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A REVIEW OF THE LOWER UROPODOID MITES
(FORMER THINOZERCONOIDEA,
PROTODINYCHOIDEA AND TRACHYTOIDEA) WITH NOTES
ON THE CLASSIFICATION OF THE UROPODINA (ACARINA).  

BY

Donald E. Johnston.

This paper had its inception as a review and revision of the mesostigmatid mites of the uropodine superfamily Trachytoidea. As work progressed it became evident that the group under study lacked natural limits and that no review of the trachytoeid mites could be sound without concomitant consideration of all other Uropodina. Through these studies this paper evolved into an attempt to accomplish two ends: (1) to place on a firmer basis the generic classification of those mites formerly included in the superfamily Trachytoidea, and (2) to provide a more realistic classification of the Uropodina.

The Classification of the Uropodina.

UROPODINA Kramer, 1881.

Monogynaspida. Epigynial shield of "trapdoor" type; hinged or broadly joined to ventral surface. Genital setae lacking in female. Sternal shield surrounding epigynial shield; fused with parapodal shields and frequently fused with ventral shield. Metasternal setae on epigynial shield, on plates flanking epigynial shield, in posterior corners of genital aperture, or absent; never at anterior margin of genital aperture (as in Parasitoidea and related groups). Male genital aperture within sternal shield, in region of coxae II, III or IV. Salivary and hypopharyngeal styli present. Median epistomal apodeme absent. Chelicerae usually elongate; male chelae lacking spermadactyl. Hypostomal setae usually arranged in two longitudinal rows. (Based on Camin and Gorirossi, 1955).

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A review of the described and many undescribed uropodine mites has revealed that within this group there are two clear-cut morphological patterns. One of these patterns occurs in the Diarthrophalloidea, the other in those mites currently classified as Thinozerconoidea, Protodinychoidea, Trachytoidea and Uropodoidea. I have utilized these patterns as the basis for the subdivision of the Uropodina into two superfamilies, Diarthrophalloidea and Uropodoidea. The Thinozerconoidea and Protodinychoidea are relegated to family status within the Uropodoidea and the families formerly included in the Trachytoidea and Uropodoidea are united under the name Uropodidae. The reasons for these changes are given in the sections which follow.

**DIARTHROPHALLOIDEA Trägårdh, 1946.**

Uropodine mites in which a single dorsal shield is present in all stages (vertical, marginal, and posterior shields and rows of marginal setae lacking). Coxae I transverse and contiguous (or nearly so). Sternal shield not produced laterally into elongate intercoxal processes; fused posteriorly with ventral shield. Epigynial shield hinged or broadly joined to ventral shield. Anterior margin of male genital shield fused with sternal shield. Adanal setae very long. Dorsal setae few and enormously elongate in most described and undescribed (as seen by me) species but much reduced in one undescribed genus. Anus and anal shield terminal. Fixed digit of chelicera with excrescences. Details of the gnathosoma, legs, ambulacral apparatus and peritremes also distinctive among Uropodina. Associated in all active stages with beetles of the family Passalidae. One family, the Diarthrophallidae.

As regards the males of Diarthrophallidae it should be pointed out that the existence of a "penis" or any other intromittent organ seems doubtful on morphological grounds. It appears likely that the genital apparatus is simply a modification of the basic uropodine type and not the unique structure that TRAGÅRDH (1946a) suggested.

Trägårdh (1946a) also reported the presence of a pair of presternal setae flanking the tritosternum in diarthrophallids. These are not setae, however, but are attenuate, hyaline cuticular processes arising from the integument lateral to the tritosternal base. There is a pair of setae in the presteral region but these are associated with coxae I.

The anatomical differences between diarthrophallids and uropodoids are many and clear cut. Consideration of the biology of the two groups indicates certain problems, however. The diarthrophallids (in so far as is known) occur in all active stages on passalid beetles. The type of association is unknown. Uropodoid mites are essentially free-living. Many are phoretic, in the final nymphal stage, on various animals; a few occur as adults in phoretic (or parasitic?) associations with other arthropods; many live permanently in the nests of ants and other social insects; but no known uropodoid has to cope with the problems of existence in all active
stages on the body of another animal. Certain of the characteristic features (among Uropodina) of the Diarthrophalloidea would appear to be correlated with their mode of life. Such features are the flattened idiosoma which is provided with elongate setae, terminal anus, complete antennary function of leg I, stoutness of legs II-IV, modified ambulacral apparatus, reduced peritremes, reduced palps, and cheliceral excrescences. Many of these features occur in unrelated mesostigmatid mites which also share this type of existence. If we exclude these characters from our definition of the Diarthrophalloidea we are left with the dorsal shield pattern, the form of the sternal shield and the anterior fusion of the male genital shield as the primary characteristics of the group. The assumption made here is that only diarthrophalloid stock will possess these particular characters and, conversely, any non-diarthrophallicid converging into the diarthrophalloid niche will not share these characters. The correctness of this view remains to be seen. It might be argued, for example, that since many diarthrophalloid features are matters of loss or reduction, the dorsal shield pattern could be regarded as a reduced uropodoid type and its occurrence in all post-embryonic stages simply reflects the similarity of their way of life.

The Classification of the Non-diarthrophalloid Uropodina.

Earlier it was stated that this paper had its beginnings as a review of the Trachytoidea. As more data came to hand, however, it rapidly became apparent that, as a zoologically meaningful entity, the Trachytoidea did not exist. The characters utilized in the definition of the group (see CAMIN and GORIROSSI, 1955) not only fail to characterize any discrete taxon but also seem to cut across lines of relationship which can be established on the basis of other characters. It is impossible, for example, to distinguish Trachytidae (Trachytoidea) from Prodinychidae-Eutrachytidae (Uropodoidea). All of the characters supposedly diagnostic of the Trachytidae occur in some members of the Prodinychidae-Eutrachytidae and most prodinychid-eutrachytid characters occur in the trachytid group. At least one undescribed mite presents a complete mosaic of trachytid and prodinychid-eutrachytid characters. The most distinctive group of trachytoids, the Polyaspididae, are linked to the Trachytidae via Pholeogynium sorrentinus and all the major characters (CAMIN, 1953) of the polyaspids occur (singly) in certain undescribed trachytid-like and prodinychid-like forms. In view of the failure of the characters utilized in previous systems and my own failure to find other characters to support the old classification, I feel that the most realistic action which can be taken is to abandon the Trachytoidea and the families included therein.

The collapse of the old Trachytoidea led me to consider the possibility of subdividing the combined Trachytoidea-Uropodoidea into two major groups, those lacking foveae pedales (the "lower uropodoids": Trachytidae, Polyaspididae, Prodinychidae, Eutrachytidae and Discourellidae) and those possessing foveae pedales
(the “higher uropodoids” : Coxequesomidae, Planodiscidae, Circocyllibanidae, Trematuridae, Trematurellidae, Cillibidae, Urodiaspididae, Trachyuropodidae, Urodinychidae, Phaulodinychidae, Metagynellidae and Uropodidae). That such a course in also destined to failure is apparent from consideration of Phaulotrachytes rackei (Oudemans) and certain undescribed forms. \textit{P. rackei} (see Oudemans, 1913 and Valle, 1954) is a typical member of the \textit{Prodinychus-Dinychus} group except for the presence of well-developed foveae pedales. Some tropical prodinychid-like forms (undescribed) also possess foveae pedales, associated in most cases with legs II to IV, in one case with legs III and IV. In addition I have been unable to find any other characters which would confirm a separation of lower and higher uropodoids. Evans (1957) recognizing the thoroughly confused nature of the classification of the higher uropodoids lumped these mites under a single name, Uropodidae. The lack of separating characters between lower and higher uropodoids leads to but one course which is in accord with the facts of failure of previous classification: the mites formerly regarded as Trachytoida (2 families) and Uropoidea (15 families) are best treated as a single family, the Uropodidae.

If the course suggested above is followed it is then natural to inquire as to what sort of infrafamilial classification should be employed. If the former families are worthless then their retention as subfamilies is obviously out of the question. What then is to be done with this mass of formally unrelated genera floating about under the label Uropodidae? I would suggest as a temporary measure (and this is begun in this paper) the extensive use of vernacular generic groups. Such groups should be capable of precise definition but need not be equal in weight. They would simply be convenient, informal handles (and as such should leave few classificatory scars) for use during these preliminary stages of exploration of the uropodid fauna. In addition to being readily assembled, dismembered or merged these groups would have the additional advantage of forcing us to work with genera and species instead of the comfortable nebulousness of acarine higher categories.

Whereas the problems of classification of the former trachytoid and uropodoid families lay in the general untenability of the categories the problems associated with the classification of the thinozerconids and protodinychids seem to be matters of degree of emphasis since there is probably agreement that these groups are distinctive. My position in this : the characters (see diagnoses below) presented by the thinozerconids and protodinychids are in agreement with those of the Uropodoidea and in contrast to those of the Diarthrophalloidea. Both, however, are separated by distinct gaps from members of the Uropodidae and from each other and are therefore perhaps best regarded as separate families of the Uropodoidea.

1. The Coxequesomidae-Circocyllibanidae-Planodiscidae group are an exception in that they represent an apparently interrelated assemblage which can be diagnosed. The retention of family status for the group seems unwarranted when the general similarity of these mites to other "higher" uropodids is considered, however.
**UROPODOIDEA** Kramer, 1881.

Uropodina. With a vertical shield which is fused with the peritremal-parapodal complex. Median dorsal shield present and accompanied by marginal setae or seta-bearing marginal platelets or marginal shields, or fused with marginal shields. Sternal shield fused with endopodals; projecting laterally between coxae. Anterior margin of male genital shield not fused with sternal shield. Adanal setae normal in length as are other body setae (marginal setae may be elongated or variously modified). Fixed digit of chelicera lacking excrecescences. Larva with one or two dorsal shields; protonymph with four distinctively arranged dorsal shields (see figure 1); deutonymph and adult with various arrangements of dorsal shields.

Also characteristic of the Uropodoidea are several morphological trends.

1. Dorsal marginal setae on unsclerotized integument; dorsal marginal setae on platelets; fusion of platelets to form elongate marginal shields; fusion of marginal shields to median dorsal shield; to ventral shield; or combinations of these.

2. Forward projection of anterior edge of idiosoma and medial expansion of coxae I to form “camerostome”.

3. Reduction of metasternal shields and loss of metasternal setae.


5. Increase in degree and extent of idiosomal sclerotization (female, male, final nymph).

6. Transition from short, broad, irregularly marginate, sclerotized tectum to elongate, narrow, finely spinose, hyaline tectum.

7. Reduction of ambulacral apparatus on leg I and modification of leg I from ambulatory to antennary appendage.

**Artificial Key to the Families of Uropodoidea** (based on the females).

<table>
<thead>
<tr>
<th>1. Jugular shields present. Epigynial shield a tongue-like flap. Dorsal marginal setae not borne on platelets</th>
<th>Thinozerconidae</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jugular shields absent</td>
<td>2</td>
</tr>
<tr>
<td>2. Tectum short, broad, sclerotized and with irregular margin (see figure 6). Dorsal marginal setae not borne on well-defined shields. Epigynial shield with a pair of setae.</td>
<td>Protodinychidae</td>
</tr>
<tr>
<td>Tectum long, narrow, hyaline and spinose (see figure 8). Dorsal marginal setae on platelets or elongate marginal shields (which may be fused to dorsal or ventral shields). Epigynial shield lacking setae (except in Dipolyaspis and Polyaspis, subgenus Dyscristaspis)</td>
<td>Uropodidae</td>
</tr>
</tbody>
</table>

**Thinozerconidae** Halbert, 1915.

This family contains a single species, *Thinozercon michaeli* Halbert, 1915, which is known only from Ireland. Our knowledge of this mite stems from the figures and descriptions of Halbert and Trägårdh (1941, 1943, 1946). No formal dia-
FIG. 1. — Diagram of dorsal shield pattern of uropodoid protonymph.
FIG. 2. — *Trachytes pyriformis*; sterni-genital region of female.
FIG. 3. — *Polyaspis lamellipes*; sterni-genital region of female.
FIG. 4. — *Trachytes* sp. (Michigan, U.S.A.); chelicera.
FIG. 5. — *Protodinychus* sp. (North America); dorsum of female.
FIG. 6. — Same; tectum of female.
FIG. 7. — Same; sterni-genital region of female.
FIG. 8. — *Dithinozercon kalberty*; tectum of female showing typical uropodid form.
gnosis will be attempted but some features considered important may be given.

Female with median dorsal shield not fused with vertical-peritremal complex; posterior dorsal shield present; dorsal marginal setae borne on unsclerotized integument; marginal shields lacking. Stigmata and peritremes on margin of dorsum. Tritosternum broad-based; with two long lacinae. Coxae I wide spread. Jugular shields present. Epigynial shield a tongue-like flap; not hinged posteriorly. Tectum intermediate in form between Protodinychidae and Uropodidae. Fovae pedales absent. Male with dorsum covered by a single shield. Nymph (final nymph?) with median dorsal shield divided into notocephalic and notogastral components; posterior dorsal shield present. In other features this mite appears similar to the lower uropodids.

According to TRAGÅRDH (1946) the tritosternum is flanked by presternal setae. This feature is unique among Uropodina and should be carefully checked when T. michaeli is rediscovered. TRAGÅRDH's report of presternal setae, coupled with the presence of a tongue-like epigynial shield, led CAMIN and GORIROSSI (op. cit.) to place Thinozercon in the Diarthrophalloidea on a provisional basis. As mentioned above however, presternal setae are lacking in the diarthrophallids and tonguelike epigynial shields which are not hinged posteriorly have appeared independently several times in the Uropodina. The morphological features of Thinozercon indicate no more than a general affinity with the diarthrophallids but do suggest close relationship with the protodinychids and uropodids and the genus is here regarded as representing a family of the Uropodoidea. The genus Dithinozercon Berlese, formerly included in this family, is placed in the Polyaspinus group of Uropodidae in this paper.

Thinozercon Halbert, 1915.
Proc. R. Irish. Acad. XXXI (311) : 82.

Types species: Thinozercon michaeli Halbert, 1915.
Loc. cit., by O. D. and Monotypy.

Protodinychidae Evans, 1957.

Uropodoidea. Tectum short, broad; well sclerotized and with irregular margin (fig. 6). Tritosternum parasitoid in facies; with narrow base and two long spinose lacinae. Coxae I widely separated. Vertical shield not prolonged anteriorly. Median dorsal shield not fused with vertical shield in female. Dorsal marginal setae borne on unsclerotized integument; marginal shields lacking (fig. 5). Jugular shields and fovae pedales lacking. Legs relatively long and each provided with caruncle, claws and pretarsus (leg I has both an antennary and an ambulatory function in these mites, as determined by observations of living specimens). Gnathosoma situated anteriorly.

To the family diagnosis the following notes on Protodinychus may be added.
Sternigenital region of female as in figure 7. Male genital aperture at level of
coxae IV; covered by two shields. Leg II of male unarmed. Median dorsal shield of male broadly joined to vertical shield and completely covering dorsum. Final nymph with perianal disc. Sternal shield of final nymph elongate, rectangular and, with the endopodals, occupying entire intercoxal area. Protonymph with vertical shield and four characteristic dorsal shields. Gnathosomal setae arranged in two longitudinal rows. Chelicerae of the uropodine type. Hypopharyngeal styli short, brush-like; salivary styli not seen.

*Protodinychus* Evans, 1957.


Type species: *Protodinychus punctatus* Evans, 1957.

Loc. cit., by O. D. and Monotypy.

The above diagnosis and notes are based upon Evans' (1957) description and figures of *P. punctatus* and on examination of a series of adults and nymphs of an undescribed North American species. The morphology of these mites corresponds with the patterns observed in the Uropodoidea and it is suggested that relationships would be best expressed by including the protodinychids in that superfamily. Evans' suggestions as to the parasitoid affinities of these mites were apparently based, in part, on the interpretation of the setae on the epigynial shield as homologues of the genital setae of the gamasid mites. The fourth pair of sternal setae are regarded by Evans as the metasternals. Trägårdh (1946 and preceding papers) and Camin (1953) have interpreted the fourth pair of sternal setae of the lower uropodines as pseudosternals and have homologized the fifth pair of setae with the metasternals of the gamasid mites. The latter interpretation is followed here and the epigynial shield setae of *Protodinychus* are regarded as metasternals.

Adult and nymphal *Protodinychus* were found in debris from beaver lodges collected in Algonquin Park, Ontario by D. M. Wood, Mr. Wood has also found the final nymphs of this mite attached to the beaver beetle *Leptinilus validus*. The two known females of *P. punctatus* Evans were taken from flood water debris in England.

**Uropodidae** Kramer, 1881.

Uropodoidea. Tectum (fig. 8) elongate narrow, spinose and hyaline. Median dorsal shield fused with vertical-peritremal-parapodal complex. Marginal setae borne on platelets or elongate marginal shields (which may be fused with median dorsal shield or ventral shields). Well developed vertex present. Jugular shields absent. Coxae I widely separated or contiguous. Tritosternal base narrow or wide. Fovae pedales present or absent.

The genera of Uropodidae treated below are those included in the former. Trachytoidea or those closely related to genera formerly included in the Trachytoidea. These genera are arranged in narrowly defined groups, the characters of which are based on undescribed as well as described forms. The number of monogeneric
groups, however, does not reflect so much the narrowness of the definition but rather the small number of named uropods.

Throughout the group diagnoses the term "trachytoid" is used to signify the following character states: (1) foveae pedales lacking (2) tritosternal base broad and widely separating coxae I; (3) peritreme-bearing humeral projections absent; (4) anterior endopodals separated from adjacent parapodals by distinct break in sclerotization of integument; (5) sculptured integument. The use of the term is a device to avoid repetition; as indicated above this combination of characters is without classificatory significance.

Polyaspis group.

The genera of the Polyaspis group (= Polyaspidae Berlese) have been critically reviewed and diagnosed by Camin (1953) from whose paper I have borrowed freely in the preparation of the present key. To Camin's characterization of this group I would add that, where known, male polyaspids lack femoral spurs on leg II.

*Polyaspis* (s. str.) Berlese 1881.

*Polyaspis* (P.) *patavinus* Berlese, 1881.

Type species: *Polyaspis patavinus* Berlese, 1881, by Monotypy [Radford, 1950].

*Polyaspis (P.)* *patavinus* Berlese, 1881.

*Polyaspis (P.) australis* Berlese, 1910.

*Polyaspis (P.)* *repandus* Berlese, 1904.

*Polyaspis* *patavinus* var. *repandus*.

*Polyaspis berlesei* Camin, 1954.

**BERLESE**'s original concept of *Polyaspis patavinus* included two species and the genital areas of both forms were illustrated in his Acari, Myriapoda, etc. (1882). In 1904 he named the second form (*repandus*). In 1954 Camin, on the basis of new material and unaware of Berlese's earlier action, named the second form *berlesei*. All available evidence indicates that both names apply to the same species and *berlesei* is here regarded as a synonym of *repandus*.

*Polyaspis* (P.) *platensis* Berlese, 1916.

*Polyaspis (P.)* *platensis* Berlese, 1916.
Polyaspis potchefstroomi Ryke, 1956.


This name is probably a synonym of *P. repandus* Berlese.

Polyaspis (*Dyscritaspis*) Camin, 1953.


Type species: *Dyscritaspis whartoni* Camin, 1953.

(= *Polyaspis lamelipes* Banks, 1914) by O. D. and Monotypy.

Polyaspis (*D.*) lamellipes Banks, 1914.


*Dyscritaspis whartoni* Camin, 1953.


The above synonymy is based on examination of Bank's type material. The type slide, which bears five phoretic "tritonymphs", is in the Museum of Comparative Zoology, Harvard University. One of these specimens is here designated as the lectotype and this specimen is so indicated on the slide label.

*Dyscritaspis* Camin differs from *Polyaspis* in the fusion of the metasternal shields with the epigynial shield and in the separation of the matapodal shields from the peritremal-parapodal complex. Otherwise these mites are morphologically and biologically almost identical and *Dyscritaspis* is here regarded as a subgenus of *Polyaspis*.

*Dipolyaspis* Berlese, 1916.

*Redia* XII (2) : 294.

Type species: *Polyaspis (Dipolyaspis) sansonei* Berlese, 1916, *loc. cit.*., by O. D. and Monotypy.

Calotrachytes Berlese, 1916.

*Redia* XII (1) : 28.

Type species: *Trachynotus sclerophyllus* Michael, 1908, by O. D.

Calotrachytes sclerophyllus (Michael), 1908.

*Trachynotus sclerophyllus*.


Calotrachytes fimbriatipes (Michael), 1908.

*Trachynotus fimbriatipes*.


The inclusion of *Trachynotus fimbriatipes* in *Calotrachytes* follows Berlese (1916a). Camin (1953) has pointed out that this species is not congeneric with *C. sclerophyllus* but lack of material prevented a more accurate placement.
Pholeogynium group.

Trachytoid. Idiosoma ovoid. Posterior dorsal shield lacking; marginal setae borne on separate platelets. Epigynial shield ovoid anteriorly; distinctly hinged to venter; reaching to level between sternal setae II and III. Large metapodal shields present; adanal shields lacking. Palps 5-segmented. Corniculi long, bladelike; reaching just beyond distal margins of palp femur.

Pholeogynium new genus.

Type species: *Polyaspis sorrentinus* Lombardini, 1952.

*Redia* XXVII: 190, by present designation.

*Pholeogynium sorrentinus* is here regarded as the sole representative of a group which is probably most closely related to the *Polyaspis* group. *P. sorrentinus* is known only from two females from Italy. Additional notes and figures based on the holotype are presented here since Lombardini's original description and figures contain many inaccuracies.

*Pholeogynium sorrentinus* (Lombardini).

**Female.** Idiosoma. Length 949 \( \mu \). Vertex round; knobbed anteriorly and ventrally. Vertical setae large, feathered; stoutest distally. Median dorsal shield not fused with vertical shield; with D-setae short, brush-like. Three irregular rows of dorso-marginal shields present; each with pore and stout, feathered setae. Sternigenital region as in fig. 12. Distance between sternal setae I = 34 \( \mu \), between sternals II = 52 \( \mu \), between sternals III = 70 \( \mu \), between sternals IV = 164 \( \mu \). Epigynial shield 204 \( \mu \) long (213 \( \mu \) including nase), 158 \( \mu \) wide at base; anterior half of shield with margins fitted above integument of sternal shield surrounding genital aperture. (This is apparently not an artifact of preparation as there is a collection of debris in the crevice formed between the sternal integument and the epigynial shield. The sternal integument surrounding the genital shield is thin and presumably quite flexible.) Stigmata between coxae II and III; peritreme extends to posterior margin of coxa I. Metapodal shields irregular in outline; with short, brush-like setae. Anal shield cone-shaped. Other details of ventral surface as in fig. 13.

Gnathosoma. Ventral aspect as in fig. 9. Salivary styli not reaching to level of distal margins of cornicula. Chelicera as in fig. 11. Tectum typically uropodid; long, attenuate, coarsely spinose proximally; finely spinose distally.

Legs I without claws; tarsus I as in fig. 10. Legs II-IV with pretarsus bearing claws and caruncle. Leg II markedly thicker than other legs. Femur and trochanter of leg I with two ventral, short, brush-like setae. Tarsus I 174 \( \mu \) in length; tarsus IV 207 \( \mu \) in length.
Fig. 9-13. — *Pholegynium sorrentinus*, female.

Fig. 9. Gnathosoma and tritosternum, ventral. — Fig. 10, Tarsus I, distal portion. — Fig. 11, Chelicera. — Fig. 12, Sternum-genital region. — Fig. 13, Idiosoma, ventral; outline of dorsal shield indicated by broken line.

**Trachytes** group.

Trachytoid. Idiosoma pyriform in outline. Dorsal marginal shields entire. Epigynial shield (fig. 2) trapezoidal; extending anteriorly to level of sternal setae III; distinctly articulated to venter. Large ventrianal and metapodal shields present, covering most of ventral opisthosoma. Palps 5-segmented. Corniculi short, not extending to distal margins of palp femur.

Male with femoral spine on leg II. Final nymph with dorsal shield pattern similar to that of protonymph.
To the group diagnosis the following notes on *Trachytes* may be added.

With well developed vertex which may bear laterally projecting, ribbed extensions of the adhering nymphal exuvium (normally lacking in several species). Metasternal shields elongate, flanking epigynial shield; bearing one or two pairs of setae. Tarsi I usually with small claws. All legs with femoral teeth. Fixed digit of chelicera with elongate, hyaline, terminal appendage. Male genital aperture at level of coxae IV. Final nymph with perianal disc. Holartic.

The above diagnosis and notes are based on the review of *Trachytes* by Berlese (1914) and on study of specimens of three European species and an extensive series of undescribed North American species. The new synonymies given in the following list are not based on examination of type specimens and should be regarded as extremely tentative.

*Trachytes* Michael, 1894.
Type species: *Trachynotus pyriformis* Kramer, 1876, by O. D.

*Trachynotus* Kramer, 1876, nom. praecoc.
  *Arch. Naturg.* 42 (1) : 74.
Type species: *Trachynotus pyriformis* Kramer, 1876, by S. D. of Michael (1894).

*Trachytes* pyriformis (Kramer), 1876.
  *Arch. Naturg.* 42 (1) : 80.

*Trachytes* inermis Tragärhdh, 1910.

*Trachytes* aegrota var. *inermis*.

*Trachytes* lamda Berlese, 1904.
  *Redia* I (2) : 272.

*Trachytes* minima Tragärhdh, 1910.

*Trachytes* *pi* var. *pauperior* Berlese, 1914.
  *Redia* X (1) : 135. New Synonymy.

*Trachytes* montanus Willmann, 1953.

*Trachytes* mystacinus Berlese, 1910.
  *Redia* VI (2) : 377.

*Trachytes* *pi* Berlese, 1910.
  *Redia* VI (2) : 245.
Trachytes tuberifer Berlese, 1914.
Redia X (1) : 135.

Species Inquirendae.

Gamasus lagenarius Duges, 1834.

Trachytes aegrota (Koch), 1841.
Celaeno aegrota.

Oudemans (1936) regarded Gamasus lagenarius as a member of Cosmolaelaps. Berlese (1887) treated G. lagenarius Duges sensu Megnin, 1876, as a member of Trachytes. I have seen both Duges’ and Megnin’s descriptions and am forced to regard the form or forms they dealt with as unrecognizable. Koch’s figure of Celaeno aegrota indicates that his form is a Trachytes but the species is also unrecognizable. Trachytes? sumatrensis Vitzthum, 1921, was transferred to Dinychus Kramer by Vitzthum (1931). Trachytes? austeni Hirst, 1923, is also a member of the Prodinychus-Dinychus group but as only the final nymph is known I am unable to place it in its proper genus.

The recent classifications of Camin (1953) and Evans (1957) have indicated a close affinity between the genera Polyaspinus and Trachytes. Comparison of the characters listed for these genera in this paper reveals many differences, however, and it is possible that the degree of relationship has been over-exaggerated. Of particular interest is the difference in dorsal shield patterns and it is primarily upon this difference that the separation of these genera into different groups is based.

The placement of Trachytes as the sole representative of its generic group is due to a lack of detailed knowledge of those mites to which Trachytes may be closely related. The body shape, dorsal shield pattern, sclerotisation of the venter and leg structure of this genus indicate possible affinity with the Eutrachytes group and Trachytes should perhaps be regarded as a Holartic representative of an essentially tropical group.

Iphidinychus group.

Trachytoid. Idiosoma pointed anteriorly, rounded posteriorly; with sides parallel. Epigynial shield (fig. 16) trapezoidal; situated between and behind coxae IV; distinctly hinged to venter. Metapodial and ventrianal shields present. Palps 3-segmented. Corniculi short, not extending to distal margins of palp femur.

To the group diagnosis the following notes on the genus Iphidinychus may be added.

Metasternal shields elongate, flanking epigynial shield. Sternal shield unornamented. Tarsi I lacking claws, pretarsi and caruncles. Leg setae simple ventrally;

*Iphidinychus* Berlese, 1913.

*Redia* IX (1) : 19.

Type species: *Epicroseius (Iphidinychus) manicatus* Berlese, 1913, *loc. cit.*, by Monotypy.

*Iphidinychus* was erected as a subgenus of the liroaspid genus *Epicroseius*. Examination of *Berlese’s* figures (1913) of the female of *I. manicatus* and study of females and nymphs of one undescribed species and a single female of another undescribed form (all from North America) clearly indicate that *Iphidinychus* is a uropodid with affinities to the genera of the "trachytoid" type. *Berlese* (1916a) stated that this genus was a senior synonym of *Thinzercon* Halbert but later (1916c) changed his mind. *Iphidinychus* is possibly related to certain undescribed forms which show a gradation from a trachytid to a prodinychid condition.

**Polyaspinus** group.

Trachytoid. Idiosoma pointed anteriorly, rounded posteriorly; with sides parallel. Dorsal marginal shields fragmented (fig. 15). Epigynial shield (fig. 14) round or oval anteriorly, truncate posteriorly; reaching anteriorly to level between sternal setae II and III; distinctly hinged to venter. Metapodal and adanal areas well defined. Palps 5-segmented. Corniculi short, not extending to distal margins of palp femur. Male with femoral spine on leg II.

The *Polyaspinus* group furnishes a good example of one of the problems that arise when more than one stage of a uropodine mite is available for study. In terms of adult morphology the genera included in the *Polyaspinus* group form a compact assemblage with many characters in common which is separated by a distinct gap from other "trachytoid" genera. When the final nymphs are considered this seemingly tightly knit group falls apart. The dorsal shield pattern of the final nymph of *Polyaspinus* is totally different from that of *Dithinozercon* and *Apionoseius* (see descriptions below). Which of these *Stadiummerkmairen* are the more reliable indicators of relationship? Until more extensive studies of all developmental stages of all genera can be made I have felt it most advantageous to base my classification on the structure of the adults. Such a course does not seem unreasonable in light or our present knowledge of these mites.

**Polyaspinus** Berlese.

Posterior dorsal shield with median ridge. Coxae I notched for reception of posterior corners of tritosternal base. Epigynial shield broadly rounded anteriorly. Metasternal shields minute, placed at posterior corners of genital aperture. Tarsi I
with strong claws. Leg setae simple ventrally; broad, feathered dorsally. Female with ventral femoral spine on leg I. Male genital aperture between level of coxae III and IV. Final nymph lacking perianal ring; with large median dorsal shield and a small posterior dorsal shield; marginal shields as in adult. Holartic.

The above diagnosis and notes are based on study of females of Polyaspinus cylindricus Berlese and of various stages of P. higginsi Camin and three undescribed species from Alaska and Oregon. The male of P. cylindricus is apparently unknown; the male trachytid described and figured by TURK and TURK (1952) is a member of the genus Apionoseius.

Polyaspinus Berlese, 1916.
Redia XII (1) : 134.
Type: Polyaspinus cylindricus Berlese, 1916, by O. D. and Monotypy.

Polyaspinus cylindricus Berlese, 1916.
Redia XII (1) : 134.

Polyaspinus higginsi Camin, 1954.
Bull. Chicago Acad. Sci. 10 (3) : 35.

Dithinozercon Berlese.

Female with three posterior dorsal shields (fig. 15); male with a single shield. Anterior margin of sternal shield with "pi"-shaped apodeme (fig. 14). Epigynial shield pointed oval anteriorly (fig. 14). Metasternal shields elongate (fig. 14). Tarsi I with small pretarsi and strong claws; caruncles lacking. Leg setae simple ventrally; broad, feathered dorsally. Male genital aperture between level of coxae III and IV. Final nymph with perianal disc; dorsum covered by single shield (fused vertical, median dorsal, posterior and marginals). Holartic.

Dithinozercon Berlese, 1916.
Redia XII (2) : 295.
Type: Thinozercon (Dithinozercon) halberti Berlese, 1916.
by O. D. and Monotypy.

Dithinozercon halberti (Berlese), 1916.
Thinozercon (Dithinozercon) halberti.
Redia XII (2) : 295.

Dithinozercon infirmus (Berlese), 1887, comb. nov.
Celaeno infirma.

The preceding treatment of Dithinozercon is based on an extensive series of D. halberti (adults and nymphs) from Ontario and Maryland, a small series of an
undescribed species from New Mexico and a single female of *D. infirmus* from Italy. The specimens of *D. halberti* were determined by comparison with a figure of the holotype male in Berlese's workbook. HirsCHMANN (1957) stated indirectly and without further explanation that *D. halberti* and *Apionoseius lagenaeformis* Berlese were synonymous with *D. infirmus* (which he calls *Uroseius* (*Apionoseius*) *infirmus*). While the genus *Dithinozercon* is of questionable validity (see remarks under *Apionoseius*) there is little question that their type species are specifically distinct. This is based upon study of nymphs and adults (male only in *A. lagenaeformis*) of both forms. As to *D. halberti* and *D. infirmus* it would appear that synonymy of these names is premature. The differences (body size, nature of dorsal and ventral integumental pebbling) are not of the order of magnitude commonly associated (in acarology) with the attainment of the species level of distinctness. It should be remembered, however, that in the Acarina we are not yet characterizing species but, rather, morphological types and secondly, degree of difference is not a satisfactory species criterion in dealing with allopatric populations (as in the present case) (Brown and Wilson, 1956).

*Apionoseius* Berlese.

Both sexes with single posterior dorsal shield. Sternal shield with "pi" shaped apodeme. Epigynial shield oval anteriorly. Metasternals? Tarsi I with small pretarsi and strong claws; caruncle lacking. Leg setae generally simple. Male genital aperture between coxae IV or between III and IV. Final nymph generally similar to that of *Dithinozercon*. Holartic and Australian.

The proceeding is based upon a study of *Apionoseius lagenaeformis* (a male and several final nymphs) collected by Reed (1958) and examination of the descriptions of all the species included below. All members of the genus are badly in need of redescription. Such information may result in the placement of *Dithinozercon* as a subgenus or an outright synonym of *Apionoseius*.

*Apionoseius* Berlese, 1904.

*Redia* II (1) : 21.

Type species: *Trachytes (?) lagenaeformis* Berlese, 1904, by O. D. and Monotypy.

*Apionoseius lagenaeformis* (Berlese), 1904.

*Trachytes (?) lagenaeformis*.

*Redia* II (1) : 21.

*Apionoseius australanus* (G. Canestrini), 1884.

*Celaeno australiana*.


*Apionoseius dubiosus* Vitzthum, 1925.

*Arch. Naturg. 90, Abt. A (10) : 12.*
Apionoseius elongatus (Kramer), 1876 comb. nov.

Trachynotus elongatus.
Arch. Naturg. 42 (1) : 81.

Apionoseius australiansus and A. elongatus are known only from the final nymphs. The latter species may be a Dithinozercon; Kramer’s description and figure do not permit any certainty in placement.

Hirschmann (1957) has placed Apionoseius as a subgenus of Uroseius Berlese. As indicated above, however, his concept of Apionoseius is based on Dithinozercon infirmus and not A. lagenaefomis, the type of the genus. Judging from the descriptions and specimens (adults and nymphs) of Uroseius which I have seen this genus is not closely related to Dithinozercon but is quite distinctive among Uropodoidea.

Discourella group.

Trachytoid. Idiosoma egg-shaped in outline. Dorsal marginal shields entire (fig. 18). Epigynial shield reaching to anterior margin of sternal shield, occupying most of intercoxal region (fig. 17); distinctly articulated to venter. Palps 5-segmented. Corniculi short, not extending to distal margins of palp femur.

To the group diagnosis the following notes on Discourella may be added.

Marginal setae long, flagelliform; anterior marginals borne on short projections. Metasternal shields minute; placed at posterior corners of genital aperture. Well developed metapodal lines present. Tarsus I with small claws and pretarsus. Legs short. Femora of all legs provided with ventral teeth. Final nymph lacking perianal disc; with dorsal shields similar to adult (excepting that posterior shields are fused with the median and marginal shields); femoral teeth weakly developed. Males unknown, Holarctic.

The above diagnosis and notes are based on figures in Berlese’s work book (p. 420), Willmann’s (1951) description and figures of D. eucoma and a series of females and nymphs of a North American species (D. modesta?).

Discourella Berlese, 1910.

Redia VI (2) : 378.

Type species: Trachyuropoda (Discourella) discopomoides.

Berlese, 1910 (= Celaeno modesta Leonardi, 1899) by O. D.

Trichodinychura Willmann, 1951 [Willman, 1953].


Type species Trichodinychura eucoma Willmann, 1951, by O. D. and Monotypy.
Discourella modesta (Leonardi), 1899.

Celaeno modesta.

in R. Canestrini: Prospetto dell' Acarofauna italiana. viii : 924.

Trachyuropoda (Janetiella) bella Berlese, 1905 [Berlese, 1916b].

Redia II (2) : 235.

Discopoma puella Berlese, 1910 [Berlese, work book, p. 420].

Redia VI (2) : 244.

Trachyuropoda (Discourella) discopomoides Berlese, 1910.

[Berlese, 1916b].

Redia VI (2) : 378.

Discourella cosmogyna (Berlese), 1910.

Trachyuropoda (Discourella) cosmogyna.

Redia VI (2) : 378.

Discourella eucoma (Willmann), 1951.

Trichodinychura eucoma.


The status of the species in Discourella is thoroughly confused. Synonymies are according to the authorities cited and the inclusion of D. cosmogyna is based on Berlese's original placement.

The Discourella group, as here defined, is monogeneric. The genera Apionoseius Berlese, 1904, and Poliaspidella Berlese, 1910, were included in this group by Tragardh (1941) and Uroseius Berlese, 1888, was added by Camin (1953). Apionoseius is regarded as a member of the Polyaspinus group in this paper. Examination of figures of Poliaspidella berenicea in Berlese's work book (p. 431) reveals that, while possessing a broad-based tritosternum interposed between coxae I, the idiosoma of this mite is characteristic of the eutrachytid group. Members of the genus Uroseius also possess a broad based tritosternum but in no other way resemble Discourella (or any of the other genera treated in this paper).

Some observations on a member of this genus are of interest here. In cleared, mounted specimens of Discourella ? modesta coxae I are wide-spread and the broad-based tritosternum is fully exposed (the trachytoid condition). Observations on living specimens revealed that coxae I were also spread apart when the mite walked about. When disturbed, however, these mites completely opposed the first coxae, thus concealing the tritosternum and gnathosoma (the uropodoid condition). Such ambivalence does not aid the cause of a trachytoid-uropodoid separation based on the disposition of coxae I.
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KEY TO THE Holarctic genera of Uropodidae which lack FOVAE PEDALES.
(based on females).

The artificial limits indicated above are imposed because the alternatives would be to key only the "trachytoid" genera (which I regard as impractical) or to key all the uropodid genera (which I find impossible).

1. Tritosternal base narrow and partially concealed by the contiguous posteromedial margins of coxae I. ................................................................. .................. 2
   Tritosternal base broad, not concealed by the widespread coxae I (Discourella has a broad-based tritosternum but is capable of completely opposing coxae I). ........... 4

2. Peritreme-bearing humeral projections present. Marginal setae greatly elongated; legs, very long. .................................................. Clausiadinychus Selinick ¹
   Peritreme-bearing humeral projections absent. Marginal setae short; legs normal. .................. Prodinychus group 3

3. Posterior region of dorsal shield with a transverse row of four strong, pilose or serrated setae. .................................................. Dinychus Kramer
   Posterior region of dorsal shield without a transverse row of strong, pilose or serrated setae ................................. Prodinychus Berlese

¹ I have recently seen specimens of this distinctive genus from Florida. Although properly a member of the Neotropical fauna it is included here for the benefit of North American workers.
4. Palp four-segmented; well defined perigenital rim present (fig. 3): legs I without claws. 

5. Palp five-segmented. Well defined perigenital rim absent. Legs I with or without claws.

6. Metapodal shields fused medially. Epigynial shield long, narrow; reaching to level of posterior margins of coxae II. 

7. Metapodal shields not fused medially. Epigynial shield about as broad as long; not reaching beyond anterior margin of coxae III.


10. Epigynial shield not extending beyond level of sternal setae II.

11. Tarsus I without claws.


13. With three posterior dorsal shields.

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Since the completion of this paper the description of Caminella peraphora Krantz and Ainscough, 1960 has been published. This species is one that strains the credibility of trachytid-prodynychid separation to the breaking point.

Caminella group.

Trachytoid but with well developed peritreme-bearing humeral projections and with the sclerotized cuticle of the anterior endopodal and parapodal continuous. Vertex setae lacking. Dorsal marginal shield trapezoidal, with anterior margin at...
level of anterior edge of coxae IV; posterior margin well behind fourth coxae; flanked by elongate metasternal shields. Male genital aperture at level of coxae IV. Tarsus I lacking claws. Femur II of male without spur. Male and final nymph lacking posterior dorsal shield.

Caminella Krantz and Ainscough, 1960.


Krantz and Ainscough erected the subfamily Caminellinae for their mite and included it in the Trachytidae with the Trachytinae and the Discourellinae. This placement was based on the characterizations of the Trachytidae and included subfamilies made by me in an earlier draft of the present paper. The maintenance of the Trachytidae was a deference to tradition that I can no longer justify, hence the present downgrading of the Caminellinae.

I have seen undescribed uropodids from the American tropics that share many of the characters of *Caminella*. As these and other members of the vast uropodoid fauna of tropical regions are made known we should advance rapidly toward a sounder classification of these mites. My guess is that this future classification will bear little resemblance to the ones I have criticized in the preceding pages or to my own.

REFERENCES CITED


Trägårdh (I.), 1943. — Further contributions towards the comparative morphology of the Mesostigmata. IV. *Ent. Tidskrift*. 64 (1/2) : 91-III.


Vitzthum (H. G.), 1931. — Acari. in Kukenthal’s Handbuch der Zoologie III (2) : i-160.
