



Phytoseiid mites of the subfamily Phytoseiinae (Acari: Phytoseiidae) from sub-Saharan Africa

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Abstract

This is the seventh publication in a series concerning the phytoseiid mites of sub-Saharan Africa. Sixteen phytoseiid species of the subfamily Phytoseiinae (*Chantia*: 1 species, *Phytoseius*: 13 species and *Platyseiella*: 2 species) are reported in this paper. They include all species of this subfamily known to occur in sub-Saharan Africa. Ten of these species are redescribed. Most of those species were collected in cassava habitats in tropical Africa and in other habitats in South Africa. A key is included to help in the separation of these species.

Key words: Biological control, predator, cassava, taxonomy, Phytoseiidae

Introduction

Phytoseiid mites are commonly used for the biological control of pest mites in many countries. An inventory of the fauna of a given region is one of the first steps in an effort to establish a biological control program against a pest species.

In 1984, the International Institute of Tropical Agriculture (IITA) initiated a campaign to control the tetranychid mite *Mononychellus tanajoa* (Bondar) biologically (Yaninek & Herren 1988; Yaninek & Hanna 2003). This mite is a pest of cassava (*Manihot esculenta* Crantz) that was accidentally introduced from the Neotropics to Africa (Nyiira 1972). Surveys were conducted by IITA personnel in cassava habitats of several cassava-growing countries in sub-Saharan Africa to determine the composition of the mite fauna before and after the introduction of exotic phytoseiids from the Neotropics to control that pest. During those surveys, many phytoseiid species were collected. This paper is the seventh in a series covering the phytoseiid species of sub-Saharan Africa. This series refers to all mites of this group previously reported by different authors from that region as well as to those found more recently in South Africa by researchers of that country and in other sub-Saharan countries by IITA personnel in the course of the project on the biological control of *M. tanajoa*. The first six papers dealt with species of the subfamily Amblyseiinae (Moraes *et al.* 2001, 2006, 2007; Zannou *et al.* 2006, 2007). The objective of the present paper is to report on the phytoseiid mites of the subfamily Phytoseiinae Berlese from sub-Saharan Africa, with redescriptions of some of these species based on the most recently collected specimens. A key is presented for the separation of the species mentioned in this paper.

Materials and methods

Setal nomenclature is that of Rowell *et al.* (1978) and Chant & Yoshida-Shaul (1991) for dorsal and ventral surfaces of the idiosoma, respectively. Idiosomal setal patterns used are those of Chant & Yoshida-Shaul (1992b). All measurements are given in micrometers; each measurement corresponds to the average for the number of individuals indicated for each sex of each species, followed (in parentheses) by the respective ranges (if measurement is variable); for some of the redescribed species, measurements of type specimens are provided (in square brackets). Dorsal shield width was always taken at the widest point of the proscutum. Macrosetae for which measurements are not provided should be considered as absent. World distribution of each species is based on the surveys corresponding to the present work and on Moraes *et al.* (2004).

Phytoseiinae Berlese

Phytoseiinae Berlese, Vitzthum, 1941: 768 (in part); Chant & McMurtry, 1994: 231; Moraes *et al.*, 2004: 231.

Cydnodromellinae Chant & Yoshida-Shaul, 1986b: 2812 (in part).

Phytoseiini Berlese, 1913: 3-19 (in part).

Chantiini Pritchard & Baker, 1962: 211 (synonymy according to Chant & McMurtry 1994).

Chantiinae Pritchard & Baker, Chant & Yoshida-Shaul, 1986a: 2025 (synonymy according to Chant & McMurtry 1994).

Chant & McMurtry (1994) gave a full description of this subfamily. Key characters used to separate this from other subfamilies are: setae Z1, S2, S4 and S5 absent and one or both of z3 and s6 present; dorsal setae s4, r3, Z4 and Z5 thick and strongly serrate on most species; r3 inserted on the podoscutum of the adult females and males [except *Platyseiella longicervicalis* (Moraes & Denmark)]; ventrianal shield of females of most species long, narrow, with a distinct waist and with preanal setae inserted along the lateral margin; ventrianal shield reduced in some species; seta Jv2 always present, Jv3 always absent, Jv4 absent (except in *Phytoseius rasilis* Corpuz-Raros); cheliceral digits with few teeth; leg IV always longer than dorsal shield; genu III with only 6 setae (1-2/0, 2/0-1).

Chantia Pritchard & Baker

Chantia Pritchard & Baker, 1962: 230; Chant & McMurtry, 1994: 231; Moraes *et al.*, 2004: 231.

Typhlodromus (*Chantia*), Van der Merwe, 1968: 99.

This monotypic genus is characterized by: female with unique idiosomal setal pattern, 12B:4A/JV-3,4:ZV, with 29 pairs of setae; setae J2, s6 and Jv4 absent; seta z6 present; seta R1 inserted on interscutal membrane; dorsal shield setae and Jv5 strongly spatulate, paddle-shaped, with little serration; legs with many setae spatulate, without elongate macrosetae; genu II with 6 setae; calyx of spermatheca flaring near vesicle and inflate near atrium; posterior extension of peritremal shield with a lamellate structure.

Chantia paradoxa Pritchard & Baker

(Fig. 1)

Chantia paradoxa Pritchard & Baker, 1962: 230; Chant & McMurtry, 1994: 232; Moraes *et al.*, 2004: 231.

FEMALE. (Specimens measured. Democratic Republic of Congo: holotype)

Dorsum. Dorsal shield [345] long and [181] wide, mostly smooth, with roundish elements. Setae j1 [20],

j3 [19], j4 [16], j5 [16], j6 [31], J5 [11], z2 [18], z3 [19], z4 [18], z5 [18], z6 [37], Z4 [31], Z5 [36], s4 [22], r3 [24], R1 [20]. All setae, except J5, thick and strongly spatulate; seta Z5 distinctly serrate, others smooth.

Peritreme. Extending to level of j1. Posterior extension of peritrematal shield with a lamellate structure.

Venter. Sternal shield smooth, with posterior margin straight; distances between St1–St3 [63], St2–St2 [66]. Genital shield smooth; distance between St5–St5 [63]. Ventrianal shield vase-shaped, smooth, anterior margin straight, [106] long, [41] wide at level of Zv2 and [44] wide at level of anus, with 3 pairs of preanal setae inserted along lateral margins of female ventrianal shield; 1 pair of preanal pores posterior to and longitudinally in line with Jv2; metapodal shields not distinguishable. Caudoventral setae smooth and sharp-tipped, except post-anal seta, rod-shaped, and Jv5, tick and spatulate.

Chelicera. Position renders measurements impossible. Movable digit apparently with 1 tooth; fixed digit apparently with 3 teeth and a *pilus dentilis*.

Spermatheca. Calyx strongly bulbous adjacent to atrium but very slender before it flares into a disc before it joins the vesicle (Chant & McMurtry 1994).

Legs. Without macrosetae, but with many spatulate setae.

Specimens examined. Holotype female, **Democratic Republic of Congo (= Belgian Congo):** from *Baphia* sp., Stanleyville, 18-IV-1995, E.W. Baker.

World distribution. Democratic Republic of Congo.

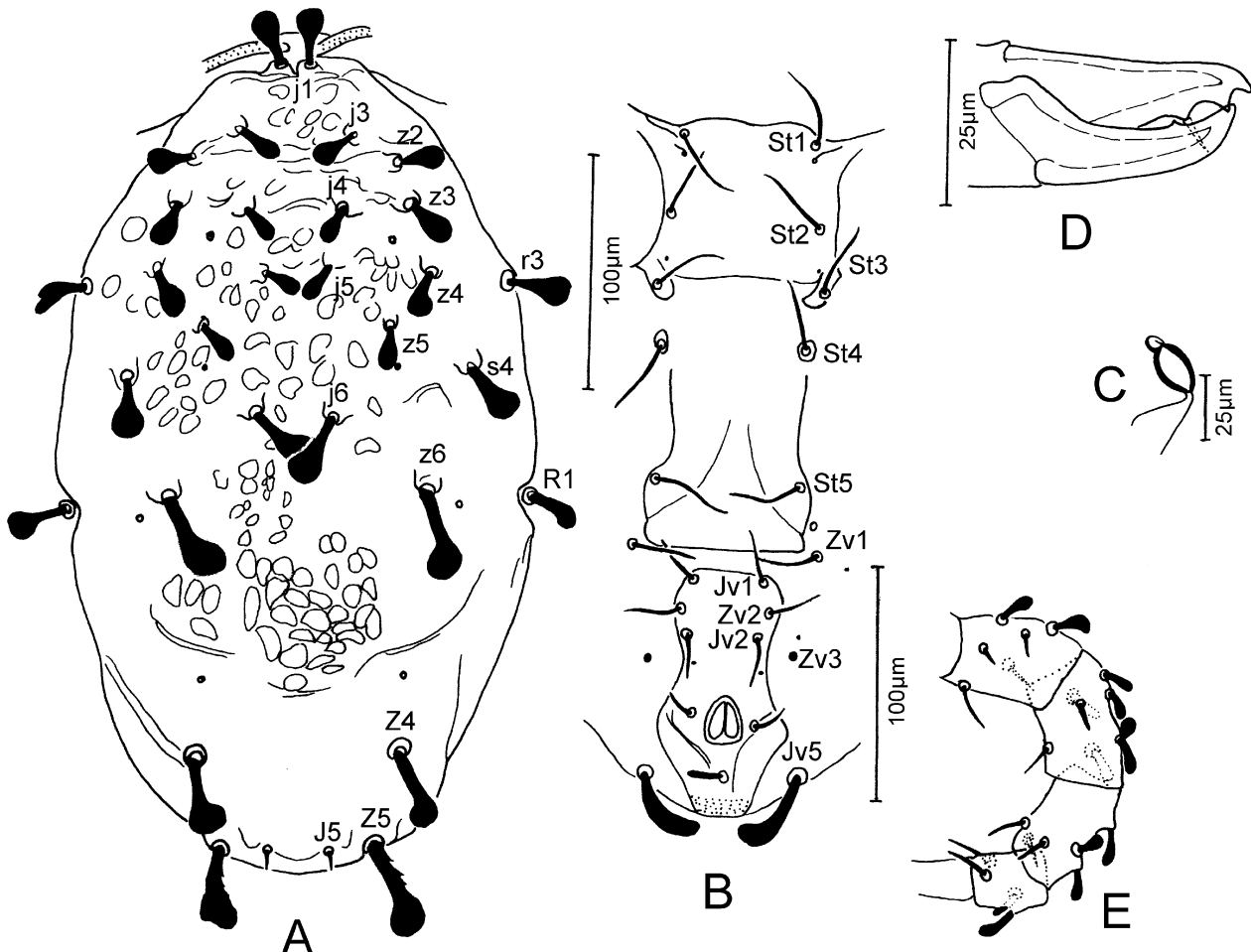


FIGURE 1. *Chantia paradoxa* Pritchard & Baker (female): A. Dorsal shield; B. Ventral surface; C. Spermatheca; D. Chelicera; E. Leg IV.

Phytoseius Ribaga

Phytoseius Ribaga, 1904: 177; Chant & Yoshida-Shaul, 1992a: 11; Chant & McMurtry, 1994: 232; Moraes *et al.*, 2004: 231.

Phytoseius (*Phytoseius*), Wainstein, 1959: 1361.

Typhlodromus (*Phytoseius*), Van der Merwe, 1968: 100.

Phytoseius (*Dubininellus*) Wainstein, 1959: 1361.

Dubininellus, Muma, 1961: 293.

Phytoseius (*Pennaseius*) Pritchard & Baker, 1962: 223.

Pennaseius, Schuster & Pritchard, 1963: 279.

Stable characters mentioned by Chant & McMurtry (1994) for the species of this genus are: both setae z3 and s6 present; genu II with 7 setae; macrosetae absent on legs I–III; 0–4 macrosetae present on leg IV. Other characters as for the subfamily Phytoseiinae.

Thirteen species of this genus are reported in this study. They have: 3 pairs of preanal setae inserted along lateral margins of female ventrianal shield; 1 pair of round preanal pores; 1 pair of elongate metapodal shields (sometimes not distinguishable); Jv4 absent, peritreme extending to level of j1 (except for *Phytoseius perforatus* El-Badry in which it extends to level of z2), chaetotaxy of genua II and III 2-2/0, 2/0-1 and 1-2/0, 2/0-1, respectively.

***Phytoseius amba* Pritchard & Baker**

(Fig. 2)

Phytoseius (*Pennaseius*) *amba* Pritchard & Baker, 1962: 224.

Phytoseius amba, Moraes *et al.*, 2004: 232.

Phytoseius (*Phytoseius*) *amba*, Denmark, 1966: 46.

Pennaseius amba, Matthyse & Denmark, 1981: 352.

Typhlodromus (*Phytoseius*) *amba*, Van der Merwe, 1968: 101.

FEMALE. (Specimens measured. Burundi: 8; Cameroon: 1; Ghana: 2; Kenya: 5; Rwanda: 7; Sierra Leon: 1; South Africa: 4; Democratic Republic of Congo: 1 and holotype)

Dorsum. Dorsal shield 282(264–304) [283] long and 141(133–149) [165] wide, mostly smooth, with few lateral striae; a pair of notches at level of s4 and a pair of large pores connected to a triangular structure, posterior to, and in close proximity with z5. Idiosomal setal pattern 12A:5A/JV-3,4:ZV. Setae j1 22(19–27) [24], j3 49(40–56) [42], j4 4(3–5) [3], j5 4(3–5) [3], j6 5(3–6) [4], J2 6(5–8) [6], J5 10(8–13) [11], z2 7(5–10) [5], z3 23(16–27) [17], z4 8(5–11) [5], z5 4(3–5) [5], Z4 62(48–70) [64], Z5 76(59–86) [83], s4 81(53–102) [81], s6 77(48–96) [79], r3 40(34–46) [41], R1 13(10–16) [12]. Setae j1, j3, z3, Z4, Z5, s4, s6 and r3 thick and serrate, other setae small and smooth; Z4 and Z5 on tubercles; R1 on interscutal membrane.

Peritreme. Extending anterolateral to setae j1.

Venter. Sternal shield smooth, with posterior margin indistinct; distances between St1–St3 60(56–64) [60], St2–St2 69(64–72) [79]. Genital shield smooth; distance between St5–St5 67(62–74) [63]. Ventrianal shield vase-shaped, mostly smooth with few striae between setae Jv2, anterior margin slightly convex, 99(86–106) [100] long, 55(50–64) [53] wide at level of Zv2 and 49(43–56) [46] wide at level of anus; preanal pores posterior to and longitudinally in line with Jv2. Caudoventral setae smooth, except for Jv5, thick and serrate.

Chelicera. Movable digit 25(23–26) [17] long, with 1 to 2 [1] teeth; fixed digit 25(23–26) [17] long, with 2 to 3 teeth and a *pilus dentilis*.

Spermatheca. Calyx slender and flaring strongly towards the vesicle, 13(8–19) [12] long; atrium at least 1.6 times as wide as the portion of calyx next to it; major duct strongly inflate near atrium.

Legs. Macrosetae irregularly expanded distally on genu, tibia and basitarsus and knobbed on telotarsus;

Sge IV 25(19–32) [21], Sti IV 34(26–40) [31], Sbt (macroseta of basitarsus) IV 35(27–43) [39] and Stt (macroseta of telotarsus) IV 32(28–38) [36].

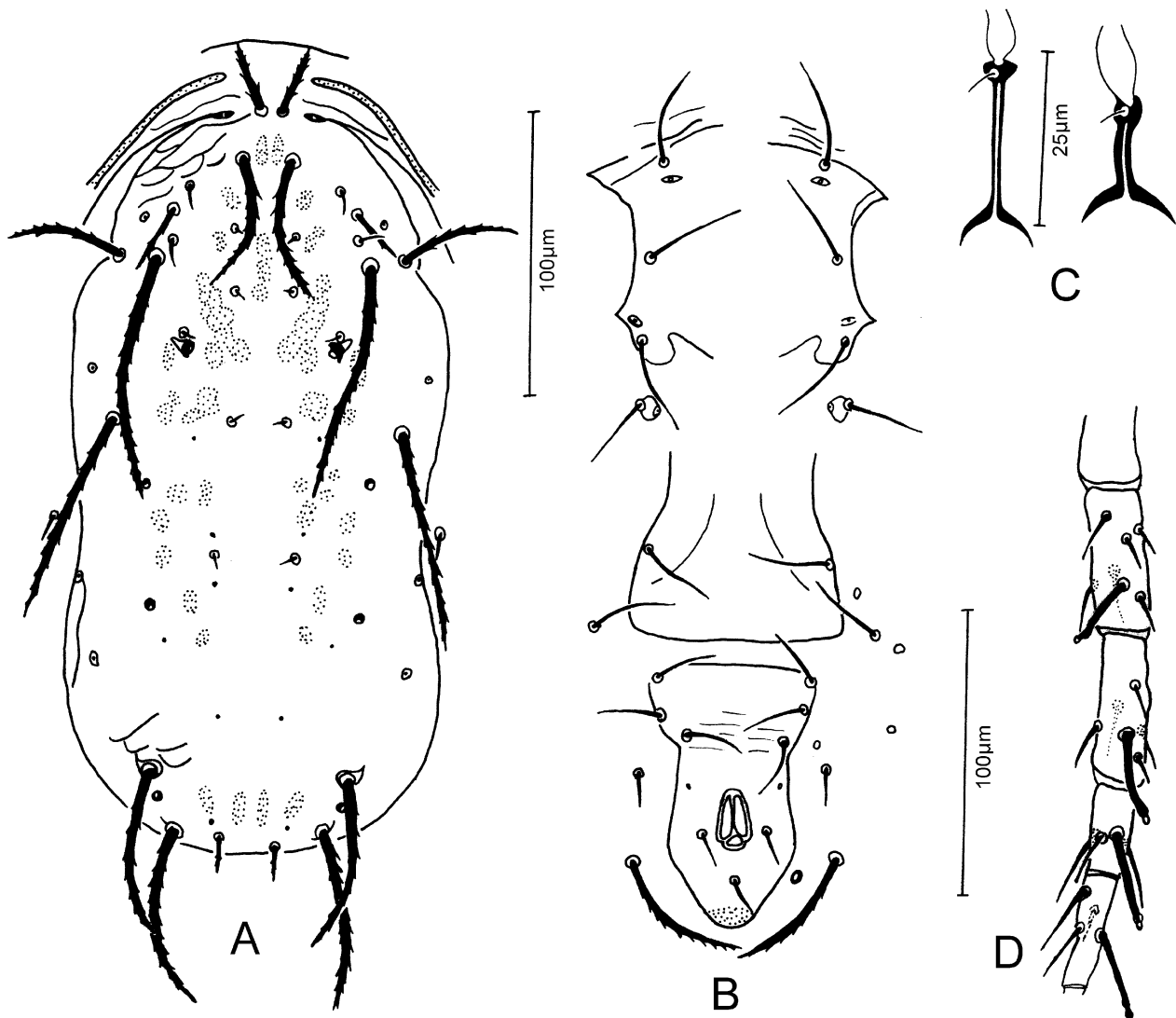


FIGURE 2. *Phytoseius amba* Pritchard & Baker (female): A. Dorsal shield; B. Ventral surface; C. Spermatheca; D. Leg IV.

Specimens examined. Two females, **Benin:** Département de l'Atacora, Djougou, on *Tectona grandis*, 20-XI-1991, A. Onzo. Ten females, **Burundi:** 42 km NW Bujumbura, on unknown plant, 11-XII-1989, J.S. Yaninek; 42 km NW Bujumbura, on *Tylosema fassoglensis*, 11-XII-1989, J.S. Yaninek; 42 km NW Bujumbura, on unknown plant, 11-XII-1989, J.S. Yaninek; 42 km N Bujumbura, on *Annona senegalensis*, 11-XII-1989, J.S. Yaninek; 16 km NW Bujumbura, on *Grevillea robusta*, 11-XII-1989, J.S. Yaninek; 53 km NE Bujumbura, on *Misanteca camara*, 12-XII-1989, J.S. Yaninek; Kibiaba, on unknown plant, 12-XII-1989, J.S. Yaninek; Rutana Province, 5 km S Gitega, on *Acanthus pubescens*, 13-XII-1989, J.S. Yaninek; Rutana Province, 16 km S. Rutana, on *Tithonia diversifolia*, 14-XII-1989, J.S. Yaninek. Two females, **Cameroon:** Central Province, 1 km SW Nkoteng, on *Erigeron floribundus*, 5-II-1991, A. Onzo. Holotype and 2 females, **Democratic Republic of Congo (= Belgian Congo):** Beni, on *Tithonia speciosa*, 11-V-1955, E.W. Baker; Bas-Congo, Kenge, 34 km E Matadi, on *Urena lobata*, 11-VII-1991, A. Onzo. Three females, **Ghana:** Kotoku, on *Eriosema glomeratum*, 7-XI-1989, J.S. Yaninek; Western Region, 28 km S Dunkwa, on *Chromolaena odorata*, 11-XI-1989, J.S. Yaninek. Seven females, **Kenya:** Nyanza Province, 16 km W Maseno, on *Triumfetta* sp., 2-XII-1989, J.S. Yaninek; Nyanza Province, 1 km N Siaya, on *Aspilia mossambicensis*, 2-XII-1989, J.S.

Yaninek; Nyanza Province, Kisumu District, Sondu, on unknown plant, 3-XII-1989, J.S. Yaninek; Valley Province, Tea Hotel, on *Spathodea campanulata*, 4-XII-1989, J.S. Yaninek; Valley Province, Tea Hotel, on unknown plant, 4-XII-1989, J.S. Yaninek. Two females, **Malawi**: Northern Province, 18.7 km SE Mzuzu, on *Conyza sumatrensis*, 31-V-2002, I.D. Zannou; 11 km SE Mzuzu, on *Erigeron floribundus*, 1-VI-2002, A. Onzo. Eleven females, **Rwanda**: Kibuye, 35 km W Gitarama, on *Triumphetta rhomboidea*, 6-XII-1989, J.S. Yaninek; Kibuye, Home Saint Jean, on *Clerodendrum* sp., 7-XII-1989, J.S. Yaninek; unknown location, on unknown plant, 7-XII-1989, J.S. Yaninek; 5 km N Ruhengeri, on *Ipomoea* sp., 8-XII-1989, J.S. Yaninek; 13 km SE Kigali, on *Triumphetta rhomboidea*, 9-XII-1989, J.S. Yaninek; unknown location, on unknown plant, 9-XII-1989, J.S. Yaninek; 6 km N Kibungo, *Clerodendrum* sp., 9-XII-1989, J.S. Yaninek. Two females, **South Africa**: Pretoria, on *Celtis african*, 23-XI-1981, E.A. Ueckermann. One female, **Tanzania**: 17 km S Njombe, on *Ethulia vernonioides*, 18-VIII-1994, B. Pallangyo. One female, **Zambia**: 10.4 km S Samfya, on *Annona senegalensis*, 9-IV-2000, I.D. Zannou.

Remarks. Length of setae j1, j3, z3, Z4, Z5, s4, s6 and of the calyx of spermatheca is rather variable even between specimens from the same country. The presence of setae J2 and R1 in this species places it in the *plumifer* species group (Chant & Yoshida-Shaul 1992a; Chant & McMurtry 1994).

World distribution. Benin, Burundi, Cameroon, Cape Verde, Democratic Republic of Congo, Ghana, Kenya, Madagascar, Malawi, Mozambique, Nigeria, Reunion Island, Rwanda, South Africa, Tanzania, Zambia and Zimbabwe.

Phytoseius antigamenti El-Banhawy & Abou-Awad

Phytoseius antigamenti El-Banhawy & Abou-Awad, 1989: 375; Moraes *et al.*, 2004: 232.

Remarks. This species was described from specimens collected in Arusha, Tanzania, on unspecified substrate. No additional specimens were collected in the present study. Idiosomal setal pattern 12A:3A/JV-3,4:ZV. The absence of setae J2 and R1 in this species places it in the *horridus* species group (Denmark 1966; Chant & McMurtry 1994).

World distribution. Tanzania.

Phytoseius comodera El-Banhawy & Abou-Awad

Phytoseius comodera El-Banhawy & Abou-Awad, 1989: 373; Moraes *et al.*, 2004: 235.

Remarks. This species was described from specimens collected in Arusha, Tanzania, on unspecified substrate. No additional specimens were collected in the present study. Idiosomal setal pattern 12A:5A/JV-3,4:ZV. The presence of setae J2 and R1 in this species places it in the *plumifer* species group (Chant & Yoshida-Shaul 1992a; Chant & McMurtry 1994).

World distribution. Tanzania.

Phytoseius crinitus Swirski & Shechter

(Fig. 3)

Phytoseius (Dubininellus) crinitus Swirski & Shechter, 1961: 102.

Phytoseius crinitus, Moraes *et al.*, 2004: 236.

Phytoseius (Phytoseius) crinitus, Ehara, 1966: 26.

FEMALE. (Specimens measured. Burundi: 3)

Dorsum. Dorsal shield 276(275–278) long and 153(153–154) wide, mostly covered by rough, roundish elements; with longitudinal to diagonal striae on a narrow band along the margins. Female idiosomal setal pattern 12A:3A/JV-3,4:ZV. Setae j1 30(29–32), j3 34(32–35), j4 6(5–6), j5 5, j6 6, J5 8, z2 14(13–14), z3 31(30–32), z4 11(10–11), z5 4(4–5), Z4 84(83–85), Z5 72, s4 107(106–107), s6 75(74–76), r3 42(41–42). Setae j1, j3, z3, Z4, Z5, s4, s6 and r3 thick, generally long, strongly serrate; other setae short or minute and smooth. Setae Z4, Z5, s4, s6 and r3 inserted on tubercles and divided longitudinally.

Peritreme. Extending almost anterior to setae j1.

Venter. Sternal shield not sufficiently distinct to be illustrated and described; distances between St1–St3 55(54–56), St2–St2 60(60–61). Genital shield smooth; distance between St5–St5 61(60–61). Ventrianal shield vase-shaped, smooth, anterior margin slightly convex, 92(88–97) long, 36(35–37) wide at level of Zv2 and 47(45–48) wide at level of anus; preanal pores posterolaterad of Jv2. Caudoventral setae smooth, except Jv5, thick and strongly serrate.

Chelicera. Movable digit 24 long, with 1 tooth; fixed digit 22 long, with 3 teeth and a *pilus dentilis*.

Spermatheca. Calyx bell-shaped, 25 long [often only the more sclerotized part near the atrium visible, 3(2–3) long]; atrium small and nodular.

Legs. Macrosetae spatulate on genu and tibia and knobbed to spatulate on basitarsus and telotarsus; Sge IV 9(8–9), Sti IV 48(46–49), Sbt IV 26 (25–26), Stt IV 25(24–25).

Specimens examined. Four females, **Burundi:** ISABU Research Station, Bujumbura, on unknown plant, 11-XII-1989, J.S. Yaninek.

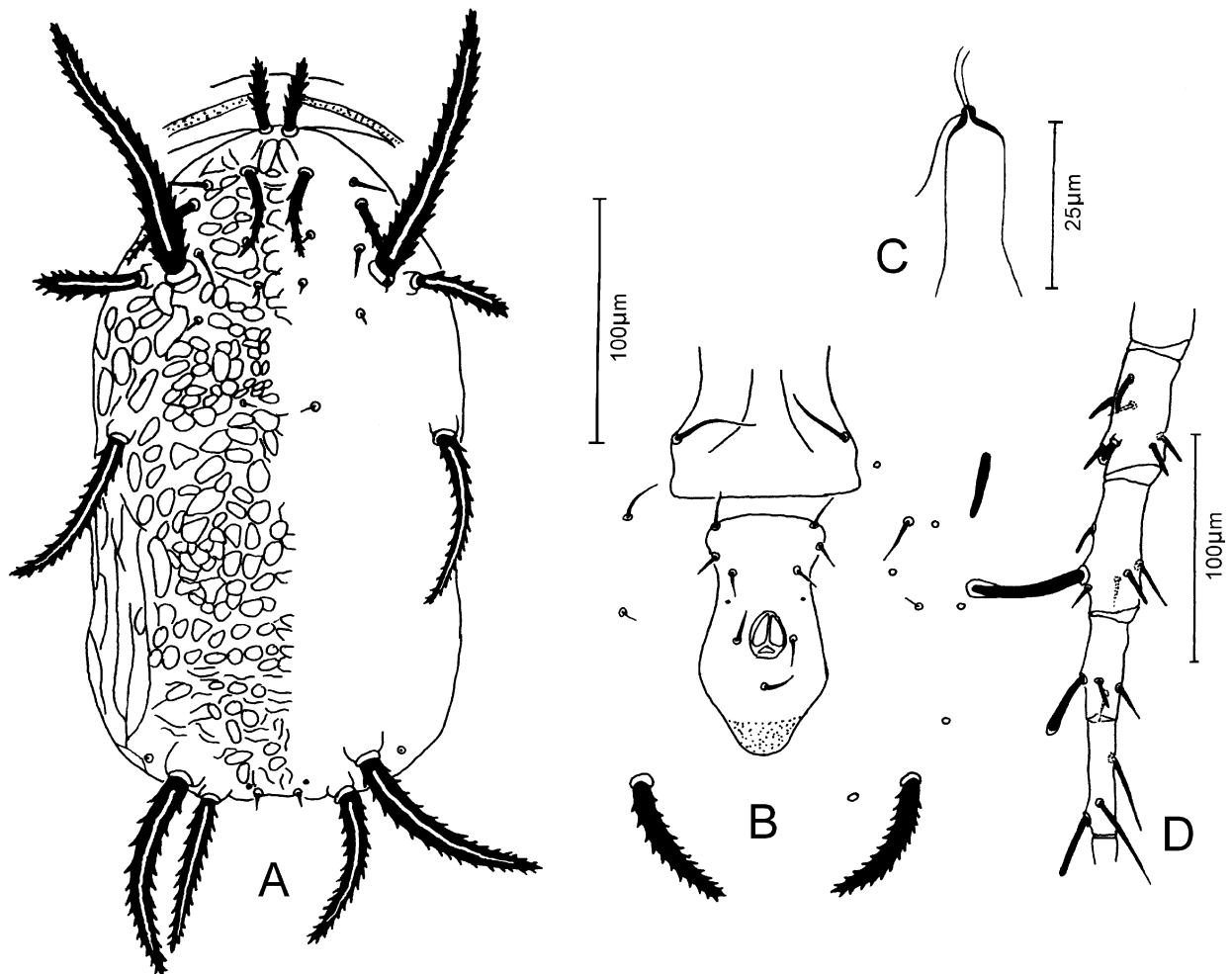


FIGURE 3. *Phytoseius crinitus* Swirski & Shechter (female): A. Dorsal shield; B. Ventral surface; C. Spermatheca; D. Leg IV.

Remarks. The absence of setae J2 and R1 in this species places it in the *horridus* species group (Denmark 1966; Chant & McMurtry 1994).

World distribution. Burundi, China, Hong Kong, India, Indonesia, Japan, Madagascar, Philippines, Reunion Island and Singapore.

***Phytoseius duplus* Ueckermann & Loots
(Fig. 4)**

Phytoseius (Phytoseius) duplus Ueckermann & Loots, 1985: 37.

Phytoseius duplus, Moraes *et al.*, 2004: 237.

FEMALE. (Specimens measured. South Africa: holotype and 1 paratype)

Dorsum. Dorsal shield 285 [314] long and 151 [158] wide, mostly covered by rough, roundish elements; with few irregular striae on a narrow band along the margin posteriorly to s6. Female idiosomal setal pattern 12A:3A/JV-3,4:ZV. Setae j1 22 [26], j3 23 [22], j4 5 [7], j5 7 [7], j6 [8], J2 [8], J5 9 [8], z2 20 [24], z3 30 [38], z4 16 [19], z5 7 [6], Z4 74 [87], Z5 60 [66], s4 59 [64], s6 72 [81], r3 36 [37]. Setae j1, j3, z2, z3, z4, Z4, Z5, s4, s6 and r3 thick, generally long, strongly serrate, on tubercles; other setae minute and smooth.

Peritreme. Extending anterolateral to j1.

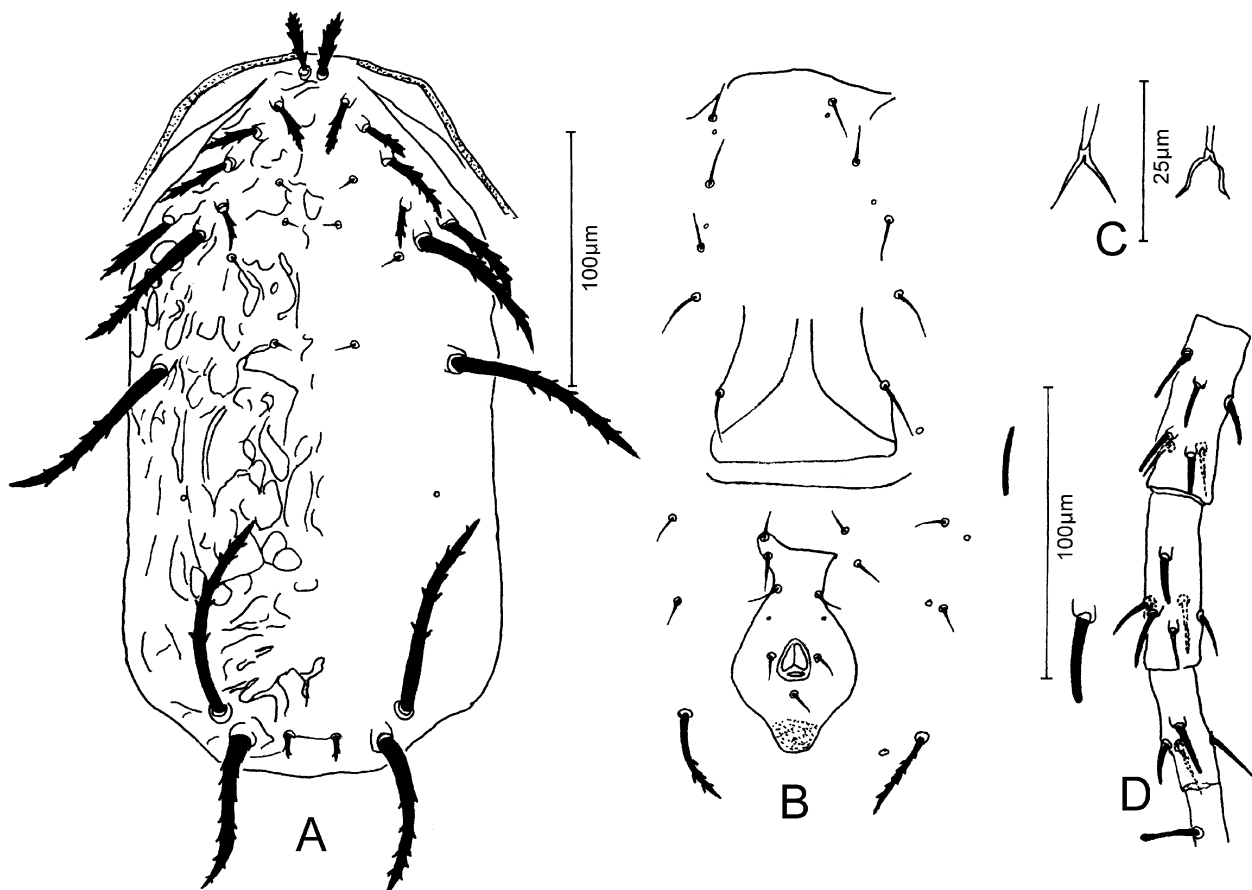


FIGURE 4. *Phytoseius duplus* Ueckermann & Loots (female): A. Dorsal shield; B. Ventral surface; C. Spermatheca; D. Leg IV.

Venter. Sternal shield smooth, not clearly outlined in the holotype, but clearly defined in the examined paratype; with 2 pairs of sternal setae (St3 on the cuticle); distances between St1–St3 52 [52], St2–St2 54 [60].

Genital shield smooth; distance between St5–St5 61 [65]. Ventrianal shield smooth, basically vase-shaped, but with anterior and anterolateral margins variable; anterior margin asymmetrically concave in holotype but straight or slightly convex in paratype, 86 [95] long, 32 [35] wide at level of Zv2 and 44 [52] wide at level of anus; seta Jv2 and the right members of setae Jv1 and Zv2 inserted on the ventrianal shield of the holotype (left members of the latter setae on the soft cuticle); Jv1, Jv2 and Zv2 inserted on the ventrianal shield of the examined paratype. Caudoventral setae smooth, except Jv5, thick and serrate.

Chelicera. Movable digit 18 long; number of teeth on this digit could not be counted; position of fixed digit renders examination not possible.

Spermatheca. Calyx cup- to cone-shaped, 8 [8] long, atrium apparently bifid.

Legs. Macroseta only on telotarsus, knobbed; Stt IV 20 [22].

Specimens examined. Holotype and 1 paratype females, **South Africa:** Limpopo Province, Pretoria, 6.5 km from Mokopane (previously Potgietersrus), on *Terminalia sericea*, 26-III-1973, M.K.P. Smith Meyer; Mpumalanga Province, Blyde River Poort Holiday Resort, on *Acacia sieberiana*, 21-II-1978, E.A. Uecker-mann.

Remarks: The absence of setae J2 and R1 in this species places it in the *horridus* species group (Denmark 1966; Chant & McMurtry 1994).

World distribution. South Africa.

Phytoseius ferox Pritchard & Baker (Fig. 5)

Phytoseius (Phytoseius) ferox Pritchard & Baker, 1962: 230.

Phytoseius ferox, Moraes *et al.*, 2004: 238.

Phytoseius (Dubininellus) ferox, Denmark, 1966: 68.

Phytosus forex [sic], El-Banhawy & Abou-Awad, 1989: 376.

FEMALE. (Specimens measured. Kenya: 1; Uganda: 1; Zambia: 1; Democratic Republic of Congo: holotype)

Dorsum. Dorsal shield 308(283–328) [295] long and 164(160–168) [173] wide, covered with rough, roundish elements. Female idiosomal setal pattern 12A:3A/JV-3,4:ZV. Setae j1 33(32–35) [36], j3 43(37–53) [43], j4 4 [3], j5 3(2–5) [3], j6 4(3–5) [3], J5 5(5–6) [5], z2 12(11–13) [7], z3 30(27–34) [28], z4 8 [7], z5 3 [3], Z4 98(86–107) [97], Z5 94(93–96) [89], s4 140(138–144) [140], s6 77(61–91) [64], r3 46(45–48) [47]. Setae j1, j3, z3, Z4, Z5, s4, s6 and r3 generally long, tick, strongly serrate; z2 short and serrate; others minute and smooth; Z4, Z5, s4, s6 and r3 inserted on tubercles.

Peritreme. Extending anterior to j1.

Venter. Sternal shield not sufficiently clear to be illustrated and described; distances between St1–St3 56 [58], St2–St2 64 [63]. Genital shield smooth; distance between St5–St5 77(75–78) [74]. Ventrianal shield vase-shaped, smooth, anterior margin slightly convex, 96(88–101) [102] long, 45(38–50) [55] wide at level of Zv2 and 57(53–59) [61] wide at level of anus; preanal pores posterolaterad of Jv2. Caudoventral setae smooth, except Jv5, tick and strongly serrate.

Chelicera. Movable digit 22 [24] long, with 1 tooth; fixed digit 23 [24] long, with 3 teeth and a *pilus denticilis*.

Spermatheca. Calyx bell-shaped, 25 long [often only the more sclerotized part near the atrium visible, 3(2–3) long]; atrium small and nodular.

Legs. Macrosetae of leg IV spatulate on genu and tibia, and knobbed on basitarsus, spatulate or knobbed on telotarsus; Sge IV 22(21–26) [30], Sti IV 50(48–53) [55], Sbt IV 26(24–29) [24], Stt IV 23(20–27).

Specimens examined. Holotype female, **Democratic Republic of Congo (= Belgian Congo):** Stanleyville, on ?*Bixa* sp., 18-IV-1955, E.W. Baker. One female, **Kenya:** 14 km W Kwale, on *Synedrella nodi-*

flora, 29-XI-1989, J.S. Yaninek. One female, **Uganda**: 5 km W Masaka, on *Vernonia amygdalina*, 6-X-1990, J.S. Yaninek. One female, **Zambia**: 10 km N Mansa, on *Combretum ghasalense*, 12-VI-1992, A. Onzo.

Remarks. Length of setae j3, Z4 and s6 is rather variable between countries. The absence of setae J2 and R1 in this species places it in the *horridus* species group (Denmark 1966; Chant & McMurtry 1994).

World distribution. Democratic Republic of Congo, Kenya, Madagascar, Tanzania, Uganda and Zambia.

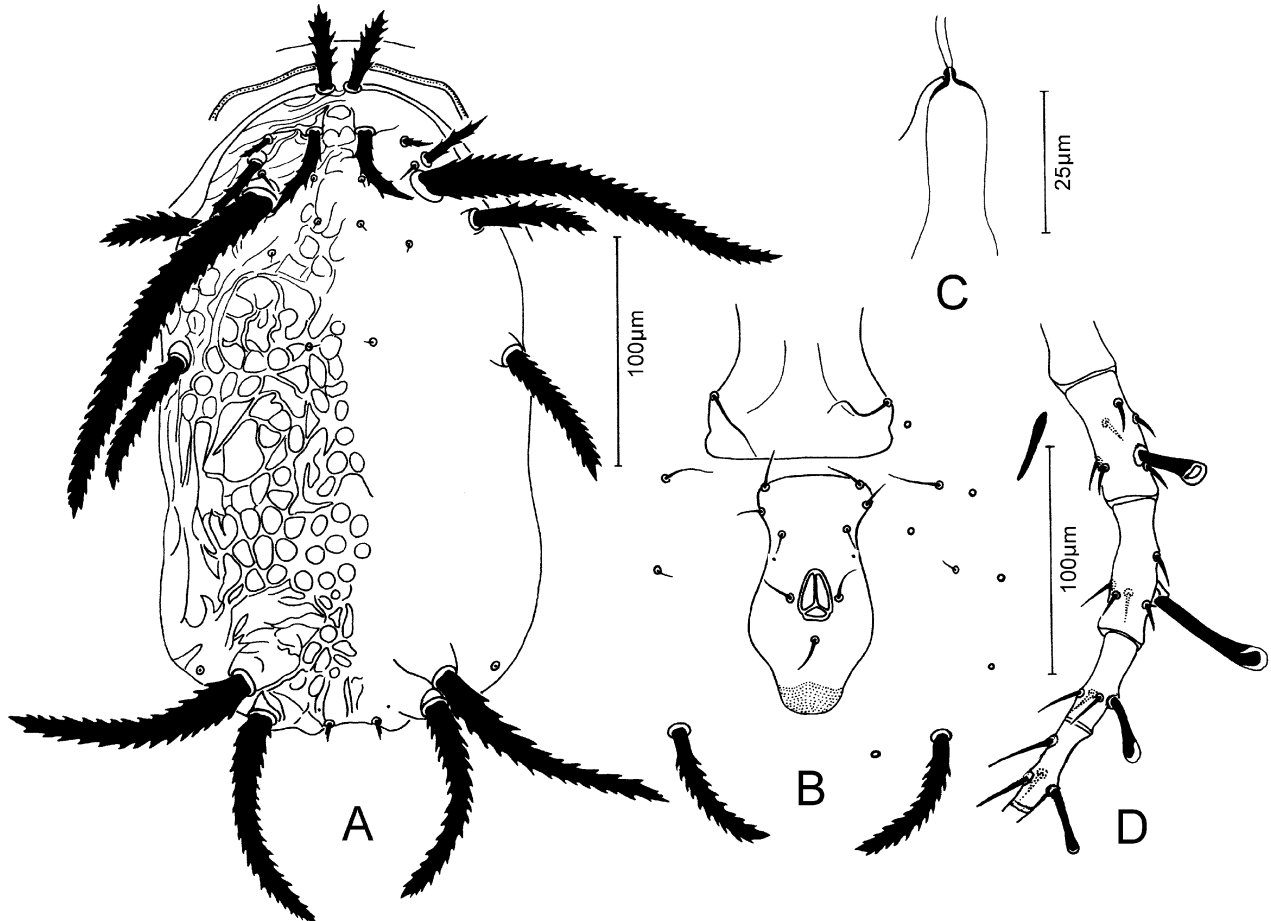


FIGURE 5. *Phytoseius ferox* Pritchard & Baker (female): A. Dorsal shield; B. Ventral surface; C. Spermatheca; D. Leg IV.

***Phytoseius hongkongensis* Swirski & Shechter (Fig. 6)**

Phytoseius (Phytoseius) hongkongensis Swirski & Shechter, 1961: 99.

Phytoseius hongkongensis, Moraes *et al.*, 2004: 240.

Phytoseius (Pennaseius) hongkongensis, Ehara, 1966: 25.

FEMALE. (Specimens measured. Benin: 1; Kenya: 2; Malawi: 1)

Dorsum. Dorsal shield 274(262–285) long and 138(133–147) wide, mostly smooth, except for few lateral striae; a pair of notches at level of s4 and a pair of large notocephalic pores connected to a triangular structure, posterior and in close proximity with z5. Female idiosomal setal pattern 12A:5A/JV-3,4:ZV. Setae j1 24(22–26), j3 67(59–71), j4 5(5–6), j5 5(5–6), j6 6(5–7), J2 9(8–10), J5 7(6–8), z2 12(10–13), z3 45(45–46), z4 8, z5 4(3–5), Z4 74(67–82), Z5 74(67–85), s4 96(90–105), s6 81(77–86), r3 42(40–43), R1 16(14–17). Setae j1, j3, z3, Z4, Z5, s4, s6 and r3 long, thick and serrate; other setae short and smooth; Z4 and Z5 inserted on tubercles.

Peritreme. Extending anterolateral to j1.

Venter. Sternal shield smooth, with parts of the margin indistinct; distances between St1–St3 60(58–63), St2–St2 66. Genital shield smooth; distance between St5–St5 60(58–62). Ventrianal shield vase-shaped, smooth, anterior margin straight, 89(85–93) long, 53(50–60) wide at level of Zv2 and 44(43–45) wide at level of anus; preanal pores not distinguishable. Caudoventral setae smooth, except Jv5, thick and serrate.

Chelicera. Movable digit 26 long, with 1 tooth; fixed digit 25 long, with 2 teeth and a *pilus dentilis*.

Spermatheca. Calyx cup-shaped toward vesicle, strongly constricted and slender on about half of its length toward atrium, 12(10–18) long; atrium at least twice as wide as the slender portion of the calyx; major duct inflate near atrium.

Legs. Macrosetae of leg IV irregularly expanded and distally knobbed on genu, tibia and basitarsus and knobbed on telotarsus; Sge IV 25(24–26), Sti IV 31(29–32), Sbt IV 24(22–24), Stt IV 24(22–25).

Specimens examined. Three females, **Benin:** Département du Zou, Atchéribé, on *Daniellia oliveri*, 4-VI-1991, A. Onzo. Four females, **Kenya:** Coastal Province, 3 km N Lunga Lunga, on unknown plant, 28-XI-1989, J.S. Yaninek; Coastal Province, 13 km W Kwale, on *Terminalia catappa*, 29-XI-1989, J.S. Yaninek. Two females, **Malawi:** Central Province, Nkhotakota, on *Annona senegalensis*, 12-V-2001, M.J. Chitete.

Remarks. The presence of setae J2 and R1 in this species places it in the *plumifer* species group (Chant & Yoshida-Shaul 1992a; Chant & McMurtry 1994).

World distribution. Australia, Benin, China, Hong Kong, Indonesia, Japan, Kenya, Madagascar, Malawi, Malaysia, Papua New Guinea, South Korea, Taiwan and Thailand.

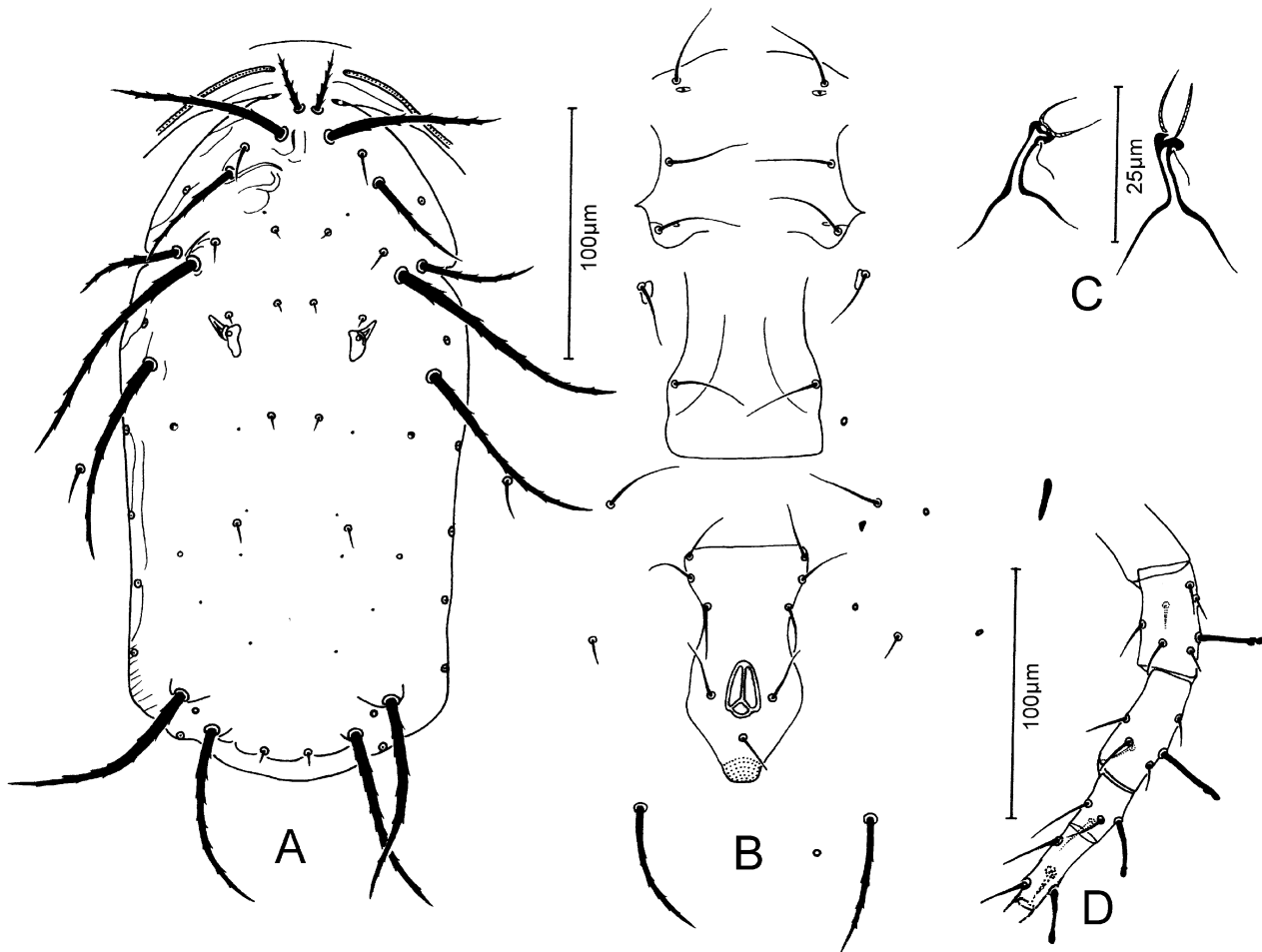


FIGURE 6. *Phytoseius hongkongensis* Swirski & Shechter (female): A. Dorsal shield; B. Ventral surface; C. Spermatheca; D. Leg IV.

***Phytoseius intermedius* Evans & MacFarlane
(Fig. 7)**

Phytoseius (Dubininellus) intermedius Evans & MacFarlane, 1962: 588.

Phytoseius intermedius, Moraes *et al.* 2004: 242.

Phytoseius (Phytoseius) intermedius, Ehara, 1972: 170.

Phytoseius (Phytoseius) yira Pritchard & Baker, 1962: 227 (synonymy according to Denmark 1966).

FEMALE. (Specimens measured. Benin: 1; Burundi: 2; Kenya: 1; Malawi: 1; Mozambique: 1; Rwanda: 3; Democratic Republic of Congo: holotype of *P. yira*).

Dorsum. Dorsal shield 286(268–304) [270] long and 148(140–157) [149] wide, mostly covered by rough, roundish elements; with few longitudinal striae along margins posteriorly to s6. Female idiosomal setal pattern 12A:3A/JV-3,4:ZV. Setae j1 23(19–26) [26], j3 22(19–24) [20], j4 6(5–7) [5], j5 6(5–7) [5], j6 7(6–8) [6], J5 8(6–9) [6], z2 20(18–22) [20], z3 32(27–37) [31], z4 16(11–20) [14], z5 7(5–8) [5], Z4 76(72–85) [78], Z5 60(56–64) [63], s4 59(56–61) [63], s6 74(69–78) [75], r3 35(32–38) [33]. Setae j1, j3, z2, z3, Z4, Z5, s4, s6 and r3 thick, generally long and serrate; z4 of medium length but also serrate; other setae minute and smooth; Z4 and Z5 on tubercles.

Peritreme. Extending anterior to j1.

Venter. Sternal shield not sufficiently clear to be illustrated and described; distances between St1–St3 53(48–57), St2–St2 57(56–59). Genital shield smooth; distance between St5–St5 65(62–69) [66]. Ventrianal shield vase-shaped, smooth, with anterior margin straight, 89(84–99) [91] long, 34(31–37) [33] wide at level of Zv2 and 49(41–54) [47] wide at level of anus; preanal pores posterolaterad of Jv2. Caudoventral setae smooth, except Jv5, thick and serrate.

Chelicera. Movable digit 20 long, with 1 tooth; fixed digit 19 long, with 2 teeth and a *pilus dentilis*.

Spermatheca. Calyx cup-shaped, 6(5–6) long; atrium small and nodular.

Legs. Without macrosetae.

Specimens examined. Two females, **Benin:** Département du Zou, Glazoué, on unknown plant, 10-VI-1991, A. Onzo. Three females, **Burundi:** 42 km NW Bujumbura, on *Piliostigma thonningii*, 11-XII-1989, J.S. Yaninek; 9 km S Rutana, on *Markhamia obtusifolia*, 13-XII-1989, J.S. Yaninek. Holotype female of *P. yira*, **Democratic Republic of Congo (= Belgian Congo):** Ruindi, on *Grewia* sp., 11-V-1955, E.W. Baker. Two females, **Kenya:** Nyanza Province, 19 km S Kisumu, on *Cassia* sp., 3-XII-1989, J.S. Yaninek. Two females, **Malawi:** Northern Province, 23.2 km NNW Nkhata-Bay and Mzuzu junction, on unknown plant, 2-V-2000, B. Eklou. Two females, **Mozambique:** Zambezia Province, 27 km S Nampula and Zambezia border, on *Manihot esculenta*, 22-IV-2000, I.D. Zannou. Five females, **Rwanda:** Butare Province, ISAR Headquarters, Rubona, on *Solanum* sp., 6-XII-1989, J.S. Yaninek; 34.6 km W Gitarama, on *Vernonia amygdalina*, 6-XII-1989, J.S. Yaninek; unknown location, on unknown plant, 9-XII-1989, J.S. Yaninek.

Remarks. The absence of setae J2 and R1 in this species places it in the *horridus* species group (Denmark 1966; Chant & McMurtry 1994).

World distribution. Benin, Burundi, Cape Verde, Democratic Republic of Congo, India, Japan, Kenya, Madagascar, Malawi, Mozambique, Pakistan, Philippines, Reunion Island, Rwanda and Zimbabwe.

***Phytoseius kisumuensis* Moraes & McMurtry**

Phytoseius kisumuensis Moraes & McMurtry, in Moraes *et al.* (1989): 87; Moraes *et al.*, 2004: 243.

REMARKS. This species was described from specimens collected near Lake Victoria, Kisumu, Kenya, on unknown plant. No additional specimens were collected in the present study. Female idiosomal setal pattern

12A:5A/JV-3,4:ZV. The reexamination of the holotype of this species confirmed that setae j3, s4, s6 and r3 are serrate as stated and not smooth as illustrated in its original description. The presence of setae J2 and R1 in this species places it in the *plumifer* species group (Chant & Yoshida-Shaul 1992a; Chant & McMurtry 1994).

World distribution. Kenya.

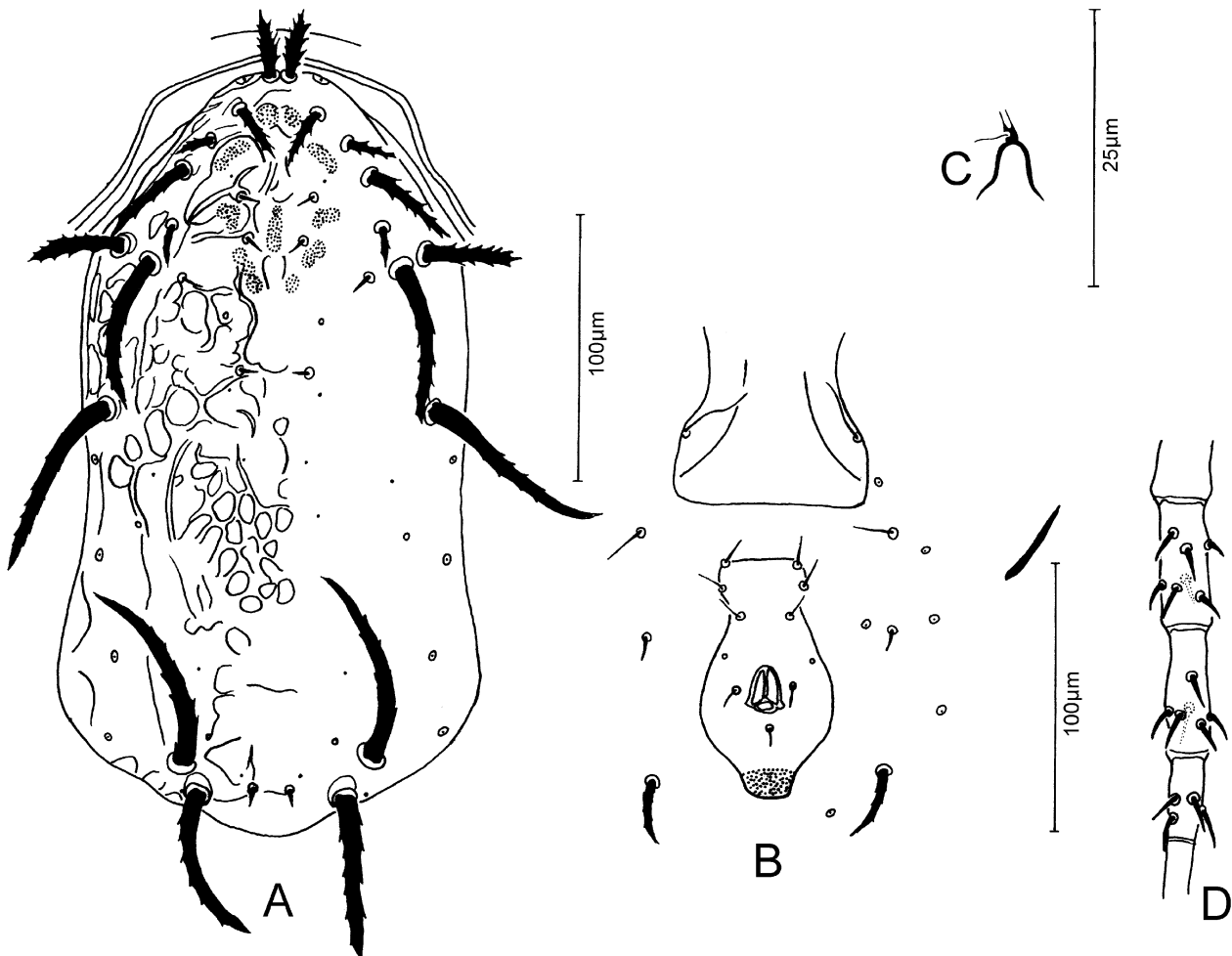


FIGURE 7. *Phytoseius intermedius* Evans & MacFarlane (female): A. Dorsal shield; B. Ventral surface; C. Spermtheca; D. Leg IV.

***Phytoseius neoamba* Ueckermann & Loots
(Fig. 8)**

Phytoseius (Pennaseius) neoamba Ueckermann & Loots, 1985: 35.

Phytoseius neoamba, Moraes *et al.*, 2004: 249.

FEMALE. (Specimens measured. South Africa: holotype and 7 paratypes)

Dorsum. Dorsal shield 297(288–304) [287] long and 147(144–150) [144] wide; mostly smooth, with few anterolateral and dorsocentral striae. Female idiosomal setal pattern 12A:5A/JV-3,4:ZV. Setae j1 22(21–23) [22], j3 31(28–33) [31], j4 12(7–13) [7], j5 11(9–13) [9], j6 12(9–16) [14], J2 13(10–16) [14], J5 12(10–14) [11], z2 10 (9–12) [11], z3 25(23–29) [24], z4 14(10–19) [15], z5 10(9–12) [10], Z4 26(24–29) [29], Z5 40(36–42) [39], s4 36(33–39) [36], s6 35(32–37) [35], r3 34(33–35) [33], R1 14(10–18) [15]. Setae j1, j3, z3, Z4, Z5, s4, s6 and r3 thick, long and serrate; J5 short, serrate; other setae of medium length and smooth.

Peritreme. Extending almost anterior to j1.

Venter. Sternal shield smooth, with posterior margin straight; distances between St1–St3 54(51–54) [54], St2–St2 66(65–68) [65]. Genital shield smooth; distance between St5–St5 56(53–59) [54]. Ventrianal shield vase-shaped, smooth, anterior margin straight, 97(93–104) [93] long, 47(44–50) [47] wide at level of Zv2 and 54(51–56) [54] wide at level of anus; preanal pores posterior to Jv2. Caudoventral setae smooth, except Jv5, thick and strongly serrate.

Chelicera. Movable digit 23(23–24) [23] long, with 1 tooth; fixed digit 21(20–22) [20] long, with 3 teeth and a *pilus dentilis*.

Spermatheca. Calyx tubular toward atrium and dish-shaped near vesicle, 11(9–12) [12] long; major duct inflate near atrium.

Legs. Macrosetae of leg IV knobbed; Sbt IV 29 (28–31) [28], Stt IV 27 (26–28) [27].

Specimens examined. Holotype and 7 paratype females, **South Africa:** Gauteng Province, Roodeplaat Dam Nature Reserve, near Pretoria, on *Triumfetta sonderii*, 23-XI-1981, E.A. Ueckermann.

Remarks: The presence of setae J2 and R1 in this species places it in the *plumifer* species group (Chant & Yoshida-Shaul 1992a; Chant & McMurtry 1994).

World distribution. South Africa.

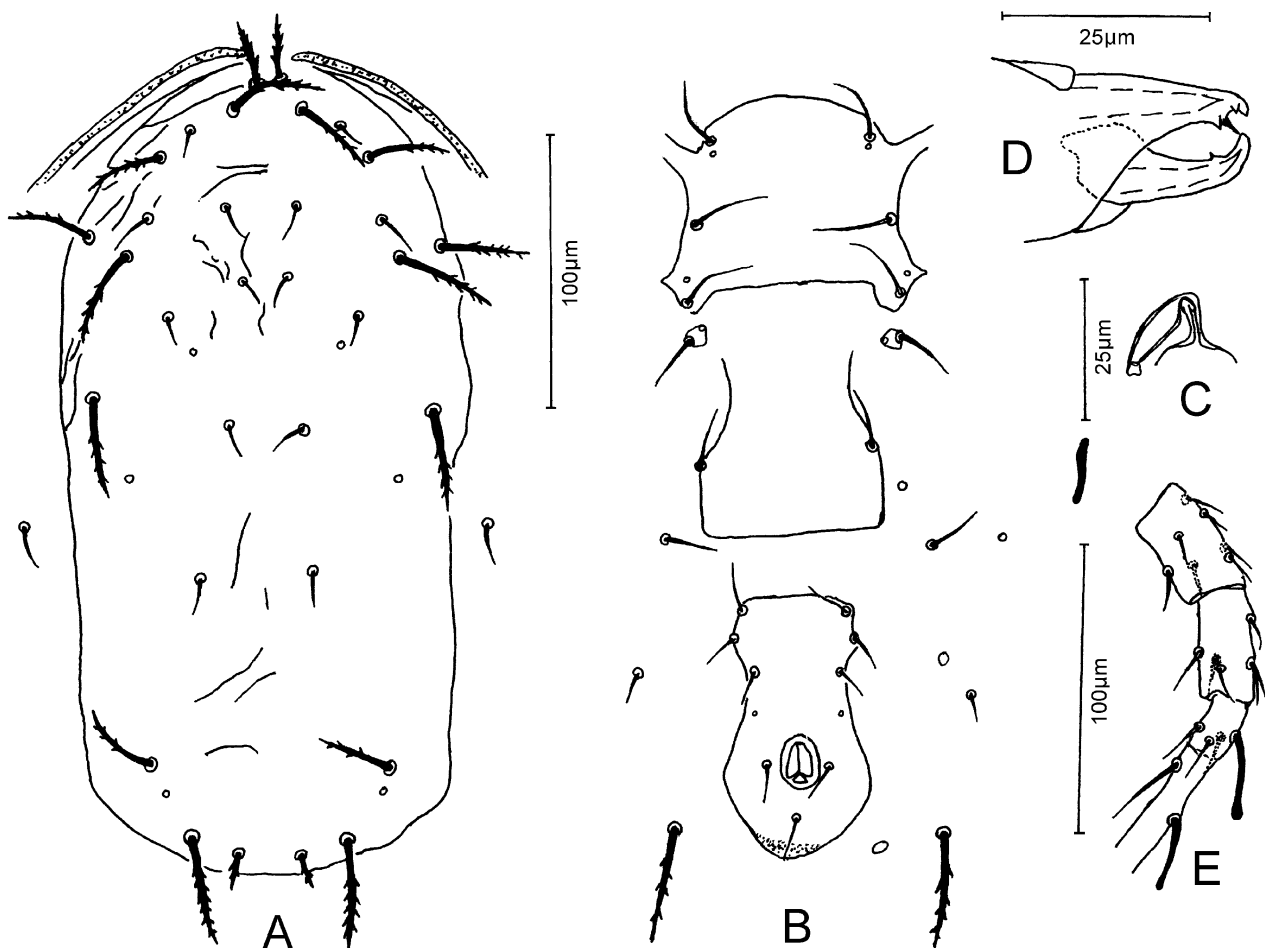


FIGURE 8. *Phytoseius neoamba* Ueckermann & Loots (female): A. Dorsal shield; B. Ventral surface; C. Spermatheca; D. Chelicera; E. Leg IV.

***Phytoseius neohongkongensis* Moraes & McMurtry**

Phytoseius neohongkongensis Moraes & McMurtry, in Moraes *et al.* (1989): 88; Moraes *et al.* 2004: 249.

Remarks. This species was described from specimens collected in Matuga, Kenya, on *Solanum nigrum*. No additional specimens were collected in the present study. Female idiosomal setal pattern 12A:5A/JV-

3,4:ZV. The presence of setae J2 and R1 in this species places it in the *plumifer* species group (Chant & Yoshida-Shaul 1992a; Chant & McMurtry 1994).

World distribution. Kenya.

Phytoseius neomontanus Moraes & McMurtry

Phytoseius neomontanus Moraes & McMurtry, in Moraes *et al.* (1989): 90; Moraes *et al.*, 2004: 249.

Remarks. This species was described from specimens collected in Kericho, Kenya, on Malvaceae. No additional specimens were collected in the present study. Female idiosomal setal pattern 12A:5A/JV-3, 4:ZV. The presence of setae J2 and R1 in this species places it in the *plumifer* species group (Chant & Yoshida-Shaul 1992a; Chant & McMurtry 1994).

World distribution. Kenya.

Phytoseius perforatus El-Badry

Phytoseius perforatus El-Badry, 1968: 1083; Moraes *et al.*, 2004: 250.

Phytoseius (Pennaseius) perforatus, Moraes *et al.*, 1986: 214.

Remarks. This species was described from specimens collected in Geneid, Blue Nile, Sudan, on Solanaceae. No additional specimens were collected in the present study. Female idiosomal setal pattern 12A:4A/JV-3,4:ZV. The absence of seta J2 and the presence of seta R1 in this species place it in the *purseglovei* species group (Chant & Yoshida-Shaul 1992a; Chant & McMurtry 1994).

World distribution. Sudan.

Platyseiella Muma

Platyseiella Muma, 1961: 280; Chant & McMurtry, 1994: 233; Moraes *et al.*, 2004: 259.

Amblyseius (Platyseiella), Van der Merwe, 1968: 168.

Phytoseius (Platyseiella), Wainstein, 1970: 1726.

Proprioseiopsis (Platyseiella), Karg, 1983: 302.

Stable characters mentioned by Chant & McMurtry (1994) for the species of this genus are: Seta z3 absent and s6 present; genu II with 7 setae; some dorsal setae and Jv5 elongate, thick and strongly serrate, Jv4 absent; and calyx of spermatheca funnel-shaped.

Two species of this genus are reported in this study. They have female idiosomal setal pattern 11D:5A/JV-3,4:ZV; R1 on interscutal membrane; 1 pair of metapodal shields; 1 pair of round preanal pores, chaetotaxy of genua II and III 2-2/0, 2/0-1 and 1-2/0, 2/0-1, respectively.

Platyseiella eliahui Ueckermann

(Fig. 9)

Platyseiella eliahui Ueckermann, 1992: 20; Moraes *et al.*, 2004: 259.

FEMALE. (Specimens measured. Zambia: 2)

Dorsum. Dorsal shield 308 long and 155(150–160) wide, striate. Setae j1 29(28–30), j3 30, j4 9(8–10), j5

8, j6 8, J2 9(8–10), J5 9(8–10) z2 25, z4 28, z5 8, Z4 35, Z5 73, s4 53, s6 76(75–78), r3 38, R1 12. Setae j1, j3, z2, z4, Z4, Z5, s4, s6 and r3 thick, long and serrate; J5 and R1 of medium length and serrate; other setae short and smooth

Peritreme. Extending to level of j1.

Venter. Sternal shield smooth, with posterior margin convex; distances between St1–St3 65, St2–St2 65. Genital shield smooth; distance between St5–St5 65. Ventrianal shield vase-shaped, smooth, anterior margin slightly convex, 100 long, 45 wide at level of Zv2 and 58(55–60) wide at level of anus, with one pair of preanal setae (Jv1 and Zv2 off ventrianal shield), preanal pores posterior to Jv2. Caudoventral setae smooth and sharp-tipped, except Jv5, thick and serrate.

Chelicera. Movable digit 28 long, with 2 teeth; fixed digit 25 long, with 3 teeth and a *pilus dentilis*.

Spermatheca. Calyx tubular toward atrium and dish-shaped near vesicle, 18 long; major duct inflate near atrium.

Legs. Macrosetae of leg IV knobbed; Sti IV 22(20–23), Sbt IV 36(33–38), Stt IV 30(29–31).

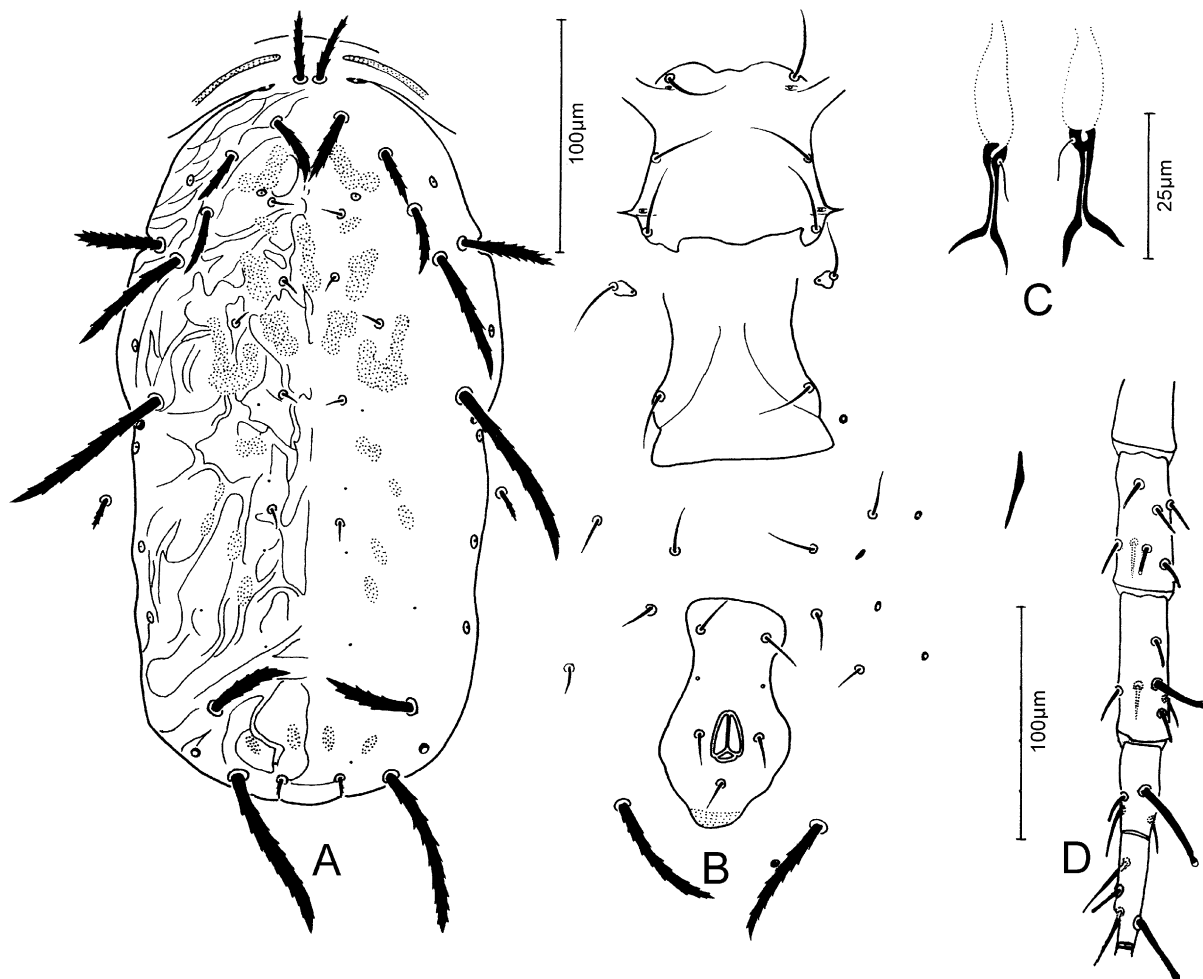


FIGURE 9. *Platyseiella eliahui* Ueckermann (female): A. Dorsal shield; B. Ventral surface; C. Spermatheca; D. Leg IV.

Specimens examined. Zambia: 150 km SW Mpika, on *Pteridium aquilinum*, 17-VI-1992, A. Onzo.

Remarks. Contrary to the original description and illustrations, the specimens examined here have Z4 serrate. After re-examining the holotype, one of the authors of the present paper (E.A. Ueckermann, author of the species) confirmed the serration of that seta. This species has setae J2 and R1 present, setae r3 inserted on dorsal shield, setae Jv1 inserted off the ventrianal shield and preanal pores widely separated and therefore it belongs to the *platypilis* species group (Chant & McMurtry 1994).

World distribution. South Africa and Zambia.

Platyseiella marikae Ueckermann
(Fig. 10)

Platyseiella marikae Ueckermann, 1990: 19; Moraes *et al.*, 2004: 259.

FEMALE. (Specimens measured. South Africa: holotype and 3 paratypes)

Dorsum. Dorsal shield 330(324–337) [324] long and 176(161–195) [182] wide, with irregular striae anterior to j6 and smooth posteriorly. Setae j1 32(31–32) [33], j3 18(17–19) [18], j4 6(6–7) [6], j5 6 [6], j6 7, J2 8(7–9) [7], J5 11(11–12) [11], z2 11(9–13) [11], z4 7(6–7) [7], z5 6(5–7) [6], Z4 83(81–86) [86], Z5 105(104–106) [104], s4 97(88–107) [107], s6 81(76–84) [83], r3 46(46–47) [46]; R1 13(12–13) [13]. Setae j1, Z4, Z5, s4, s6 and r3 long, thick, serrate; j3 of medium length, thick and serrate; other setae small and smooth.

Peritreme. Extending to level between j1 and j3.

Venter. Sternal shield smooth, with posterior margin irregular; distances between St1–St3 64(62–65) [65], St2–St2 65(64–66) [66]. Genital shield smooth; distance between St5–St5 68(66–69). Ventrianal shield vase-shaped, smooth, anterior margin slightly convex, 113(109–117) long, 66(65–66) wide at level of Zv2 and 65(63–66) wide at level of anus, with 2 pairs of preanal setae (Jv1 off ventrianal shield), preanal pores posterior and slightly laterad to Jv2. Caudoventral setae smooth, except Jv5, serrate.

Chelicera. Movable digit 32(31–33) [33] long, with 2 teeth; fixed digit 30(29–30) [30] long, with 3 teeth and a *pilus dentilis*.

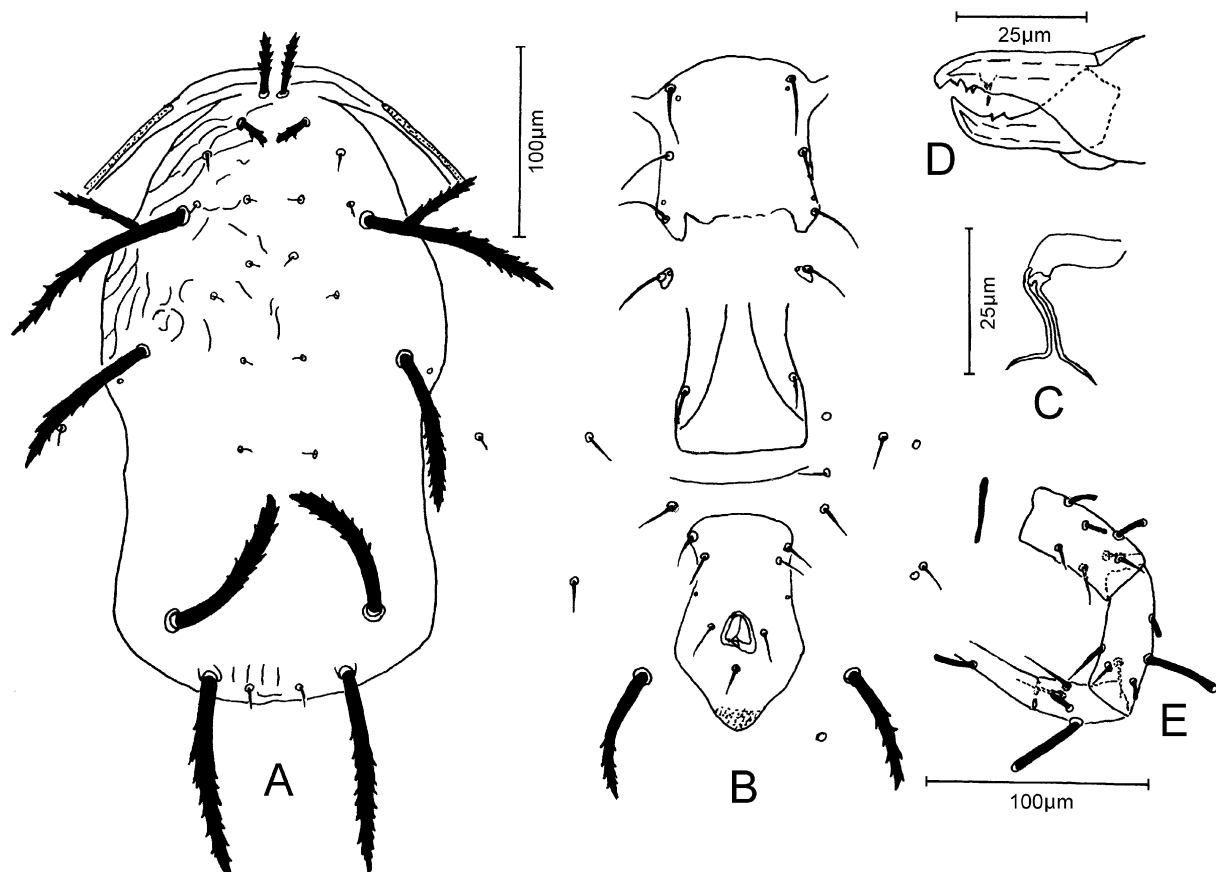


FIGURE 10. *Platyseiella marikae* Ueckermann (female): A. Dorsal shield; B. Ventral surface; C. Spermatheca; D. Chelicera; E. Leg IV.

Spermatheca. Calyx tubular toward atrium and dish-shaped near vesicle, 15(14–17) long; major duct inflate near atrium.

Legs. Macrosetae of leg IV knobbed; Sge IV 16(12–22) [14], Sti IV 34(33–36) [36], Sbt IV 36(33–37) [36], Stt IV 29(27–30) [28], most of the other leg setae blunt distally.

Specimens examined. Holotype female and 3 paratype females, **South Africa:** Western Cape Province, Outeniqua Pass, near George, on *Dryopteris* sp., 24-VIII-1988, E.A. Ueckermann.

Remarks: This species has setae J2 and R1 present, setae r3 inserted on dorsal shield, setae Jv1 inserted off the ventrianal shield and preanal pores widely separated and therefore it belongs to the *platypilis* species group (Chant & McMurtry 1994).

World distribution. South Africa.

Key to the genera and species of the subfamily Phytoseiinae treated in this paper

- 1 Setae z3 and z6 present; seta s6 absent; most setae of dorsal shield paddle-shaped; genu II with 6 setae ...
Chantia Pritchard & Baker *Chantia paradoxa* Pritchard & Baker
- Setae z3 present/absent and z6 absent; seta s6 present; dorsal setae not paddle-shaped; genu II with 7 setae
 2
- 2 Seta z3 present *Phytoseius* Ribaga ... 3
- Seta z3 absent *Platyseiella* Muma ... 15
- 3 Setae J2 and R1 present ... *plumifer* species group Chant & Yoshida-Shaul 4
- Setae J2 absent and R1 present/absent 10
- 4 Setae s4 at most 0.7 as long as distance between their bases; setae Z4 at most half as long as distance
 between their bases 5
- Setae s4 at least as long as distance between their bases; setae Z4 at least 0.8 times as long as distance
 between their bases 7
- 5 Female ventrianal shield smooth; major duct of spermatheca inflate near atrium
 *P. neoamba* Ueckermann & Loots
- Female ventrianal shield striate anteriorly to anus; major duct of spermatheca not inflate near atrium 6
- 6 Diameter of flared part of calyx of spermatheca ca. equal to length of tubular part; with a single, knobbed
 macroseta on leg IV (basitarsus)..... *P. neomontanus* Moraes & McMurtry
- Diameter of flared part of calyx of spermatheca much larger than length of tubular part; with 3, setiform
 macrosetae on leg IV (genu, tibia and basitarsus) *P. kisumuensis* Moraes & McMurtry
- 7 Seta s6 ca. 1.5 times as long as Z4; macrosetae absent on genu and tibia of leg IV
 *P. comodera* El-Banhawy & Abou-Awad
- Seta s6 at most 1.3 times as long as Z4; macrosetae present on genu and tibia of leg IV 8
8. Calyx of spermatheca without a tubular portion; major duct of spermatheca not inflated near atrium
 *P. neohongkongensis* Moraes & McMurtry
- Calyx of spermatheca with a distinct tubular portion; major duct of spermatheca inflate near atrium..... 9
- 9 Seta j3 ca. twice as long as j1; seta z3 ca. 0.7 times as long as r3 *P. amba* Pritchard & Baker
- Seta j3 ca. 2.8 times as long as j1; seta z3 at least as long as r3 *P. hongkongensis* Swirski & Shechter
- 10 Seta R1 present *purseglovei* species group Chant & Yoshida-Shaul ...*P. perforatus* El-Badry
- Seta R1 absent..... *horridus* species group Denmark...11
- 11 Without leg macrosetae *P. intermedius* Evans & MacFarlane
- Leg IV with at least 1 macroseta 12
- 12 With only 1 macroseta, on telotarsus of leg IV *P. duplus* Ueckermann & Loots
- With 4 macrosetae, on genu, tibia, basitarsus and telotarsus of leg IV 13
- 13 Seta s4 ca. 2.5 as long as j1 and ca. 0.8 times as long as s6 *P. antigamenti* El-Banhawy & Abou-Awad
- Seta s4 at least 3.5 times as long as j1 and 1.4 times as long as s6 14

- 14 Seta z3 ca. as long as j3; macroseta of basitarsus (Sbt) IV at least twice as long as Sge IV *P. crinitus* Swirski & Shechter
 - Seta z3 ca. 0.7 times as long as j3; Sbt IV ca. as long as Sge IV *P. ferox* Pritchard & Baker
- 15 Setae s4 ca. half as long as distance between their bases; ventrianal shield with 1 pair of preanal setae (Jv2) *P. eliahui* Ueckermann
 - Setae s4 about as long as distance between their bases; ventrianal shield with 2 pairs of preanal setae (Jv2 and Zv2) *P. marikae* Ueckermann

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