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Previous volumes (2010-2017): 250 € / year (4 issues)
Acarologia, CBGP, CS 30016, 34988 MONTFERRIER-sur-LEZ Cedex, France
ISSN 0044-586X (print), ISSN 2107-7207 (electronic)

The digitalization of Acarologia papers prior to 2000 was supported by Agropolis Fondation under the reference ID 1500-024 through the « Investissements d’avenir » programme (Labex Agro: ANR-10-LABX-0001-01)

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HYBALICIDAE, A NEW FAMILY OF ENDEOSTIGMATIC MITES
(ACARI : TROMBIDIFORMES)

BY

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ABSTRACT

Notes on the new family Hybalicidae are given together with descriptions of the genera Hybalicus Berlese (1913) and Grandjeanicus n.g. on which it is based. The new species included are Hybalicus arboriger, H. spathatus, H. dorysetatus and Grandjeanicus uncus.

INTRODUCTION

In 1905 Berlese described the species Alicius ornatus and in 1913 when he described the species Hybalicus flabelliger he transferred the former species to the genus Hybalicus, allocating it as the type species. In 1916 Berlese published a brief description of a third species, viz. H. piliger. Judging from Berlese's paper, H. ornatus exhibits all the essential characteristics of the genus Lordalychus such as the presence of 2 pairs of propodosomal sensillae, the presence of 2 claws and an empodium on tarsus I, and the prominent integumental tubercles. For the reasons cited above I now suggest that the species H. ornatus be transferred to the genus Lordalychus and that H. flabelliger be considered type species of the genus Hybalicus. Thor & Willmann (1941) briefly summarised the 3 above-mentioned species and placed them in the family Pachygnathidae (now suppressed in favour of Alycidae). In 1944 Womersley described and illustrated the species H. gibbosus, which in my opinion belongs to the genus Terpnacarus on account of the following: the presence of a single spatulate solenidion on the palpal tarsus; the elongated claws and empodia present on all the tarsi and the shape of the body setae. In 1939 when he introduced the genus Lordalychus (type species L. peraltus) Grandjean established the family Lordalychidae to accommodate this genus as well as the genus Hybalicus. During the course of this study however it became evident that the genus Hybalicus and the new genus Grandjeanicus exhibit some charac-
teristics e.g. the chaetotaxy of the propodosoma, the shape of the body setae, hypognathum, chelicerae and pedipalpi which are atypical for the family Lordalychidae and I hereby introduce the family Hybalicidae to accommodate the latter two genera.

The type material of the new species described in this paper is deposited in the collections of the Institute for Zoological Research, Potchefstroom University and the Acarology Section of the Plant Protection Research Institute, Dept. of Agricultural Technical Services, Pretoria.

Hybalicidae, new family

Mites of this family are relatively small, 200-300 µm in length with an off-white to yellowish colour. The propodosoma bears one pair of sensillae and four pairs of setae. The nomenclature as proposed by van der Hammen (1969) is used for the propodosomal setae. This nomenclature is based on the phenomenon (in the Endeostigmata) of having a maximum of six setae (sensillae included) and is used for descriptive purposes only and not implying homology. Setae \( x_p \) are lacking and a pair of proper setae is present in the position of sensillae \( le \). The propodosoma terminates in a prominent nasso but lacks a differentiated sensory area. Eyes are present or lacking. The 16-18 pairs of hysterosomal setae are plumose or arborescent and transversally arranged. The palpi consist of 6 segments, palpal tarsus terminally provided with sensory setae. The chelicerae are relatively short and chelate-dentate. Hypognathum (venter of gnathosoma) provided with 5-6 pairs of setae and prominent rutella (ectomalae). The coxae are adjacent and coxae III and IV are partially fused. Femur IV is always completely divided whilst the others are sometimes divided. Ambulacra II-IV comprise a vestigial apotele, two unequal claws and a clawlike empodium. Tarsus I with a single empodial claw or with a minute empodial claw together with a styliform (probably sensory) type of seta (Hybalicus); tarsus I lacking true claws or empodia (Grandjeanicus).

The adult female possesses 7-9 pairs of genital setae, 3-5 pairs of para-genital setae, 2-9 pairs of internal setae and 3 pairs of genital papillae. The integument is striate with fine tubercles (Hybalicus) or punctulate (Grandjeanicus).

Key to the South African genera and species of the Hybalicidae

1. Tarsus I without claws or empodia, with many sensory setae inter alia an extremely long pilose seta
   - Tarsus I with a single empodial claw or with a minute empodial claw together with a styliform type of seta
     Hybalicus ucns n.g., n.sp.
   - H. arboriger n.sp.
2. Body setae arborescent; with eyes; nasso relatively small.
   - Body setae plumose (broadly spatulate to globose); nasso large; without eyes.
   - H. spathatus n.sp.
3. Body setae plumose (broadly spatulate to globose); hypognathum with six pairs of setae; female with seven pairs of genital setae and two pairs of internal setae.
   - H. dorysetatus n.sp.
   - Body setae plumose (broadly spatulate); hypognathum with five pairs of setae; female with nine pairs of genital setae and eight pairs of internal setae.

Genus Hybalicus Berlese, 1913

The main characteristics of this genus are: body setae arborescent or plumose (spatulate to globose); tarsus I with a single empodial claw or with a minute claw together with a styliform seta; integument finely striate with numerous tubercles.

*Type species*: *Hybalicus flabelliger* Berlese, 1913

*Hybalicus arboriger* n. sp. figs. 1-16

This species is closely related to *H. flabelliger* but can be differentiated from the latter on account of the characteristics of the palp tarsus and the body setae.

Female (figs. 1-12): Dimensions: length of body (incl. gnathosoma) 276-299 \( \mu m \); length of body (excl. gnathosoma) 189-209 \( \mu m \); breadth of body 209-213 \( \mu m \).

Dorsum (figs. 1-2): The propodosoma bears five pairs of setae, namely setae ro, le, xa and in as well as sensillae bo. Setae xa are more slender than the others whilst setae ro and in are slightly smaller than setae le. Sensillae bo are filamentous and finely ciliate, ca. 110 \( \mu m \) long and situated 22 \( \mu m \) apart. One pair of eyes is situated lateral on the propodosoma and is finely striate. The integument is finely striate and as illustrated in figure 1, tuberculous areas appear on the propodosoma. The naso is relatively small, pointed and situated directly anterior to seta ro. The hysterosoma is saciform, almost as deep as it is broad and bears 18 pairs of arborescent setae arranged in 7 transverse rows (figs. 1-2). The hysterosomal integument is uniformly tuberculate and striate.

Venter (figs. 3-4): The relatively small genital pore is surrounded by 7 pairs of pilose genital setae and 5 pairs of para-genital setae. Three pairs of genital papillae and 5 pairs of internal setae which are relatively long, nude and situated on prominent protuberances are present (fig. 4). The anal covers bear 4 setae each.

Gnathosoma (figs. 5-7): The setal count for the 6 pedipalpal segments (fig. 5) is: 0 — 0 — I — I — 2 — II (5). Four eupathidia are situated at the tip of the tarsus while a slender solenidion is situated medio-dorsally. Eight of the 11 proper setae on the palptarsus are pilose whilst the remaining 3 are bifurcate distally. The chelicerae (fig. 6) are strong chelate-dentate and each bears 2 setae in an antero-dorsal position. The hypognathum (fig. 7) bears 6 pairs of setae. Setae h1 and h3 are nude while setae h2 are bifurcate. Setae h4, h5 and h6 are pilose. A pointed protuberance is present between setae h2 and h3. Prominent rutella are present and each terminates in 5 denticles. The labrum-epipharynx (fig. 7) is pointed and projects beyond the anterior margin of the hypognathum.

Legs (figs. 8-12): The legs are of moderate length and all the femora are completely divided. With the sensory setae (solenidia) in parentheses the formulae for the leg setae are: tarsi 5 (t4) — 10 (3) — 15 — 16; tibiae 2 (g) — 4 (2) — 3 (2) — 6 (4); genua 3 (t) — 3 (t) — 2 (t) — 5 (t); femora 6 — 6 — 4 — 4; trochanters 0 — 0 — 2 — 0; coxae I — I — 4 — 7. Tarsus I (fig. 8) bears 12 mucronate solenidia, one long, obtuse solenidion and one microsensory seta. Tibia I (fig. 9) bears one obtuse solenidion and 8 mucronate solenidia. Tarsus II (fig. 10) bears 2 obtuse and one mucronate solenidia while tibiae II and III each bear 2 adjacent, obtuse solenidia. Tibia IV (fig. 11) bears 4 adjacent, obtuse solenidia whilst one of the proper setae is almost nude. Tarsus I
FIGS. 1-8: *Hybalicus arboriger* n. sp., female. 1) Dorsum; 2) Dorsal seta; 3) Venter; 4) Genital opening; 5) Palp; 6) Chelicera; 7) Hypognathum; 8) Tarsus I.
(fig. 8) terminates in a minute empodial claw as well as a rodlike, probably sensory type of seta. Tarsi II, III and IV (fig. 12) each bear 2 true claws and a large empodial claw. Both claws and empodium are provided with fine rays.

**TRITONYMPH** (fig. 13): The dimensions of the tritonymph are: length of body (incl. gnathosoma) 249-289 µm; length of body (excl. gnathosoma) 199-203 µm; breadth of body 103-130 µm.

The tritonymph is similar to the adult, differing on only a few respects. The genital pore (fig. 13) bears 5 pairs of genital setae, 3 pairs of para-genital setae and 3 pairs of papillae.

**DEUTONYMPH** (fig. 14): The dimensions of the deutonymph are: length of body (incl. gnathosoma) 220-246 µm; length of body (excl. gnathosoma) 165-181 µm; breadth of body 106-126 µm.

The propodosoma resembles that of the adult but the hysterosoma bears only 15 pairs of arborescent setae. The genital opening (fig. 14) is provided with 3 pairs of genital setae and one pair of para-genital setae. Two pairs of genital papillae are present. Setae h5 are absent from the hypognathum. With the solenidia in parentheses the setal formulae for the leg setae are: tarsi 4 (13) - 15 (3) - 14 - 13; tibiae 2 (8) - 4 (2) - 3 (2) - 4 (2); genua 3 (1) - 3 (1) - 2 (1) - 2 (1); femora 5 - 3 - 2 - 2; trochanters 0 - 0 - 1 - 0 and coxae I - I - 2 - 3.

**PROTONYMPH** (figs. 15-16): The dimensions of the protonymph are: length of body (incl. gnathosoma) 193-206 µm; length of body (excl. gnathosoma) 143-149 µm; breadth of body 100-113 µm.

The hysterosoma is provided with 12 pairs of setae. One pair of genital setae and one pair of genital papillae are present (fig. 15). The hypognathum is similar to that of the deutonymph. With the solenidia in parentheses the setal formulae for the leg setae are: tarsi 4 (11) - 13 (2) - 12 - 7; tibiae 2 (8) - 4 (2) - 3 (2) - 1; genua 3 (1) - 3 (1) - 2 (1) - 0; femora 3 - 3 - 2 - 0; trochanters 0 - 0 - 1 - 0; coxae I - I - 2 - 1. All femora are complete.

**MATERIAL STUDIED:** ♀ — Holotype, 3 ♀ — paratypes, 2 paratype tritonymphae, 3 paratype deutonymphae and 4 paratype protonymphae from dry soil covered with furrow-weed (Cynodon dactylon), Potchefstroom, Tvl., 1969-70, P. D. Theron.

**Hybalicus spathatus** n. sp.,

**Figs. 17-29**

**FEMALE** (figs. 17-29): Dimensions: length of body (incl. gnathosoma) 213-233 µm; length of body (excl. gnathosoma) 149-189 µm; breadth of body 103-113 µm.

**Dorsum** (figs. 17-18): Sensillae bo are filamentous, relatively densely ciliated, 50 µm in length and situated 16 µm apart. Setae le are globose while setae xa and in are spatulate.

Setae ro are slender and situated on a very prominent naso (fig. 17). There are no median or lateral eyes. One pair of supracoxal setae is present dorsal to the palpal coxae. The propodosomal integument is finely striated and as illustrated in figure 17 the middle portion is provided with numerous tubercles. The sacciform hysterosoma bears 17 pairs of globose setae (figs. 17-18) arranged in 7 transverse rows. The hysterosomal integument is finely striate and tuberculate.

**Venter** (figs. 19-20): The genital covers bear 7 pairs of setae and are flanked by 3 pairs of para-genitals. Three pairs of genital papillae and 2 pairs of small nude internal setae are present. The integument between the genital opening and coxae IV and between the coxae are provided with smooth striae, while the rest resembles that of the dorsum.

Gnathosoma (figs. 21-23): The pedipalpi have the same setal formulae as those of *H. arboriger*. The posteriorly situated tarsal solenidion is obtuse (fig. 21). The chelicerae (fig. 22) are strong and chelate-dentate. The fixed digit bears 4 denticles and the movable digit bears 3. Six pairs of setae are present on the hypognathum (fig. 23). Setae *h1* are plumose, setae *h2* small and nude and setae *h3-*h*6* pilose. The rutella are strong and each terminates in 6 denticles.

Legs (figs. 24-29): Femora I, III and IV are completely divided. With the solenidia in parentheses the setal formulae are: tarsi 16 (5) — 15 (3) — 13 — 18; tibiae 7 (5) — 5 (2) — 4 (2) — 4 (2).
genua \(3\) (2) — 3 — 2 — 4 (2) ; femora 5 — 3 — 3 — 4 ; trochanters 0 — 0 — 2 — 0 ; coxae I — I — 3 — 5. Tarsus I (fig. 24) bears 2 long and 2 short solenidia as well as a peculiar shaped sensory seta (famulus) (fig. 25). Tibia and genu I (fig. 26) bear 5 and 2 obtuse solenidia respectively. Tibia II (fig. 27), tibia III (fig. 28) and genu IV (fig. 29) bear 2 obtuse solenidia each whilst tibia IV bears one obtuse solenidion and one strong nude seta. Tarsus I terminates in a single empodial claw, while the other tarsi on the contrary each bear 2 claws and a clawlike empodium.

**Material studied:**

\(♀\) — Holotype and \(♀\) — paratype from dry soil covered with furrow-weed (*Cynodon dactylon*), Potchefstroom, Tvl., XII. 1969, P. D. Theron.

**Hybalicus dorysetatus** n. sp.

Figs. 30-46 and pls. A-B

**Female** (figs. 30-42 and pls. A-B). Dimensions: length of body (incl. gnathosoma) 249-269 \(\mu\)m; length of body (excl. gnathosoma) 201-229 \(\mu\)m; breadth of body 126-149 \(\mu\)m.

**Plates A-B :** *Hybalicus dorysetatus* n. sp., female. A) Hysterosomal integument \(×\) 12 000; B) Hysterosomal setae \(×\) 6 250

**Dorsum** (fig. 30 and pls. A-B): Sensillae \(bo\) are filamentous, finely ciliate, 65 \(\mu\)m long and situated 45 \(\mu\)m apart. The propodosomal setae are plumose and differ from the hysterosomal setae by being more tapered. Setae \(le\) and \(in\) are more robust than \(ro\) and \(xa\). Setae \(ro\) are situated on the large, overlapping naso. Eyes are absent. The integument is finely striate and covered with numerous tubercles (fig. 30 and pl. A). The 16 pairs of hysterosomal setae (pl. B) are plumose and broadly spatulate.

**Venter** (figs. 31-32): The relatively large genital pore is flanked by 4 pairs of para-genital setae and each genital cover bears a row of 9 setae. Internal to the genital covers 3 pairs of papillae and 8 pairs of pilose setae are present. The ventral integument is similar to that of the dorsum.
Gnathosoma (figs. 33-35) : The palpal tarsus (fig. 33) bears 14 proper setae of which 3 are slender and bifurcate distally while the remaining 11 are pilose. Four mucronate eupathidia are present at the tip of the tarsus while an obtuse solenidion is situated more proximally. The chelicerae (fig. 34) are strong and chelate-dentate. The hypognathum (fig. 35) bears 5 pairs of setae. The rutella are relatively long and each terminates in 6 denticles. The labrum-epipharynx does not project beyond the anterior margin of the hypognathum.

Legs (figs. 36-42) : Femora III and IV are completely divided, whilst femur I is partly and femur II undivided. With the sensory setae in parentheses the formulae for the leg setae are:
- tarsi: 20 (5) - 18 (3) - 16 - 21 ;
- tibiae: 10 (8) - 5 (2) - 3 (2) - 6 (3) ;
- genua: 5 (2) - 3 (2) - 2 (1) - 5 (4) ;
- femora: 9 - 4 - 4 - 5 ;
- trochanters: 0 - 0 - 2 - 0 and coxae: 1 - 1 - 3 - 8.
A peculiar shaped sensory seta (famulus) is present on tarsus I (fig. 36). The rest of the solenidia differ in size but are all obtuse. One of the proper setae on tibia IV (fig. 40) is strong and nude. Tarsus I (fig. 41) terminates in a single, rayed empodial claw. Tarsi II, III and IV terminate in two rayed, uneven claws and a clawlike empodium which is smaller than the true claws (fig. 42).

Tritonymph (fig. 43-44) : Dimensions: length of body (incl. gnathosoma) 181-192 µm ; length of body (excl. gnathosoma) 163-171 µm ; breadth of body 93-95 µm.

The propodosomal setae, especially le and in are less prominent than those of the female (fig. 43). The hysterosoma is slightly constricted just behind coxae IV and bears 15 pairs of setae. The genital opening (fig. 44) is provided with 3 pairs of papillae and 7 pairs of setae and is flanked by 2 pairs of para-genitals. The detail of the gnathosoma resembles that of the female.

Deutonymph (fig. 45-46) : Dimensions: length of body (incl. gnathosoma) 151-154 µm ; length of body (excl. gnathosoma) 132-137 µm ; breadth of body 65-71 µm.

The propodosoma resembles that of the tritonymph except for sensillae bo (fig. 45) which are densely ciliate distally. The integument is coarser in appearance than that of the tritonymph or female. The hysterosomal setae are shorter than those of the female. Four pairs of genital setae and 2 pairs of papillae are present. The 2 deutonymph paratypes were somewhat crumpled up with the result that the detail of the legs and hypognathum could not be studied. The palpal tarsus (fig. 46) bears 8 proper setae, one large obtuse solenidion and terminally 3 mucronate eupathidia.

Material studied

Genus Grandjeanicus n. g.

This genus can be recognised by the following characteristics: tarsus I is relatively short and broad, without claws and empodia and bears many sensory setae, inter alia a long, ciliated, whiplike seta; the body setae are plumose and spatulate; propodosoma with one pair of sensillae and 4 pairs of setae; eyes absent; integument finely striate and punctulate.
Figs. 47-54: Grandjeanicus unicus n. sp., female 47) Propodosoma; 48) Integument; 49) Hysterosomal seta; 50) Genital opening; 51) Palp; 52) Chelicera; 53) Hypognathum. 54) Rutellum.
Type species: Grandjeanicus uncus n. g., n. sp.

**Grandjeanicus uncus** n. g., n. sp.

**FEMALE** (figs. 47-57)

*Dorsum* (figs. 47-49): The holotype and paratype females carried 6 eggs each with the result that the hysterosoma of both were damaged and unsuitable for study. The propodosoma (fig. 47) bears 4 pairs of densely plumose setae, viz. setae ro, le, xa and in as well as a pair of sensillae (bo) which is filamentous, finely ciliate, 75 µm long and situated 43 µm apart. Setae ro are situated on a prominent naso. Eyes are absent. The propodosomal integument is covered with fine, smooth striae, whereas the hysterosomal striae are punctulate (fig. 48). The hysterosomal setae (fig. 49) are relatively long, densely plumose and broadening distally.

*Venter* (fig. 50): The genital covers bear 8 pairs of setae and are flanked by 5 pairs of paragenitals. Nine pairs of long, pilose setae and 3 pairs of papillae are present internally. The anal pore is relatively large, adjacent to the genital opening, bears 3 pairs of setae and is flanked by 3 pairs of para-anal setae.

*Gnathosoma* (figs. 51-54): The palpal tarsus (fig. 51) bears 12 proper setae of which 9 are pilose whilst the remaining 3 are nude and bifurcate distally, one mucronate solenidion and at the palpal tip, 4 slightly branched (sensory?) setae. The chelicerae (fig. 52) are strong, chelate-dentate and each bears 2 setae in a antero-dorsal position. The hypognathum (fig. 53) bears 5 pairs of setae out see copy hI, h2 and h3 are slightly branched and are almost twice as small as setae h4 and h5. A pointed protuberance is present between setae h2 and h3. The ectomalae are strong and each terminates in 5 sclerotized denticles. A small papilliform protuberance (probably a chemoreceptor) is present dorsally on the shaft of each rutellum (fig. 54).

*Legs* (figs. 55-57): Femur IV is completely divided while the others are only partly divided. The legs are moderately covered with setae. With the solenidia in parentheses the formulae for the setae are: tarsi 6 (r8) — 26 (5) — 28 — 32; tibiae 3 (3) — 6 (2) — 4 (2) — 7 (4); genua 6 — 8 (2) — 5 (2) — 5 (4); femora 7 — 3 — 2 — 5; trochanters 0 — 0 — 2 — 0 and coxae I — 2 — 4 — 8. Tarsus I (fig. 55) is relatively short, without claws or empodia and bears 4 proper pilose setae, one nude seta, 17 differently shaped solenidia, one peculiar, clawlike solenidion and a very long, pilose (sensory?) seta. Tibia I (fig. 56) bears 3 mucronate solenidia. Tarsus II bears 2 obtuse and 3 mucronate solenidia while tibia II bears one obtuse and one mucronate solenidion. Genua II and III each bear 2 mucronate solenidia and tibia III bears one obtuse and one mucronate solenidion. Tibia and genu IV are both provided with one obtuse and 3 mucronate solenidia. Tarsi II, III and IV are each provided with 2 uneven claws and a large clawlike empodium (fig. 57).

**Protonymph** (figs. 58-62): Dimensions: length of body (incl. gnathosoma) 233 µm; length of body (excl. gnathosoma) 183 µm; breadth of body 116 µm.

The propodosoma bears the same number of setae as that of the female and the hysterosoma bears 11 pairs of plumose, lanceolate setae (fig. 58). The genital opening is provided with one pair of papillae and the genital covers bear one seta each. The hypognathum and chelicerae are identical to those of the female. One of the sensory setae at the tip of the palpal tarsus is nude and much smaller than the others (fig. 59). With the solenidia in parentheses the formulae for...
the leg setae are: tarsi 4 (8) — 12 (2) — 12 — 7; tibiae 3(3) — 5 (2) — 4 (1) — 1; genua 2 — 3 (2) — 2 (2) — 0; femora 1 — 3 — 2 — 0; trochanters 0 — 0 — 1 — 0 and coxae 3 — 1 — 1 — 2. The integument of leg IV is scaly (fig. 61). The empodia of legs II, III and IV are obviously more slender than those of the female (fig. 62).

Material studied

♀ — Holotype, ♀ — paratype and paratype protonymph from dry soil covered with furrowweed (Cynodon dactylon), Potchefstroom, Tvl., ii. 1968, P. D. Theron.

Acknowledgements

The author wishes to acknowledge the financial assistance given by the Department of Agricultural Technical Services and the C.S.I.R.

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