

TWO NEW UROPODINA SPECIES (ACARI: UROPODIDAE) FROM A *PINUS RADIATA* PLANTATION IN KENYA

JENŐ KONTSCHÁN

Plant Protection Institute, Centre for Agricultural Research, Hungarian Academy of Sciences
H-1525 Budapest, P.O. Box 102, Hungary; E-mail: kotschan.jeno@agrar.mta.hu

Two new Uropodina mite species are described and illustrated on the basis of specimens collected in a *Pinus radiata* D. Don plantation in Kenya. The first species, *Trichouropoda mahnerti* sp. n. differs from the other species in this genus on the basis of the setae association with oval pits on dorsal and ventral surface, the surface of genital shield and the setae length on the marginal shield. The second species *Rotundabaloghia (Circobaloghia) perreti* sp. n. differs from the other East African members of the subgenus *Circobaloghia* in the shape and sculptural pattern of genital shield and the positions of the ventral setae. New keys to the Eastern Afrotropical species of the subgenus *Circobaloghia* and genus *Trichouropoda* are given.

Key words: Acari, Uropodina, new species, *Pinus radiata* plantation, Kenya.

INTRODUCTION

Monterey pine (*Pinus radiata* D. Don) is one of the most often planted pine species in several regions of the world. The largest plantations of *P. radiata* can be found in Australia, New Zealand, Chile and Spain. In the Afrotropical region, large plantations are mainly present in South Africa (ca. 57000 ha), but smaller forests can be seen in other countries (e.g. Kenya) as well (MEAD 2013).

The soil dwelling mites of the *Pinus radiata* plantations have already been investigated by several authors. MIGLIORINI (2009) presented Oribatida records from three different forest types in Sardinia, including a mixed *Pinus radiata* and *Pinus pinaster* pineland. This latter pine forest was characterized by the smallest species number compared with two different oak forests.

Neotropical *Pinus radiata* plantations were investigated by MARTÍNEZ and CASANUEVA (1995) who recorded 13 Oribatida species in this specific habitat. Later, ŁOCHYŃSKA (2008) listed the Nothridae (Oribatida) species found in Ecuador and she mentioned one species (*Nothrus glaesarius* Kutý, 2007) from a *Pinus radiata* plantation.

In the Austral-Asian region, LUXTON (1985) reported new occurrences of soil dwelling mites collected in *Pinus radiata* plantations and listed two Oribatida species from the leaf litter. However, the members of the order Mesostigmata are scarcely investigated in the soil and leaf litter of Monterey pine plantations. Only DENHOLM (2003) mentioned in her PhD thesis two species

belonging to the family Uropodidae (Uropodina) without exact identification from her study area in New Zealand.

Here I present the first records of Uropodina mites from an African pine plantation. Unfortunately the plantations are extremely under-investigated and also the biodiversity and the function of the Uropodina mites in the agroecosystems are poorly understood. Up to now only a few papers dealt with related questions such as KARG (1986, 1989), KOEHLER (1999) and KONTSCHÁN (2014).

MATERIAL AND METHODS

Specimens of the new species were found in one of the unsorted African soil samples of the Arachnida Collection of Natural History Museum Geneva which was collected in a *Pinus radiata* plantation in Nyandarua district (Kenya). Specimens were cleared in lactic acid and drawings were made with the aid of a drawing tube. Specimens investigated are stored in ethanol and deposited in the Natural History Museum of Geneva, Switzerland. Abbreviations used: St: sternal setae, h: hypostomal setae, v: ventral setae, ad: adanal setae. The name of ventral setation of rotundabaloghid mites follows KONTSCHÁN (2010).

RESULTS

Trichouropoda mahnerti sp. n. (Figs 1–13)

Material examined. Holotype. Female, KENYA: Ke-77/68, Nyandarua district, 10km SE from Njabini, leaf litter of a *Pinus radiata* plantation, alt. 2550 m; 9.XI.1977, leg. V. Mahnert & J.-L. Perret. Paratypes: one female and seven males. Locality and date same as of holotype.

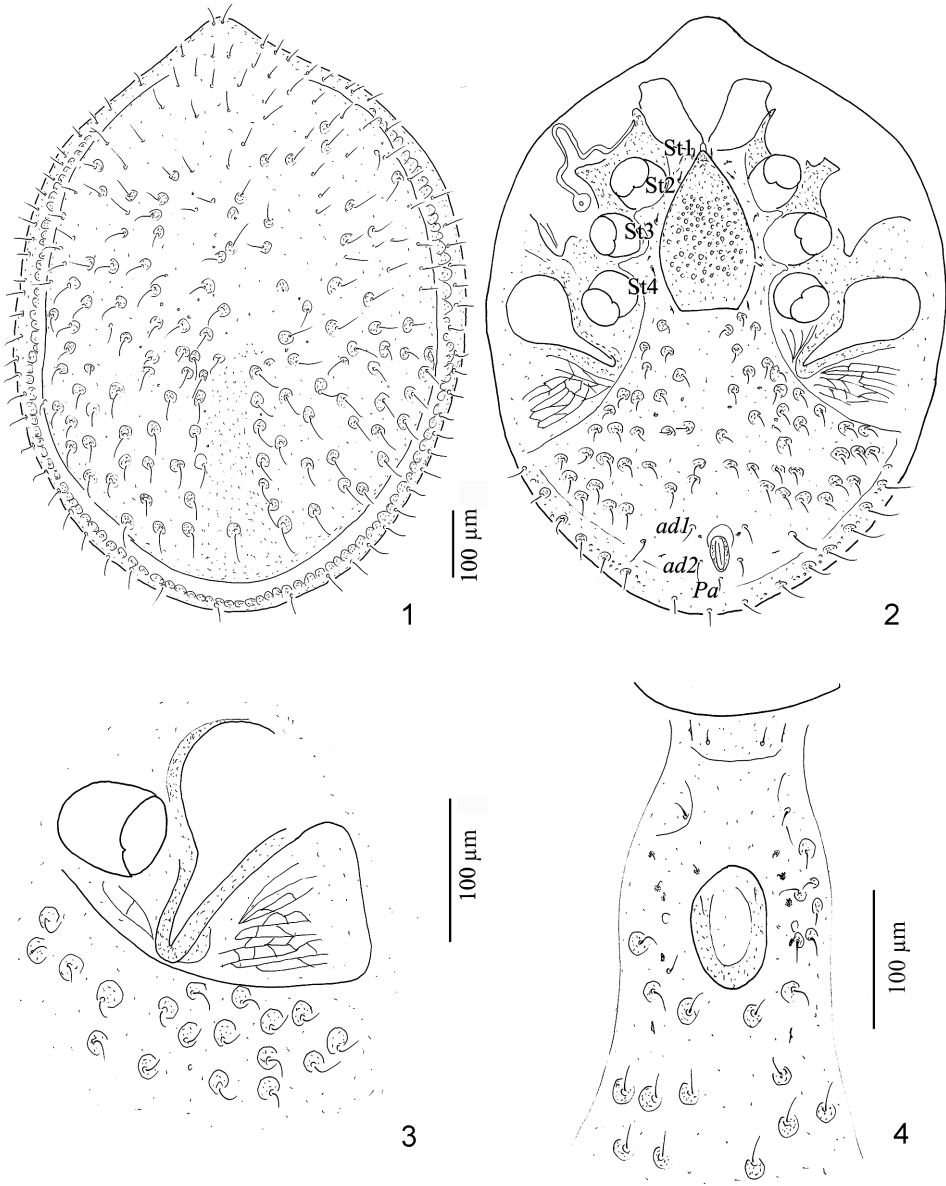
Diagnosis. Dorsal and ventral idiosoma covered by rounded pits associated with needle-like setae. Genital shield of females scutiform with short anterior process and covered by small irregular pits on its surface. Prestigmatid part of peritremes long with one long and U-shaped and two smaller bends.

Description. Female. Length of idiosoma 820–850 μm , width 650–670 μm ($n = 2$), colour brown. Shape oval, posterior margin rounded.

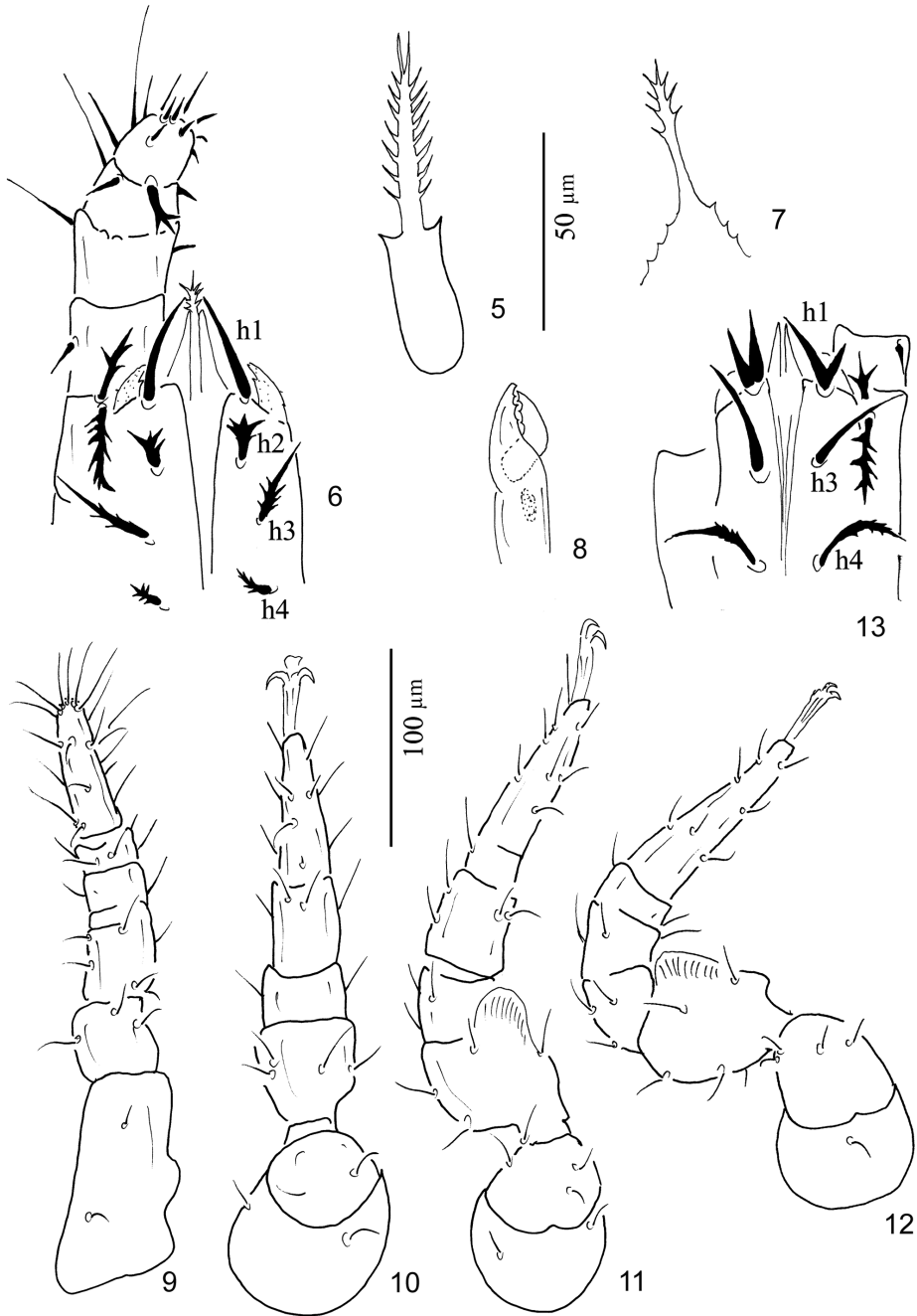
Dorsal idiosoma (Fig. 1). Marginal and dorsal shields fused anteriorly. Dorsal shield neutrichous, all dorsal setae short, smooth and needle-like (*ca* 30–40 μm). Setae on central and caudal part of dorsal shield associated with round pits (diameter: *ca* 20–22 μm), setae on anterior part of body without associated pits. Setae on marginal shield similar in shape and length to dorsal setae but not associated with pits. Inner margin of marginal shield strongly sclerotized and undulate.

Ventral idiosoma (Fig. 2). All sternal setae smooth, needle-like and *ca* 9–10 μm long. Seta St1 inserted near anterior margin of sternal shield, St2 at the level of the anterior margin of coxae II, St3 at the level of the anterior margin of coxae III, St4 at the level of the anterior margin of coxae IV. Sternal shield without sculptural pattern. One pair of lyri-form fissure situated near St1 and second one pair of it near basal edges of genital shield. One pair of short and seta-like poroids visible near St3. Majority of setae on ventral shield smooth, needle-like and short (*ca* 20–25 μm) and associated with round pits (diameter: *ca*

18–21 μm). Five ventral setae not associated with rounded pits, one pair situated lateral to anal opening and three setae posterior to anal opening, these five setae similar in shape and length to other ventral setae. Adanal setae needle-like and as long as other ventral setae, postanal setae short (ca 10–15 μm). One pair lyriform fissured placed lateral to anal opening and one pair of sensory organ inserted near to setae ad1. Some small rounded pits can



Figs 1–4. *Trichouropoda mahnerti* sp. n., female, holotype: 1 = dorsal view of body, 2 = ventral view of body, 3 = region of pedofossa IV, 4 = intercoxal area of male paratype.



Figs 5–13. *Trichouropoda mahnerti* sp. n., female, holotype: 5 = tritosternum, 6 = ventral view of gnathosoma and palp, 7 = epistome, 8 = chelicerae, 9 = leg I, 10 = leg II, 11 = leg III, 12 = leg IV, 13 = ventral view of gnathosoma of male paratype.

be seen between setae situated on caudal margin. Pedofossae deep, without sculptural pattern and with separate furrows for tarsi IV. Reticulate sculptural pattern situated around separated furrows for tarsi IV (Fig. 3). Genital shield scutiform, situated between coxae III and IV, with a short apical process and covered by small irregular pits. Prestigmatid part of peritremes long with one long and U-shaped and two smaller bends, poststigmatid part absent. Tritosternum (Fig. 5) with narrow base with two apical spines, laciniae marginally pilose and apically divided into two short branches.

Gnathosoma (Fig. 6). Corniculi small, horn-like with one tooth, internal malae smooth and longer than corniculi. Hypostomal setae h1 long (*ca* 28–30 μm) and smooth, h2 antler-shaped and short (*ca* 8–9 μm), h3 and h4 marginally serrate, h3 longer (*ca* 28–30 μm) than h4 (*ca* 10–11 μm). Trochanter of palp with two long and serrate ventral setae (Fig. 6), other setae on palp smooth, except one trifurcated seta on ventral side of tarsi. Epistome with wide and marginally serrate basis, apically laciniae-like, long and serrate (Fig. 7). Chelicerae with internal sclerotised nodes, both digit bearing 3-3 teeth (Fig. 8).

Legs (Figs 9–12): Leg I without ambulacral claws. All setae on legs smooth and needle-like, genua III and IV with flap-like ventral expansion.

Male. Length of idiosoma 820–850 μm , width 610–650 μm ($n=7$). Sternal shield without ornamentation and bearing numerous needle-like setae (*ca* 10–12 μm) with or without associated pits (Fig. 4). One pair of lyriform fissure situated near anterior margin of sternal shield and a second pair at level of coxae IV. Three pairs of short, cuticulated and spine like and two pairs of pit-like poroids situated around genital opening. Genital shield small, oval and placed between coxae III. Ventral part of gnathosoma (Fig. 13) with three pairs of setae (h2 absent). Hypostomal setae h1 bifurcated and *ca* 28–29 μm long, h3 long (*ca* 35–40 μm) and smooth, h4 marginally serrate (*ca* 25–27 μm), one of ventral setae on palp trochanter shorter than in female. Other characters same as in female.

Larva and nymphs unknown.

Etymology. I dedicate the new species to Dr. Volker Mahnert, the renowned pseudoscorpion specialist, who collected this sample.

Remarks. The setae associated with rounded pits on dorsal and ventral idiosoma is a rare character combination within the genus *Trichouropoda* Berlese, 1916. The species *T. pocsi* Hirschmann et Wiśniewski, 1987 has similar setation in its body, but the female genital shield is not ornamented unlike the new species which is ornamented by irregular pits. *T. meruensis* Hirschmann et Wiśniewski, 1987 is ornamented with oval pits associated setae, but the marginal setae are three times shorter and narrower than the dorsal setae however, these are uniform in length and shape in the new species.

KEY TO THE ADULT *TRICHOUROPODA* SPECIES FROM THE EASTERN AFROTROPICAL REGION

- 1 Two pairs of very long caudal setae present on dorsum
T. rackae Hirschmann et Wiśniewski, 1987
- Long caudal setae absent 2

-
- | | | | |
|---|--|--|---|
| 2 | Ventral shield without sculptural pattern | <i>T. krantzi</i> Hirschmann, 1975 | |
| – | Ventral shield with sculptural pattern | | 3 |
| 3 | Genital shield with bifurcate anterior process | <i>T. bifurcata</i> Hirschmann et Wisniewski, 1986 | |
| – | Genital shield without bifurcate anterior process | | 4 |
| 4 | Ventral shield with reticulate sculptural pattern | | 5 |
| – | Ventral shield with oval pits | | 6 |
| 5 | Ventral setae long, reaching base of adjacent setae | <i>T. szunyegi</i> Hirschmann, 1980 | |
| – | Ventral setae short, not reaching base of adjacent setae | <i>T. jeanelli</i> (André, 1945) | |
| 6 | Surface of female genital shield without large pits | | 7 |
| – | Surface of female genital shield ornamented by large pits | | 9 |
| 7 | Surface of female genital shield smooth | <i>T. pocsi</i> Hirschmann et Wiśniewski, 1987 | |
| – | Female genital shield not smooth | | 8 |
| 8 | Surface of female genital shield dotted | <i>T. dimidiata</i> Hirschmann et Wiśniewski, 1987 | |
| – | Surface of female genital shield covered by small oval pits | <i>Trichouropoda mahnerti</i> sp. n. | |
| 9 | Female genital shield ornamented by pits on its lateral region | <i>T. zeamays</i> Hirschmann et Wiśniewski, 1987 | |
| – | Female genital shield ornamented by pits on the central area | <i>T. meruensis</i> Hirschmann et Wiśniewski, 1987 | |

Notes to the key. Currently 26 *Trichouropoda* species are listed from the East Afrotropical region (WIŚNIEWSKI 1993). Unfortunately 17 of them were found in association with beetles and were described on the basis of deutonymph. The adults of these species are unknown and the exact identification of the nymphs is absolutely impossible without the knowledge of the adults.

Rotundabaloghia (Circobaloghia) perreti sp. n.
(Figs 14–24)

Material examined. Holotype. Female, KENYA: Ke-77/68, Nyandarua district, 10km SE from Njabini, leaf litter of a *Pinus radiata* plantation, alt. 2550m; 9.XI.1977, leg. V. Mahnernt & J.-L. Perret. Paratypes: one male. Locality and date same as of holotype.

Diagnosis: Dorsal shield without ornamentation, all dorsal setae smooth and needle-like. Genital shield linguliform, its surface with some oval pits. Ventral setae V6 situated between V2 and V7, V7, V8 and ad inserted in same horizontal row. Surface of ventral shield smooth.

Description of female: Length of idiosoma 400 μm , width 330 μm (n=1). Shape circular, posterior margin rounded, color reddish brown.

Dorsal idiosoma (Fig. 14): Marginal and dorsal shields fused. All dorsal setae short (ca 26–28 μm) and smooth, some of them curved. Majority of dorsal setae associated with short and poroids. Lyriform fissures situated near setae j4 and J3. Dorsal idiosoma without sculptural pattern, only some muscle scars can be seen.

Ventral idiosoma (Fig. 16): Surface of sternal shield without sculptural pattern. All sternal setae short (ca 6–7 μm) and needle-like. Setae St1 situated at level of anterior margin of coxae II, St2 at level of posterior margin of coxae II, St3 at level of posterior margin of coxae III, St4 at level of anterior margin of coxae IV. Ventral setae smooth and needle-like. V2 (ca 17–18 μm) situated near posterior margin of genital shield. Setae V6 ca 16–17 μm long and situated between V2 and V7; V7 and V8 ca 18–19 μm , situated near end of pedofossae IV in same row with adanal setae. Adanal setae (ad) lateral to anal opening and ca 20 μm long. One pair of lyriform fissures placed near anterior margin of sternal shield, second pair near basal edges of genital shield, third pair near anterior margin of anal opening. Stigmata situated between coxae II and III. Prestigmatid part of peritremes hook-shaped, inner margin undulate, poststigmatid part short and straight. Genital shield linguliform, surface with some oval pits and its apical margin rounded. Pedofossae deep, their surface smooth, separated furrows for tarsi IV present. Base of tritosternum narrow, tritosternal laciniae smooth, subdivided into one long and two short smooth branches (Fig. 18).

Gnathosoma (Fig. 19): Corniculi horn-like, internal malae serrate and longer than corniculi. Hypostomal setae smooth and needle-like, h1 (ca 32 μm) and h3 (ca 34 μm) long, h2 (ca 14 μm) and h4 (ca 11 μm) short. Ventral side of palp trochanter with one long and one short needle-like setae, other setae on palp smooth and needle-like. Apical part of epistome marginally serrate (Fig. 20). Fixed digit of chelicerae longer than movable digit, internal sclerotized node present.

Legs (Figs 21–24). All legs with ambulacral claws and smooth and needle-like setae.

Description of male: Length of idiosoma 400 μm , width 320 μm (n=1).

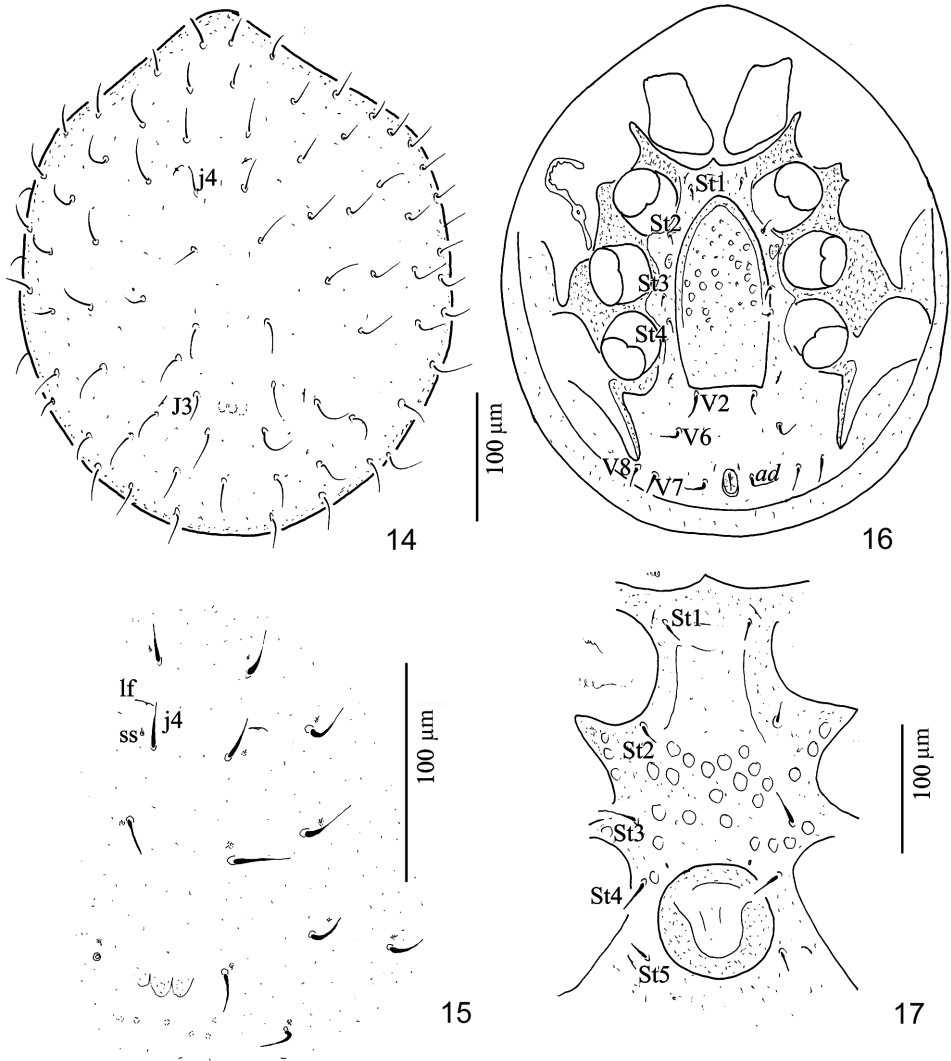
Dorsal idiosoma: Ornamentation and chaetotaxy of dorsal shield as for female.

Ventral idiosoma (Fig. 17): All sternal setae smooth and needle-like. Setae St1 inserted at level of anterior margin of coxae II, St2 at level of posterior margin of coxae II, St3 at level of posterior margin of coxae III, St4 at level of anterior margin of genital shield, St5 at level of posterior margin of genital shield. One pair of lyriform fissures situated near St1, second pair placed near St5. Surface of sternal shield with numerous oval pits. Surface of ventral shield and shape and size of ventral setae as in female. Genital shield circular and situated between coxae IV.

Larva and nymphs unknown.

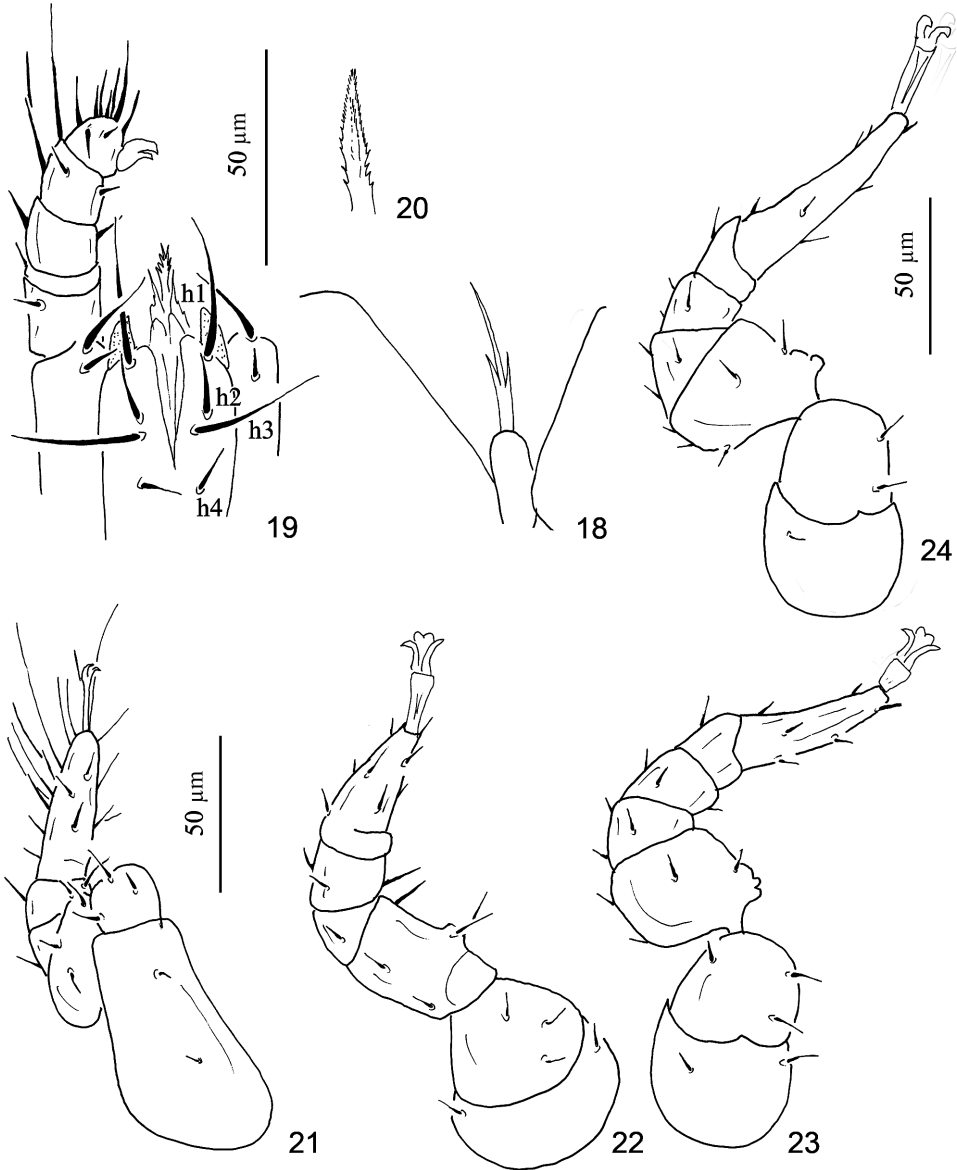
Etymology: I dedicate the new species to Dr. J.-L. Perret the noted herpetologist, who collected this sample.

Remarks. The new species belongs to the *Rotundabaloghia* (*Circobaloghia*) subgenus (KONTSCHÁN 2010). This subgenus is the most speciose taxon in the family Rotundabaloghiidae, with 22 species (including the new one) recorded for the Eastern Afrotropical region (KONTSCHÁN 2010).



Figs 14–17. *Rotundabaloghia* (*Circobaloghia*) *perreti* sp. n., female, holotype: 14 = dorsal view of body, 15 = detail of dorsal setation, 16 = ventral view of body, 17 = intercoxal area of male paratype (ss = poroid, lf = lyriform fissures).

The position of the ventral setae V6, V7 and V8 and the sculptural pattern of genital shield of the new species are similar to those of *R. (C.) heterochaeta* Kontschán, 2004, but this species possesses pilose dorsal setae; in contrast, the dorsal setae smooth and needle-like in *R. (C.) perreti* sp. n.



Figs 18–24. *Rotundabaloghia (Circobaloghia) perreti* sp. n., female, holotype: 18 = tritosternum, 19 = ventral view of gnathosoma and palp, 20 = detail of distal part of epistome, 21 = leg I, 22 = leg II, 23 = leg III, 24 = leg IV.

KEY TO THE EAST AFROTROPICAL *ROTUNDABALOGHIA*
(*CIRCOBALOGHIA*) SPECIES
(after KONTSCHÁN 2010, modified)

- | | | |
|----|---|----|
| 1 | Genital shield of female with anterior process | 2 |
| – | Genital shield of female without process | 3 |
| 2 | Setae V7 and V8 with pilose margins <i>R. (C.) rwandae</i> Hirschmann, 1984 | |
| – | Setae V7 and V8 smooth <i>R. (C.) bukavuensis</i> Kontschán, 2008 | |
| 3 | Well sclerotized ventral line present <i>R. (C.) lineata</i> Kontschán, 2010 | |
| – | Well sclerotized ventral line absent | 4 |
| 4 | Genital shield of female and sternal shield of male ornamented | 5 |
| – | Genital shield of female and sternal shield of male without ornamentation | 17 |
| 5 | All ventral setae smooth | 8 |
| – | Setae V7 and V8 not smooth | 6 |
| 6 | Setae V8 smooth | 7 |
| – | Setae V6, V7 and V8 pilose apically <i>R. (C.) uluguruensis</i> Hirschmann, 1992 | |
| 7 | Setae V7 trifurcated, V8 star-like <i>R. (C.) erinacea</i> Kontschán, 2008 | |
| – | Setae V7 and V8 needle-like with pilose margins
<i>R. (C.) dodomae</i> Hirschmann, 1992 | |
| 8 | Ventral shield with ornamentation | 9 |
| – | Ventral shield without ornamentation | 10 |
| 9 | Genital and ventral shields of female with large alveolar ornamentation, setae V6 shorter (1/2) than V7 and V8 <i>R. (C.) spatulata</i> Kontschán, 2004 | |
| – | Genital and ventral shields of female with small alveolar ornamentation, V6 as long as V7 and V8 <i>R. (C.) lupangae</i> Hirschmann, 1992 | |
| 10 | Setae V6 placed near to V2 <i>R. (C.) meruensis</i> Hirschmann, 1992 | |
| – | Setae V6 placed far from V2 | 11 |
| 11 | Setae V6 placed close to V7 and V8 | 16 |
| – | Setae V6 placed in equidistantly between V2 and V7–V8 | 12 |

- 12 Genital shield of female with large alveolar pits 13
- Genital shield of female with small, punctuate pits 14
- 13 Dorsal setae smooth *R. (C.) perreti* n. sp.
- Dorsal setae pilose *R. (C.) heterochaeta* Kontschán, 2004
- 14 Genital shield of female linguliform *R. (C.) nguruensis* Hischmann, 1992
- Genital shield of female scutiform 15
- 15 Distance between St2 and St3 as long as distance St3 and St4, female genital shield ornamented on central areas *R. (C.) pocsi* Hischmann, 1992
- Distance St2-St3 longer than distance St3-St4, central area of female genital shield smooth *R. (C.) tanzaniae* Hischmann, 1992
- 16 Genital shield of female linguliform *R. (C.) mahunkaiana* Kontschán, 2006
- Genital shield of female scutiform *R. (C.) africana* Hischmann, 1992
- 17 Setae V7 and V6 smooth 18
- Margins of V7 and V6 not smooth 21
- 18 Genital shield of female linguliform 19
- Genital shield of female scutiform 20
- 19 Setae V6 shorter than V7 and V8, V7 and V8 situated in same row
R. (C.) lindqvistiformis Kontschán, 2008
- Setae V6 as long as V7 and V8, V6 and V7 situated in same row
R. (C.) feherdii Kontschán, 2004
- 20 Distance between V6 and V7 as long as distance between V6 and V8
R. (C.) lindqvisti Hischmann, 1992
- Distance between V6 and V7 shorter than distance between V6 and V8, V8 situated far from V6 and V7
R. (C.) kimbozae Hischmann, 1992
- 21 Genital shield of female linguliform, V7 and V8 star-like
R. (C.) stellata Kontschán, 2010
- Genital shield of female scutiform, V6, V7 and V8 with pilose margins
R. (C.) splendida Kontschán, 2008

DISCUSSION

Until recently, no *Rotundabaloghia* species were recorded from agricultural areas in the tropics (KONTSCHÁN 2010) and we do not have any direct information about their diet. Nevertheless, some presumptions can be deduced concerning the food choice of these mites on the basis of the shape and dentation of the chelicerae. The chelicerae of rotundabaloghid mites are weak and poorly dentate; therefore it is reasonable to suppose that they do not feed on soil dwelling arthropods, at most they can prey on nematods or tiny maggots in these agricultural habitats. In turn, fungal hyphae seem to be the most likely preferred food in this family.

Currently only one *Trichouropoda* species is known from agricultural soils in the Eastern Afrotropical region, namely *T. zeamays* Hirschmann et Wiśniewski, 1987 being described from an East African corn plantation. On the basis of the shape of the chelicerae (short and strongly dentate) KARG (1989) hypothesized that the *Trichouropoda* species are consumer of fungal hyphae in agricultural soils. However, I cannot agree with this idea. The strongly dentate chelicerae are useful tools for catching moving animals; therefore, I presume that *Trichouropoda* species regularly feed on other small, soil dwelling arthropods as well as on nematods.

*

Acknowledgements – I am grateful to the Dr. Peter Schwendinger (curator of the Arachnida collection of the Natural History Museum Geneva) for the loan of the material. I would like to thank to Dr. Csaba Csuzdi and Dr. Balázs Kiss for the linguistic revisions. This research was supported by OTKA 108663.

REFERENCES

- DENHOLM, P. M. (2003) *Biodiversity, biosolids and bioindicators in Pinus radiata D. Don planted forests*. PhD Thesis, University of Canterbury, 249 pp.
- KARG, W. (1986) Vorkommen und Ernährung der Milbencohors Uropodina Kramer (Schildkrötenmilben) sowie ihre Eignung als Indikatoren in Agroökosystemen. *Pedobiologia* **29**: 285–29.
- KARG, W. (1989) *Acari (Acarina), Milben; Parasitiformes (Anactinochaeta), Uropodina Kramer Schildkrötenmilben*. Die Tierwelt Deutschlands, 67G. Fischer, Jena (1989), 203 pp.
- KOEHLER, H. (1999) Predatory mites (Gamasina, Mesostigmata). *Agriculture Ecosystems & Environment* **74**: 395–410. doi:10.1016/S0167-8809(99)00045-6
- KONTSCHÁN, J. (2010) *Rotundabaloghiid mites of the world (Acari: Mesostigmata: Uropodina)*. AdLibrum Kiadó, Budapest, 116 pp.
- KONTSCHÁN, J. (2014): New Uropodina mites (acari: Mesostigmata) from a Taiwanese *Cryptomeria japonica* (Taxodiaceae) plantation. *Acta Zoologica Academiae Scientiarum Hungaricae* **59**(4): 321–336.

- ŁOCHYŃSKA, M. (2008) Nothrid mites from Ecuador – recapitulation (Acari: Oribatida: Nothridae). *Genus* **19**(1): 143–149.
- LUXTON, M. (1985) *Cryptostigmata (Arachnida: Acari) – a concise review*. Fauna of New Zealand, 106 pp.
- MARTÍNEZ, R. I. & CASANUEVA, M. E. (1995) Comparacion cuali-cuantitativa de la fauna oribatologica de suelo (Acari: Oribatida) de bosques nativos y *Pinus radiata*. *Revista Chilena de Entomología* **22**: 25–34.
- MEAD, D. J. (2013) *Sustainable management of Pinus radiata plantations*. FAO Forestry Paper No. 170. Rome, FAO, 246 pp.
- MIGLIORINI, M. (2009) Oribatid mite (Arachnida: Oribatida) coenoses from SW Sardinia. *Zootaxa* **2318**: 8–37.

Revised version received August 28, 2014, accepted December 20, 2014, published April 30, 2015