. Two ♀, Logan Canyon, Utah, Nov. 19, 1949 (G. F. Knowlton, Shi-Chun Ma) *ex* red juniper; 2♀, nr. Mt. Pinos, Ventura Co., Calif., May 2, 1952 (S. F. Bailey) *ex* manzanita leaf mold; 5♀, 30 mi. E. Bakersfield, Kern Co., California, May 12, 1959 (L. M. Smith) *ex* oak mulch.

The recognition characters of *raneyi* are as follows: three areas of microtuberculated striae, lenticular bodies on propodosomal plate, five pairs of setae on anogenital covers, bipartite genital plate.

Stigmaeus constrictus n. sp.

(Pl. 11, fig. 49)

Female. Idiosoma fusiform, with emphatic humeral sulcus; a less emphatic sulcus between metapodosoma and opisthosoma. Propodosomal plate much longer than wide, faintly ornamented with a few elongate, furrow-like dimples; a small bar-like apodemal mark present in mid-line, not refringent. Auxiliary platelets delicately sclerotized but substantial in size. No eyes. Integumental striae coarse, double-lined, not uniformly parallel—they diverge or stretch apart to form numerous spindle-like naked streaks, such irregularities especially noticeable between central and marginal plates. Humeral plates displaced to venter. Central plate type II, narrowed and rounded posteriorly, with at least four deep furrows along its full length, the furrows irregularly interrupted where interspaced ridges anastomose; lateral areas of this plate invaded by irregularly fragmented striae. Marginal plates very long, slender, poorly differentiated from striated integument; setae *la* aligned with *a* to form a straight cross-row. Median zonal plate an inverted triangle, its rounded apex intrudes between small intercalary plates, irregularly ribbed to resemble decorative pattern of central plate. Lateral zonal plates very small, their setae *lm* aligned with setae *c* in a cross-row. Suranal plate bears three pairs setae, middle pair *le* longer than all others on opisthosoma. Dorsal setae hair-like, smooth, some with tips so finely pointed that ends difficult to find; arranged in six size groups: $be = he > de > le > ce > li = e > a = la = lm$. Ratio $be/ce = 2.1$. Three setae on coxae I-II flagelliform, all approximately as long as *be*. Genital plate entire, with four pairs setae. Anogenital covers with six pairs setae: three pairs on genital segment, two short, one longer; three pairs on anal segment. Femora 6-4-3-2, genua 6-4-2-3, tarsi 14-9-8-8. Solenidion *w* I short, 7μ , bulbous, with constricted pedicel; *k* I setiform, 8μ , about one-half as long as adjacent dorsal. Macro-

seta IV 45μ ; macroseta IV/ l' = 2.6. Empodial raylets capitate. Measurements in microns (holotype): length idiosoma 281; setae *be* 59, *ce* 27, *de* 47, *he* 55, *a* 16, *la* 16, *lm* 16, *li* 23, *le* 35, *e* 23.

Type. Holotype ♀, Lake Pillsbury, Napa County, California, Sept. 12, 1957 (D. W. Price) *ex* pine mulch. Retained by author.

The spot characters of *constrictus* are: the pattern of linear furrows on central plate, and genua 6-4-2-3.

***Stigmaeus uncus* n. sp.**

(Pl. 12, fig. 55)

Female. Idiosoma fusiform, with emphatic humeral sulcus and minor sulci on hysterosoma. Ornamentation of plating distinctive. Propodosomal plate with hexagonal reticulum on anterior half, posterior half transitional to pattern on central plate; with short, bar-like, refringent apodemal mark in midline. No eyes. Central plate type II, striated and dimpled; five to six rows of laterally compressed, elongate dimples situated in shallow, linear furrows; ridges separating furrows provided with fascicles of fine longitudinal striae (best seen with phase-contrast microscopy). Median zonal plate integral, rounded behind, ornamented as central plate. Marginal and lateral zonal plates not definable. Intercalary plates small, widely separated. Dorsal setae dissimilar, with size graduations between divers pairs as follows: *be* > *he* > *de* = *le* > *ce* = *li* = *e* > *a* = *la* = *lm*; two longest pairs whip-like, apparently smooth; others shorter, less sharply pointed, minutely barbed. Ratio *be/ce* = 2.3. Setae *la* equidistant from *a*, *b*; setae *lm*, *c* on zonal plates aligned in a cross-row. Suranal plate with three pairs setae, middle pair *le* equal to dorsal-most setae on anogenital covers. Three of four pairs of setae on coxae I–II very long, 51μ , flagelliform, not quite as long as *be*. Genital plate entire, shaped like that of *luteus* (fig. 44) but faintly reticulated in part; holotype with four and one-half pairs genital setae; six pairs anogenitals. Femora 6-6-3-2, genua 6-5-3-3, tarsi 14-9-8-8. Solenidion *w* I fusiform, 12μ , basally constricted; solenidion $\phi\rho$ on tibia II stubby, inflated, resembles *w* III; *k* I rod-like, 10μ . Macroseta IV 47μ ; macroseta IV/ l' = 2.0. Empodial raylets capitate. Measurements in microns (holotype): length idiosoma 334; setae *be* 70, *ce* 31, *de* 43, *he* 62, *a* 20, *la* 20, *lm* 20, *li* 27, *le* 39, *e* 31.

Type. Holotype ♀, Clarksburg, Yolo County, California, Nov. 23, 1960 (V. E. Burton) *ex* alfalfa soil. Retained by author.

Collection Data. One ♀, Rancho Margarita, 60 mi. E.S.E. Laguna de Guerrero, Vizcaino Desert, Baja California, MEXICO, Nov. 29, 1960 (F. C. Raney), *ex* cortex of cardon cactus log.

The single specimen from Mexico is distinguishable from the holotype in several respects. Its central plate is similarly ornamented but the plate widens very noticeably between setae *a* and *b*, such that its transverse diameter is greater between these setae than in front of or behind them. A pair of elongate marginal plates are evident; these are dimpled and striated in the

manner of the central plate. The basal leg segments are dimpled. Five pairs of setae occur on the genital plate. In all other respects the specimen from Mexico appears to be identical with the one from California. The two specimens are provisionally regarded as conspecific because the presence, absence or precise shape of such faintly sclerotized plates may possibly vary according to state of preservation. In this case, there is doubt in the mind of the observer about whether or not marginal plates are identifiable in the holotype.

Larger size, location of setae *la*, femur II with six setae, genu III with three setae, and peculiar ornamentation of the central plate are characters which amply distinguish *uncus* from *constrictus*. In *constrictus* the plate is furrowed but lacks the several rows of dimples. The fact that the central plate of *uncus* is well-sclerotized and ornamented with furrows and dimples separates it from *luteus*.

Stigmaeus gracilimus n. sp.

(Pl. 11, fig. 51)

Female. Another fusiform species closely related to *luteus* and *insectus*. Chelicerae, maxillicoxae noticeably sclerotized, stippled with minute perforations. Integument on front part of propodosoma microtuberculate, smoothly striated on other parts of idiosoma. Propodosomal plate elevated, clearly outlined, its surface faintly stippled with very small perforations. Auxiliary platelets conspicuous, protruding, not ornamented. No eyes. Plating on hysterosoma thinly sclerotized, not ornamented. Central plate type II, elongate, abuts single median zonal plate at sulcus between propodosoma and opisthosoma. Marginal plates wide, strap-like, nearly as long as central plate. Lateral zonal plates elongate, extend posteriorly to suranal plate; intercalary plates crowded between lateral zonals and triangular median zonal plate. Suranal plate with three pairs of setae. Proximal segments of legs noticeably sclerotized, surfaces minutely perforated, internally braced with trabeculae which appear to represent a modified reticulum. Dorsal setae with few pairs of equal lengths, size graduations as follows: $be > he > li = le > de > e > ce > a = la = lm$; two longest pairs whip-like, smooth; others slightly heavier, minutely barbed. Ratio $be/ce = 1.8$. Setae *la* equidistant from *a*, *b*; *lm*, *c* on zonal plates aligned in a cross-row; suranals *le* equal to dorsalmost pair on anogenital covers. Genital plate entire, with four pairs genital setae; six pairs anogenitals. Femora 6-5-3-2, genua 6-5-3-3, tarsi 14-9-8-8. Solenidion *w* I bulbous, 7μ ; *k* I setiform, 13μ . Macroseta IV 40μ ; macroseta IV/*v*' = 2.4. Empodial raylets capitate. Average measurements in microns ($n = 2$): length idiosoma 296; setae *be* 54, *ce* 25, *de* 32, *he* 42, *a* 19, *la* 17, *lm* 19, *li* 37, *le* 35, *e* 29.

Type. Holotype ♀, 2 paratype ♀, Lincoln, Lancaster County, Nebraska, Apr. 26, 1960 (K. Orwig) *ex* decaying matter around rotting tree. Holotype in USNM; one paratype retained by author; one paratype returned to Dr. Warren T. Atyeo, University of Nebraska, Lincoln, Nebraska.

S. gracilimus can be distinguished from *luteus* by the ornamentation of its chelicerae and propodosomal plate, and by the presence of sizeable marginal and lateral zonal plates. It separates from *uncus* on the above features and by the fact that femur II bears only five setae. *S. insectus* Willm. has very nearly the same size and body conformation as *gracilimus* but *insectus* has eyes and paired median zonal plates.

***Stigmaeus fissuricola* Halbert**

Stigmaeus rhodomelas var. *fissuricola* Halbert, 1920. Proc. Royal Irish Acad., Sec. 13, 25:143, fig. 27.

Stigmaeus fissuricola, Oudemans, 1923. Ent. Ber. Nederl. Ent. Ver. 6:142.

This fusiform species is known only from the original description; type specimens are not known to exist. Halbert's description is clear on several points which serve to distinguish the species. A single median zonal plate present, not joined to central plate. No eyes. No setae on genua III and IV. Length 330–380 μ . Orange color; from limestone rocks, Malahyde, Ireland.

S. fissuricola more nearly resembles the American species *constrictus* than it does *rhodomelas*. *S. constrictus* has two and three setae on genua III and IV respectively, and three pairs of setae on the suranal plate.

***Stigmaeus youngi* (Hirst)**

Raphignathus youngi Hirst, 1926. Indian Journ. Med. Res. 13:1023–6, fig. 1.

Stigmaeus youngi (Hirst), new combination.

Female. Central plate type II; intercalaries paired. Dorsal plates slightly sculptured with reticulate markings. Dorsal setae subequal, stout, appreciably barbed (plumose); verticals *ae*, postoculars *ce* monaxial; preoculars *be* trifurcate; humerals and dorsal hysterosomals symmetrically bifurcate, split to bases; similarly fashioned setae present on dorsum of femora I–IV, genua I, tibiae II–IV. Length idiosoma, 350 μ . Type specimens labelled “white mites on flies,” Peshwar.

***Stigmaeus smithi* (Mitra and Mitra)**

Raphignathus smithi Mitra and Mitra, 1953. Zeitschr. f. Parasitenk. 15:429–32, figs. 1–4.

Stigmaeus smithi (Mitra and Mitra), new combination.

Female. Central plate type II; major plates, dorsal setae with form and arrangement described for *youngi* (Hirst). Reticulum with larger meshes on propodosomal plate than on metapodosomal plates. Intercalary plates separated. Zonal plates incompletely differentiated. Dorsal setae on femora I symmetrically forked beyond distal third, plumose; corresponding setae on femora II, IV asymmetrically forked near tips, described as not plumose. Length idiosoma 380 μ . Type specimens from abdomen of *Phlebotomus papatasi*, Poona, India.

Stigmaeus anomalus Willmann

Stigmaeus anomalus Willmann, 1953. Sitzungsber. Österr. Akad. Wiss. Math.-naturw. Kl., Abt. I, 162:492, Abb. 33.

A small species with central plate a modified type III, incorporating median zonal behind but with setae *a* originating on small independent platelets in front; main part of central plate therefore bears only setae *b*, *c*. Illustrated with two pair of ultralong setae *be* (100μ) and *lm*, both longer than *he*. One pair of eyes. Length (idiosoma), 330μ . Found in a creekbed, near Gstatterboden, Gesause, Austria.

Stigmaeus insectus Willmann

Stigmaeus insectus Willmann, 1953. Sitzungsber. Österr. Akad. Wiss. Math.-naturw. Kl., Abt. I, 162:490, Abb. 32.

Described as a fusiform species, emphatically constricted between pro- and metapodosoma. Eyes: one pair. Plates on hysterosoma conventional; median zonals larger than lateral zonals, intercalaries. Setae *be*, *he* much longer than all others, $be > he$; setae *ce* very short. Length idiosoma 340μ . From sod, alpine meadow, eastern Alps, Austria.

Willmann's description includes also a pair of unusual setae on the propodosomal integument, overlying the bases of the chelicerae. It is possible that the elevated, sharpened flanges which border the cheliceral depression in the base of the capitulum were interpreted to be setae.

S. insectus resembles *eutrichus* because it possesses ultralong preocular *be*, very short postoculars *ce*, and a pair of eyes. However, *eutrichus* has a pair of very long lateral zonal setae *lm*, and its median zonal plates are united with the central plate (type III). In *insectus*, the setae *lm* are not longer than setae *li*, and the median zonal plates are paired (central plate type II).

OTHER SPECIES OF STIGMAEUS

Only ten of the thirty-one species incorporated in this study were named by earlier describers. However, nineteen additional species have been described in or later referred to *Stigmaeus* since its inception. Some of these were subsequently transferred to other genera, as indicated below. When the obvious misfits are eliminated, there remain in *Stigmaeus* a number of species about which there are questions of identity or affinity.

Although nothing constructive can be done at this time about the identification or disposition of the uncertain species, it is worthwhile to list the names of species provisionally or continuously associated with *Stigmaeus* and to cite such changes as have been proposed.

Species Transferred to Other Genera.

Stigmaeus scapularis Koch, 1838.

Homocaligus scapularis, Berlese, 1910.

- Caligonus robustus* Berlese, 1885.
Stigmaeus robustus, Berlese, 1910.
Storchia robustus, Oudemans, 1923.
Raphignathus sculus Berlese, 1885.
Stigmaeus sculus, G. Canestrini, 1889.
Podaia rubens, Oudemans, 1923.
Stigmaeus longirostris Berlese, 1887.
Mediolata longirostris, G. Canestrini, 1889.
Eupalopsis longirostris, Berlese, 1893.
Stigmaeodes elongatus var. *longipilis* G. Canestrini, 1889.
Stigmaeus (*Stigmaeus*) *longipilis*, Berlese, 1910.
Storchia longipilis, Oudemans, 1923.
Stigmaeus (*Eustigmaeus*) *ottavii* Berlese, 1910.
Ledermuelleria ottavii, Summers and Price, 1961.
Stigmaeus (*Macrostigmaeus*) *anguineus* Berlese, 1910.
Macrostigmaeus anguineus, Oudemans, 1923.
Barbutia anguineus, Oudemans, 1927.
Stigmaeus (*Macrostigmaeus*) *serpentinus* Berlese, 1910.
Macrostigmaeus serpentinus, Oudemans, 1923.

Species Inquirendae

- Stigmaeus cruentus* Koch, 1836.
(= *S. crassirostris* Leonardi, 1889; Oudemans, 1923)
Stigmaeus megacephalus Koch, 1836.
Caligonus rufulus Koch, 1836.
Stigmaeus rufulus, Oudemans, 1923.
Stigmaeus comatulus Koch, 1838.
Caligonus bdelloides Koch, 1838.
Stigmaeus kermesinus Koch, 1841.
Stigmaeus (*Eustigmaeus*) *kermesinus*, Berlese, 1910.
Stigmaeus bicolor Canestrini and Fanzago, 1876.
Stigmaeus elongatus Berlese, 1886.
Stigmaeus simrothi Mola, 1907.
Stigmaeus confinis Berlese, 1910; *nomen nudum*.
Stigmaeus antrodes var. *reticulatus* Halbert, 1923.

The list of transferred species includes several mites which are sketchily described and difficult to recognize from published figures and descriptions. Further clarification of the ill-defined species awaits the attention of someone who has access to the museums of Europe and an intimate knowledge of European raphignathoid mites.

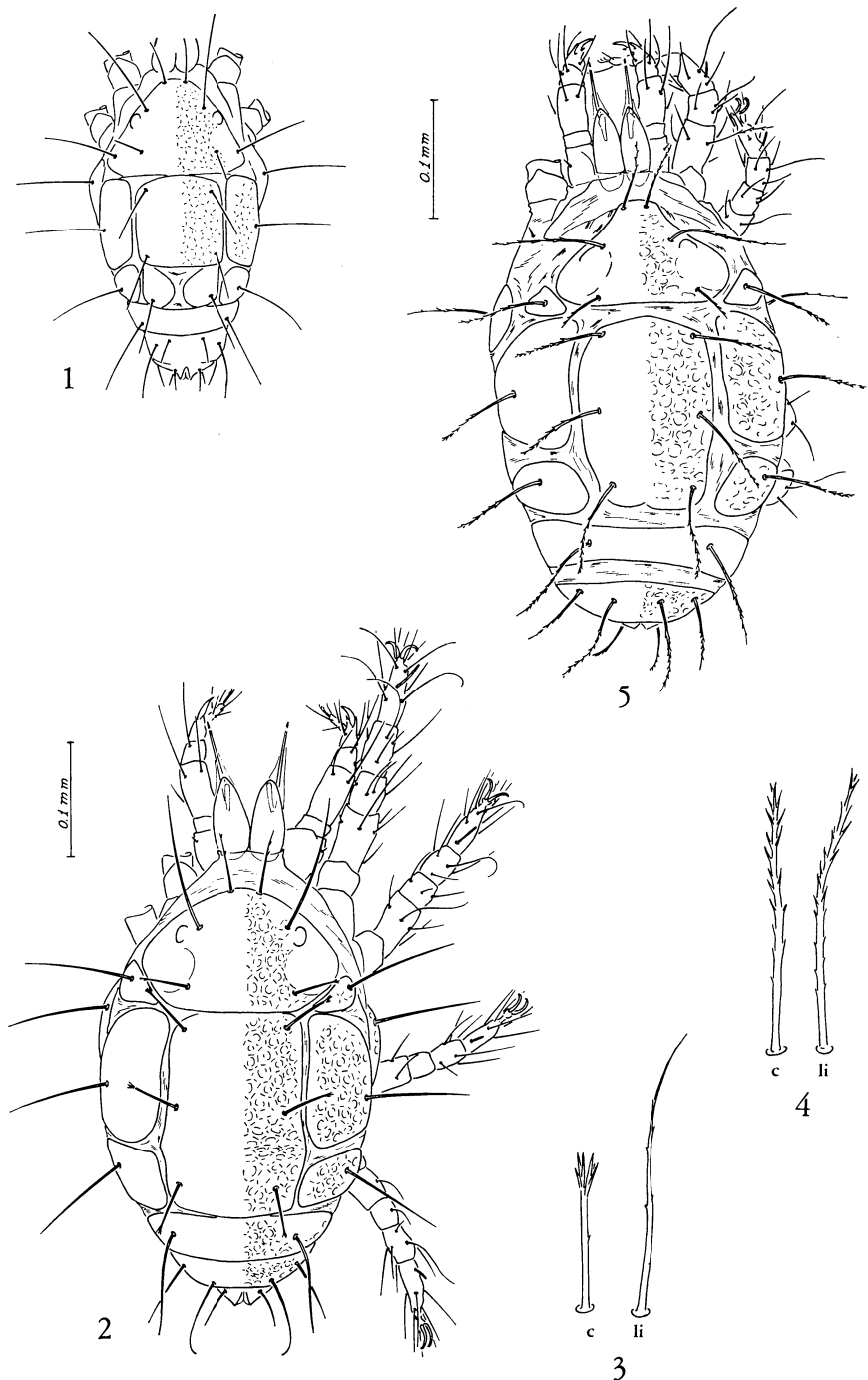


Plate 1. 1-3, *Stigmaeus clitellus*: 1, male; 2, female; 3, setae *c* and *li* of female. 4-5, *Stigmaeus comatus*: 4, setae *c* and *li*; 5, female. (The millimeter scales on all plates are applicable only to figures immediately adjacent.)

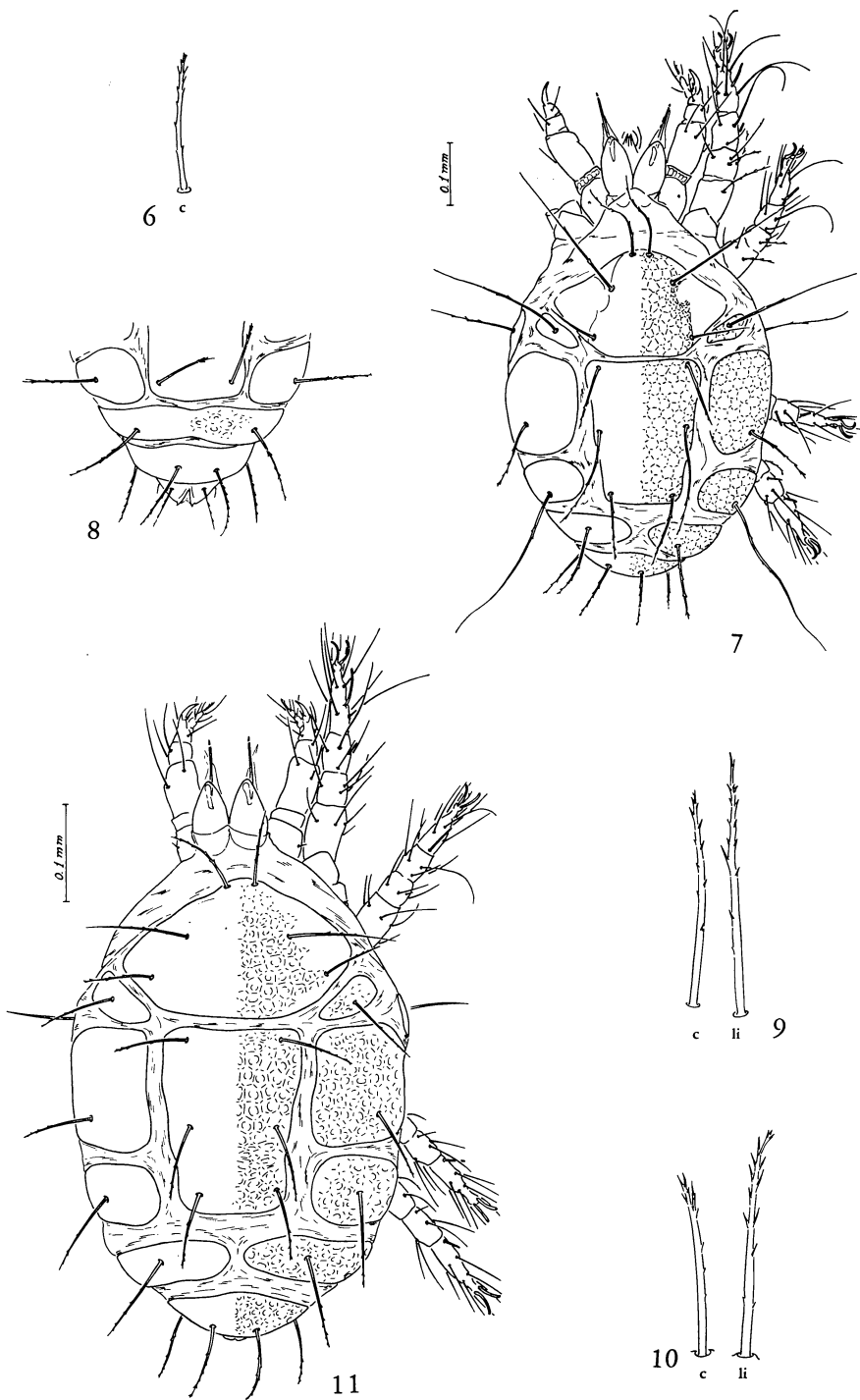


Plate 2. 6-7, *Stigmaeus glypticus*: 6, dorsomedian seta *c*; 7, female. 8-11, *Stigmaeus scaber*: 8, opisthosoma of variant with one intercalary plate; 9, setae *c* and *li* of holotype; 10, corresponding setae of variant; 11, holotype female.

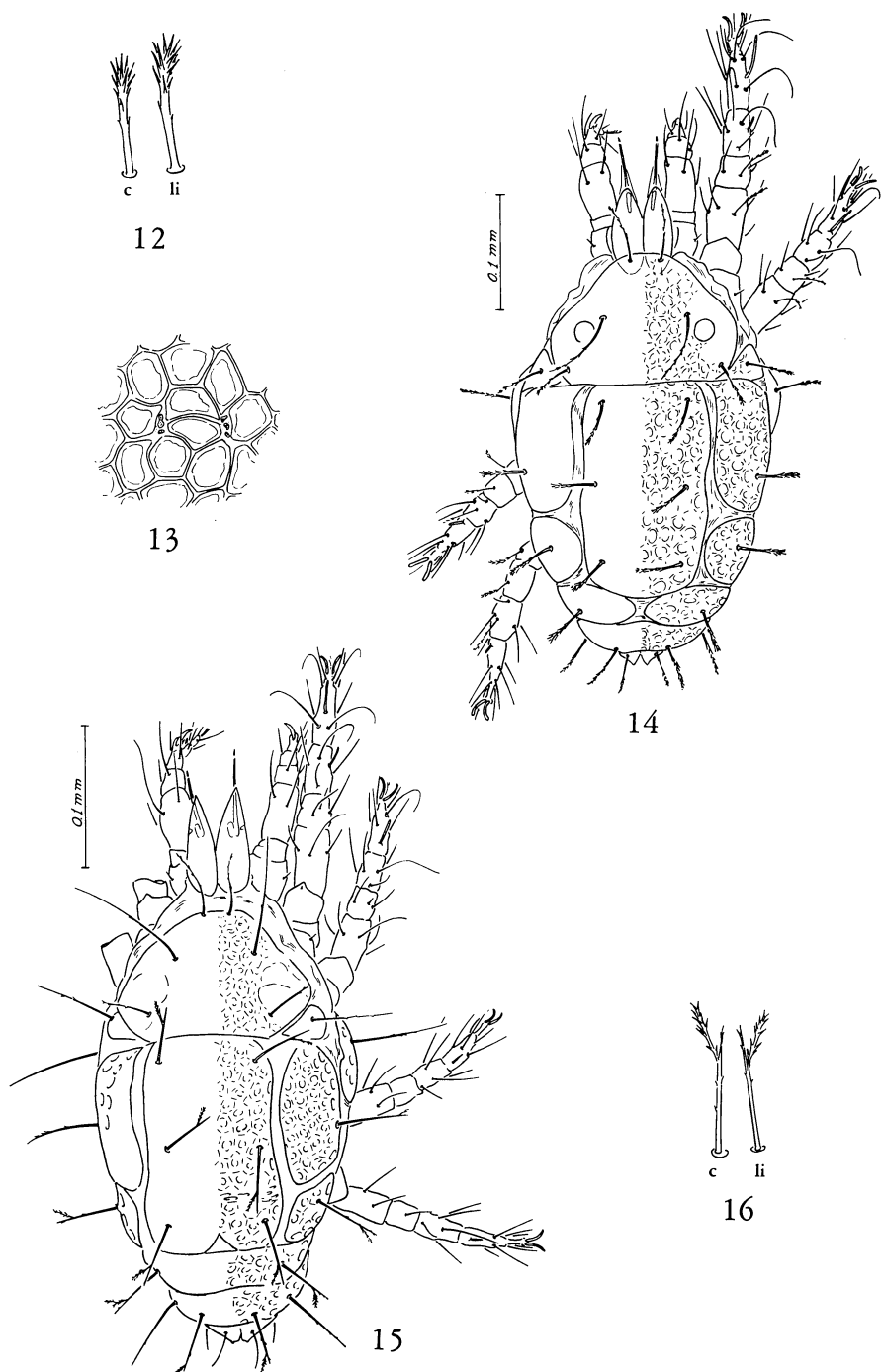


Plate 3. 12-14, *Stigmaeus sphagneti*: 12, setae *c* and *li*; 13, ornamentation in center of propodosomal plate showing paired apodemal markings, reticulum and outlines of dimples; 14, female. 15-16, *Stigmaeus sectisetus*: 15, female; 16, setae *c* and *li*.

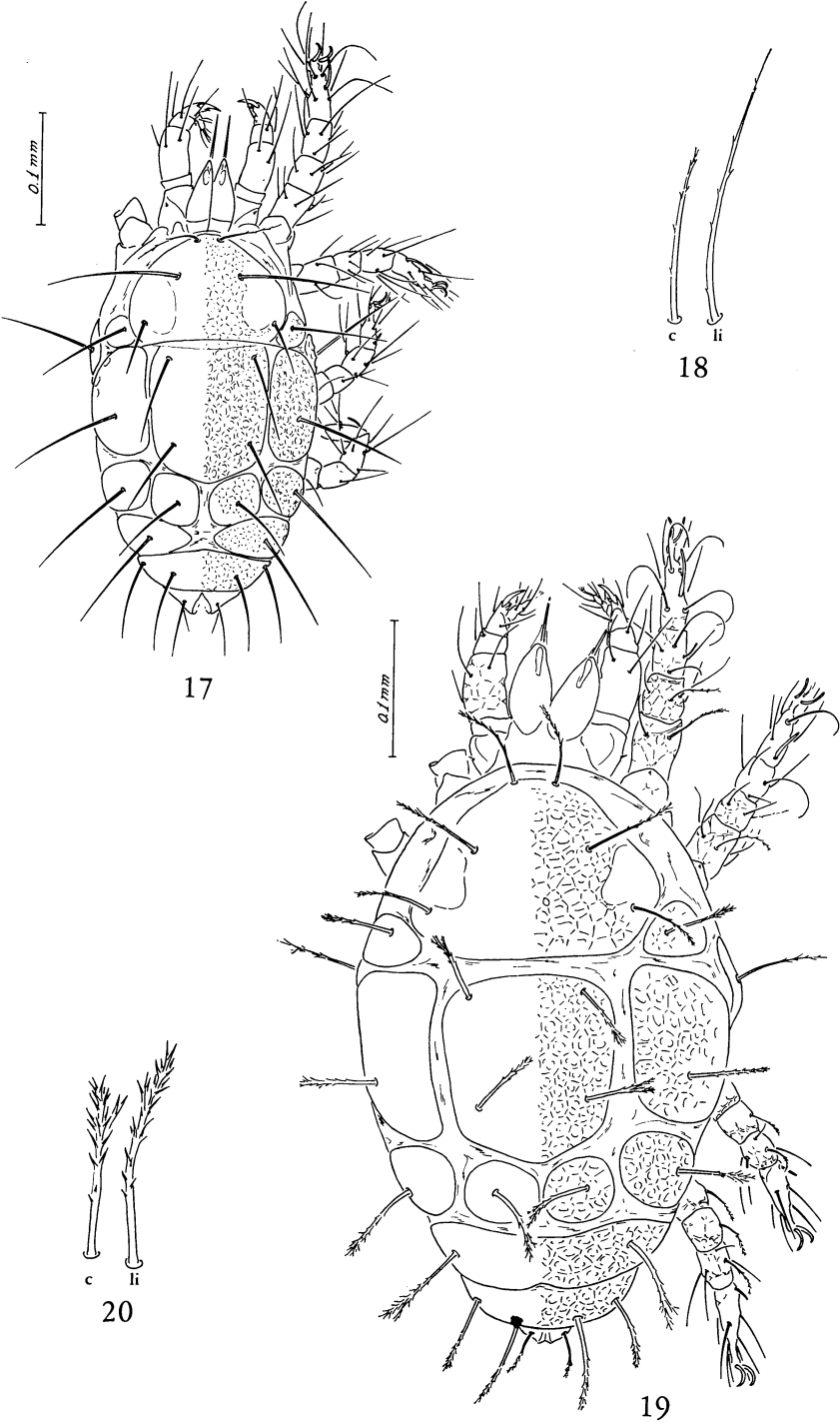


Plate 4. 17-18, *Stigmaeus pricei*: 17, female; 18, setae *c* and *li*. 19-20, *Stigmaeus mimus*: 19, female; 20, setae *c* and *li*.

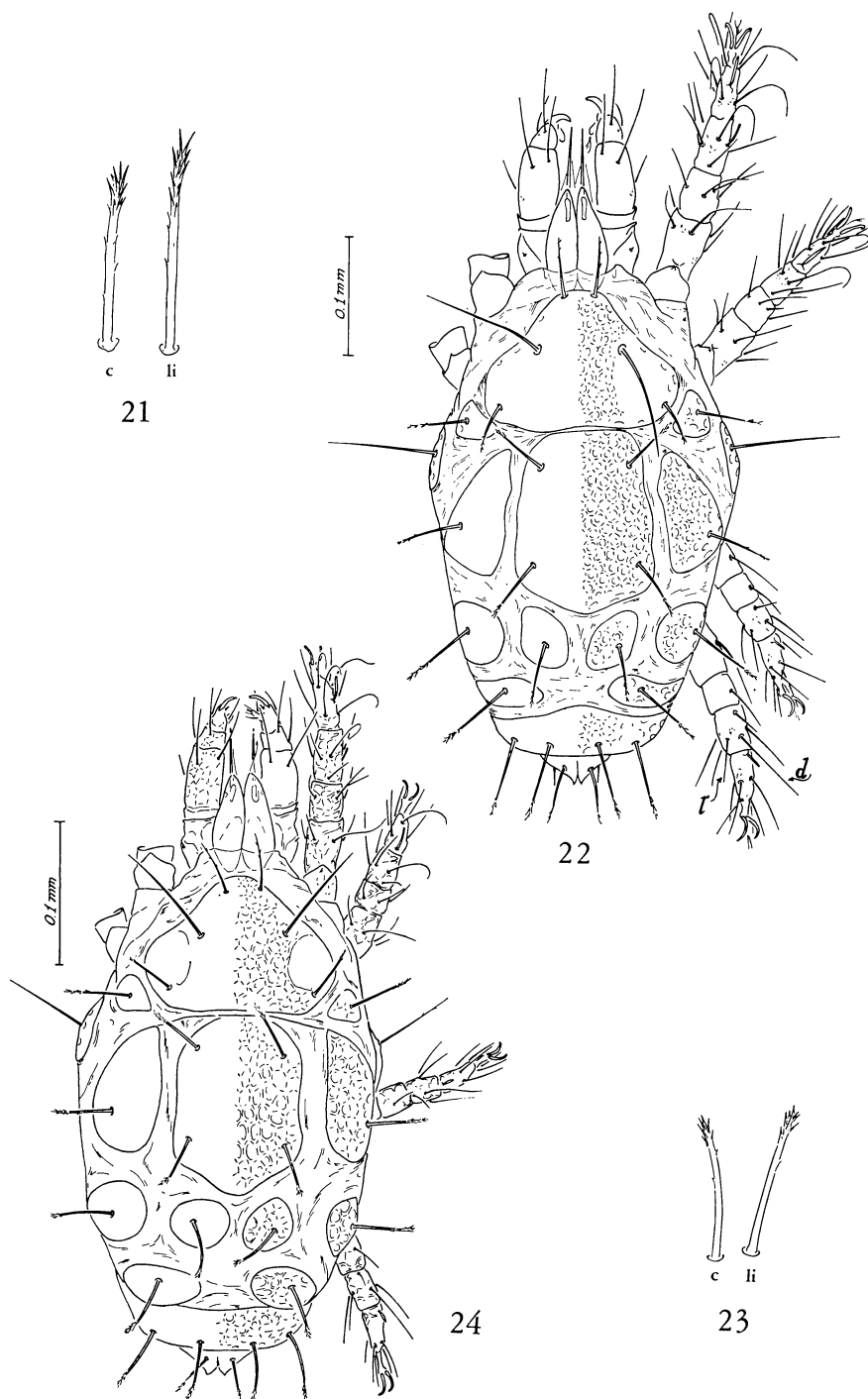


Plate 5. 21-22, *Stigmaeus antrodes*: 21, setae *c* and *li*; 22, female. 23-24, *Stigmaeus echinopus*: 23, setae *c* and *li*; 24, female.

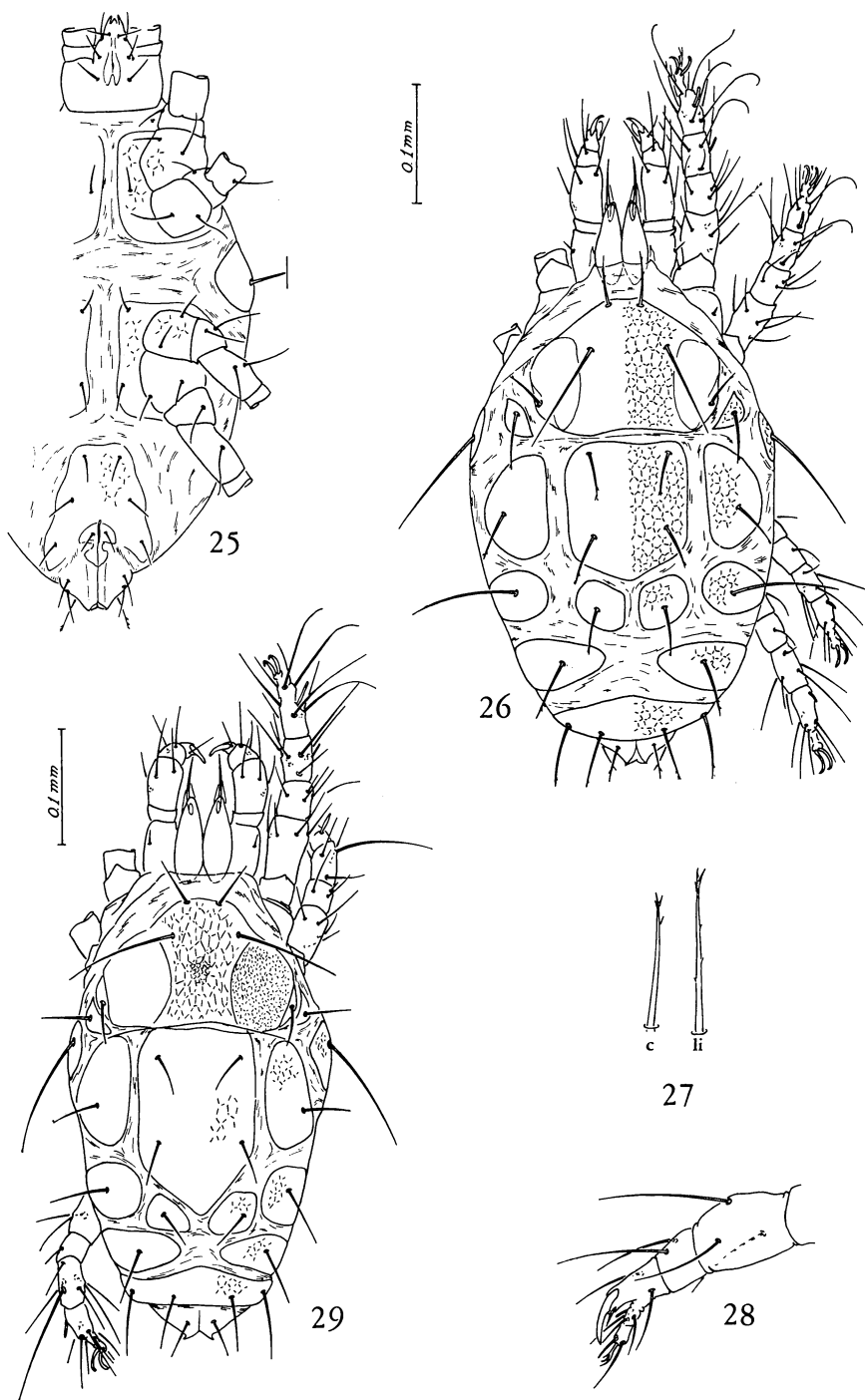


Plate 6. 25-28, *Stigmaeus glabrisetus*: 25, venter of female; 26, dorsum of female; 27, setae *c* and *li*; 28, palpus. 29, *Stigmaeus microtuberculatus*, female.

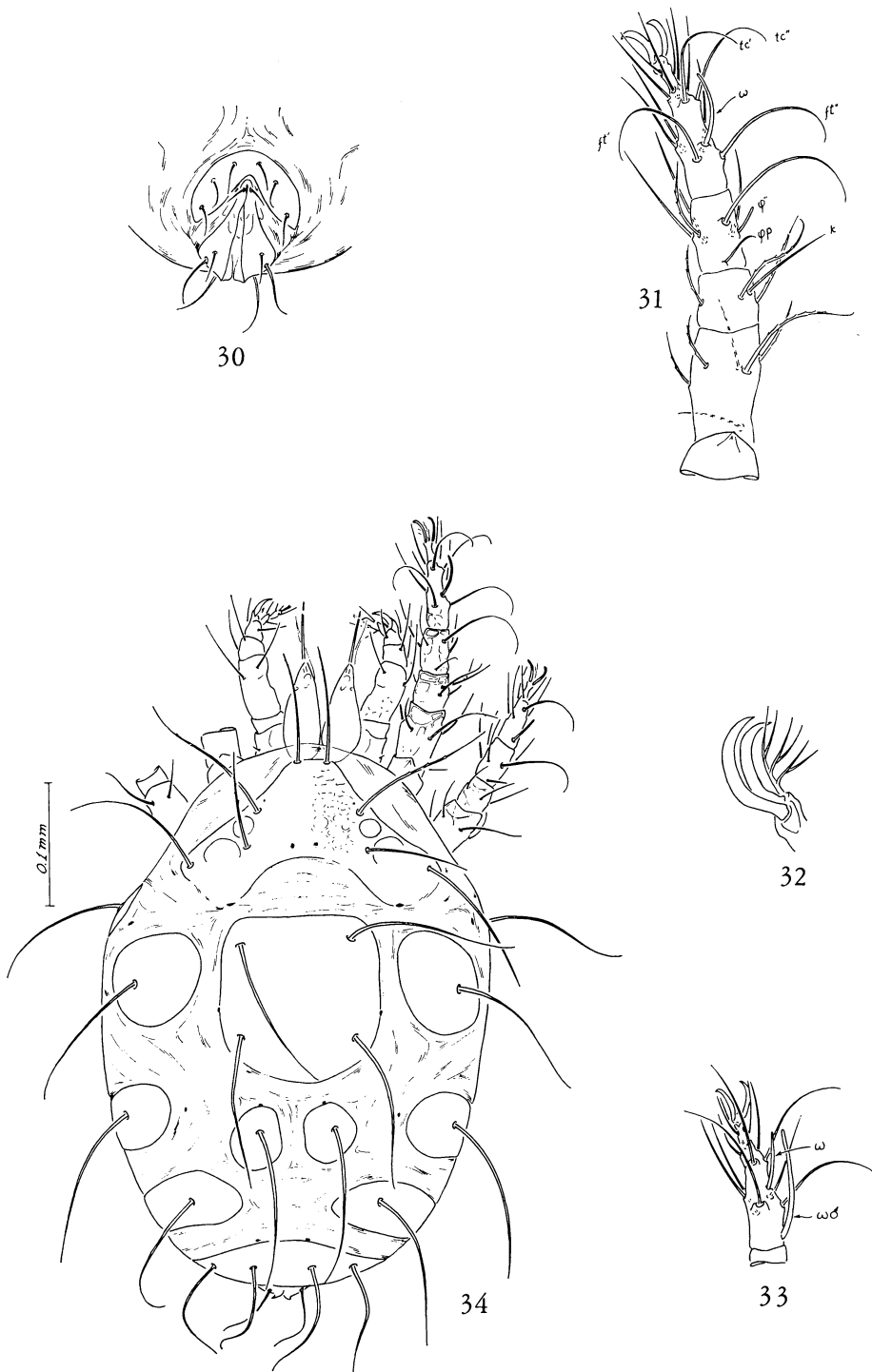


Plate 7. 30–34, *Stigmaeus crobylus*: 30, ventral opisthosoma of female; 31, dorsal aspect of right leg I; 32, empodium; 33, tarsus I of male; 34, female.

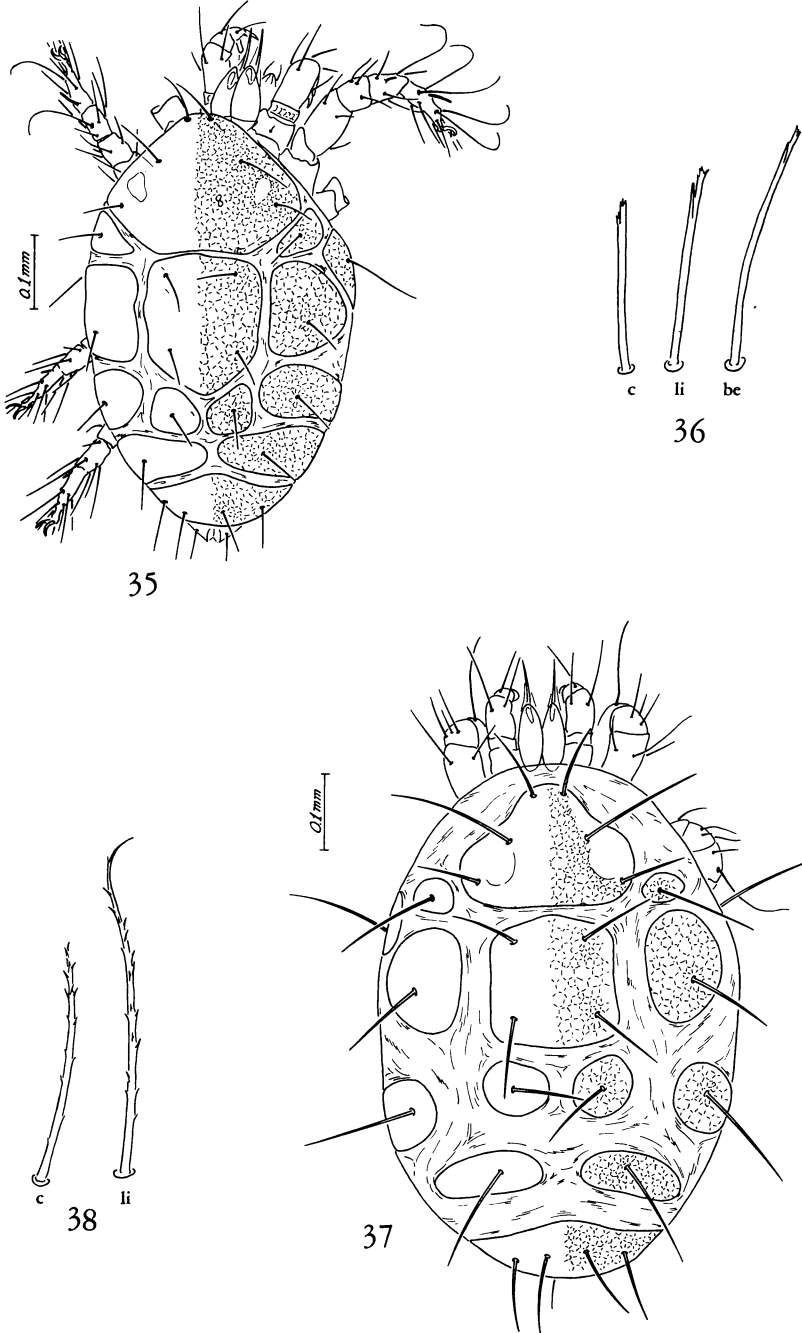


Plate 8. 35-36, *Stigmaeus obtectus*: 35, female; 36, setae *c*, *li*, and *be*. 37-38, *Stigmaeus parmatum*: 37, female; 38, setae *c* and *li*.

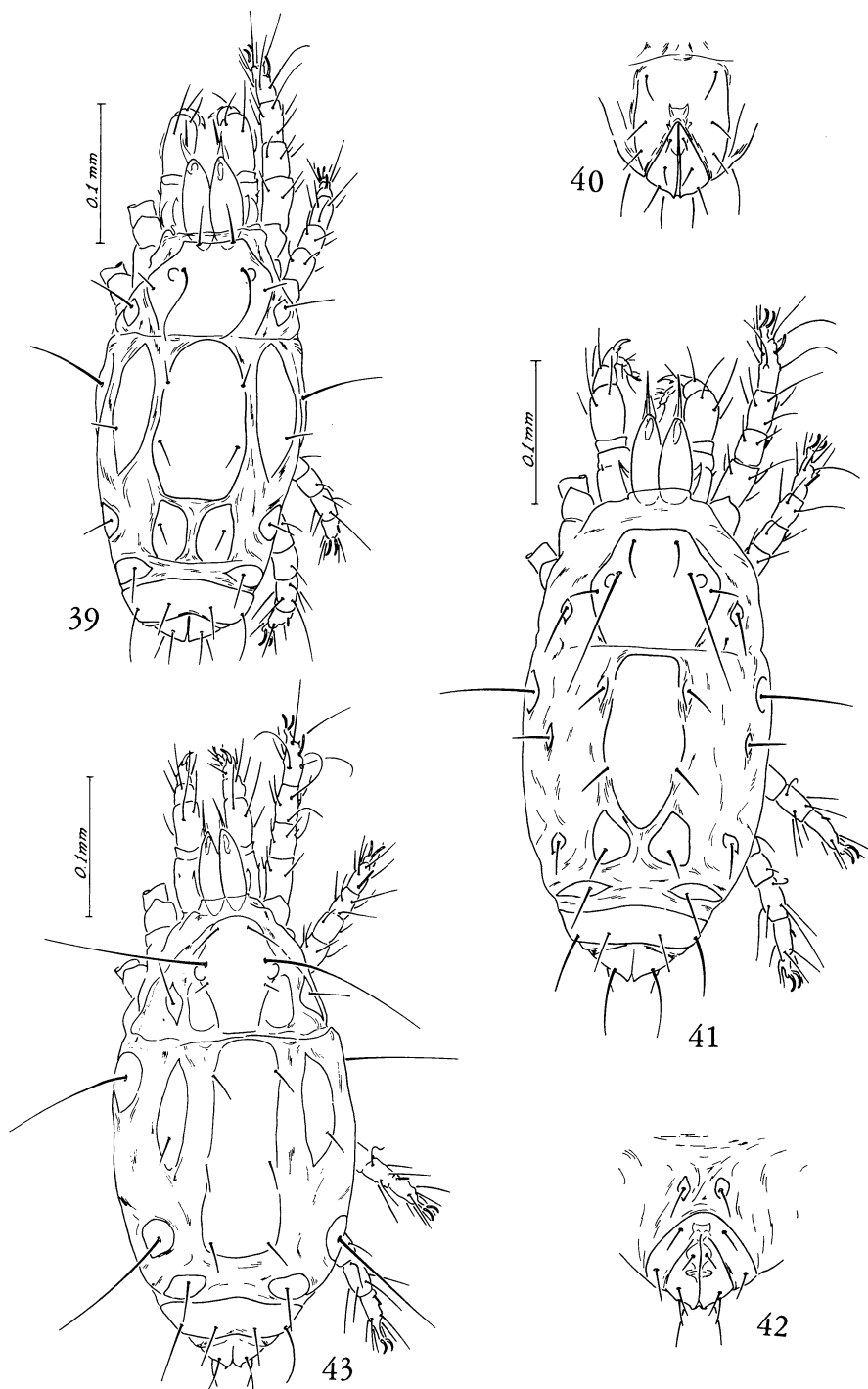


Plate 9. 39-40, *Stigmaeus callunae*: 39, female; 40, ventral opisthosoma of female. 41, *Stigmaeus fusus*, female. 42-43, *Stigmaeus eutrichus*: 42, ventral opisthosoma of female; 43, female.

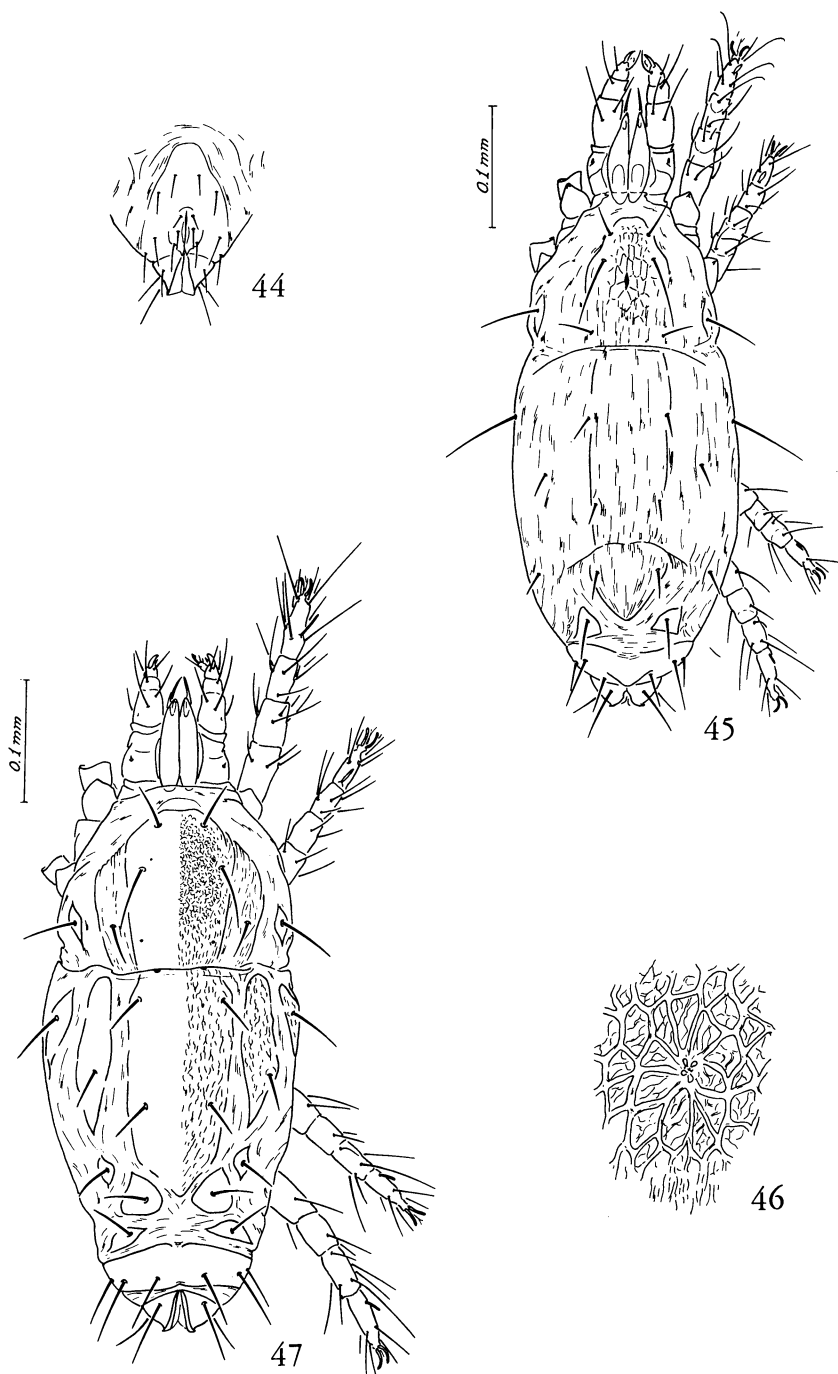


Plate 10. 44-45, *Stigmaeus luteus*: 44, genital region, female; 45, female. 46-47, *Stigmaeus lucaris*: 46, pattern of reticulation in middle of propodosomal plate; 47, female.

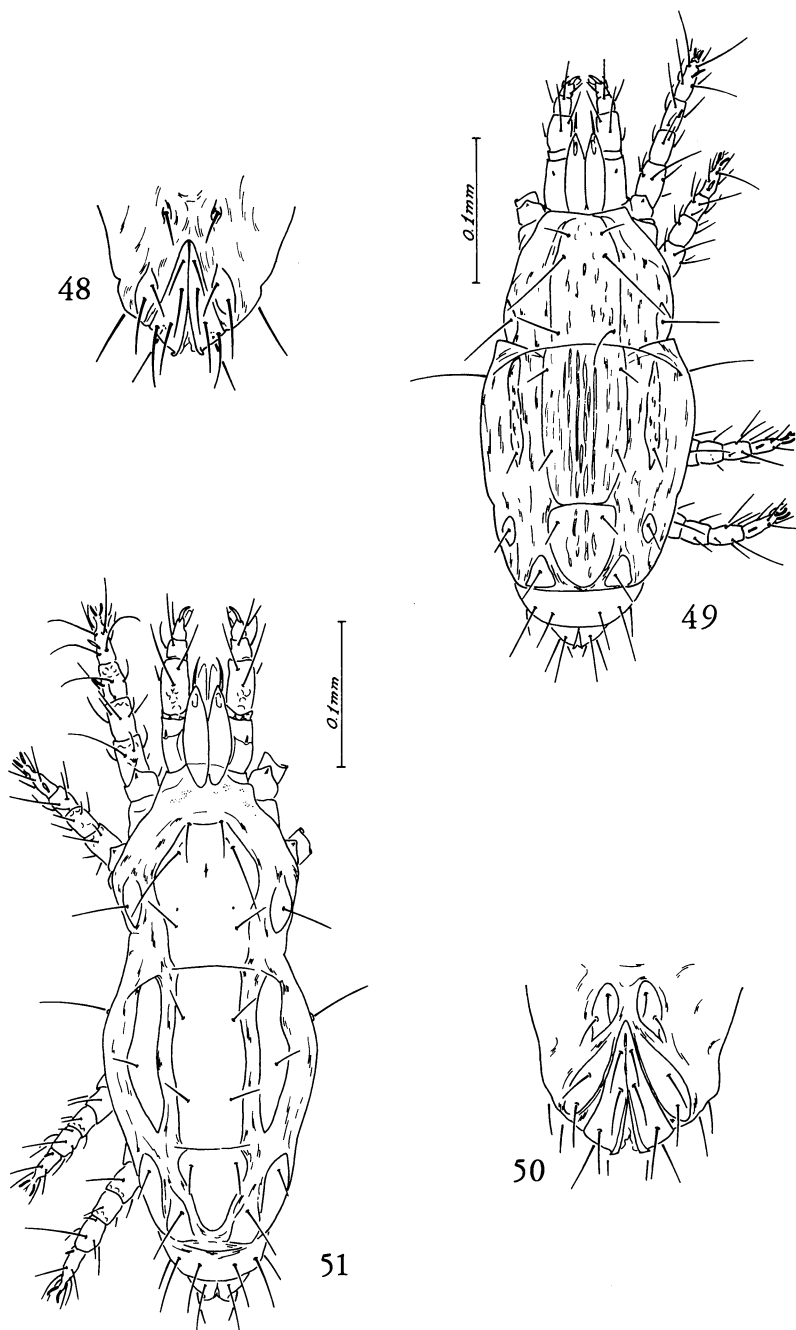


Plate 11. 48, *Stigmaeus lucaris*, venter of opisthosoma, female. 49, *Stigmaeus constrictus*, female. 50, *Stigmaeus purpurascens*, venter of opisthosoma, female. 51, *Stigmaeus gracilimus*, female.

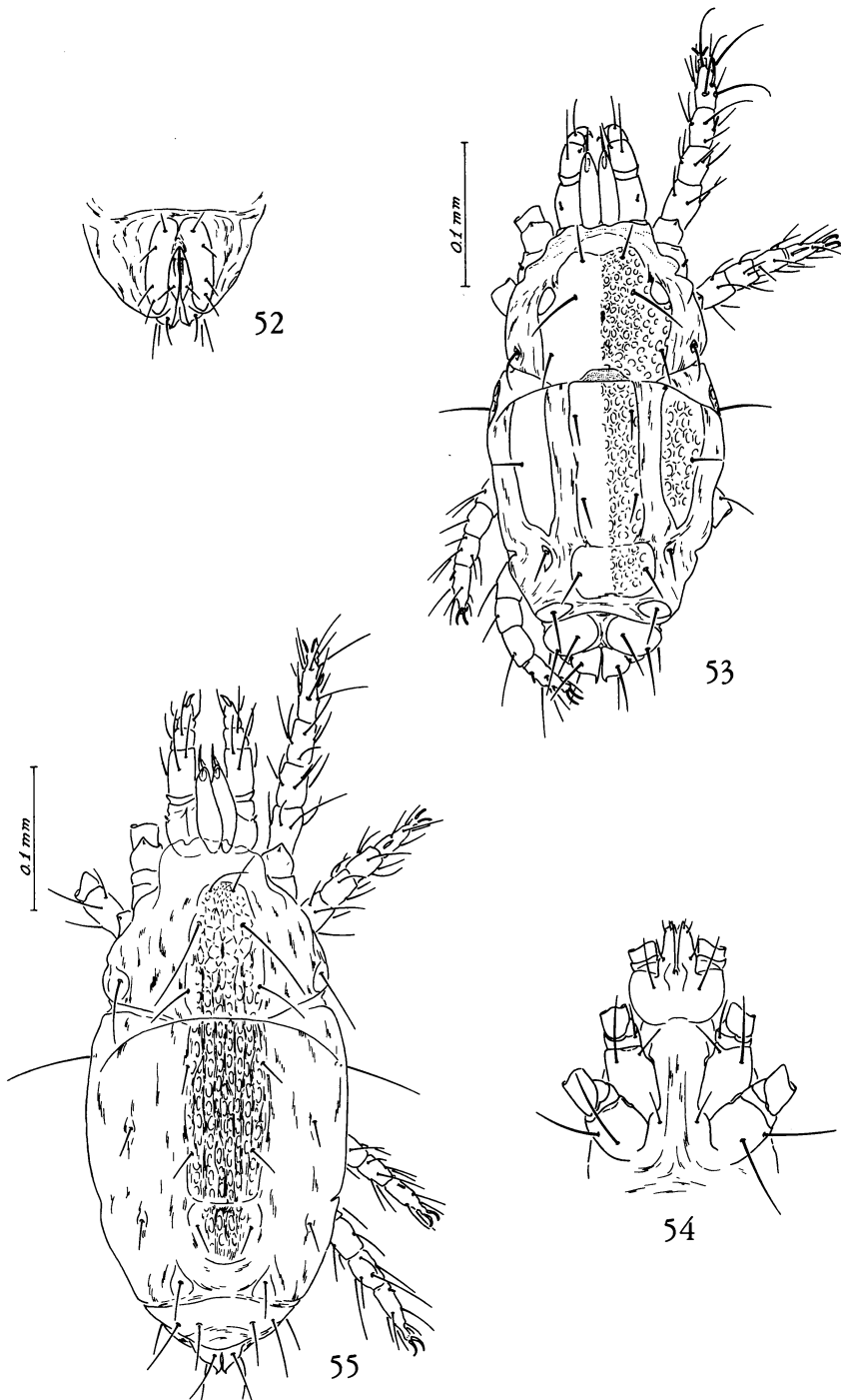


Plate 12. 52-53, *Stigmaeus raneyi*: 52, anogenital region of female; 53, female. 54, *Stigmaeus luteus*, ventral aspect of propodosoma and gnathosoma. 55, *Stigmaeus uncus*, female.

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LITERATURE CITED

BANKS, NATHAN

1900. The red spiders of the United States (*Tetranychus* and *Stigmaeus*). U. S. Dept. Agric. Div. Ent. Tech. Ser. 8:65-77.

BERLESE, ANTONIO

- 1882-93. Acari, Myriopoda et Scorpiones hucusque in Italia Reperta. Ordo Prostigmata (Trombidiidae). Patavii, Portici.
1910. Acari nuovi. Manipulus V. Redia 6:199-214.

CANESTRINI, G.

1889. Prospetto dell'Acarofauna Italiana. Famiglia dei Tetranychini. Atti d. reale Ist. Ven. d. Sci., Lettre ed Arti (Ser. 6), 7:491-537.

CANESTRINI, G., and F. FANZAGO

1876. Nuovi Acari Italiani. Atti d. Soc. Veneto-Trentina di Sci. Nat. 5:139.

EVANS, G. OWEN

1954. Some new and rare species of Acarina. Proc. Zool. Soc. London, 123:793-811.

EWING, H. E.

1911. New predaceous and parasitic Acarina. Psyche, 18:37-43.

GRANDJEAN, FRANÇOIS

1944. Observations sur les acariens de la famille des Stigmatidae. Arch. Sci. phys. et nat. 26:103-131.

HALBERT, J. N.

1920. The Acarina of the seashore. Proc. Royal Irish Acad., Sec. B, 35:106-152.
1923. Notes on acari, with descriptions of new species. Jour. Linn. Soc. Zool. London, 35:363-92.

HIRST, STANLEY

1926. Report on the acari found on or associated with sandflies in India. Indian Jour. Med. Res. 13:1023-6.

HULL, J. E.

1918. Terrestrial acari of the Tyne Province. Trans. Nat. Hist. Soc. Northumberland, Durham, and Newcastle-upon-Tyne 5(n. ser.):13-88.

KOCH, C. L.

- 1835-44. Deutschlands Crustaceen, Myriapoden und Arachniden. Heft. 1-40. Regensburg.
1842. Uebersicht des Arachnidensystems. III. Heft, III. Abt. Nürnberg.

LEONARDI, G.

1899. Prima lista di Acari raccolti a Portici. Ann. d. R. Scuola Super. d. Portici, 1(II):10.

MITRA, R. D., and S. D. MITRA

1953. A new species of *Raphignathus* associated with *Phlebotomus* in India. Zeitschr. f. Parasitenk, 15:429-32.

MOLA, PASQUALE

1907. Nuovi acari parassiti. Zoologischer Anz. 32:41-4.

OUDEMANS, A. C.

1923. Acarologischen Aanteekeningen LXXI. Ent. Ber. Nederland. Ent. Ver. 6:138-55.
1927. Acarologischen Aanteekeningen LXXXVIII. Ent. Ber. Nederland. Ent. Ver. 7:260.

PRITCHARD, A. E., and E. W. BAKER

1958. The false spider mites. Univ. Calif. Publ. Ent. 14:175-274.

SAYED, M. T.

1938. Sur une nouvelle sous-famille et deux nouveaux genres de Tetranyques (Acariens). Bull. Mus. Hist. Nat. Paris (Sér. 2), 10:601-610.

SUMMERS, F. M., and D. W. PRICE

1961. New and redescribed species of *Ledermuelleria* from North America. Hilgardia 31:369-82.

WILLMANN, CARL

1953. Neue Milben aus den östlichen Alpen. Sitzungsber. de. Österr. Akad. Wiss., Math.-naturw. Kl., Abt. I, 162:449-519.

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