

REVISION OF STIGMAEIDAE (ACARI : PROSTIGMATA)
IN THE BERLESE COLLECTION.

BY

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SUMMARY.

The following species were studied and, if necessary, re-described; new synonymies are given in parentheses. *Stigmaeus rhodomelas*, *S. fissuricola*, *S. longilipis* (*S. eutrichus*), *S. elongatus* (*S. luteus*), *S. hericius* (*S. crobylus*), *S. siculus* (*S. antrodes*); *Eustigmaeus kermesinus*, *E. etruscus*, *E. ottavii*, *E. rhodomela*, *E. clavatus*, *E. anauniensis* (*E. pectinata*), *E. segnis*, *E. microsegnis*; *Cheylostigmaeus scutatus* *Storchia robustus* (*Apostigmaeus navicella*); *Barbutia anguineus*; *Mediolata longirostris*, *M. pini*; *Zetzellia crassirostris*. The genus *Ledermuelleria* is made a synonym of *Eustigmaeus*, and *Apostigmaeus* is made a synonym of *Storchia*.

INTRODUCTION.

Many of the Stigmaeidae described or noted by BERLESE are not familiar to contemporary acarologists and this has resulted in a certain amount of uncertainty concerning the status of such species and the validity and characteristic features of certain genera (GONZALEZ, 1965; SUMMERS, 1966; WOOD, 1967). In March 1971, I was able to spend two weeks at the Istituto Sperimentale per la Zoologia Agraria (ex Stazione de Entomologia Agraria) in Florence (Italy) studying specimens of Stigmaeidae in the Berlese collection. It was not possible to examine all the available slides of Stigmaeidae, but representatives of each species, including type specimens wherever possible, were examined and if necessary remounted. I believe I was able to study all the specimens of nomenclatural significance with the exception of *Macrostigmaeus serpentinus* Berlese and *Raphignathus curtipilis* Berlese which could not be found in the collection. Among the specimens I examined were some that were mis-identified, some that were un-described and some that had been "named" by BERLESE but neither the name nor a description had been published. A Summary of my notes on these specimens has been sent to Dr. PEGAZZANO at the Istituto Sperimentale per la Zoologia Agraria.

Nomenclature follows the system previously adopted by the author (e.g. WOOD, 1967). All measurements are given in microns (μ) and the length of the body is measured from the anterior margin of the propodosomal plate to the tip of the anal covers. Inter-setal distances are indicated as *a-a*, *a-b*, etc. and the relative lengths of setae and inter-setal distances as *a/a-a* etc.

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Genus *Stigmaeus* KOCH, emend. Summers.

Stigmaeus Koch, 1836. Deutschlands Crustaceen, Myriapoden and Arachniden, fasc. 4 (No. 9).

Type species : *Stigmaeus cruentus* Koch, 1836.

Stigmaeus : Summers, 1962. *Hilgardia*, 33 (10) : 495.

The type species, *Stigmaeus cruentus* Koch, is unknown. OUDEMANS (1923 a) made *Stigmaeus crassirostris* Leonardi (1899) a synonym of *S. cruentus*. There are seven specimens of *S. crassirostris* in the Berlese collection but in fact they do not belong to *Stigmaeus*, but to *Zetzellia* (see below). As OUDEMANS made *crassirostris* a synonym of *cruentus* on the basis of little or no evidence it would seem preferable to dispute this synonymy rather than to make drastic nomenclatural changes within currently well-established genera. Thus the procedure adopted by BERLESE (1910 a) and SUMMERS (1962) in basing the genus *Stigmaeus* on *S. rhodomelas* Berlese, while recognising *cruentus* as the nominal type species, will be followed here.

Stigmaeus rhodomelas Berlese.

Stigmaeus rhodomelas Berlese, 1910 a. *Redia*, 6 : 205.

Female (n = 4). Length 415 (360-470).

Dorsum : BERLESE'S (1910 a) illustration (plate 18, fig. 24) gives an accurate representation of the shape and placement of dorsal plates and setae with the following exceptions : setae *a* are located on individual platelets adjacent to the median hysterosomal plate (Berlese's illustration shows only a faint suture separating these platelets from the median plate) and the 3 pairs of suranal setae are located on a single plate, not on individual platelets. The plates are moderately sclerotised without any obvious dimpling ; in two of the specimens examined (77/43 and 204/49) the plates are ornamented with a fine reticular network which is not apparent in the other specimens. Berlese's illustration shows smooth finely punctuate plates with no reticulation, but as the appearance of surface ornamentation depends partly on the preparation and treatment of the specimens and partly on the type of illumination used for examination, such discrepancies are only to be expected. Plates separated by smooth striae, area posterior to chelicerae microtuberculate. Setae simple, short, of relatively uniform length : *ae*, *lr*, *b* 19-21 ; *ce*, *de*, *a*, *c*, *li*, *e* 22-24 ; *be* 28 ; *he*, *le* 33.

Venter : Not illustrated or described by Berlese. Maxillicoxae apparently smooth : setae *n* 32, *m* 24 ; *n-n* < *m-m*. Anterior intercoxal plates narrow, faintly reticulated bearing setae 1a (24) ; associated coxal setae 1b (24), 1c (37), 2b (47), 2c (41). Posterior intercoxal plates narrow, faintly reticulated, bearing subequal setae 3a and 4a (27). Four pairs of paragenital setae, platelets poorly-defined : *pg*₁ and *pg*₂ subequal (17) located on single pair of platelets, well separated from *pg*₃ and *pg*₄ (24) also on single pair of platelets (Fig. 1). Five pairs of setae on ano-genital covers : *g*₁, *g*₂ and *g*₄ subequal (26), *g*₃ (24), *g*₅ (28) ; *g*₄ and *g*₅ slightly thickened. All ventral striae smooth.

Appendages : Numbers of setae (special sensillae in parentheses) on leg podomeres as follows : tarsi 14 (ω) — 10 (ω) — 8 (ω) — 8 (ω) ; tibia 7 (φφφ) — 6 (φφ) — 6 (φφ) — 6 (φφ) ; genua 5 (*k*) — 3 — 2 — 2 ; femora 4 — 4 — 3 — 2 ; trochantera 1 — 1 — 2 — 1 ; coxae 2 — 2 — 2 — 2.

Solenidion ω I reaches as far as base of setae tc ; length ω I = ω II $>$ ω III and ω IV; k I short, $1/4$ to $1/5$ as long as associated dorsal seta; dorsal seta d on tibia IV slightly more than twice as long (75) as lateral seta l and extending to slightly beyond base of claws. Claws with typical empodium; empodium with capitate raylets. Numbers of setae from palp-femur to palp-tarsus 3 — 1 — 4 — 7; terminal sensillum on palp-tarsus trifid with distinct stem; accessory seta on palp-tibia slender, acicular.

DISTINGUISHING FEATURES.

It most closely resembles *S. lucaris* Summers (1962) from North America and *S. brevisetis* Wood (1967) from New Zealand. It can be distinguished from *S. brevisetis* by the presence of 3 pairs of suranal setae (lr present), from *S. lucaris* by the presence of setae a on individual platelets and from both species by the presence of eyes.

SPECIMENS EXAMINED.

Berlese collection slide numbers given in parentheses. 1 ♀, Palermo (Sicily), Italy, moss — cotype (77/43); 1 ♀, Palermo, moss (77/45); 1 ♀, Boboli Gardens, Firenze, Italy, (77/50); 1 ♀, Firenze (204/49).

Stigmaeus fissuricola Halbert.

Stigmaeus rhodomelas var. *fissuricola* Halbert, 1920. *Proc. roy. Ir. Acad.* 35 : 143.

Stigmaeus fissuricola, Oudemans (1923 a). *Ent. Ber. Amst.*, 6 (129) : 142.

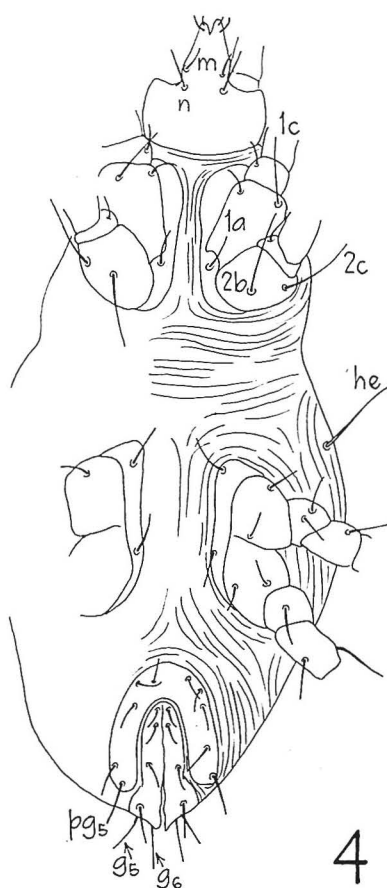
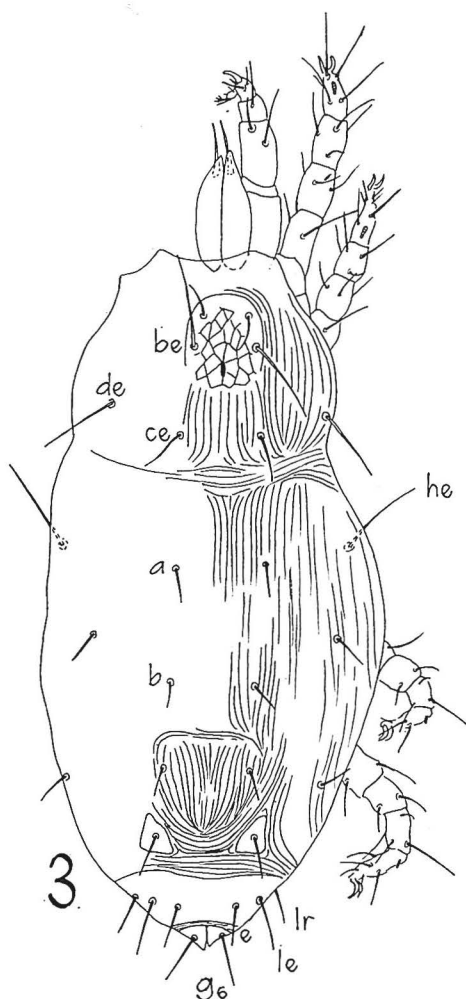
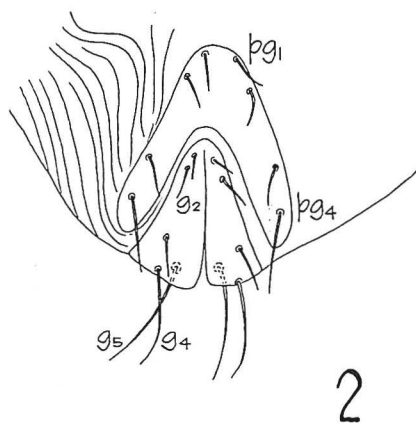
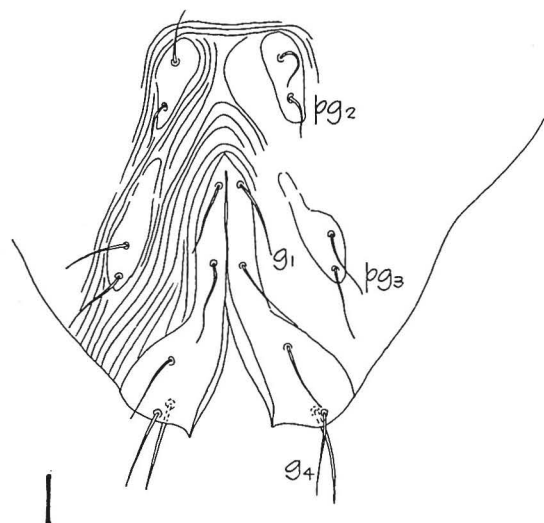
HALBERT'S (1920) original description of specimens from Ireland is inadequate in some respects and in an earlier paper (WOOD, 1967) I had commented on the fact that there were only minor differences between *S. ruficola* Wood from New Zealand and the apparent features of *S. fissuricola*. As both species are inhabitants of fissures in rocks in the intertidal zone there was some likelihood of the species being con-specific. Examination of specimens of *S. fissuricola* in the Berlese collection confirmed that the two species were distinct and thus *S. fissuricola* is more fully described below.

FEMALE ($n = 2$). Length 370-380.

Dorsum : The shape and arrangement of dorsal plates and placement and relative lengths of setae is as illustrated (plate 23, fig. 27 a) by HALBERT (1920). Further details are : plates faintly punctuate, median propodosomal plate faintly reticulate; all setae except be and he faintly pilose; integument between plates ornamented with smooth, widely separated striae interrupted posterior to chelicerae by a microtuberculate area.

Venter : Maxillicoxae smooth; setae n (23) shorter than m (36); $n-n = m-m$. Intercoxal plates smooth, anterior pair narrowly separated anteriorly; intercoxal setae of relatively uniform length (18-25) except rc (34) and $2b$ (36). Four pairs of paragenital setae located on single, smooth, crescentic plate (Fig. 2) : pg_1 , pg_2 and pg_3 subequal (13), pg_4 (26); pg_2 and pg_3 widely separated. Five pairs of setae on anogenital covers : g_1 (8), g_2 (10), g_3 (13), g_4 (40), g_5 (50); g_1 and g_2 close together, g_2 and g_3 widely separated.

Appendages : Numbers of setae and special sensillae on leg podomeres differs from *S. rhodomelas* as follows : genua 6 (k) — 5 (k) — 0 — 0; femora 6 — 4 — 3 — 2; ω I reaches as far as base of setae tc ; k I and k II $1/3$ to $1/4$ as long as respective associated dorsal setae; dorsal seta d on tibia IV nearly 4 times as long as lateral seta l . Empodium with capitate raylets. Numbers



50 μ 1, 2
100 μ 3, 4

FIGS. 1-4 : *Stigmaeus rhodomelas* : Fig. 1 — ♀, opisthosoma ventral. *Stigmaeus fissuricola* : Fig. 2 — ♀, opisthosoma ventral. *Stigmaeus elongatus* : Fig. 3 — ♀, dorsal. Fig. 4 — ♀, ventral.

of setae from palp-femur to palp-tarsus 3 — 2 — 4 — 7 ; terminal trifold sensillum on palp-tarsus stalked ; seta at base of palp-tarsus slender, acicular, not thickened and thorn-like as illustrated (plate 23, fig. 27 c) by HALBERT (1920) ; accessory seta on palp-tibia slender, acicular.

DISTINGUISHING FEATURES.

It closely resembles *S. rupicola* and the two species are identical in their dorsal features. The only differences are in leg chaetotaxy (*S. rupicola* has a single seta on genua III and genua IV) and in certain ventral setae. *S. rupicola* has flagelliform (85) coxal setae *1b* and *2b* which are longer than all dorsal setae except *he*, whereas in *S. fissuricola* none of the coxal setae are flagelliform although *1c* and *2b* are longer (34-36) than the other coxal setae but are shorter than setae *he*, *be*, *e*, *le* and *li* on the dorsum.

SPECIMENS EXAMINED.

1 ♀, Dublin, Ireland — cotype (204/46) ; 1 ♀, Malahide, Ireland (186/2). Specimens collected and donated by J. N. HALBERT.

Stigmaeus longipilis (G. Canestrini).

Stigmaeodes elongatus var. *longipilis* G. Canestrini, 1889. *Atti Ist. veneto Sci.* 7 (6) : 449.

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

Storchia longipilis, Oudemans (1923 b). *Ent. Ber., Amst.*, 6 (130) : 150.

Stigmaeus longipilis, Oudemans (1927). *Ent. Ber., Amst.*, 7 (158) : 263.

Stigmaeus eutrichus Berlese, 1910 a. *Redia* 6 : 206. SYNONYM NOV.

CANESTRINI'S (1889) illustration of *Stigmaeodes elongatus* var. *longipilis* shows a species with the general features of *Stigmaeus eutrichus* including the very characteristic, unusually long dorsal setae *be*, *he* and *lm*. The species hitherto known as *S. eutrichus* is one of the more abundant and widely-distributed species of *Stigmaeus* in western Europe and it is most unlikely that there is another species with the same characteristic distribution and relative lengths of dorsal setae. There are no types or named specimens of *Stigmaeodes elongatus* var. *longipilis* in the Berlese collection nor could types of *Stigmaeus eutrichus* be located, but examination of a wide range of European species of *Stigmaeus* has lead me to propose the above synonymy, which had previously been suggested as a possibility by SUMMERS (1962). This species has been re-described under the name of *Stigmaeus eutrichus* by SUMMERS (1962).

SPECIMENS EXAMINED.

1 ♀, Mugello, Italy (78/7) ; 1 ♀, Firenze, Italy (91/5) ; 1 ♀ Padova, Italy (48/35) ; 1 ♀, Vallombrosa (43/38) ; 1 ♀ (80/28). All specimens are labelled *Stigmaeus eutrichus*, except 80/28 which is labelled *Stigmaeus elongatus*.

Stigmaeus elongatus Berlese.

Stigmaeus elongatus Berlese, 1886. *Acari, Myriapoda et Scorpiones hucusque in Italia Reperta* 30 (7).

Stigmaeodes elongatus, G. Canestrini (1889). *Atti. Ist. veneto Sci.*, 7 (6) : 448.

Stigmaeus luteus Summers, 1962. *Hilgardia.*, 33 (10) : 516. SYNONYM NOV.

Types of this species could not be located in the Berlese collection. However, BERLESE's (1886) illustration of *S. elongatus* illustrates some salient features which are shown by specimens in the collection labelled *S. elongatus*: namely, lack of obvious dorsal plates, dorsal setae *be*, *de* and *he* longer than other dorsal setae and coxal setae *rc*, *zc* and *zb* longer than other central setae. These specimens are therefore taken to be representatives of *S. elongatus*.

It is also obvious that these specimens are con-specific with *Stigmaeus luteus* Summers (1962) as will be apparent by a comparison of my illustrations (Figs. 3 and 4) with the description and illustrations (Figs. 44, 45 and 54) given by SUMMERS (1962). Here it is only necessary to summarise the significant features of the species and to add minor details to Summers' (1962) description.

FEMALE.

Dorsum: Dorsal plates absent except for characteristically reticulated propodosomal plate bearing setae *ea* and *be* only, small paired intercalary plates and single suranal plate bearing 3 pairs of setae. Setae *c* located on raised triangular area of characteristically striated cuticle on which the anterior extremities of the longitudinal striae do not join with the transverse striae running along the anterior margin of the raised area.

Venter: Maxillicoxae smooth; setae *n* > *m*. Setae *ra* located on narrow intercoxal plates in area provided by excavation of mesal ends of coxae I; setae *3a* and *4a* on narrow intercoxal plate. Coxal setae *rc*, *zb* and *zc* distinctly longer than intercoxal and other coxal setae. Paragenital plate entire, U-shaped bearing 5 pairs of setae (SUMMERS, 1962 noted 4 or 5 pairs); *pg*₁, *pg*₂ and *pg*₃ subequal, close together, distinctly shorter than *pg*₄ which is shorter than *pg*₅. Anogenital opening contiguous but covers partly separated; anal region has *g*₁ and *g*₂ subequal, close together, separated from and slightly shorter than *g*₃; genital region has 3 pairs of setae, relative lengths *g*₆ > *g*₅ > *g*₄. All ventral striae smooth.

Appendages: SUMMERS (1962) gives details of leg chaetotaxy except tarsi which are as given in this paper for *S. rhodomelas*. Numbers of setae on palps as given for *S. rhodomelas*, terminal trifold sensillum distinctly stalked (see also Fig. 4, BERLESE, 1886); accessory seta slender, acicular.

SPECIMENS EXAMINED.

3 ♀♀, fioruma Stalle, Firenze, Italy (195/35, 195/36, 195/37); 1 ♀, Firenze (80/27) — labelled as *S. eutrichus*.

Stigmaeus hericius (Berlese), COMB. NOV.

Raphignathus hericius Berlese, 1910 b. *Redia*, 6: 347.

Stigmaeus crobylus Summers, 1962. *Hilgardia*, 33 (10): 509 SYNONYM NOV.

There is no need to add to SUMMERS' (1962) description of *S. crobylus*. The specimens I examined in the Berlese collection agree in detail with the distinguishing features and measurement data ascribed to *crobylus* by SUMMERS (1962).

SPECIMENS EXAMINED.

1 ♀, Duke City, Florida, U.S.A. (108/12 — type, difficult to observe details of this specimen).
2 ♀♀, humus, Columbia, U.S.A. (184/8, 184/9).

Stigmaeus sculus (Berlese).

Caligonus sculus Berlese, 1883. *Bull. Soc. ent. Ital.*, 15 : 214.

Raphignathus sculus, Berlese (1885). Acari, Myriapoda et Scorpiones hucusque in Italia Reperta, 22 (3).

Stigmaeus sculus, G. Canestrini (1889). *Atti Ist. veneto Sci.*, 7 (6) : 450. (Not) *Acarus rubens* Schrank, 1781. Enumerato Insectorum Austriae Indigenorum. (See Oudemans, 1923 b. *Ent. Ber. Amst.*, 6 (130) : 153).

Stigmaeus antrodes Berlese (1910 a). *Redia*, 6 : 206. SYNONYM NOV.

Although OUDEMANS (1923 b) synonymised this species with *Acarus rubens* Schrank and made it the type species of a new genus *Podaia*, it seems advisable to dispute this synonymy on the grounds that it was done on the basis of very little evidence. For example, at the time OUDEMANS (1923 b) also made *Raphignathus anauniensis* G. Canestrini, a species quite different to *S. sculus*, a synonym of *Acarus rubens*.

Types of *S. sculus* could not be located but there are several named specimens in the Berlese collection. These specimens are conspecific with types and named specimens of *Stigmaeus antrodes* Berlese (1910 a). This proposed synonymy relies upon the named specimens of *sculus* (collected in Florence) being con-specific with types of *sculus* collected in Sicily.

S. sculus has been re-described by SUMMERS (1961) under the name of *S. antrodes* and there is no need to add to this description here except to indicate that the suranal plate is entire as shown by SUMMERS (1962) and not divided as shown by BERLESE (1910 a) in his description of *S. antrodes*.

SPECIMENS EXAMINED.

4 ♀♀, gardens, Firenze, Italy (217/34, 217/35, 217/36, 217/37). The following specimens are labelled *S. antrodes* : 3 ♀♀, Maestricht (Holland) (83/16 — type, 83/15 — cotype, 83/17).

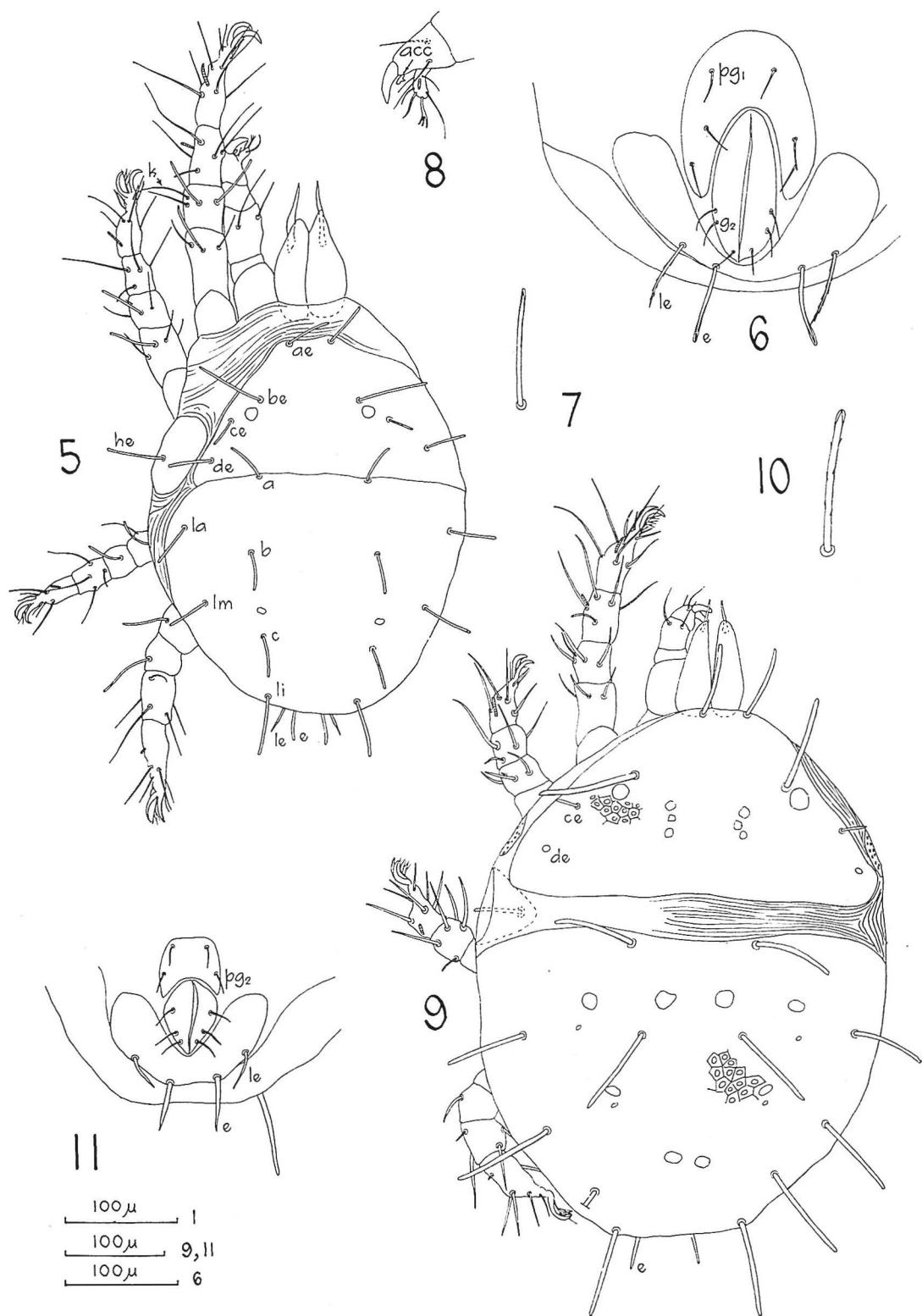
Genus *Eustigmaeus* Berlese.

Stigmaeus subgenus *Eustigmaeus* Berlese, 1910 a. *Redia*, 6 : 206. Type species : *Stigmaeus kermesinus* Koch, 1841.

Eustigmaeus, Oudemans (1923 a). *Ent. Ber. Amst.*, 6 (129) : 143.

Ledermuelleria Oudemans, 1923 b. *Ent. Ber. Amst.*, 6 (130) : 150. SYNONYM NOV.

Stigmaeus kermesinus, the type species of *Eustigmaeus*, was unknown to contemporary acarologists apart from BERLESE's (1887) brief description and illustration. Several species have been assigned to the genus *Eustigmaeus*, but all except *kermesinus* are currently accommodated within the genus *Ledermuelleria* (OUDEMANS, 1923 b). I was able to examine two specimens named *Stigmaeus kermesinus* in the Berlese collection and they are con-generic with species in the genus *Ledermuelleria*. Thus, *Ledermuelleria* becomes a synonymy of *Eustigmaeus* on the assumption that Berlese was familiar with *Stigmaeus kermesinus* Koch and that he correctly identified the specimens (204/50, 70/16) which I examined. This synonym is a little unfortunate as *Ledermuelleria* is one of the more well-known and stable genera in the Stigmaeidae. The



FIGS. 5-11 : *Eustigmaeus kermesinus* : Fig. 5 — ♀, dorsal ; Fig. 6 — ♀, opisthosoma ventral ; Fig. 7 — dorsal seta ; Fig. 8 — palp-tibia and palp-tarsus. *Eustigmaeus etruscus* : Fig. 9 — ♀, dorsal ; Fig. 10 — dorsal seta ; Fig. 11 — ♀, opisthosoma ventral.

name could be preserved by splitting the genus into three genera based on the three recognised "species-groups" (see SUMMERS and PRICE, 1961; CHAUDHRI, 1965; WOOD, 1966) but I feel that this would be a premature and unnecessary step at the present time.

Eustigmaeus kermesinus (Koch).

Stigmaeus kermesinus Koch, 1841. Deutschlands Crustaceen, Myriapoden und Arachniden, 37.
Stigmaeus kermesinus, Berlese (1887). Acari, Myriapoda et Scorpiones hucusque in Italia Reperta, 34 (6).

Stigmaeus (*Eustigmaeus*) *kermesinus*, Berlese (1910 a). Redia, 6 : 207.

Eustigmaeus kermesinus, Oudemans (1923 a). Ent. Berl. Amst., 6 (129) : 144.

FEMALE (n = 2). Length 340-380.

Dorsum : Arrangement of plates and setae typical for genus. BERLESE (1887) showed distinct reticulation on plates but the only evidence of surface ornamentation on specimens I examined was faint dimpling on down-curved margins of suranal plate (Fig. 6) and posterior margin of hysterosomal plate (Fig. 5); surface cuticle finely punctuate. However, it is likely that BERLESE'S (1887) illustration is a reasonably accurate representation of the appearance of freshly prepared specimens as the specimens in the Berlese collection are not in very good condition and it is well-known that details of surface ornamentation are often difficult to detect in old material. Suranal plate not visible from above, hidden below posterior margin of hysterosomal plate. No callosities in humeral region. One pair of anomalous dimples or fossettes between setae *b* and *c*. Dorsal setae rod-like with terminal, hyaline sheath extending beyond tip of setal core (Fig. 7), excepting setae *le* which are acicular and faintly barbed; lengths as follows: *be* 68; *he*, *li* 53; *le* 34; *ce* 28; others 38-44.

Venter : Maxillicoxae faintly reticulated, surface finely punctuate; *n-n* = *m-m*. Intercoxal plates separated in mid-line; faintly reticulate and finely punctuate; setae *4a* present. Paragenital plate crescentic, faintly reticulate and finely punctuate (Fig. 6) bearing 3 pairs of subequal setae (15); *pg*₂ closer to *pg*₃ than to *pg*₁. Anogenital covers with 3 pairs of subequal setae (12).

Appendages : Numbers of setae (special sensillae in parentheses) on leg podomeres as follows: tarsi 14 (ω) — 10 (ω) — 8 (ω) — 8 (ω); tibiae 7 (ϕ , $\phi\phi$) — 6 ($\phi\phi$) — 6 ($\phi\phi$) — 6 ($\phi\phi$); genua 4 (*k*) — 4 (*k*) — 1 — 1; femora 6 — 5 — 3 — 2; trochantera 1 — 1 — 2 — 1; coxae 2 — 2 — 2 — 2. Solenidion ω I reaches to base of setae *tc*; ω I > ω II > ω III > ω IV: *k*I longer than associated dorsal seta, 7-8 times longer than *k*II. Sheathed setae distributed as follows: genu I (2), genua II, III and IV (1), all femora (1). Numbers of setae from palp-femur to palp-tarsus 3 — 1 — 4 — 7; tibial "claw" approximately as long as tarsal "thumb"; accessory seta thickened, distended terminally with marked cleft (Fig. 8); solenidion on palp-tarsus rod-like, terminal trifid sensillum distinctly stalked. Cheliceral bases 95, stylets 57.

DISTINGUISHING FEATURES.

In the following combination of characters, 3 pairs of paragenital setae, presence of ω IV and absence of humeral callosities, this species most closely resembles *E. ovata* (CHAUDHRI, 1965) from which it can be distinguished by the less obvious ornamentation of its dorsal plates, the reduced post-ocular setae *ce*, acicular setae *le* and the long spine *k*I.

SPECIMENS EXAMINED.

2 ♀♀, humus, Maccarese, Roma, Italy (204/50, 70/16).

Eustigmaeus etruscus (Berlese), COMB. NOV.

Raphignathus patrius var. *etruscus* Berlese, 1910 a. *Redia*, 6 : 209.

Ledermuelleria etruscus, Oudemans (1923 b). *Ent. Ber. Amst.*, 6 (130) : 152.

This species has been completely unknown to contemporary workers due to lack of a description or illustrations.

FEMALE (n = 3). Length 530 (520-540).

Dorsum : Arrangement of plates and setae typical for genus. Dorsal plate ornamented with deep dimples enclosed in thick-walled cells of distinct reticulim (Fig. 9) ; surface cuticle finely punctuate. Several anomalous thin-walled dimples or fossettes : 3 pairs medially on propodosomal plate, 2 large pairs in transverse row between setae *a* and *b*, and others as shown in Fig. 9. Single, large humeral callosity. Suranal plate located beneath posterior region of hysterosomal plate and not visible from above. Dorsal setae rod-like (Fig. 10) with a few minute, lateral spinules and terminal hyaline sheath which does not extend beyond tip of setal core, except *e* and *le* which are acicular ; lengths as follows : (*be*, *b*, *c*, *lm*, *li* 95-105, *ae*, *a*, *la* 75-77, *he* 47 ; *ce* 22 ; *e* 53 ; *le* 40 ; all specimens were damaged and none had retained setae *de* intact.

Venter : Maxillicoxae reticulate and finely punctuate ; *n-n* = *m-m*. Intercoxal plates separated in mid-line ; faintly reticulate and finely punctuate ; setae *4a* present. Paragenital plate faintly reticulate, finely punctuate, bearing 2 pairs of subequal (22) setae (Fig. 11). Anogenital covers with 3 pairs of subequal (22) setae, *g*₂ closer to *g*₃ than to *g*₁.

Appendages : Numbers of setae, including special sensillae, on leg podomeres as in *E. kermesinus*. Solenidion ω I reaches to base of setae *tc* ; ω I = ω II > ω III > ω IV ; ϕ IV noticeably shorter than ϕ on other tarsi ; *k*I approximately 2/3 as long as associated dorsal seta ; *k*II minute. Leg setae thickened, acicular except for the following dorsal setae which have terminal hyaline sheath : genua I and II (3), genua III and IV (1) all femora (1). Numbers of setae on palp as in *E. kermesinus* ; accessory seta on palp-tibia thickened, claw-like. Cheliceral stylets relatively very short (32), bases 100.

MALE (n = 1). Length 310.

Features and relative dimensions as described for female except for normal sex-associated characters and following differences : dorsal setae *c* short, only slightly longer than *ce* ; *lm* and *li* relatively longer than in female ; hysterosoma transversely divided dorsally between setae *b* and *c*. Solenidion ω 0 very long on all tarsi, reaching to end of ω and base of *tc* on tarsus I.

DISTINGUISHING FEATURES.

This species can be readily distinguished from all other species of *Eustigmaeus* except *E. schusteri* (SUMMERS and PRICE, 1961) which it resembles in details of leg chaetotaxy, ornamentation of dorsal plates and shape, distribution and relative lengths of dorsal setae. Males of *E. schusteri* also have dorsal setae *c* much reduced. The only obvious distinguishing feature is the much

larger size of *E. etruscus* (length of *E. schusteri* : ♀ 340, ♂ 210). There is a possibility that *E. schusteri*, which is a north American species (SUMMERS and PRICE, 1961), is conspecific with *E. etruscus* but this can only be decided when more is known of variation in size within and between local populations of these species in North America and Europe.

SPECIMENS EXAMINED.

3 ♀♀, leaf litter, Mt. Falterona, near Firenze, Italy (80/33, 80/34 — type, 80/35) ; 10 same details (80/32).

Eustigmaeus ottavii Berlese.

Stigmaeus (*Eustigmaeus*) *ottavii* Berlese, 1910 a. *Redia*, 6 : 207.

Eustigmaeus ottavii, Oudemans (1923 a). *Ent. Ber. Amst.*, 6 (129) : 144.

Ledermuelleria ottavi, Summers and Price (1961). *Hilgardia*, 31 (10) : 376.

SUMMERS and PRICE (1961) identified specimens from North America as *E. ottavii* by comparison with Berlese's (1910 a) description and illustration. Their diagnosis was based mainly on the absence of dimpling or reticulation mid-dorsally and they redescribed the species on the basis of specimens from North America. I was unable to locate types of *E. ottavii* in the Berlese collection but my examination of named specimens would appear to confirm SUMMERS and PRICE's (1961) diagnosis and here it is necessary only to add minor details to their description.

Cuticle of dorsal plates minutely punctuate, shallow dimples of diameter less than distance separating them only apparent on down-curved margins of plates. Dorsal setae as described by SUMMERS and PRICE (1961) but with slender, terminal hyaline sheath. Maxillicoxae, intercoxal plates and paragenital plate faintly reticulate and finely punctuate ; setae 4a present.

SPECIMENS EXAMINED.

1 ♀, (70/36), 10, (70/34), soil and moss, Casalmoferrato, Italy.

Eustigmaeus rhodomela (Koch) COMB. NOV.

Celaeno rhodomela Koch, 1841. Deutschlands Crustaceen, Myriapoden und Arachniden 32 (2).

Full synonymy is given by SUMMERS and PRICE (1961). The species was re-described by SUMMERS and PRICE (1961) and WOOD (1972) on the basis of specimens from north America and the specimens I examined in the Berlese collection are con-specific with the north American specimens.

SPECIMENS EXAMINED.

2 ♀♀, humus, Castions di Strava, Udine, Italy (170/19, 216/42).

Eustigmaeus clavatus (Canestrini and Fanzago), COMB. NOV.

Caligonus clavatus Canestrini and Fanzago, 1876. *Atti. Accad. scient. venetotrent.-istriana*, 5 (1), 135.

Full synonymy is given by SUMMERS (1957, 1959) and SUMMERS and PRICE (1961) and my examination of named specimens in the Berlese collection confirms the identification of this species and its re-description by the above authors on the basis of specimens from north America.

SPECIMENS EXAMINED.

1 ♀, Botanic Gardens, Padova, Italy (66/14) ; 1 ♀, moss, Citta di Castello, Italy (156/37) ; 2 ♀♀, no data (43/34. 43/33).

Eustigmaeus anauniensis (G. Canestrini) COMB. NOV.

Raphignathus anauniensis G. Canestrini, 1889. *Atti Ist. veneto Sci.*, 7 (6) : 447.

Raphygnathus pectinatus Ewing, 1917. *Bull. Am. Mus. nat. Hist.*, 37 : SYNONYM NOV.

Ledermuelleria pectinatus, Oudemans (1923 b). *Ent. Ber. Amst.*, 6 (130) : 152.

Not *Acarus rubens* Schrank, 1781 ; (see Oudemans, 1923 b. *Ent. Ber. Amst.*, 6 (130) : 153).

Eustigmaeus granulatus Willmann, 1951 b. *Sber. Akad. Wiss. Wien. Abt.*, 1 (160) : 137.

This species has not been identified by contemporary workers. However the features of named specimens (no types were available) in the Berlese collection are consistent with features of *R. anauniensis* illustrated by CANESTRINI (1889). The specimens I examined are also conspecific with EWINGS' (1917) north American species, *R. pectinatus* which was re-described by SUMMERS (1957) and SUMMERS and PRICE (1961). This synonymy was previously suspected by SUMMERS (1957). Specimens identified as *L. pectinata* by MARSHALL and KEVAN (1964) were not this species, but belonged to an undescribed species subsequently described under the name of *L. collegiensis* (WOOD, 1972).

SPECIMENS EXAMINED.

1 ♀, Firenze (84/25) ; 1 ♀, Firenze (85/7) ; 1 ♀, Portici (43/40).

Eustigmaeus segnis (Koch), COMB. NOV.

Caligonus segnis Koch, 1836. *Deutschlands Crustaceen, Myriapoden und Arachniden*, 5 (10).

Recognition of this species depends on accepting the synonymies proposed by OUDEMANS (1923 b) (see also SUMMERS, 1957) and re-descriptions based on specimens from North America by SUMMERS (1957) and SUMMERS and PRICE (1961). Type specimens are unknown and it would seem advisable to accept the opinions of the above authors on synonymy. The specimen I examined possessed the features of *segnis* as described by the above authors. It was collected in Somalia (north Africa) and is the only known record of this species outside Europe and north America. BERLESE (1885 : A.M.S. 22, 1) recorded the species, under the name of *Raphignathus piger* Schrank,

as being common in mosses in Italy. However, early workers could easily have confused *segnis* with a similar species, *microsegnis*, recently described from north America (CHAUDHRI, 1965 ; WOOD, 1972) and now known to occur in Europe (see below).

SPECIMEN EXAMINED.

1 ♀, Foreste del Giuda, Somalia (217/33). The specimen is labelled *Raphignathus piger* Schrank.

Eustigmaeus microsegnis (Chaudri), COMB. NOV.

Ledermuelleria microsegnis Chaudhri, 1965. *Acarologia*, 7 : 472.

The occurrence of this species, which is superficially similar to *E. segnis*, in Europe throws some doubt on the validity of the present nomenclature of *E. segnis* (see above comments). *E. microsegnis* was previously known only from north America (CHAUDHRI, 1965 ; WOOD, 1972).

SPECIMEN EXAMINED.

1 ♀, Mugello, Italy (217/32). This specimen is labelled *Raphignathus piger* Schrank.

Genus *Cheylostigmaeus* Willmann.

Cheylostigmaeus Willmann, 1951 a. *Bonn. zool. Beitr.* 2 : 141-176. Type species : *Cheylostigmaeus grandiceps* Willmann, 1951 a.

Cheylostigmaeus, Summers and Ehara (1965). *Acarologia* 7 : 49.

Cheylostigmaeus scutatus (Halbert).

Raphignathus scutatus Halbert, 1920. *Proc. roy. Ir. Acad.*, 35 : 142.

Podaia scutatus, Oudemans (1923 b). *Ent. Ber. Amst.*, 6 (130) : 155.

Eustigmaeus scutatus, Willmann (1951 b). *Sber. Akad. Wiss. Wien. Abt.*, I 160 : 136.

Cheylostigmaeus scutatus, Willmann (1925). *Veröff. Inst. Meeresforsch Bremerh.*, 1 : 160.

Current knowledge of this species relies upon rather inadequate descriptions of the female (HALBERT, 1920) and male (WILLMANN, 1952). Unfortunately it was not possible to redescribe this species as the specimen in the Berlese collection is in poor condition and has lost most of its dorsal setae.

SPECIMEN EXAMINED.

1 ♀, 205/13 — cotype.

Genus *Storchia* Oudemans.

Storchia Oudemans, 1923 b. *Ent. Ber. Amst.*, 6 (130) : 150. Type species : *Caligonus robustus* Berlese, 1885.

Apostigmaeus Grandjean, 1944. *Archs. Sci. phys. nat.*, 26 : 105. SYNONYM NOV.

OUDEMANS (1923 *b*) placed two species in his new genus *Storchia* — *Caligonus robustus* Berlese and *Stigmaeodes elongatus* var. *longipilis* G. Canestrini. Both species were known only from brief descriptions and as OUDEMANS gave only a brief diagnosis of the genus, *Storchia* has been one of the genera that contemporary workers have been unable to recognise. The second species is now accommodated in the genus *Stigmaeus* (see p. 80). Types of *Caligonus robustus* could not be located in the Berlese collection, but named specimens were available. These conformed in general appearance to BERLESE's (1885) illustrations of *C. robustus* and in detail with the original description of *Apostigmaeus navicella* by GRANDJEAN (1944). Therefore *A. navicella* is conspecific with *C. robustus* and since both these are type species, the genus *Apostigmaeus* becomes a synonym of *Storchia*. The characters of this genus have been defined by GRANDJEAN (1944), SUMMERS (1964) and WOOD (1967) under the nomenclature of *Apostigmaeus*.

Storchia robustus (Berlese), COMB. NOV.

Caligonus robustus Berlese, 1885. Acari, Myriapoda et Scorpiones hucusque in Italia Reperta., 22 (6).

Stigmaeus robustus, Berlese (1910 *a*). *Redia*, 6 : 204.

Storchia robustus, Oudemans (1923 *b*). *Ent. Ber. Amst.*, 6 (130) : 150.

Apostigmaeus navicella Grandjean, 1944. *Archs. Sci. phys. nat.*, 26 : 105. SYNONYM NOV.

GRANDJEAN (1944) gives an excellent description and illustrations of this species based on specimens from Perigueux (France) and Zicavo (Corsica). The species is also known from South Africa (MEYER and RYKE, 1959), New Zealand (WOOD, 1967) and the British Solomon Islands (WOOD, 1971). The specimens in the Berlese collection conform to the typical form (GRANDJEAN, 1944) rather than the variant described by WOOD (1967).

SPECIMENS EXAMINED.

1 ♀, (251/20) ; 1 ♀, Monti pisomi, Jerricio cast. Italy (70/31) ; 1 ♀, S. Vincenzo, Pisa, Italy (204/40) ; 1 ♀, moss, Toiano, Pisa (210/9) ; 10, moss, Toiano, Pisa (204/41). The last three specimens are labelled *Stigmaeodes elongatus* Berlese.

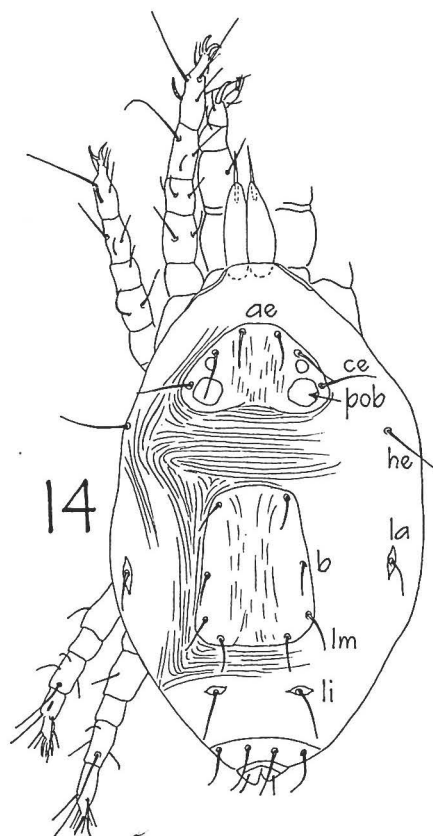
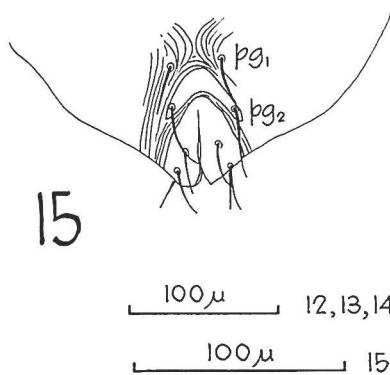
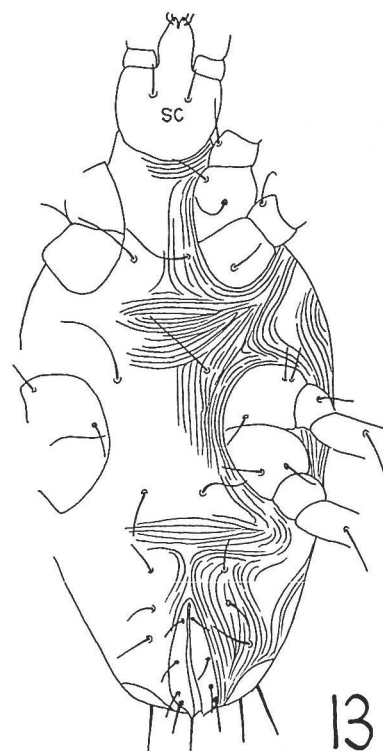
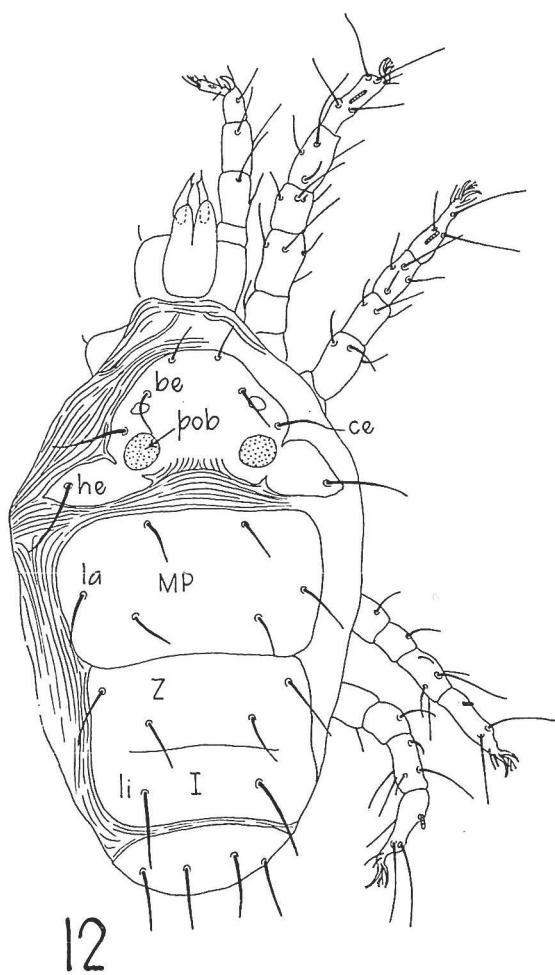
Genus *Barbutia* Oudemans.

Barbutia Oudemans, 1927. *Ent. Ber. Amst.*, 7 (158) : 262. Types species : *Stigmaeus anguineus* Berlese, 1910 *a*.

Barbutia anguineus (Berlese).

Stigmaeus anguineus Berlese, 1910 *a*. *Redia*, 6 : 204.

Full synonymy and a re-description of this species based on specimens from North America is given by SUMMERS (1964). My examination of this specimens confirms SUMMERS' (1964) identification.



FIGS. 12-15 : *Mediolata longirostris* : Fig. 12 — ♀, dorsal ;
Fig. 13 — ♀, ventral. *Zetzellia crassirostris* : Fig. 14 — ♀, dorsal ; Fig. 15 — ♀, opisthosoma ventral.

SPECIMENS EXAMINED.

3 ♀♀, S. Vincenzo, Pisa, Italy (73/31, 73-32, 73/33 — all labelled as type). The specimens are labelled *Stigmocheylus anguineus* Berlese.

Genus *Mediolata* G. Canestrini.

Mediolata G. Canestrini, 1889. *Atti. Ist. veneto Sci.*, 7 : 524. Type species *Stigmaeus longirostris* Berlese, 1887.

Mediolata, Gonzalez (1965). *Univ. Calif. Publs. Ent.*, 41 : 7.

Present day concepts of the genus *Mediolata* are due to GONZALEZ (1965) who re-defined the genus on the basis of *Mediolata pini* G. Canestrini, as the type species (*longirostris*) was assumed to be lost and its description (BERLESE, 1887) was inadequate to ascertain whether it was con-generic with *M. pini* or whether it belonged to the superficially similar genus *Eupalopsis* (Eupalopsellidae). There is a single named specimen of *M. longirostris* in the Berlese collection and I have re-described the species on the basis of this specimen although it has no type designation. Its features are consistent with those proposed for *Mediolata* (GONZALEZ, 1965).

Mediolata longirostris (Berlese).

Stigmaeus longirostris Berlese, 1887. *Acari, Myriapoda et Scorpiones hucusque in Italia Reperta* 34 (7).

Mediolata longirostris, G. Canestrini (1889). *Atti. Ist. veneto Sci.*, 7 : 524.

Eupalopsis longirostris, Oudemans (1923 b). *Ent. Ber. Amst.*, 6 (130) : 149.

FEMALE (n = 1). Length 355.

Dorsum : Arrangement of plates as shown in Fig. 12. Propodosomal plate bears 4 pairs of setae, 1 pair of eyes and 1 pair of large, protuberant, finely microtuberculate post-ocular bodies (*pob*); lateral and posterior margins of plate invaginated posterior to *pob*; posterior margin of plate concave, invaded by striae. Metapodosomal plate (MP) separated from zonal (Z) only by suture; zonal and intercalary (I) plates contiguous laterally, separated medially by faint suture. Plates thinly sclerotised; surface ornamentation difficult to observe as specimen is in poor condition but faint reticulation apparent with some appearance of alveolation within cells of the reticulum. Dorsal setae slender, acicular, faintly barbed; lengths as follows: *he*, *li* 84; *ce*, *lm* 70; *e*, *le* 60; *la* 54; *be*, *a*, *b*, *c* 45; *ae* 37; *be/be-ce* = 0.1; *a/a-a* = 0.5; *b/b-b* = 0.4; *c/c-c* = 0.5; *b/b-c* = 0.5.

Venter : Maxillicoxae smooth; *sc* 30; *sc/sc-sc* = 1.0 Fig. (13). Intercoxal setae slender, located on striated integument, *1a* (70), *2a* (80) *3a* (45). Three pairs of paragenital setae, successive pairs being equally spaced from each other, located on striated integument; *pg*₁ and *pg*₂ subequal (30), *pg*₃ (36). Four pairs of anogenital setae; *g*₁ and *g*₂ subequal (22), *g*₃ (26), *g*₄ (30) Setae *pg*₃ and *pg*₄ slightly thicker than other pairs. All ventral striae smooth.

Appendages : Numbers of setae (special sensillae in parentheses) on leg podomeres as follows : tarsi 12 (ω) — 10 (ω) — 8 (ω); — 8 (ω); tibiae 6 (φφ) — 6 (φφ) — 6 (φφ) — 6 (φφ); genua 4 (*k*) — 3 — 1

— 1; femora 5 — 4 — 2 — 1; trochantera 1 — 1 — 1 — 0; coxae 2 — 1 — 2 — 2. Solenidion ω I not reaching to base of setae *tc*; dorsal macrosetae (*d*) on all tibiae smooth, longer than length of their respective tibia; *k*I minute; left coxa III aberrant in bearing 3 setae. Empodial raylets capitate. Numbers of setae on palp-femur to palp-tarsus 2 — 2 — 4 — 7; accessory seta on palp-tibia slender, acicular; lateral solenidion on palp-tarsus rod-like, terminal sensillum trifid with long stem. Chelicerae with basal segments partly fused; stylets broad with sub-apical tooth.

DISTINGUISHING FEATURES.

The leg chaetotaxy is sufficient to distinguish this species, notably the number of setae on genua I and II, the femora and on trochanter IV. More obvious distinguishing features are the postero-lateral incisions on the propodosomal plate and the relatively long humeral (*he*) setae.

SPECIMENS EXAMINED.

1 ♀, Firenze (53/54).

Mediolata pini G. Canestrini.

Mediolata pini G. Canestrini, 1889. *Atti. Ist. veneto Sci.*, 7 (6) : 525.

Eupalopsis pini, Berlese (1894). *Acari, Myriapoda et Scorpiones hucusque in Italia Reperta*, 71 (10).

Eupalopsis reticulata Berlese, 1910 *a. Redia*, 5 : 208.

Eupalopsis pini Berlese (1910 *a*) [not *M. pini* G. Canestrini], *Redia*, 5 : 209.

Eupalopsis pinicola Oudemans, 1923 *b. Ent. Ber. Amst.*, 6 (130) : 149. [nom. nov. for *E. pini*, Berlese 1910 *a*].

The confusions surrounding synonymies and nomenclature of this species have been discussed by SUMMERS (1960 *a*) and GONZALEZ (1965). I was able to examine a type specimen and one other specimen labelled *E. pini* which are probably the species named as *E. pini* by BERLESE (1894) but later (BERLESE, 1910 *a*) regarded as being a different species, eventually named as *E. pinicola* by OUDEMANS (1923 *b*). These specimens are con-specific with the specimens from North America regarded by SUMMERS (1960 *a*) and GONZALEZ (1965) as being *M. pini* G. Canestrini. Furthermore, my examination of a type specimen of *E. reticulata* indicated that BERLESE's (1910 *a*) illustration is incorrect in showing the presence of 3 setae on genua I to IV and in fact this specimen is con-specific with *E. pinicola* and *M. pini* (see also OUDEMANS, 1923 *b*; SUMMERS, 1960 *a*).

SPECIMENS EXAMINED.

1 ♀, under pines, Doss Tavern, Trentino, Italy (125/27 — type); 2 ♀♀, Boboli Gardens, Firenze (251/22, 78/44); 1 ♀, Tiarno, Italy (80/50). The last specimen is labelled *Eupalopsis reticulata* Berlese — Type.

Genus *Zetzellia* Oudemans.

Zetzellia Oudemans, 1927. *Ent. Ber. Amst.*, 7 (158) : 263. Type species : *Zetzellia methlagli* Oudemans, 1927.

Agistemus Summers, 1960 b. *Proc. ent. Soc. Wash.*, 62 : 234.

Zetzellia, Wood (1967). *Trans. roy. Soc. N. Z., Zool.*, 9 : 125.

Zetzellia crassirostris (Leonardi), COMB. NOV.

Stigmaeus crassirostris Leonardi, 1899. *Annali Scu. sup. Agric. Portici*, 1 (II).

Not *Stigmaeus cruentus* Koch, 1836 (see Oudemans, 1923 a. *Ent. Ber. Amst.*, 6 (129) : 140).

FEMALE (n = 4). Length 315 (300-340).

Dorsum : Propodosomal plate with 3 pairs of setae, a pair of eyes and a pair of post-ocular bodies ; faint, discontinuous, longitudinal striae cover the plate medially posterior to setae *ae* ; posterior margin concave. Median hysterosomal plate with 4 pairs of setae (Fig. 14) ; plate with lateral margins more or less straight ; faint, discontinuous, longitudinal striae cover the plate medially between dorso-central pairs of setae. Setae *he*, *la* and *li* on small, individual platelets ; suranal plate entire. Setae slender, acicular, faintly barbed, lengths as follows : *he* 45 ; *ce* 40 ; *be*, *li*, *e* 32-34 ; *le* 29 ; *ae*, *la*, *lm* 25-27 ; *c* 24 ; *a*, *b* 22. Setal/inter-setal distance ratios : $ae/ae-ae = 1.0$, $be/be-be = 1.2$, $a/a-a = 0.5$, $b/b-b = 0.3$, $b/b-c = 0.7$. Integumental striae smooth.

Venter : Maxillicoxae smooth ; setae *n* (34) slightly shorter than *m* (37) ; $n-n$ slightly $> m-m$. Intercoxal setae located on striated integument, *1a* (26), *2a* and *3a* subequal (32) ; $1a/1a-1a = 2.0$. Coxal setae *1b* (34), *1c* and *2c* (41-44) longer than other coxal setae (25). Paragenital plate smooth, narrow, crescentic (Fig. 15) bearing only one pair of setae (*pg*₂, 32) ; *pg*₁ (21) on striated integument. Four pairs of subequal (17-19) anogenital setae, *g*₃ and *g*₄ slightly thickened.

Appendages : Numbers of setae (special sensillae in parentheses) on leg podomeres as follows : tarsi 13 (ω) — 10 (ω) — 8 (ω) — 7 ; tibiae 6 ($\phi\phi$) — 6 ($\phi\phi$) — 6 ($\phi\phi$) — 6 ($\phi\phi$) ; genua 4 (*k*) — 1 — 0 — 0 ; femora 4 — 4 — 3 — 2 ; trochantera 1 — 1 — 1 — 1 ; coxae 2 — 1 — 2 — 2. Solenidion ω I reaching to base of setae *tc* ; *k*I short, approximately 1/16 as long as associated dorsal seta ; dorsal macrosetae on tibiae I, III and IV longer than length of their respective tibiae and on tibia IV extending beyond base of tarsal claws ; dorsal seta *d* on femur I shorter than propodosomal setae *be*. Empodium with capitate raylets. Numbers of setae on palp-femur to palp-tarsus 3 — 1 — 4 — 7 ; tibial claw shorter than tarsus ; accessory seta spine-like, about half as long as claw ; lateral solenidion on tarsus rod-like, terminal sensillum distinctively trifold.

MALE (n = 3). Length 305 (290-330).

Arrangement of plates and setae as in female ; relative lengths of setae similar to female except *a*, *b*, and *c* (17-18) relatively shorter than *la*, *lm* (24) and *li* (29). Solenidion ω and ω on tarsus I subequal ; only one small solenidion on tarsi III and IV.

DISTINGUISHING FEATURES.

The presence of 4 pairs of setae on the median hysterosomal plate is characteristic of the *methlagli* species — group. *Z. crassirostris* can be distinguished from other members of this group by the smooth dorsal plates with their faint striations, the shape of the median hysterosomal plate and the relative lengths of dorsal setae.

SPECIMENS EXAMINED.

4 ♀♀, 300, (43/39).

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REFERENCES

- BERLESE (A.), 1882-1893. — Acari, Myriapoda et Scorpiones hucusque in Italia Reperta. Ordo Prostigmata (Trombididae). — Patavii, Portici.
- BERLESE (A.), 1883. — Acarofauna sicula, 1st. Seri. — Bull. Soc. ent. Ital. : 212-220.
- BERLESE (A.), 1910 a. — Acari Nuovi. — Manipulus V Redia, 6 : 199-234.
- BERLESE (A.), 1910 b. — Brevi diagnosi di generi e specia nuovi di Acari. Redia, — 6 : 346-388.
- CANESTRINI (G.), 1889. — Prospetto del 'Acarofauna Italiana. Famiglia dei Tetranychini. — Atti. Ist. veneto Sci., 7 (6) : 491-537.
- CANESTRINI (G.) & FANZAGO (F.), 1876. — Nuovi Acari Italiana. Famiglia dei Tetranychini. — Atti. Accad. scient. veneto — trent. — istriana, 5 (1) : 130-142.
- CHAUDHRI (W.), 1965. — New mites of the genus *Ledermuelleria*. — Acarologia, 7 : 467-486.
- EWING (H. E.), 1917. — New Acarina. Part II. — Descriptions of new species and varieties from Iowa Missouri, Illinois, Indiana and Ohio. — Bull. Am. Mus. nat. Hist., 37 : 149-172.
- GONZALEZ (R. H.), 1965. — A taxonomic study of the genera *Mediolata*, *Zetzellia* and *Agistemus* (Acarina Stigmaeidae). — Univ. Calif. Publs. Ent., 41 : 1-64.
- GRANDJEAN (F.), 1944. — Observations sur les acarins de la famille des Stigmaeidae. — Archs. Sci. phys. nat., 26 : 103-131.
- HALBERT (J. N.), 1920. — The Acarina of the seashore. — Proc. R. Ir. Acad., 35 : 106-152.
- KOCH (C. L.), 1835-1844. — Deutschlands Crustaceen, Myriapoden und Arachniden. — Heft 1-40. Regensburg.
- LEONARDI (G.), 1899. — Prima lista di Acari raccolti a Portici. — Annali Scu. sup. Agric. Portici, 1 (II) 10.
- MARSHALL (V. G.) & KEVAN (D. K.) McE., 1965. — Ann. Ant. Soc. Quebec, 9, 54-67.
- MEYER (M. K. P.) & RYKE (P. A. J.), 1959. — Mites of the superfamily Raphignathoidea (Acarina, Prostigmata) associated with South African plants. — Ann. Mag. nat. Hist., 2 (13) : 209-234.
- OUDEMANS (A. C.), 1923 a. — Acarologische Aanteekeningen LXX. — Ent. Ber. Amst., 6 (129) : 138-144.
- OUDEMANS (A. C.), 1923 b. — Acarologische Aanteekeningen LXXI. — Ent. Ber. Amst., 6 (130) : 145-155.
- OUDEMANS (A.C.), 1927. Acarologische Aanteekeningen LXXXVIII. — Ent. Ber. Amst. 7 (158) : 257-268.
- SCHRANK (F. V.) PAULA, 1781. — Enumeratio Insectorum Austriae Indigenorum. Augustae Vindelicorum.
- SUMMERS (F. M.), 1957. — American species of *Ledermuelleria* and *Ledermuelleriopsis* with a note on new synonymy in *Neognathus*. — Proc. ent. Soc. Wash., 59 : 49-60.

- SUMMERS (F. M.), 1959. — *Raphignathus tessellatus* Ewing, 1909, a new synonym of *Ledermuelleria clavata* (Can. and Franz., 1876). — Proc. ent. Soc. Wash., **61** : 85.
- SUMMERS (F. M.), 1960 a. — *Eupalopsis* and eupalopsellid mites (Acarina : Stigmaeidae, Eupalopsellidae) — Fla. Ent., **43** : 119-138.
- SUMMERS (F. M.), 1960 b. — Several stigmaeid mites formerly included in *Mediolata* redescribed in *Zetzellia* Ouds., and *Agistemus*, new genus. — Proc. ent. Soc. Wash., **62** : 233-247.
- SUMMERS (F. M.), 1962. — The genus *Stigmaeus* (Acarina : Stigmaeidae). — Hilgardia, **33** : 491-537.
- SUMMERS (F. M.), 1964. — Three uncommon genera of the mite family Stigmaeidae (Acarina). — Proc. ent. Soc. Wash., **66** : 184-192.
- SUMMERS (F. M.), 1966. — Genera of the mite family Stigmaeidae Oudemans (Acarina). — Acarologia, **8** : 230-250.
- SUMMERS (F. M.) & PRICE (D. W.), 1961. — New and redescribed species of *Ledermuelleria* from North America. — Hilgardia, **31** : 369-382.
- SUMMERS (F. M.) & EHARA (S.), 1965. — Revaluation of the taxonomic characters in four species of the genus *Cheylostigmaeus* Willmann. — Acarologia, **7** : 49-62.
- WILLMANN (C.), 1951 a. — Die hochalpine Milbenfauna der mittleren Hohen Tauern, insbesondere der Grossglockner-Gebietes (Acari). — Bonn. zool. Beitr., **2** : 141-176.
- WILLMANN (C.), 1951 b. — Untersuchungen über die terrestrische Milbenfauna in pannonischen Klimagebiet Österreichs. — Sber. Akad. Wiss. Wien. Abt., **1** (160) : 91-176.
- WILLMANN (C.), 1952. — Die Milbenfauna der Nordseeinsel Wangerooge. — Veröff. Inst. Meeresforsch. Bremerh., **1** (2) : 139-186.
- WOOD (T. G.), 1966. — Mites of the genus *Ledermuelleria* Oudms. (Prostigmata, Stigmaeidae) from New Zealand, with records of one species from some southern Pacific Islands. — N. Z. Jl. Sci., **9** : 84-102.
- WOOD (T. G.), 1967. — New Zealand mites of the family Stigmaeidae (Acari, Prostigmata). — Trans. roy. Soc. N. Z., Zool., **9** : 93-139.
- WOOD (T. G.), 1971. — Stigmaeidae (Acari : Prostigmata) from the British Solomon Islands. — Acarologia, **13** : 65-87.
- WOOD (T. G.), 1972. — New and re-described species of *Ledermuelleria* Oudms. and *Villersia* Oudms. (Acari : Stigmaeidae) from Canada. — Acarologia, **13** : 301-318.
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