



## Phytoseiid mites of the subtribe Amblyseiina (Acari: Phytoseiidae: Amblyseiini) from sub-Saharan Africa

IGNACE D. ZANNOU<sup>1</sup>, GILBERTO J. DE MORAES<sup>1</sup>, EDDIE A. UECKERMANN<sup>2</sup>,  
ANIBAL R. OLIVEIRA<sup>1</sup>, JOHN S. YANINEK<sup>3</sup> & RACHID HANNA<sup>4</sup>

<sup>1</sup>Depto. Entomologia, Fitopatologia e Zoologia Agrícola, ESALQ-Universidade de São Paulo-13418-900 Piracicaba-SP, Brazil.  
E-mail: gjmoraes@carpa.ciagri.usp.br

<sup>2</sup>Plant Protection Research Institute, Private Bag X134, Queenwood, Pretoria; 0121 South Africa

<sup>3</sup>Dept. Entomology, Smith Hall Room 100, 901 W. State Street, Purdue University, West Lafayette, IN 47907-2089; USA

<sup>4</sup>Biological Control Centre for Africa, International Institute of Tropical Agriculture, 08 B.P. 0932, Cotonou, Benin, West Africa

### Table of contents

Abstract .....	2
Introduction .....	2
Tribe Amblyseiini Wainstein .....	3
Subtribe Amblyseiina Chant & McMurtry .....	3
<i>Amblyseius</i> Berlese .....	3
<i>Amblyseius adhatodae</i> Muma .....	4
<i>Amblyseius anomalus</i> Van der Merwe .....	5
<i>Amblyseius brachyscutatus</i> Zannou, Moraes & Oliveira, n. sp. ....	7
<i>Amblyseius cameroonensis</i> (Zannou, Zundel, Hanna & Moraes) .....	8
<i>Amblyseius caudatus</i> Berlese .....	8
<i>Amblyseius comatus</i> Ueckermann & Loots .....	9
<i>Amblyseius curticalyx</i> Zannou, Moraes & Oliveira, n. sp. ....	9
<i>Amblyseius duplicesetus</i> Moraes & McMurtry .....	10
<i>Amblyseius genya</i> Pritchard & Baker .....	11
<i>Amblyseius jamesi</i> Zannou, Moraes & Oliveira, n. sp. ....	13
<i>Amblyseius herbicolus</i> (Chant) .....	14
<i>Amblyseius hurlbutti</i> Denmark & Muma .....	15
<i>Amblyseius largoensis</i> (Muma) .....	16
<i>Amblyseius lumangweensis</i> Zannou, Moraes & Oliveira, n. sp. ....	17
<i>Amblyseius neoankaratrae</i> Ueckermann & Loots .....	19
<i>Amblyseius neolargoensis</i> Van der Merwe .....	20
<i>Amblyseius ovalitectus</i> Van der Merwe .....	21
<i>Amblyseius pretoriaensis</i> Ueckermann & Loots .....	22
<i>Amblyseius chanti</i> Zannou, Moraes & Oliveira, n. sp. ....	23
<i>Amblyseius sundi</i> Pritchard & Baker .....	25
<i>Amblyseius swirskii</i> Athias-Henriot .....	27
<i>Amblyseius tamatavensis</i> Blommers .....	29
<i>Amblyseius victoireae</i> Zannou, Moraes & Oliveira, n. sp. ....	30
<i>Graminaseius</i> Chant & McMurtry .....	32
<i>Graminaseius bufortus</i> (Ueckermann & Loots) .....	32
<i>Graminaseius lippiai</i> Ueckermann, Zannou & Moraes, n. sp. ....	34
<i>Graminaseius occidentafricanus</i> (Moraes, Oliveira & Zannou) .....	35
<i>Transeius</i> Chant & McMurtry .....	35

<i>Transeius katumaniensis</i> Zannou, Moraes & Oliveira, n. sp. ....	36
<i>Transeius msabahaensis</i> (Moraes & McMurtry) .....	37
<i>Transeius soniae</i> Zannou, Moraes & Oliveira, n. sp. ....	38
<i>Transeius ventriconstrictus</i> Zannou, Moraes & Oliveira, n. sp. ....	40
<i>Transeius violini</i> (Meyer & Rodrigues) .....	41
Key to the genera and species of the subtribe Amblyseiina treated in this paper .....	42
Acknowledgements .....	44
References .....	44

## Abstract

This is the fifth publication in a series to determine the phytoseiid mites of sub-Saharan Africa. Thirty-one phytoseiid species of the subtribe Amblyseiina are reported in this paper. They refer to all species of this subtribe known to occur in sub-Saharan Africa. Ten of these species are described for the first time, 15 species are redescribed and 6 are not evaluated in this study. Most of those species were collected in cassava habitat in tropical Africa and in other habitats in South Africa. A key is included to help in the separation of these species.

**Key words:** Acari, Mesostigmata, Phytoseiidae, Amblyseiini, predator, cassava, taxonomy, sub-Saharan Africa

## Introduction

Phytoseiidae mites are commonly used for the biological control of pest mites in several countries. The inventory of the faunistic composition in 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 *Mononychellus tanajoa* (Bondar) biologically (Yaninek & Herren 1988). *Mononychelles tanajoa* is a cassava (*Manihot esculenta* Crantz) pest that was accidentally introduced from the Neotropics to Africa, apparently in early 1970's (Nyiira 1972). Surveys were conducted in cassava habitats of several cassava-growing countries in sub-Saharan Africa from 1986 to 2002 by IITA personnel to identify the composition of the mite fauna before and after the introduction of exotic phytoseiids from the Neotropics. During those surveys, many phytoseiid species were collected, some of which are new to science. This paper is the fifth in a series dealing with the identification of sub-Saharan African phytoseiid mites elaborated within the scope of the IITA program for the biological control of *M. tanajoa*. The first paper dealt with species of the genus *Euseius* (Moraes et al. 2001b), the second with the species in the subtribes Typhlodromalina and Euseiina (Moraes et al. 2006), the third with the species of the genus *Neoseiulus* (Zannou et al. 2006) and the fourth with the species of the subtribes Arrenoseiina and Proprioseiopsina (tribe Amblyseiini) and the tribe Typhlodromipsini (Moraes et al. 2007). The objective of the present paper is to report the phytoseiid mites of the subtribe Amblyseiina Chant & McMurtry (tribe Amblyseiini Wainstein) known from sub-Saharan Africa with redescription of known species and descriptions of new species based on specimens found in the surveys previously reported, plus specimens collected by South African researchers. A key is presented to help in the separation of all the species of this subtribe known from sub-Saharan Africa.

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 here are those of Chant and Yoshida-Shaul (1992). 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 brackets). Dorsal shield width was always taken at the widest level of the proscutum. Macrosetae

for which measurements are not provided should be considered as absent. Abbreviations used for depositories of type specimens are: ESALQ-USP (Escola Superior de Agricultura Luiz de Queiroz, Universidade de São Paulo, Piracicaba-SP, Brazil); IITAIM (International Institute of Tropical Agriculture Insect Museum; Cotonou, Republic of Benin) and NCA-PPRI (National Collection of Arachnida, PPRI, Pretoria, South Africa). World distribution of each species is based on the surveys corresponding to the present work and on Moraes et al. (2004).

### **Tribe Amblyseiini Wainstein**

Amblyseiini Wainstein, 1962: 26.

Chant & McMurtry (2004) gave a full description of the tribe Amblyseiini. Key characters used to separate this from other tribes of the same subfamily (Chant & McMurtry 2006) are: idiosoma with more than 25 pairs of setae, ratio between the length of seta s4 and that of seta Z1 greater than 3.0:1.0 (except *Amblyseius ankaratrae* Blommers, *A. neoankaratrae* Ueckermann & Loots and the species of *Paraamblyseius* Muma in which this ratio is smaller than 3.0:1.0), seta S4 usually present, dorsal shield entire, peritrematal shield fused anteriorly to the dorsal shield, sternal shield without median posterior projection and genua II and III usually with macrosetae.

### **Subtribe Amblyseiina Chant & McMurtry**

Amblyseiina Chant & McMurtry, 2004: 179.

Chant & McMurtry (2004) gave a full description of the subtribe Amblyseiina. Key characters used to separate this subtribe from other subtribes of the same tribe are: J2 present in most species, except *pusillus* species group (*Amblyseius*); setae z2, z4, Z1 (when present), S2, S4, S5 and the dorsocentral setae usually short/minute; setae Z4, Z5 and s4 are often greatly elongate, sometimes whip-like; female ventrianal shield of variable shape and, similarly to sternal and genital shields, usually narrower than in other subtribes of Amblyseiini; dorsal setal pattern is 10A:9B, except the species groups *pusillus* (10A:8E) and *sundi* (10A:8A) of the genus *Amblyseius*, as well as the species of *Amblyseiella* (10A:8B) and *Maunaseius* (10A:8A) [*Amblyseius occidentafricanus* (Moraes, Oliveira & Zannou) has dorsal setal pattern 10A:8C]. Macrosetae always present on genu, tibia and tarsus of leg IV [*Graminaseius polisenis* (Schicha) does not have macroseta on tibia IV]. Of the 7 genera belonging to this subtribe (Chant & McMurtry 2004), only 3: *Amblyseius*, *Graminaseius* and *Transeius* are known to occur in sub-Saharan Africa.

### ***Amblyseius* Berlese**

*Amblyseius* Berlese, 1914: 143; Chant & McMurtry, 2004: 188; Moraes et al. 2004: 12.

*Amblyseiopsis* Garman, 1948: 16.

*Amblyseius* (*Amblyseialus*) Muma, 1961: 287.

*Amblyseius* (*Amblyseius*) Muma, 1961: 287.

*Amblyseius* (*Amblyseius*) section *Italoseius* Wainstein, 1962: 15.

*Amblyseius* (*Multiseius*) Denmark & Muma, 1989: 82.

*Amblyseius* (*Pauciseius*) Denmark & Muma, 1989: 132.

*Proprioiseiopsis* (*Peloiseius*) Karg, 1983: 303.

Stable characters mentioned by Chant & McMurtry (2004) for species of this genus are: idiosoma lightly sclerotized, rarely brownish in color; setae *z2*, *z4* (except *americanus* species group), *Z1* (when present), *S2*, *S4*, *S5* and the dorsocentral setae short/minute, approximately subequal in length; *Z4*, *Z5* and *s4* usually extremely elongate (except *A. ankaratrae* and *A. neoankaratrae* in which *Z4* is short and subequal to *z2*, *z4*, *Z1*, *s2*, *S4*, *S5* and dorsocentral setae); ratio *s4*:*S2* > 3.0:1.0 [except in *ankaratrae* species subgroup Chant & McMurtry of the *largoensis* species group McMurtry & Moraes]; female ventrianal shield not extremely wide, spermatodactyl with heel and toe or L-shaped (with heel suppressed).

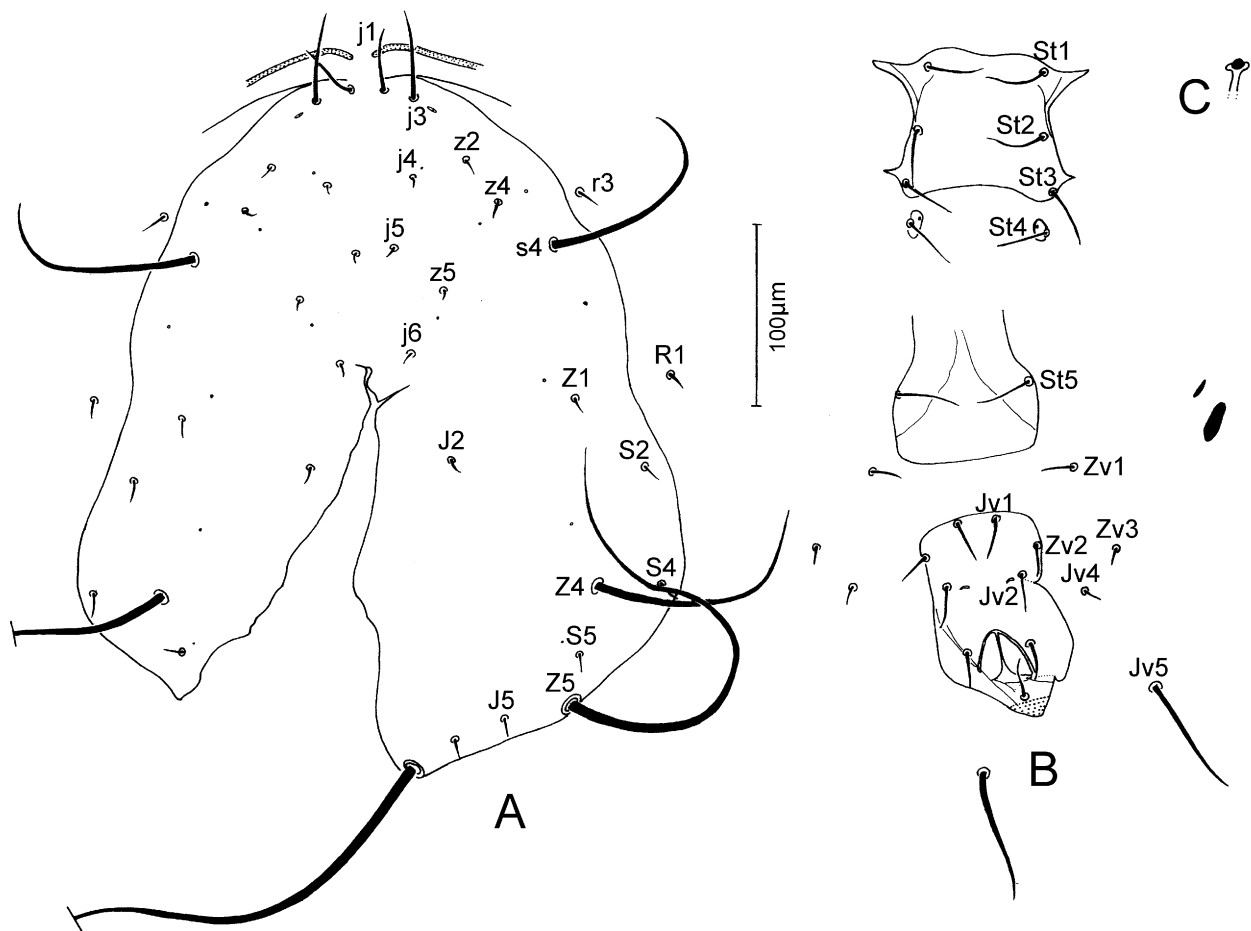
Twenty-three species of this genus are reported in this paper. Females of those species have idiosomal setae sharp; caudoventral setae smooth and sharp-tipped; 3 pairs of preanal setae, except *Amblyseius brachyscutatus* **n. sp.**, which has only one pair (*Jv2*); a pair of preanal pores; chaetotaxy of genua II and III 2-2/0, 2/0-1 and 1-2/1, 2/0-1, respectively. All known males of these species have 3 pairs of preanal setae; males described for the first time, or redescribed, in this paper have chaetotaxy of genua II and III similar to what was reported for females.

### *Amblyseius adhatodae* Muma

(Fig. 1)

*Amblyseius adhatodae* Muma, 1967: 268; Moraes et al. 1989b: 79; Chant & McMurtry, 2004: 203; Moraes et al. 2004: 12.

*Amblyseius (Amblyseius) adhatodae*, Gupta, 1985: 336.



**FIGURE 1.** *Amblyseius adhatodae* Muma (female): A. Dorsal shield; B. Ventral surface; C. Spermatheca.

FEMALE—(Specimens measured—Pakistan: holotype). Idiosomal setal pattern 10A:9B/JV-3:ZV.

Dorsum (Fig. 1A)—Dorsal shield smooth, [377] long and [258] wide. Setae j1 [36], j3 [52], j4 [4], j5 [4], j6 [5], J2 [6], J5 [10], z2 [7], z4 [8], z5 [5], Z1 [8], Z4 [142], Z5 [312], s4 [133], S2 [11], S4 [11], S5 [10], r3 [14], R1 [10]. All setae smooth.

Peritreme—Extending beyond level of j1.

Venter (Fig. 1B)—Sternal shield mostly smooth, posterior margin concave; distances between St1-St3 [66], St2-St2 [72]. Genital shield smooth; distance between St5-St5 [74]. Ventrianal shield smooth, subpentagonal, anterior margin convex, [120] long, [66] wide at level of Zv2 and [84] wide at level of anus; preanal pores elliptical, slightly posterior and mesad to Jv2. Two pairs of metapodal shields.

Chelicera—Movable digit [32] long, with apparently 4 teeth; fixed digit [30] long, with 11 teeth and a *pilus dentilis*.

Spermatheca (Fig. 1C)—Calyx swollen near atrium, not in good position to be measured.

Legs—Sharp-tipped macrosetae: Sge I [46], Sge II [37], Sge III [58], Sti III [47], St III [27], Sge IV [152], Sti IV [112], St IV [74].

MALE—Not encountered in this study.

SPECIMENS EXAMINED—Holotype female from *Adhatoda vasica*, Karachi, Sind, **Pakistan**.

REMARKS—This species was described from specimens collected in Karachi, Sind, Pakistan, on *Adathoda vasica*. It was reported from Kenya (East Africa) by Moraes et al. (1989b). No additional specimens were collected in the present study.

According to Gupta (1986), *A. adhatodae* and *A. ipomoeae* Ghai & Menon are synonyms, but Denmark & Muma (1989) considered them as different species.

WORLD DISTRIBUTION—India, Kenya and Pakistan.

### ***Amblyseius anomalus* Van der Merwe**

(Fig. 2)

*Amblyseius (Amblyseius) anomalus* Van der Merwe, 1968: 157.

*Amblyseius anomalus*, Chant & McMurtry, 2004: 199; Moraes et al. 2004: 16.

FEMALE—(Specimens measured—Benin: 1; Ghana: 1; Kenya: 2; Sierra Leone: 2). Idiosomal setal pattern 10A:9B/JV-3:ZV-3.

Dorsum (Fig. 2A)—Dorsal shield mostly smooth, with few anterolateral striae, 325 (312–339) long and 246(232–264) wide. Setae j1 24(19–26), j3 40(37–46), j4 7(6–8), j5 7(6–8), j6 9(8–10), J2 10(10–11), J5 7(6–8), z2 8(8–10), z4 8(8–10), z5 7(6–8), Z1 9(8–10), Z4 76(72–80), Z5 141(131–147), s4 63(58–67), S2 9(8–10), S4 8(6–10), S5 9(6–11), r3 12(10–14), R1 7(5–8). Setae smooth, except Z4 and Z5, serrate.

Peritreme—Extending forward to level of j1.

Venter (Fig. 2B)—Sternal shield mostly smooth, with few lateral striae, posterior margin concave; distances between St1-St3 57(54–61), St2-St2 67(64–69). Genital shield smooth; distance between St5-St5 67(62–70). Ventrianal shield smooth, subpentagonal, anterior margin slightly concave, lateral margins slightly concave immediately posterior to Zv2, 107 (104–110) long, 85 (83–86) wide at level of Zv2 and 75 wide at level of anus; preanal pores elliptical, posterior and slightly mesad to Jv2. Two pairs of metapodal shields. Seta Zv3 absent.

Chelicera—Position renders illustrations impossible; movable digit 27 long, with 3 teeth; fixed digit 24(22–26) long, with 10 teeth and a *pilus dentilis*.

Spermatheca (Fig. 2C)—Calyx funnel-shaped, 11(8–16) long and 14(13–16) in diameter near vesicle; atrium bulbous.

Legs—Sharp-tipped macrosetae—Sge I 32(30–35), Sge II 33(30–34), Sge III 39(37–42), Sti III 27(26–

30), Sge IV 74(64–82), Sti IV 37(35–38), St IV 48(45–50); presence of a prominent erect seta at base of tarsus I.

MALE—(Specimen measured—Sierra Leone: 1).

Dorsum—Dorsal shield pattern as in female, 261 long and 193 wide. Setae j1 19, j3 34, j4 6, j5 6, j6 6, J2 8, J5 6, z2 6, z4 6, z5 6, Z1 6, Z4 56, Z5 106, s4 41, S2 6, S4 6, S5 6, r3 9, R1 6. Setae smooth, except Z4 and Z5, lightly serrate.

Peritreme—Extending to level between j1 and j3.

Venter (Fig. 2F)—Ventrianal shield subtriangular, with transverse striae anteriorly to Zv2; 117 long, 133 wide at the anterior corners, 4 pairs of lyrifissures (2 anterior to Jv1, 1 lateral and posterior to Jv1 and 1 lateral and almost in line with Zv2); preanal pores elliptical, posterior and slightly mesad to Jv2.

Spermatodactyl (Fig. 2E)—L-shaped; shaft 19 long.

Legs—Sharp-tipped macrosetae: Sge I 23, Sge II 27, Sge III 22, Sti III 20, Sge IV 55, Sti IV 31 and St IV 41.

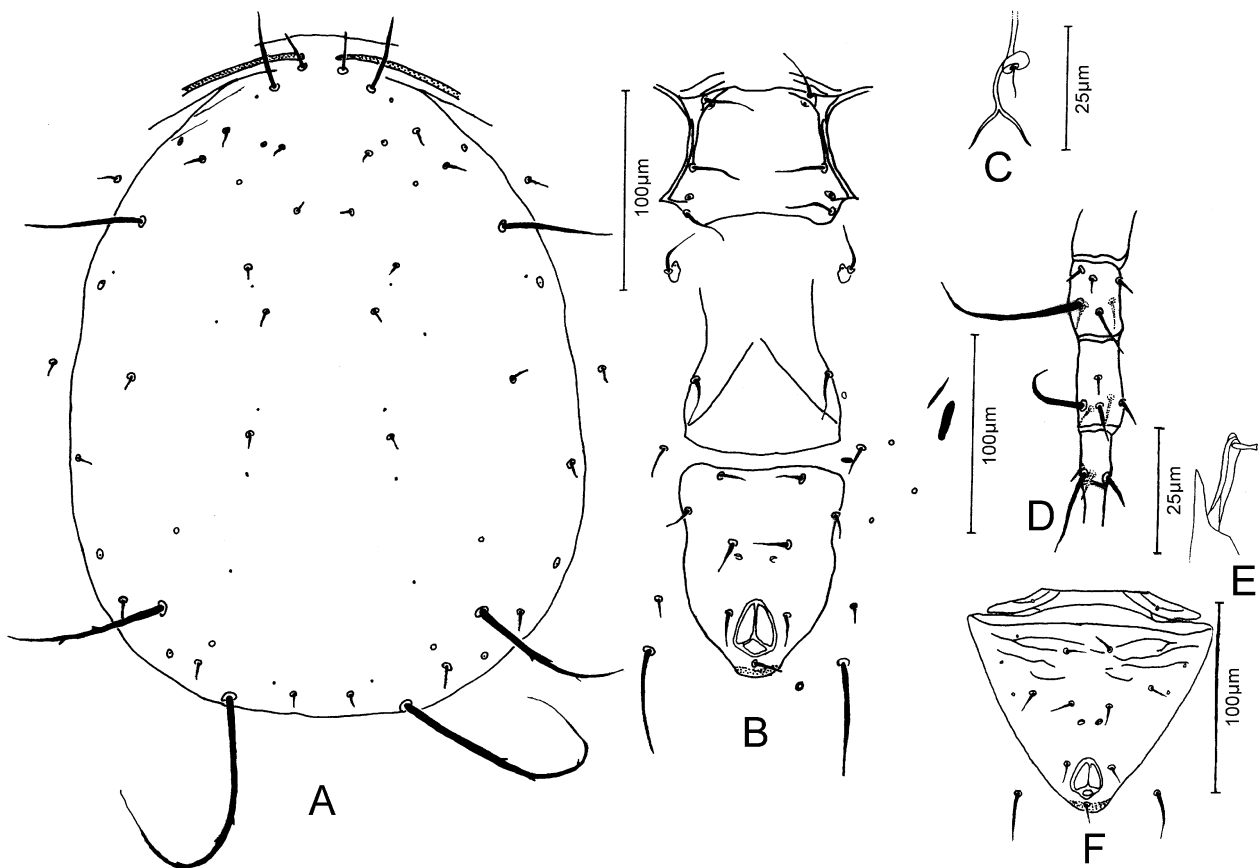


FIGURE 2. *Amblyseius anomalus* Van der Merwe A. Female dorsal shield; B. Female ventral surface; C. Spermatheca; D. Female leg IV; E. Spermatodactyl; F. Male ventrianal shield.

SPECIMENS EXAMINED—Two females, **Benin**: Département de l'Atlantique, International Institute of Tropical Agriculture, Abomey-Calavi, on *Mangifera indica*, 4-XI-1989, G.J. Moraes. One female, **Cameroon**: 12 km S Obala, Central Province, on *M. indica*, 5-II-1991, L. Louis. Two females, **Ghana**: 3 km E Mankessim, on *Mallotus oppositifolius*, 12-XI-1989, G.J. Moraes. Four females, **Kenya**: 25 km S Malindi, on *Grewia* sp. 1-XII-1989, J.S. Yaninek; 25 km S Malindi, on *Triumfetta* sp., 1-XII-1989, J.S. Yaninek. Three females and 2 males, **Sierra Leone**: Masiaka, on *Elaeis guineensis*, 14-I-1992, A. Kebbie.

REMARKS—The major duct of the spermatheca of the specimens from Kenya and of one of the two specimens from Sierra Leone is inflated as in the original description, while that of the specimens from Benin,

Ghana and of one specimen from Sierra Leone is not inflated.

WORLD DISTRIBUTION—Benin, Cameroon, Ghana, Kenya, Sierra Leone and South Africa.

*Amblyseius brachyscutatus* Zannou, Moraes & Oliveira, n. sp.

(Fig. 3)

DIAGNOSIS—Seta Z1 present; setae Z5 much longer than distance between their bases; ratios  $s4:Z1 = 26.8$ ,  $s4:S2 = 22.3$ . Ventrianal shield ovoid, with 1 pair of preanal setae (Jv1 and Zv2 off ventrianal shield); Jv4 absent. Movable cheliceral digit with 5–6 teeth; fixed cheliceral digit with 11–12 teeth. Genu of leg I with a macroseta. Spermatheca with calyx cup-shaped and major duct thick-walled, bifurcate at junction with atrium. Spermatodactyl L-shaped.

FEMALE—(Specimens measured—Ghana: 3). Idiosomal setal pattern 10A:9B/JV-3,4:ZV.

Dorsum (Fig. 3A)—Dorsal shield smooth, 333(320–344) long and 219(211–227) wide. Setae j1 31(29–34), j3 35(34–37), j4 3, j5 3, j6 4(3–5), J2 5(5–6), J5 4(3–5), z2 9(8–10), z4 5, z5 4(3–5), Z1 5, Z4 116(93–134), Z5 238(173–285), s4 134(130–139), S2 6, S4 6(5–6), S5 6(5–6), r3 13(10–14), R1 6(5–6). Setae smooth.

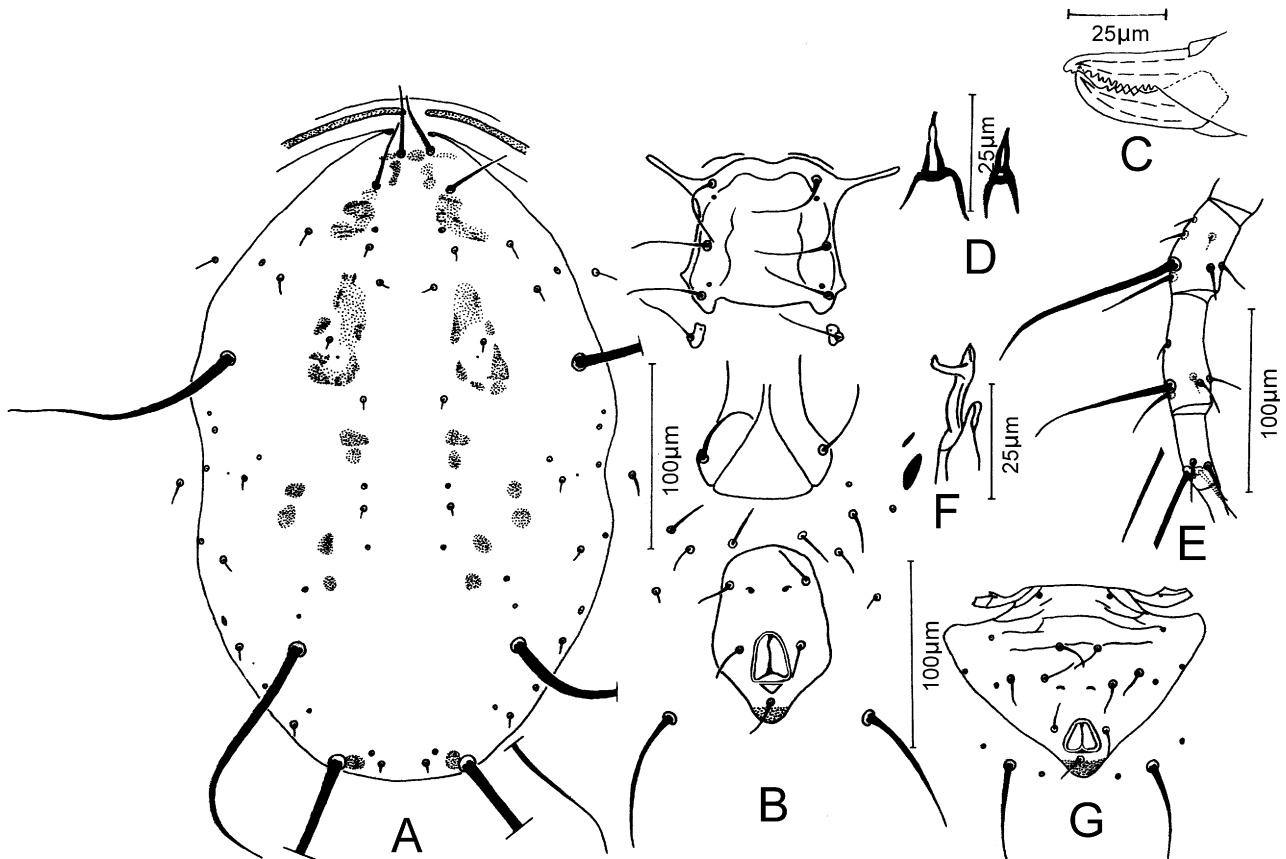


FIGURE 3. *Amblyseius brachyscutatus* Zannou, Moraes & Oliveira, n. sp. A. Female dorsal shield; B. Female ventral surface; C. Female chelicera; D. Spermatheca; E. Female leg IV; F. Spermatodactyl; G. Male ventrianal shield.

Peritreme—Extending beyond level of j1.

Venter (Fig. 3B)—Sternal shield mostly smooth, with few lateral striae; posterior margin slightly convex; distances between St1–St3 66(64–67), St2–St2 70(67–70). Genital shield smooth; distance between St5–St5 67. Ventrianal shield smooth, ovoid, anteriorly truncate, 115(99–131) long, 52(50–54) wide at level immediately

anterior to Jv2 and 70(67–72) wide at level of anus; with 1 pair (JV2) of preanal setae (Jv1 and Zv2 on soft cuticle); preanal pores elliptical, mesad and slightly posterior to Jv2. Two pairs of metapodal shields. Seta Jv4 absent.

Chelicera (Fig. 3C)—Movable digit 35 long, with 5 to 6 teeth; fixed digit 29(29–30) long, with 11 to 12 teeth and a *pilus dentilis*.

Spermatheca (Fig. 3D)—Calyx cup-shaped 12(11–13) long, atrium small.

Legs—Sharp-tipped macrosetae: Sge I 58(54–61), Sge II 42(40–43), Sge III 50(50–51), Sti III 43, Sge IV 111(106–115), Sti IV 77(75–78), St IV 94); presence of a prominent erect seta at base of tarsus I.

MALE—(Specimens measured—Ghana: 2).

Dorsum—Dorsal shield pattern as in female, 256(235–277) long and 200(192–208) wide. Setae j1 26(24–27), j3 32(30–34), j4 3, j5 4(3–5), j6 4(3–5), J2 6(5–6), J5 3, z2 7(6–8), z4 3, z5 4(3–5), Z1 5, Z4 114(106–122), Z5 218(203–234), s4 101, S2 6(5–6), S4 5, S5 6, r3 11, R1 5. Setae smooth.

Peritreme—Extending beyond level of j1.

Venter (Fig. 3G)—Ventrional shield subtriangular, with transverse striae anteriorly to Jv1, 109 long, 147 wide at the anterior corners; with 4 pairs of lyrifissures (1 well anterior and slightly laterad of Jv1, 1 anterior and well lateral of Jv1, 1 anterior and well laterad to Zv2 and 1 slightly posterior and laterad to Zv2); preanal pores elliptical, mesad and slightly posterior to Jv2.

Spermatodactyl (Fig. 3F)—L-shaped; shaft 18(18–19) long.

Legs—Sharp-tipped macrosetae: Sge II 33(30–35), Sge III 41(40–42), Sti III 36(35–37), Sge IV 76(75–77), Sti IV 64(54–74) and St IV 75(72–78).

LOCALITY AND TYPE MATERIAL—Holotype female, allotype male, 4 paratype females and paratype male from *Chromolaena odorata*, 3 km S New Aboi, Western Region, Ghana, 11-XI-1989, J.S. Yaninek, deposited at ESALQ-USP.

ETYMOLOGY—The epithet *brachyscutatus* refers to the short ventrional shield of the female of this species.

REMARKS – This new species is distinct from all known *Amblyseius* species by having a single pair of preanal setae (Jv2) on a reduced ventrional shield. *Amblyseius paucisetosus* McMurtry & Moraes, 1985 resembles this new species by lacking Jv4; however, *A. paucisetosus* also lacks Z1 and Zv3, which are present in this new species.

### ***Amblyseius cameroonensis* (Zannou, Zundel, Hanna & Moraes)**

*Typhlodromips cameroonensis* Zannou, Zundel, Hanna & Moraes, 2005: 57.

REMARKS—Idiosomal setal pattern 10A:9B/JV-3:ZV. This species was collected from Mankon, Bamenda, Cameroon on an unidentified plant. No additional specimens were collected in the present study.

WORLD DISTRIBUTION—Cameroon.

### ***Amblyseius caudatus* Berlese**

*Amblyseius caudatus* Berlese, 1914: 145; Womersley, 1954: 190; Chant & McMurtry, 2004: 203; Moraes et al. 2004: 18. *Typhlodromus caudatus*, Chant 1957: 306, 308.

REMARKS—This species was described from specimens collected in Java, Indonesia, on unknown substrate. It was reported from Kenya (Moutia 1958), but no additional specimens were collected in the present study. The true identity of this species is unknown, as discussed by Chant (1959), Denmark & Muma (1989) and

Chant & McMurtry (2004). For this reason, it is not included in the key provided in this publication.

WORLD DISTRIBUTION—Guyana, Hawaii, Kenya, Mauritius and Poland.

### *Amblyseius comatus* Ueckermann & Loots

*Amblyseius* (*Amblyseius*) *comatus* Ueckermann & Loots, 1988: 68.

*Amblyseius comatus*, Chant & McMurtry, 2004: 199; Moraes et al. 2004: 21.

REMARKS—Idiosomal setal pattern 10A:9B/JV-3:ZV. This species was described from specimens collected in Golden Gate Highland National Park, Free State Province, South Africa, on *Filicia filifolia*. No additional specimens were collected in the present study.

WORLD DISTRIBUTION—South Africa.

### *Amblyseius curticalyx* Zannou, Moraes & Oliveira, n. sp.

(Fig. 4)

DIAGNOSIS—Seta Z1 present; setae Z5 longer than distance between their bases; ratios s4:Z1 = 6.2, s4:S2 = 4.7. Ventrianal shield subpentagonal. Fixed cheliceral digit with 7–8 teeth. Genu of leg I with a macroseta. Spermatheca with calyx short, saccular, narrowed medially and flaring near vesicle; atrium bifurcate.

FEMALE—(Specimen measured—Zambia: 1). Idiosomal setal pattern 10A:9B/JV-3:ZV.

Dorsum (Fig. 4A)—Dorsal shield smooth, 328 long and 187 wide. Setae j1 22, j3 31, j4 5, j5 5, j6 6, J2 9, J5 6, z2 9, z4 8, z5 5, Z1 9, Z4 73, Z5 109, s4 56, S2 11, S4 11, S5 11, r3 12, R1 11. Setae smooth, except Z4 and Z5, lightly serrate.

Peritreme—Extending beyond level of j1.

Venter (Fig. 4B)—Sternal shield mostly smooth, with few lateral striae, posterior margin slightly concave; distances between, St1–St3 61, St2–St2 62. Genital shield smooth; distance between St5–St5 55. Ventrianal shield smooth, subpentagonal, constricted at level of preanal pores, anterior margin straight, 103 long, 92 wide at level of Zv2 and 83 wide at level of anus; preanal pores elliptical, mesad and slightly posterior to Jv2. Two pairs of metapodal shields.

Chelicera—Position renders illustrations impossible; movable digit 30 long, apparently with 3 teeth; fixed digit 27 long, apparently with 7–8 teeth and a *pilus dentilis*.

Spermatheca (Fig. 4C)—calyx short, saccular, narrowed medially and flaring near vesicle, 8 long; atrium bifurcate.

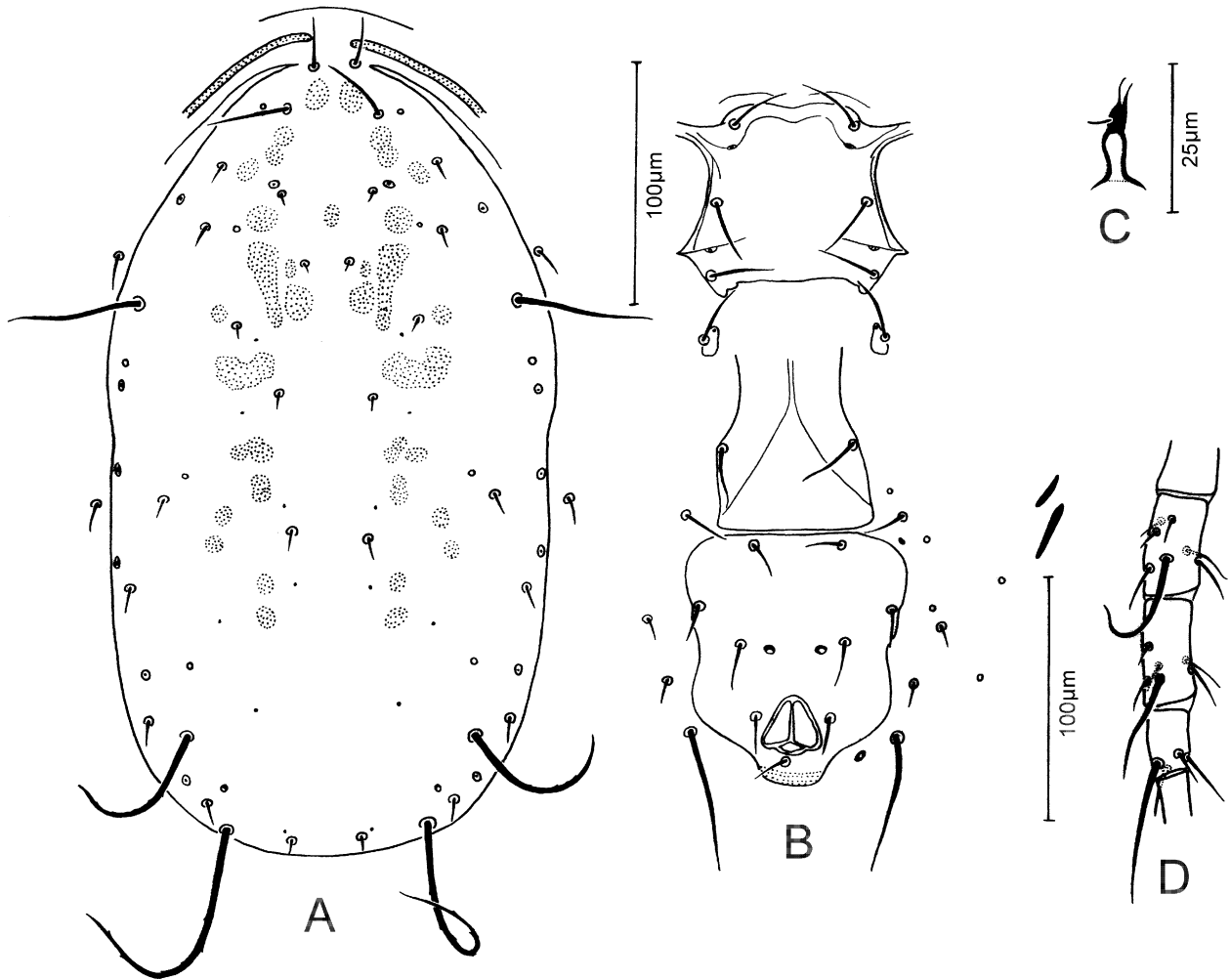
Legs—Sharp-tipped macrosetae: Sge I 28, Sge II 31, Sge III 34, Sti III 25, Sge IV 56, Sti IV 42, St IV 59); presence of a prominent erect seta at base of tarsus I.

MALE—Unknown.

LOCALITY AND TYPE MATERIAL—Holotype female from *Rhynchelytrum repens*, 84 km S Kasama, Zambia, 16-VI-1992, A. Onzo, deposited at ESALQ-USP.

ETYMOLOGY—The epithet *curticalyx* refers to the short calyx of spermatheca of this species.

REMARKS—*Amblyseius ovalitectus* van der Merwe, 1968 differs by having setae Z5 shorter than the distance between their bases and by having ventrianal shield subtriangular, without lateral constriction. *Amblyseius monacus* Wainstein, 1975 and *Amblyseius pamperisi* Papadoulis, 1997 differ from the new species by having atrium of the spermatheca nodular and not bifurcate. In addition, *A. monacus* has z2 and z4 at least twice as long as in the new species, while *A. pamperisi* has 15 teeth on the fixed cheliceral digit and calyx of spermatheca is at least 3 times longer than in the new species.



**FIGURE 4.** *Amblyseius curticalyx* Zannou, Moraes & Oliveira, **n. sp.** (Fig. 4) (female): A. Dorsal shield; B. Ventral surface; C. Spermatheca; D. Leg IV.

***Amblyseius duplicesetus* Moraes & McMurtry**  
(Fig. 5)

*Amblyseius duplicesetus* Moraes & McMurtry, 1988: 13; Moraes et al. 2004: 22.  
*Amblyseius duplicisetus* [sic], Chant & McMurtry, 2004: 208.

FEMALE—(Specimen measured—Kenya: 1). Idiosomal setal pattern 10A:9B/JV-3:ZV.

Dorsum (Fig. 5A)—Dorsal shield smooth, 384 long and 259 wide. Setae j1 43, j3 54, j4 6, j5 6, j6 8, J2 11, J5 8, z2 8, z4 10, z5 6, Z1 8, Z4 102, Z5 330, s4 109, S2 11, S4 11, S5 11, r3 11, R1 10.

Peritreme—Extending forward to level of j1.

Venter (Fig. 5B)—Sternal shield smooth, posterior margin indistinct; distances between St1-St3 66, St2-St2 74. Genital shield smooth; distance between St5-St5 70. Ventrianal shield vase-shaped, smooth, with a strong constriction posterior to Jv2 and at the level of pores, anterior margin convex, 128 long, 56 wide at level of Zv2 and 67 wide at level of anus; preanal pores mesad and slightly posterior to Jv2, 2 pairs of metapodal shields.

Chelicera (Fig. 5C)—Movable digit 31 long, with 3 teeth; fixed digit 29 long, with 12 teeth and a *pilus dentilis*.

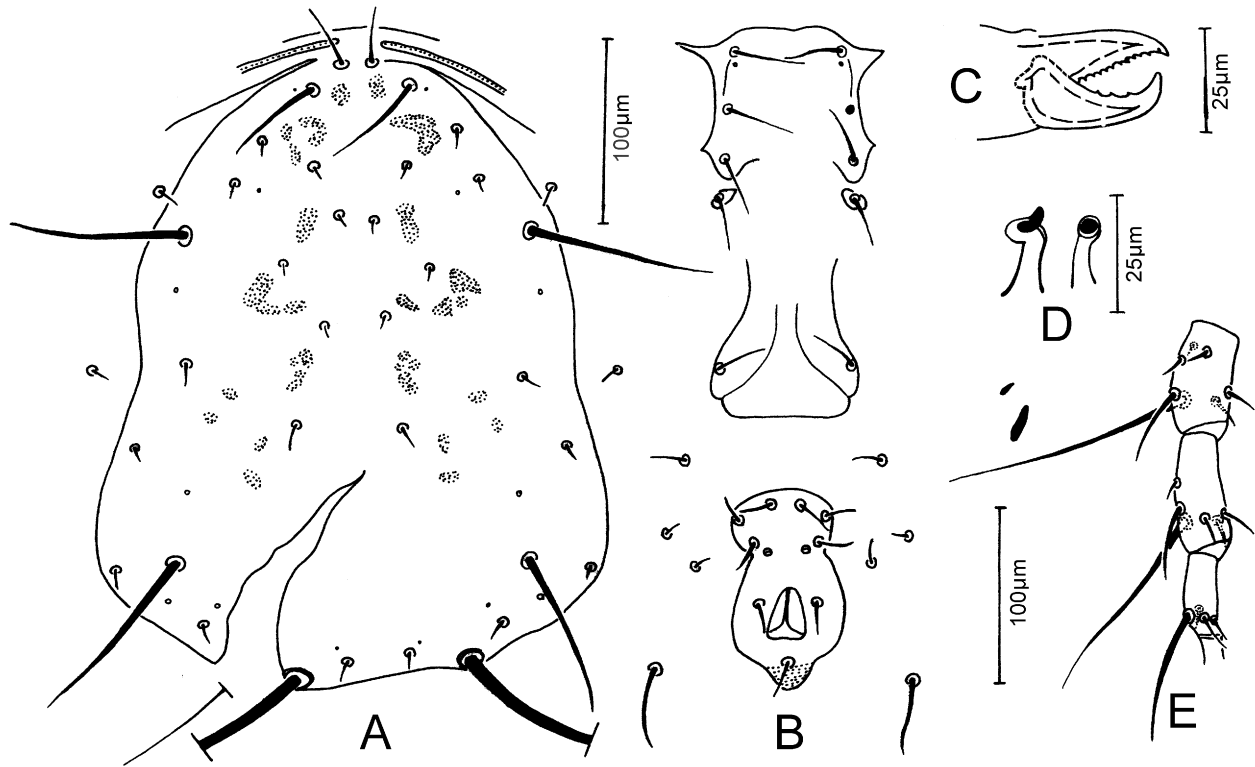
Spermatheca (Fig. 5D)—Calyx flared, 16 long; atrium globate with lateral insertion of major duct.

Legs—Sharp-tipped macrosetae: Sge I 50, Sge II 40, Sge III 53, Sti III 46, Sge IV 166, Sti IV 118, St IV 74); presence of a prominent erect seta at base of tarsus I.

MALE—Unknown.

SPECIMENS EXAMINED—Two females, **Kenya**: 19 km N Kilifi, Coastal Province, on *Anacardium occidentale*, 30-XI-1989, J.S. Yaninek.

WORLD DISTRIBUTION—Kenya.



**FIGURE 5.** *Amblyseius duplicesetus* Moraes & McMurtry (female): A. Dorsal shield; B. Ventral surface; C. Chelicera; D. Spermatheca; E. Leg IV.

### *Amblyseius genya* Pritchard & Baker

(Fig. 6)

*Amblyseius* (*Amblyseius*) *genya* Pritchard & Baker, 1962: 244.

*Amblyseius genya*, Chant & McMurtry, 2004: 199.

*Typhlodromips genya*, Moraes et al. 2004: 213.

FEMALE—(Specimens measured—Cameroon: 2; Democratic Republic of Congo: holotype). Idiosomal setal pattern 10A:9B/JV-3:ZV-3.

Dorsum (Fig. 6A)—Dorsal shield mostly smooth, with few lateral striae, 298 [312] long and 235 [199] wide. Setae j1 11 [14], j3 34 [34], j4 7(6–8) [7], j5 7(6–8) [7], j6 7(6–8) [7], J2 7(6–8) [7], J5 7(6–8) [6], z2 11(10–13) [10], z4 8 [7], z5 8 [7], Z1 8 [6], Z4 50(46–53) [53], Z5 74(72–77) [77], s4 36(35–37) [37], S2 6 [5], S4 6 [5], S5 7(6–8) [5], r3 10 [5], R1 6 [6]. Setae smooth, except Z4 and Z5, lightly serrate.

Peritreme—Extending beyond level of j1.

Venter (Fig. 6B)—Sternal shield mostly smooth, with few lateral striae, posterior margin slightly concave; distances between St1–St3 47(46–48) [50], St2–St2 64(62–66) [61]. Genital shield smooth; distance between

St5-St5 61 [65]. Ventrianal shield with few transverse striae anteriorly to Jv2, subpentagonal, slightly constricted at level of Jv2, with anterior margin slightly concave, 97(96–98) [102] long, 84(83–85) [89] wide at level of Zv2 and 82 [79] wide at level of anus; preanal pores elliptical and posteromesad to Jv2. Two pairs of metapodal shields. Seta Zv3 absent.

Chelicera—Position renders illustrations impossible; movable digit 25 long, with 3 teeth; fixed digit 23 long, with ca. 11 teeth and a *pilus dentilis*.

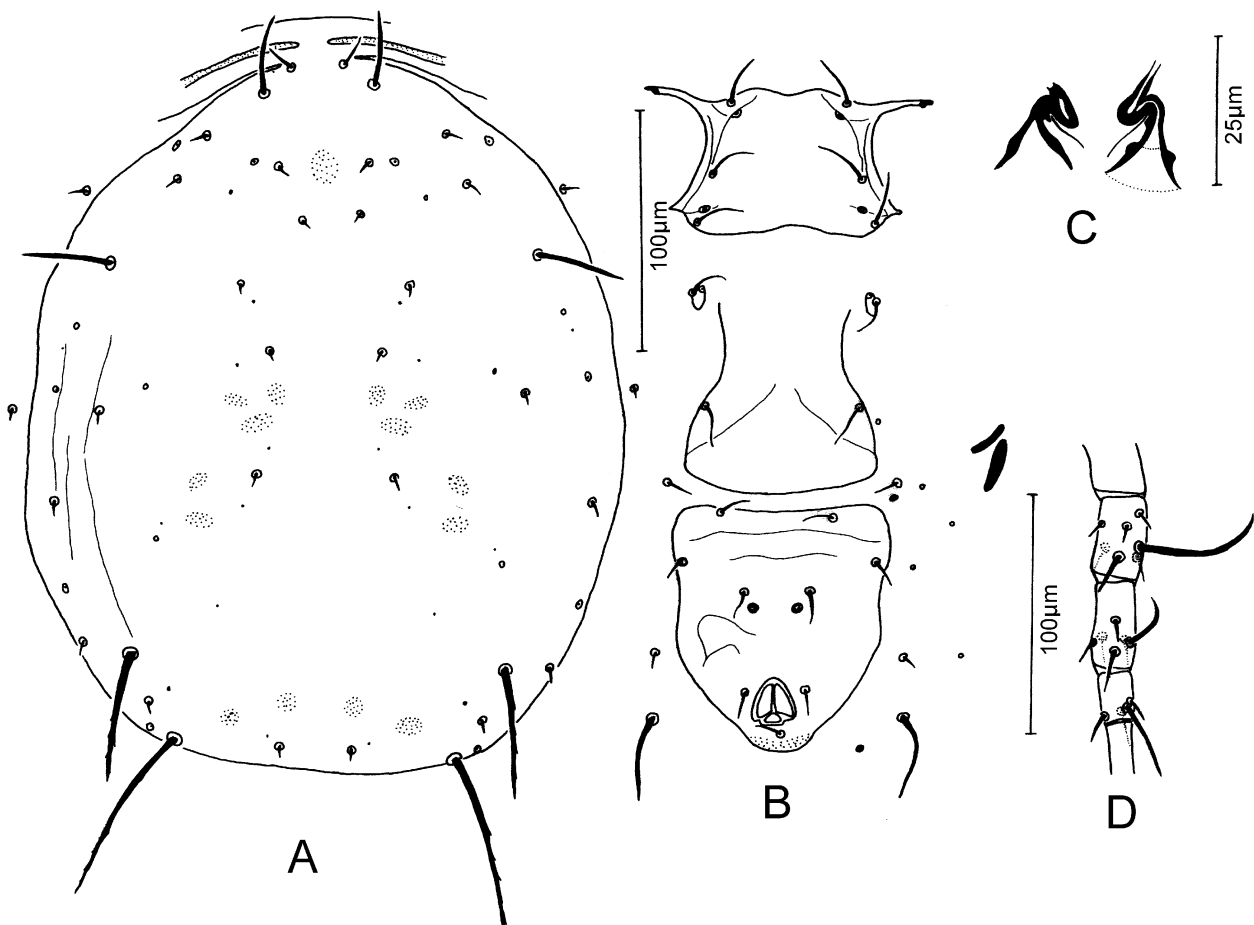
Spermatheca (Fig. 6C)—Calyx cone-shaped, 19(14–24) [12] long, 14(13–15) [14] in diameter next to the vesicle; atrium distinct; connection of minor duct to atrium located between curved base of major duct and calyx.

Legs—Sharp-tipped macrosetae: Sge I 26 [26], Sge II 26 [28], Sge III 30(29–32) [30], Sti III 19 [17], Sge IV 57(56–58) [61], Sti IV 25(24–26) [24], St IV 30 [31]; presence of a prominent erect seta at base of tarsus I.

MALE—Unknown.

SPECIMENS EXAMINED—Four females, **Cameroon**: 12 km S Obala, Central Province, on *Mangifera indica*, 5-II-1991, L. Louis; 105 km N Kribi, Littoral Province, on *Persea americana*, 8-II-1991, L. Louis. Holotype female, **Democratic Republic of Congo (Belgian Congo)**: Stanleyville, on *Citrus* sp. 19-IV-1955, E.W. Baker.

WORLD DISTRIBUTION—Cameroon and Democratic Republic of Congo.



**FIGURE 6.** *Amblyseius genya* (Pritchard & Baker) (female): A. Dorsal shield; B. Ventral surface; C. Spermatheca; D. Leg IV.

*Amblyseius jamesi* Zannou, Moraes & Oliveira, n. sp.

(Fig. 7)

DIAGNOSIS—Seta Z1 present; setae Z5 much longer than distance between their bases; ratios  $s4:Z1 = 11.5$ ,  $s4:S2 = 10.2$ . Ventrianal shield subpentagonal. Fixed cheliceral digit apparently with 15 teeth. Genu of leg I with a macroseta. Spermatheca with calyx tubular, slightly constricted near vesicle; atrium slightly wider than calyx.

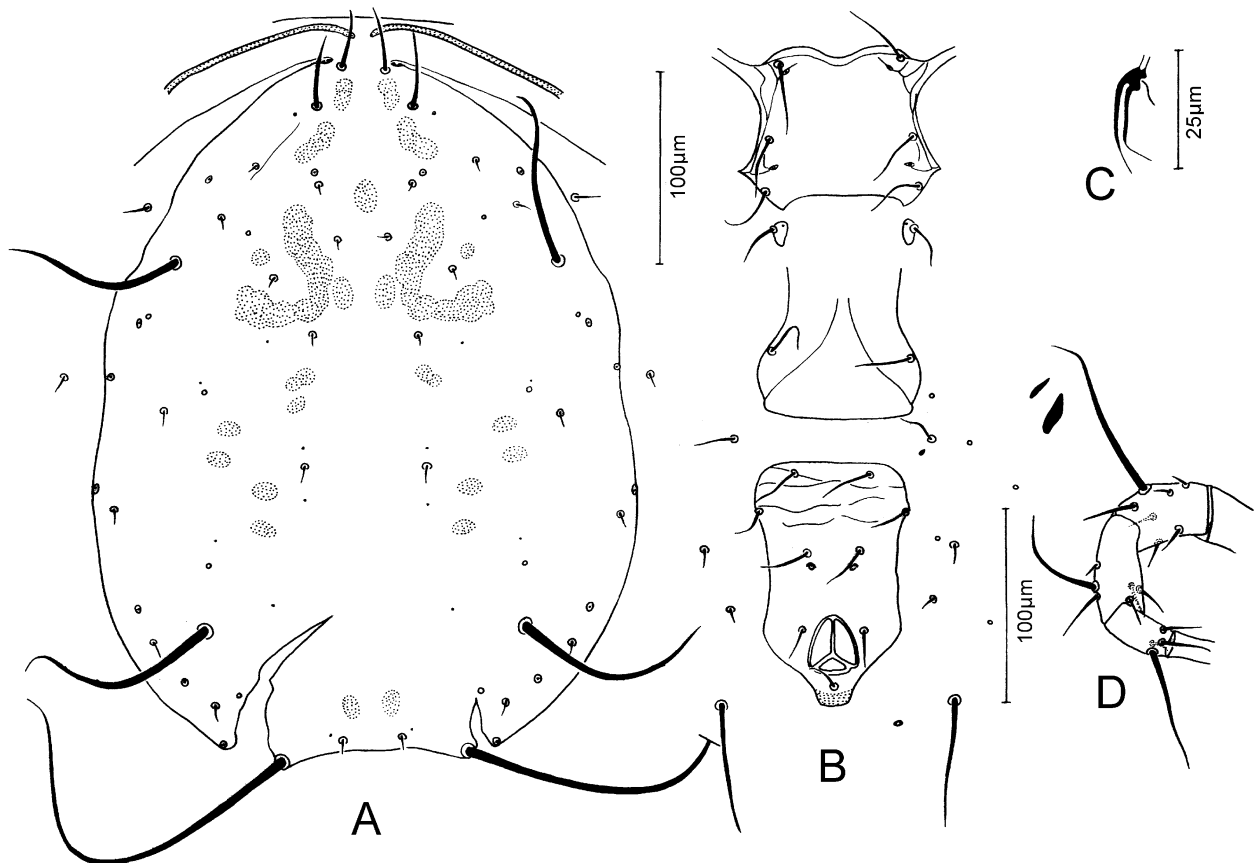


FIGURE 7. *Amblyseius jamesi* Zannou, Moraes & Oliveira, n. sp. (female): A. Dorsal shield; B. Ventral surface; C. Spermatheca; D. Leg IV.

FEMALE—(Specimen measured—Cameroon: 1). Idiosomal setal pattern 10A:9B/JV-3:ZV.

Dorsum (Fig. 7A)—Dorsal shield smooth, 351 long and 265 wide. Setae j1 33, j3 37, j4 5, j5 5, j6 5, J2 8, J5 8, z2 5, z4 6, z5 5, Z1 8, Z4 112, Z5 207, s4 92, S2 9, S4 9, S5 6, r3 12, R1 9. Setae smooth.

Peritreme—Extending beyond level of j1.

Venter (Fig. 7B)—Sternal shield mostly smooth, with few lateral striae; posterior margin straight; distances between St1-St3 66, St2-St2 75. Genital shield smooth; distance between St5-St5 73. Ventrianal shield with transverse striae anteriorly to Jv2, subpentagonal, slightly constricted at level of preanal pores, anterior margin about straight, 125 long, 81 wide at level of Zv2 and 73 wide at level of anus; preanal pores elliptical, posterior to and slightly mesad to Jv2. Two pairs of metapodal shields.

Chelicera—Position renders illustrations impossible; movable digit 48 long, apparently with 4 teeth; fixed digit 45 long, apparently with 15 teeth and a *pilus dentilis*.

Spermatheca (Fig. 7C)—Calyx tubular, slightly constricted near vesicle, 15 long; atrium slightly wider than calyx.

Legs—Sharp-tipped macrosetae: Sge I 42, Sge II 39, Sge III 45, Sti III 34, Sge IV 94, Sti IV 58, St IV 62); presence of a prominent erect seta at base of tarsus I.

MALE—Unknown.

LOCALITY AND TYPE MATERIAL—Holotype female from *Psidium guajava*, 27 km SW Ngoulemalong, Cameroon, 06-II-1991, L. Louis, deposited at ESALQ-USP.

ETYMOLOGY—This species is named in honor of the eminent acarologist James A. McMurtry, for his outstanding contribution to the knowledge of the phytoseiid taxonomy.

REMARKS—*A. adhatodae* and *A. hurlbutti* Denmark & Muma, 1989 differ from this species by having ventrianal shield smooth and calyx of spermatheca not constricted near vesicle. *Amblyseius tamatavensis* Blommers, 1974 also differs from the new species by having major duct not distinctly sclerotized and considerably narrower than calyx.

### *Amblyseius herbicolus* (Chant)

(Fig. 8)

*Typhlodromus* (*Amblyseius*) *herbicolus* Chant, 1959: 84.

*Amblyseius herbicolus*, Moraes et al. 1989b: 79; Chant & McMurtry, 2004: 208; Moraes et al. 2004: 27.

*Amblyseius* (*Amblyseius*) *herbicolus*, Muma, 1961: 287.

*Typhlodromus herbicolus*, Hirschmann, 1962: 23.

*Amblyseius deleoni* Muma & Denmark, in Muma et al. 1970: 68 (synonymy according to Daneshvar & Denmark, 1982; Denmark & Muma, 1989).

*Amblyseius giganticus* Gupta, 1981: 33 (synonymy according to Gupta, 1986).

*Amblyseius impactus* Chaudhri, 1968: 553 (synonymy according to Daneshvar & Denmark, 1982; Denmark & Muma, 1989).

*Amblyseius* (*Amblyseialus*) *thermophilus* Karg, 1991: 12 (synonymy according to Karg, 1991).

*Typhlodromus* (*Amblyseius*) *amitae* Bhattacharyya, 1968: 677 (synonymy according to Denmark & Muma, 1989).

FEMALE—(Specimens measured—Benin: 1; Burundi: 1; Democratic Republic of Congo: 1; Ghana: 1; Kenya: 3; Rwanda: 1). Idiosomal setal pattern 10A:9B/JV-3:ZV.

Dorsum (Fig. 8A)—Dorsal shield mostly smooth, with few anterolateral striae, 352(325–368) long and 256(240–274) wide. Setae j1 37(34–40), j3 49(38–58), j4 6(5–8), j5 4(3–5), j6 7(5–8), J2 10(8–11), J5 8(6–10), z2 11(8–16), z4 8(8–10), z5 6(5–6), Z1 10(8–13), Z4 126(101–152), Z5 281(251–306), s4 113(98–130), S2 12(8–14), S4 11(8–13), S5 9(8–10), r3 14(11–16), R1 9(8–10). Setae smooth, except Z4 and Z5, lightly serrate.

Peritreme—Extending beyond level of j1.

Venter (Fig. 8B)—Sternal shield mostly smooth, with few anterolateral striae, posterior margin slightly convex; distances between St1–St3 65(58–70), St2–St2 71(66–75). Genital shield smooth; distance between St5–St5 71(67–75). Ventrianal shield smooth, vase-shaped, with a strong constriction posterior to Jv2, anterior margin convex, 116(112–118) long, 57(53–59) wide at level of Zv2 and 71(66–77) wide at level of anus; pre-anal pores elliptical, posterior to and in line with Jv2. Two pairs of metapodal shields.

Chelicera—Movable digit 35(34–35) long, with 3 teeth; fixed digit 31(30–31) long, with 10 teeth and a *pilus dentilis*.

Spermatheca (Fig. 8C)—Calyx trumpet-shaped, 32(32–35) long; atrium much wider than adjoining section of calyx.

Legs—Sharp-tipped macrosetae: Sge I 42(35–48), Sge II 38(35–42), Sge III 52(45–59), Sti III 41(34–48), Sge IV 124(96–158), Sti IV 90(67–109), St IV 76(66–86); presence of a prominent erect seta at base of tarsus I.

MALE—Not encountered in this study.

SPECIMENS EXAMINED—Two females, **Benin**: Département de l'Atlantique, International Institute of Tropical Agriculture, Abomey-Calavi, on *Mallotus oppositifolius*, 1989, G.J. Moraes. Two females,

**Burundi:** 16 km S Rutana, ISABU-MOSO, on *Ficus vallis-choudae*, 13-XII-1989, J.S. Yaninek. Two females, **Democratic Republic of Congo:** Muanda, Bas-Congo, on *Elaeis guineensis*, 11-VII-1991, A. Onzo. One female, **Ghana:** University of Legon, Accra, on *Euphorbia heterophylla*, 08-IX-1989, J.S. Yaninek. Five females, **Kenya:** 6.5 km S Mombasa, Coastal Province, on *Sida acuta*, 28-XI-1989, J.S. Yaninek; 6.5 km S Mombasa, Coastal Province, on *Stachytarpheta jamaicensis*, 28-XI-1989, J.S. Yaninek. Two females, **Rwanda:** Ruhengeri, on unknown plant, 08-XII-1989, J.S. Yaninek.

REMARKS—The specimens from Democratic Republic of Congo, Ghana and Kenya have setae Z5 3-13% and s4 12-30% longer, while the ones from Democratic Republic of Congo, Ghana have Sge IV 25-35% longer than in specimens reported in McMurtry and Moraes (1984).

WORLD DISTRIBUTION—Cosmopolitan.

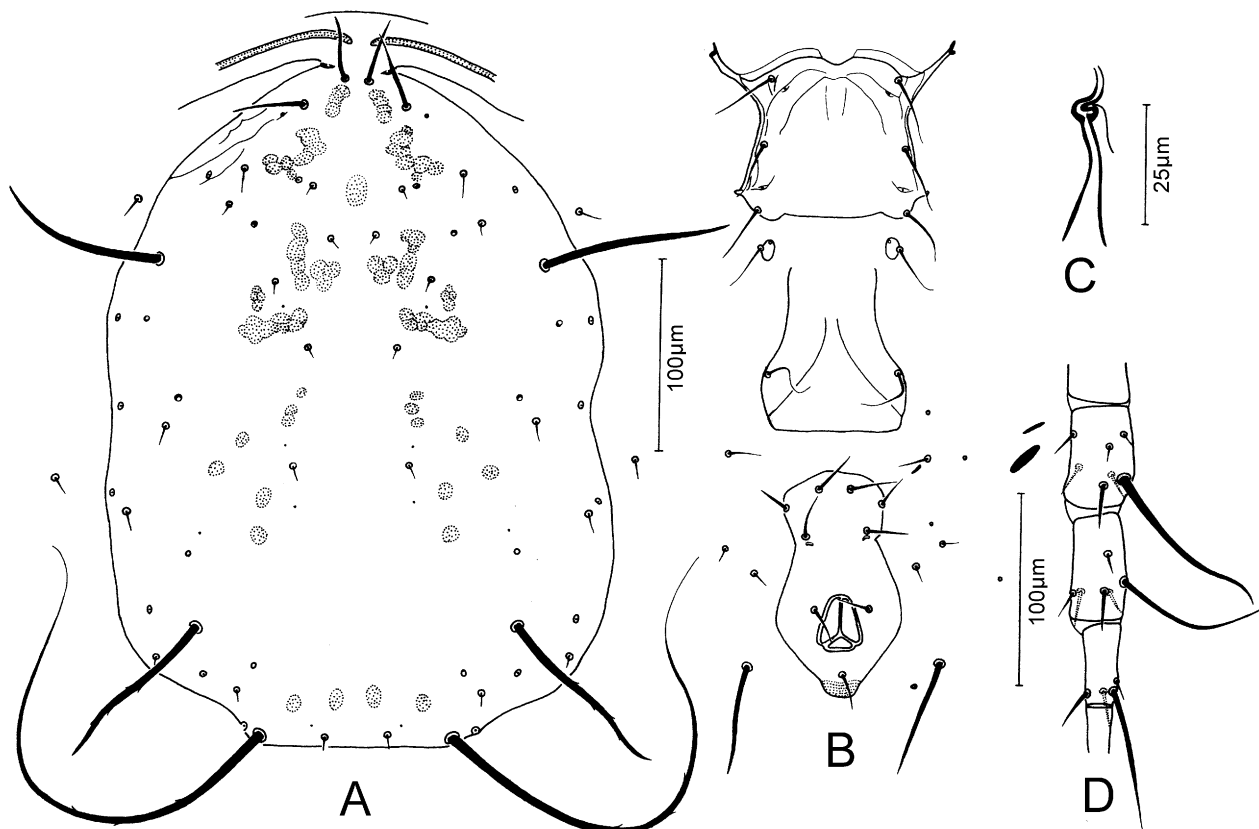


FIGURE 8. *Amblyseius herbicolus* (Chant) (female): A. Dorsal shield; B. Ventral surface; C. Spermatheca; D. Leg IV.

### *Amblyseius hurlbutti* Denmark & Muma

*Amblyseius hurlbutti* Denmark & Muma, 1989: 106; Chant & McMurtry, 2004: 203; Moraes et al. 2004: 30.  
*Amblyseius (Multiseius) hurlbutti*, Denmark & Muma, 1989: 106.

REMARKS—Idiosomal setal pattern 10A:9B/JV-3:ZV. This species was described from specimens collected in Chaza Forest, north Turiani, Tanzania, on unknown substrate. No additional specimens were collected in the present study.

WORLD DISTRIBUTION—Tanzania.

*Amblyseius largoensis* (Muma)

(Fig. 9)

*Amblyseiopsis largoensis* Muma, 1955: 266.

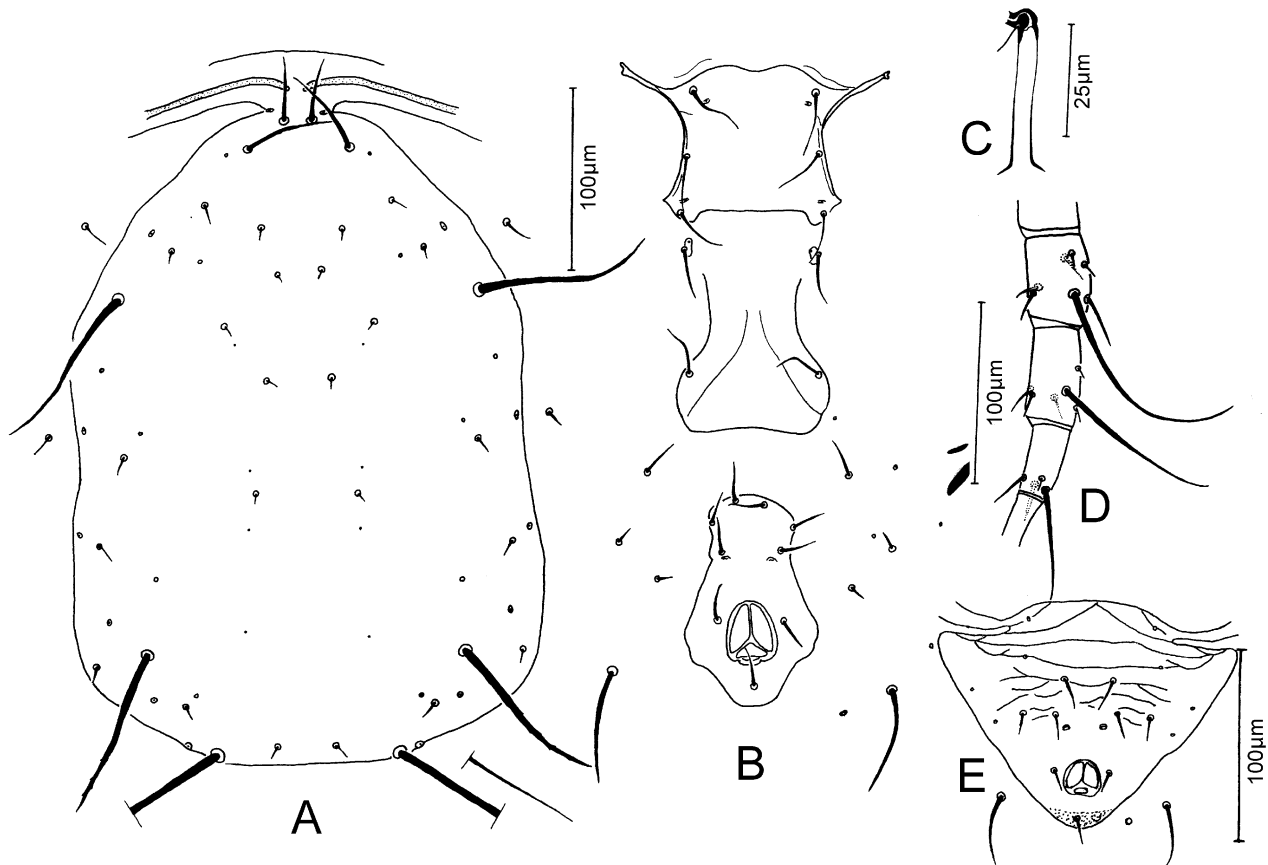
*Amblyseius largoensis*, Chant & McMurtry, 2004: 208; Moraes et al. 2004: 33.

*Amblyseius amtalaensis* Gupta, 1977: 53 (synonymy according to Gupta, 1986).

*Amblyseius (Amblyseius) sakalava* Blommers, 1976: 96 (synonymy according to Ueckermann & Loots, 1988).

*Typhlodromus (Amblyseius) amitae* Bhattacharyya, 1968: 677 (synonymy according to Gupta, 1986).

FEMALE—(Specimens measured—Ghana: 1; Kenya: 3; Sierra Leone: 1). Idiosomal setal pattern 10A:9B/  
JV-3:ZV.



**FIGURE 9.** *Amblyseius largoensis* (Muma): A. Female dorsal shield; B. Female ventral surface; C. Spermatheca; D. Female leg IV; E. Male ventrianal shield.

Dorsum (Fig. 9A)—Dorsal shield smooth, 343(320–374) long and 241(224–272) wide. Setae j1 36(32–40), j3 50(48–56), j4 7(6–8), j5 5(5–6), j6 8(6–10), J2 9(6–11), J5 9(8–10), z2 11(10–13), z4 8(6–10), z5 6(5–8), Z1 10(8–14), Z4 91(85–98), Z5 260(218–294), s4 90(78–101), S2 13(11–16), S4 12(10–16), S5 11(10–13), r3 13(10–16), R1 12(11–13). Setae smooth, except Z4 and Z5, lightly serrate.

Peritreme—Extending beyond level of j1.

Venter (Fig. 9B)—Sternal shield smooth, posterior margin straight; distances between St1–St3 66(61–75), St2–St2 67(62–70). Genital shield smooth; distance between St5–St5 66(62–69). Ventrianal shield smooth, vase-shaped, anterior margin convex, 110(101–120) long, 45(40–50) wide at level of Zv2 and 68(62–74) wide at level of anus; preanal pores elliptical, posterior and slightly mesad to Jv2. Two pairs of metapodal shields.

Chelicera—Movable digit 33 long, with 3 teeth; fixed digit 28(28–29) long, with 11 teeth and a *pilus dentilis*.

Spermatheca (Fig. 9C)—Calyx tubular, 28(26–30) long; atrium as wide as calyx.

Legs—Sharp-tipped macrosetae: Sge I 39(37–43), Sge II 36(34–42), Sge III 45(40–50), Sti III 40(35–46), Sge IV 120(104–142), Sti IV 95(86–107), St IV 61(58–69); presence of a prominent erect seta at base of tarsus I.

MALE—(Specimen measured—Ghana: 1).

Dorsum—Dorsal shield pattern as in female, 273 long and 218 wide. Setae j1 33, j3 47, j4 6, j5 6, j6 8, J2 9, J5 9, z2 9, z4 8, z5 8, Z1 12, Z4 86, Z5 218, s4 81, S2 14, S4 14, S5 12, r3 12, R1 12. Setae smooth, except Z4 and Z5, lightly serrate.

Peritreme—Extending forward to level between j1 and j3.

Venter (Fig. 9E)—Ventrional shield subtriangular, with transverse striae anteriorly to Jv2; 120 long, 148 wide at the anterior corners, 4 pairs of lyrifissures (2 anterior to Jv1, 1 lateral and posterior to Jv1 and 1 lateral and posterior to Zv2); preanal pores elliptical, posterior and almost on line behind Jv2.

Spermatodactyl—L-shaped; shaft 17 long.

Legs—Sharp-tipped macrosetae: Sge I 36, Sge II 33, Sge III 41, Sti III 36, Sge IV 86, Sti IV 73 and St IV 64.

SPECIMENS EXAMINED—One female, **Benin**: Cotonou, Département du Littoral, on *Terminalia catappa*, 3-XI-1989, G.J. Moraes. Two females and 1 male, **Ghana**: University of Cape Coast, Cape Coast, Central Region, on *Mangifera indica*, 12-XI-1989, J.S. Yaninek. Four females, **Kenya**: 6.5 km S Likoni, Coastal Province, on unknown plant, 22-XI-1989, C.W. Kariuki; 6.5 km S Mombasa, Coastal Province, on *Cocos nucifera*, 28-XI-1989, J.S. Yaninek; 50 km S Mombasa, Coastal Province, on *Plumeria rubra*, 28-XI-1989, J.S. Yaninek. Two females, **Sierra Leone**: Lansar, on *Luffa aegyptiaca*, 16-XII-1991, J.S. Yaninek.

REMARKS—*Amblyseius neolargoensis* Van Der Merwe, 1965 is very similar to *A. largoensis*, but it differs by having Z4 ca. 1.2 times as long as s4, Z4 ca. 75%, Z5 ca. 30%, s4 ca. 45%, Sge IV ca. 45%, Sti IV ca. 25% and St IV ca. 25% longer than in *A. largoensis*.

Phytoseiid taxonomists do not agree on the synonymy of those two species. Chant et al. (1978) and Muma et al. (1970) reported that *A. largoensis* is a senior synonym of *A. neolargoensis*, while Amitai & Swirski (1981), McMurtry & Moraes (1984) and Schicha (1981) reported that they are two different species. Based on the differences mentioned above we also considered them as different species in this study.

WORLD DISTRIBUTION—Cosmopolitan.

### *Amblyseius lumangweensis* Zannou, Moraes & Oliveira, n. sp.

(Fig. 10)

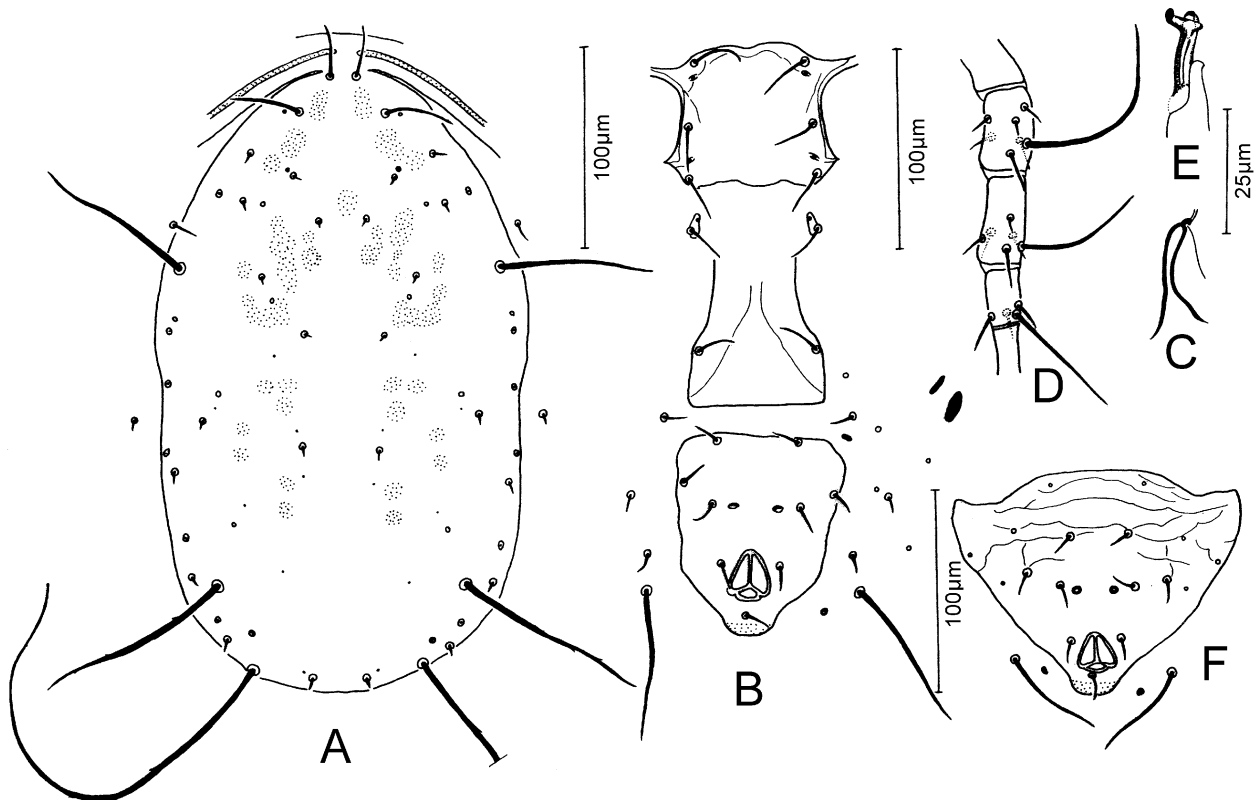
DIAGNOSIS—Seta Z1 present; setae Z5 much longer than distance between their bases; ratios s4:Z1 = 13.5, s4:S2 = 13.5. Ventrional shield pentagonal. Fixed cheliceral digit with 10 teeth. Genu of leg I with a macroseta. Spermatheca with calyx swollen basally, bladder-like, then narrowing and flaring distally; atrium nodular, small.

FEMALE—(Specimen measured—Zambia: 1). Idiosomal setal pattern 10A:9B/JV-3:ZV.

Dorsum (Fig. 10A)—Dorsal shield smooth, 304 long and 184 wide. Setae j1 28, j3 36, j4 5, j5 5, j6 5, J2 5, J5 5, z2 8, z4 8, z5 5, Z1 6, Z4 101, Z5 218, s4 81, S2 6, S4 6, S5 6, r3 12, R1 5. Setae smooth, except Z4 and Z5, lightly serrate.

Peritreme—Extending forward to level of j1.

Venter (Fig. 10B)—Sternal shield mostly smooth, with few lateral striae; posterior margin wavy; distances between, St1-St3 56, St2-St2 62. Genital shield smooth; distance between St5-St5 59. Ventrional shield smooth, pentagonal, anterior margin straight, 97 long, 84 wide at level of Zv2 and 72 wide at level of anus; preanal pores elliptical and in line with Jv2. Two pairs of metapodal shields.



**FIGURE 10.** *Amblyseius lumangweensis* Zannou, Moraes & Oliveira, n. sp.: A. Female dorsal shield; B. Female ventral surface; C. Spermatheca; D. Female leg IV; E. Spermatodactyl, F. Male ventrianal shield.

Chelicera—Movable digit 30 long, with apparently 3 teeth; fixed digit 23 long, apparently with 10 teeth and a *pilus dentilis*.

Spermatheca (Fig. 10C)—Calyx swollen basally, bladder-like, then narrowing and flaring distally, 20 long; atrium nodular, small.

Legs—Sharp-tipped macrosetae: Sge I 36, Sge II 30, Sge III 42, Sti III 31, Sge IV 105, Sti IV 66, St IV 67); presence of a prominent erect seta at base of tarsus I.

MALE—(Specimen measured—Zambia: 1)

Dorsum—Dorsal shield pattern as in female, 261 long and 190 wide. Setae j1 23, j3 36, j4 3, j5 3, j6 3, J2 5, J5 5, z2 6, z4 5, z5 3, Z1 5, Z4 101, Z5 203, s4 81, S2 5, S4 5, S5 5, r3 8, R1 5. Setae smooth, except Z4 and Z5, lightly serrate.

Peritreme—Extending forward to level between j1 and j3.

Venter—(Fig. 10F)—Ventrianal shield subtriangular, with transverse striae anteriorly to Jv2, 109 long, 147 wide at the anterior corners, with 4 pairs of lyrifissures (1 anterior to Jv1, 2 lateral and almost in line or slightly posterior to Jv1 and 1 lateral and slightly posterior to Zv2); preanal pores elliptical and in line with Jv2.

Spermatodactyl (Fig. 10E)—L-shaped; shaft 16 long.

Legs—Sharp-tipped macrosetae: Sge I 34, Sge II 30, Sge III 37, Sti III 31, Sge IV 81, Sti IV 55 and St IV 62.

LOCALITY AND TYPE MATERIAL—Holotype female and 1 allotype male from *Psidium guajava*, Lumangwe Falls, Zambia, 14-VI-1990, J.S. Yaninek deposited at ESALQ-USP.

ETYMOLOGY—The epithet *lumangweensis* refers to the location where the types of this species were collected.

REMARKS – *Amblyseius chanioticus* Papadoulis, 1997, *A. monacus* Wainstein, 1975 and *A. pamperisi*

Papadoulis, 1997 differ from the new species by having z2 and z4 at least twice as long; in addition *A. chanioticus* has ventrianal shield vase-shaped, with 2 pairs of preanal setae; *A. monacus* has s4, Z4 and Z5 25–40% shorter and *A. pamperisi* has Z5 ca. 30% shorter than in the new species. *Amblyseius sculpticollis* Denmark & Evans (in Denmark et al. 1999), *A. supercaudatus* Karg, 1994 and *A. longisaccatus* Wu, Lan & Liu, 1995 differ from the new species by having Z4 and Z5 45–70% longer. Furthermore, the first two species have the atrium of the spermatheca undifferentiated and the last has fixed cheliceral digit with more than 15 minute teeth. *Amblyseius incognitus* Schuster, 1966 also differs from the new species by having atrium of spermatheca undifferentiated; fixed cheliceral digit with 2 large subapical teeth and 18–20 minute teeth; and Sge IV as long as St IV, each ca. 20% longer than Sti IV.

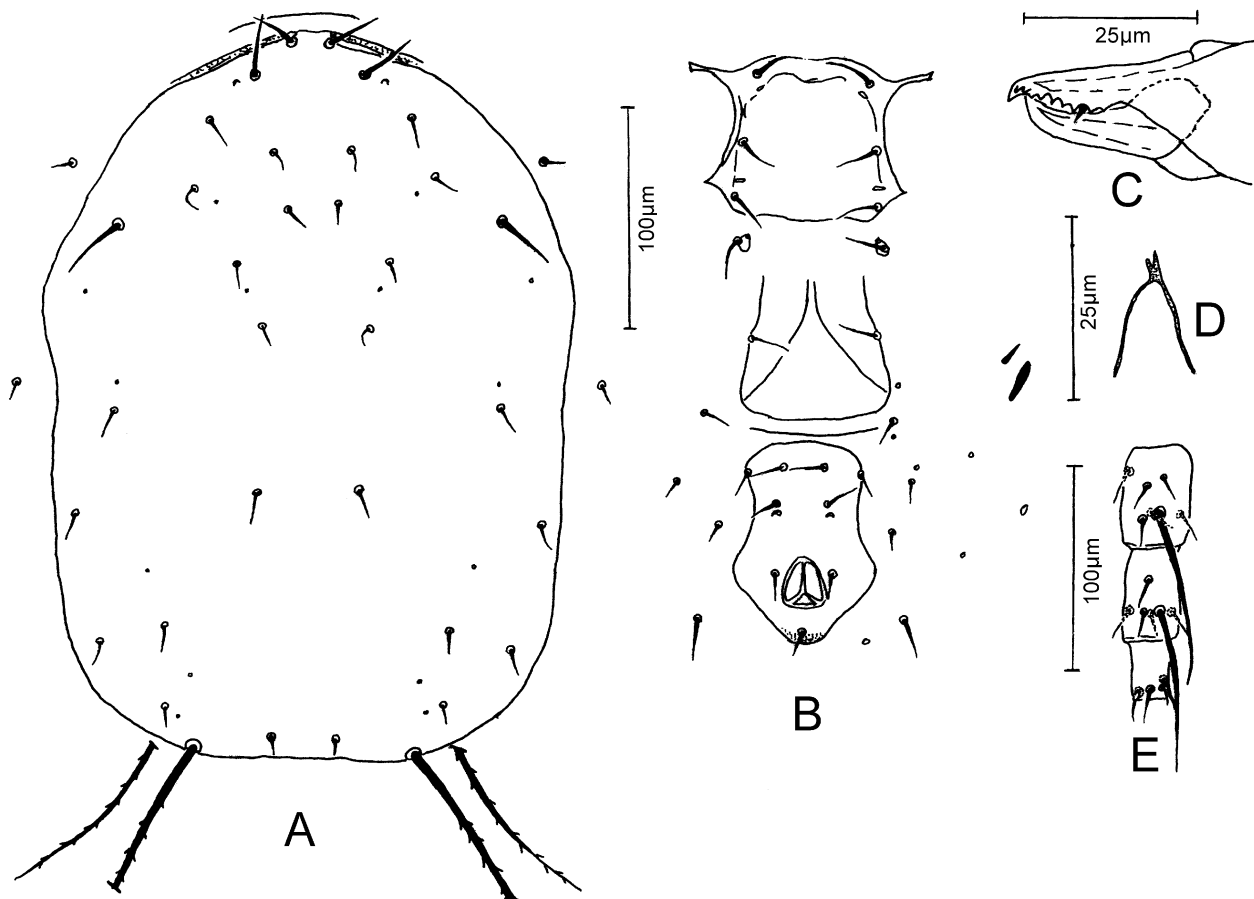
***Amblyseius neoankaratrae* Ueckermann & Loots**

(Fig. 11)

*Amblyseius* (*Amblyseius*) *neoankaratrae* Ueckermann & Loots, 1988: 92.

*Amblyseius neoankaratae*, Chant & McMurtry, 2004: 210; Moraes et al. 2004: 40.

FEMALE—(Specimens measured—South Africa: Holotype and 1 paratype). Idiosomal setal pattern 10A:9B/JV-3:ZV.



**FIGURE 11.** *Amblyseius neoankaratrae* Ueckermann & Loots (female): A. Dorsal shield; B. Ventral surface; C. Chelicera; D. Spermatheca; E. Leg IV.

Dorsum (Fig. 11A)—Dorsal shield smooth, 337 [315] long and 208 [230] wide. Setae j1 16 [19], j3 28 [28], j4 13 [13], j5 13 [13], j6 13 [13], J2 16 [16], J5 9 [9], z2 16 [13], z4 13 [13], z5 13 [13], Z1 16 [16], Z4

13 [14], Z5 164 [172], s4 32 [32], S2 13 [13], S4 13 [13], S5 13 [13], r3 9 [9], R1 13 [13]. Setae smooth, except Z5, serrate.

Peritreme—Extending forward to level of j1.

Venter (Fig. 11B)—Sternal shield smooth, except for few anterior and lateral striae; posterior margin slightly convex, distances between St1-St3 50 [50], St2-St2 54 [57]. Genital shield smooth; distance between St5-St5 57 [54]. Ventrianal shield smooth, vase-shaped, anterior margin convex, 95 [88] long, 54 [54] wide at level of Zv2 and 67 [63] wide at level of anus; preanal pores elliptical, slightly posterior to Jv2. Two pairs of metapodal shields.

Chelicera (Fig. 11C)—Movable digit 28 [28] long, apparently toothless; fixed digit 28 [28] long, with at least 8 teeth and a *pilus dentilis*.

Spermatheca (Fig. 11D)—Calyx cup-shaped, 13 [13] long; atrium slightly bifurcate.

Legs—Sharp-tipped macrosetae: Sge I 35 [32], Sge II 32 [32], Sge III 35 [38], Sti III 28 [32], Sge IV 85 [85], Sti IV 76 [82]; presence of a prominent erect seta at base of tarsus I.

MALE—Unknown.

SPECIMENS EXAMINED—South Africa: Holotype and paratype female, St. Lucia, Kwazulu/Natal on *Rothmannia globosa*, 14-IX-1972, M.K.P. Smith Meyer.

REMARKS—Differently from other *Amblyseius* species, *A. ankaratrae* and *A. neoankaratrae* (*ankaratrae* species subgroup Chant & McMurtry of *largoensis* species group McMurtry & Moraes) have ratios s4:Z1 and s4:S2 < 3.0:1.0.

### *Amblyseius neolargoensis* Van der Merwe

(Fig. 12)

*Amblyseius (Amblyseius) neolargoensis* Van der Merwe, 1965: 59.

*Amblyseius neolargoensis*, Meyer & Rodrigues, 1966: 27; Chant & McMurtry, 2004: 208; Moraes et al. 2004: 41.

*Amblyseius vazimba* Blommers & Chazeau, 1974: 312 (synonymy according to Ueckermann & Loots, 1988).

FEMALE—(Specimens measured—South Africa: holotype and 1 additional specimen; Mozambique: 1). Idiosomal setal pattern 10A:9B/JV-3:ZV.

Dorsum (Fig. 12A)—Dorsal shield smooth, 363(362–372) [356] long and 263(246–277) [277] wide. Setae j1 39 (38–41) [41], j3 49(47–50) [50], j4 6 [6], j5 6[6], j6 8(6–9) [6], J2 9 [9], J5 10(9–13) [13], z2 8(6–9) [6], z4 8(6–9) [6], z5 6 [6], Z1 9[9], Z4 158(154–161) [158], Z5 334(331–337) [334], s4 132(131–132) [132], S2 13 [13], S4 12(9–13) [13], S5 12(11–13), r3 12(9–13) [13], R1 13 [13]. Setae smooth.

Peritreme—Extending forward to level of j1.

Venter (Fig. 12B)—Sternal shield smooth, except for few anterior and lateral striae; posterior margin straight; distances between St1-St3 56(54–57) [57], St2-St2 66(63–68) [66]. Genital shield smooth; distance between St5-St5 66(63–69) [69]. Ventrianal shield (not visible in holotype) smooth, vase-shaped, anterior margin convex, 104(91–117) long, 60 wide at level of Zv2 and 74(72–76) wide at level of anus; preanal pores elliptical, slightly posterior and mesad to Jv2. Two pairs of metapodal shields.

Chelicera (Fig. 12C)—Movable digit 31(28–32) [32] long, with 3 teeth [3]; fixed digit 28 [28] long, with 11 [11] teeth and a *pilus dentilis*.

Spermatheca (Fig. 12D)—Calyx tubular, swollen near atrium, 28 [28] long; atrium large.

Legs—Sharp-tipped macrosetae: Sge I 50(47–54) [47], Sge II 41[41], Sge III 66(63–69) [63], Sti III 47[47], Sge IV 174(173–174) [173], Sti IV 117(113–120) [113], St IV 78(76–79) [76]; presence of a prominent erect seta at base of tarsus I.

MALE: Not encountered in this study.

SPECIMENS EXAMINED—**South Africa:** Munster, Kwazulu/Natal, holotype female, on unidentified

plant, 14-IV-1955, M.K.P. Smith Meyer; Botanical Gardens, Durban, Kwazulu/Natal, 1 female, on grass, 31-I-1966, M.K.P. Smith Meyer. One female, **Mozambique**: Gurve, on *Camellia sinensis*, 21-III-64, M.K.P. Smith Meyer.

REMARKS—*Amblyseius largoensis* and *A. neolargoensis* are very similar. The resemblance between the two species is discussed in the remark section of the former.

WORLD DISTRIBUTION—Cape Verde, Hawaii, Madagascar, Mozambique, Reunion Island, South Africa and Zimbabwe.

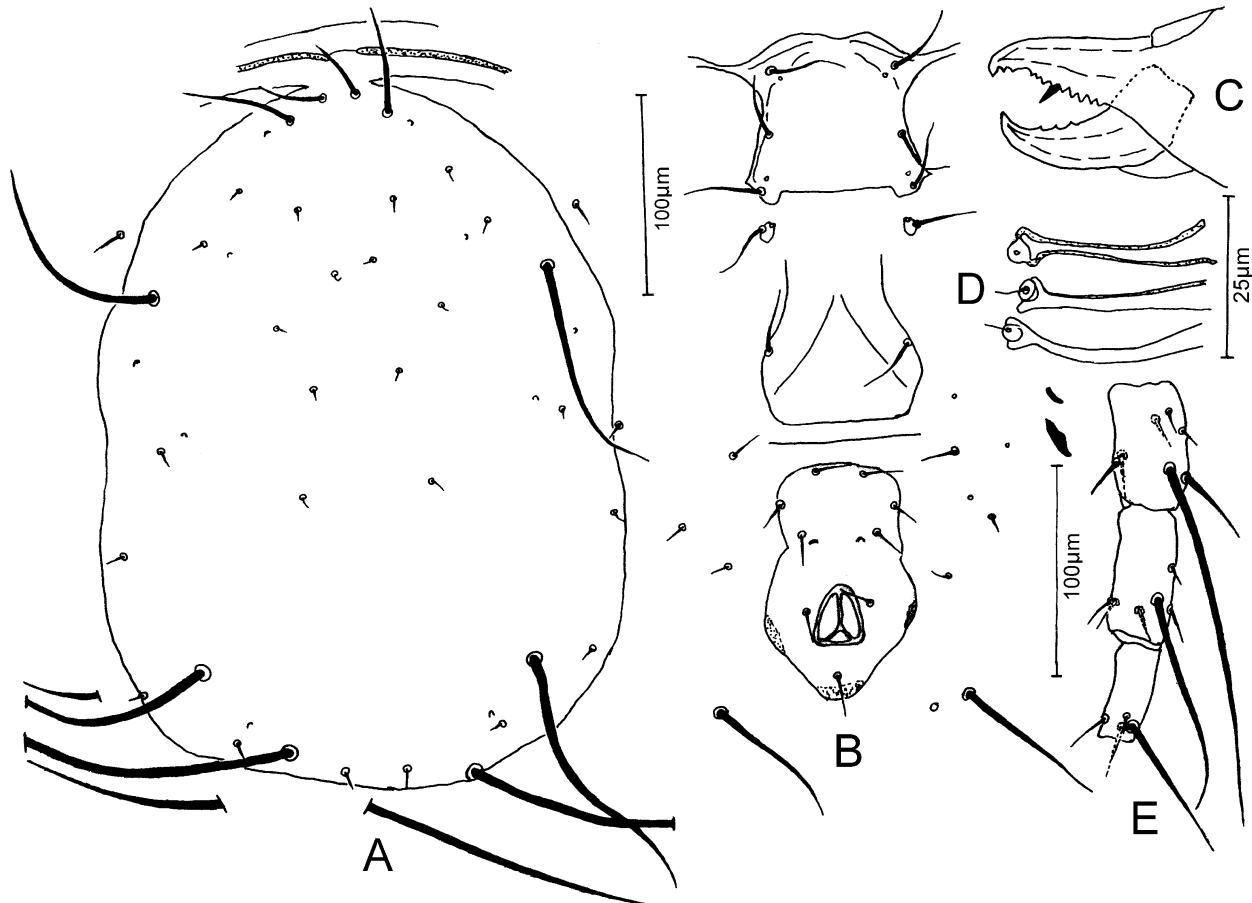


FIGURE 12. *Amblyseius neolargoensis* Van der Merwe (female): A. Dorsal shield; B. Ventral surface; C. Chelicera; D. Spermatheca; E. Leg IV.

### *Amblyseius ovalitectus* Van der Merwe

*Amblyseius* (*Amblyseius*) *ovalitectus* Van der Merwe, 1968: 155.

*Amblyseius ovalitectus*, Chant & McMurtry 2004: 197; Moraes, et al. 2004: 45.

REMARKS—Idiosomal setal pattern 10A:9B/JV-3:ZV. This species was described from specimens collected in Potchefstroom, North-West Province, South Africa, from soil. No additional specimens were collected in the present study.

WORLD DISTRIBUTION—South Africa.

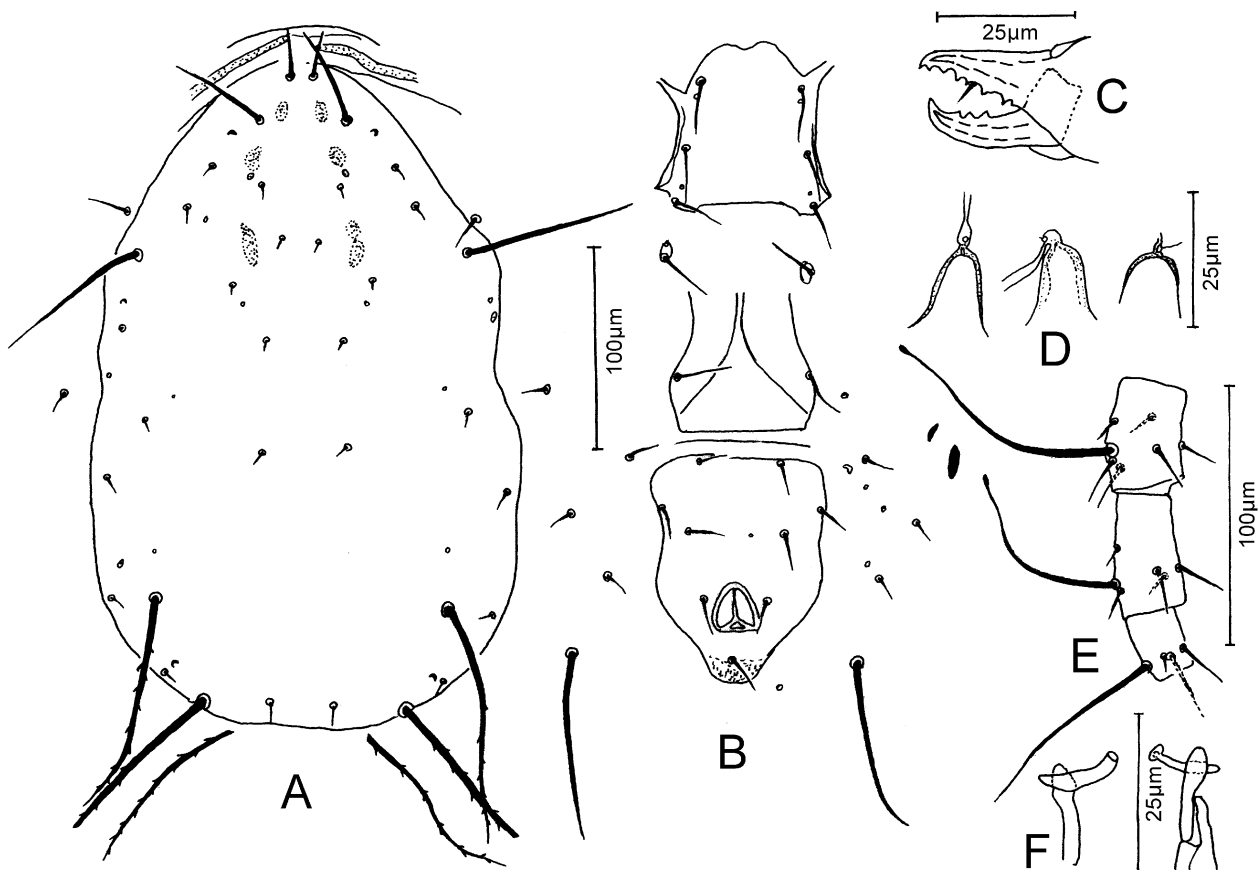
*Amblyseius pretoriaensis* Ueckermann & Loots

(Fig. 13)

*Amblyseius (Amblyseius) pretoriaensis* Ueckermann & Loots, 1988: 79.

*Amblyseius pretoriaensis*, Chant & McMurtry, 2004: 201; Moraes et al. 2004: 48.

FEMALE—(Specimens measured—South Africa: holotype, 4 paratypes and 5 additional specimens). Idiosomal setal pattern 10A:9B/JV-3:ZV.



**FIGURE 13.** *Amblyseius pretoriaensis* Ueckermann & Loots: A. Female dorsal shield; B. Female ventral surface; C. Female chelicera; D. Spermatheca; E. Female leg IV; F. Spermatodactyl.

Dorsum (Fig. 13A)—Dorsal shield smooth, 330 (309–350) [343] long and 215(195–233) [195] wide. Setae j1 25 [25], j3 47(41–50) [50], j4 6 [6], j5 6 [6], j6 6 [6], J2 6 [6], J5 9 [9], z2 6 [6], z4 9 [9], z5 6 [6], Z1 9 [9], Z4 120(104–132) [117], Z5 216(180–249) [239], s4 91(88–101) [88], S2 11(9–16) [9], S4 10(9–13) [9], S5 9(6–11) [6], r3 18(16–19) [19], R1 14(13–16) [16]. Setae smooth except Z4 and Z5, serrate.

Peritreme—Extending forward to level of j1.

Venter (Fig. 13B)—Sternal shield smooth; posterior margin slightly concave; distances between St1–St3 57(54–60) [55], St2–St2 60(57–63) [57]. Genital shield smooth; distance between St5–St5 63(57–67) [63]. Ventrianal shield smooth, vase-shaped, anterior margin straight, 111(104–117) [110] long, 82(76–85) [85] wide at level of Zv2 and 81(76–85) [82] wide at level of anus; preanal pores small and in line with Jv2. Two pairs of metapodal shields.

Chelicera (Fig. 13C)—Movable digit 28(25–32) [27] long with 3 teeth, fixed digit 27(25–32) [27] long, with 7–9 teeth and a *pilus dentilis*.

Spermatheca (Fig. 13D)—Calyx cup to bell-shaped, 12(9–13) [9] long; atrium nodular and major duct slender to rather broad.

Legs—Macrosetae sharp-tipped on legs II and III and with tiny knobs on leg IV, except in 2 specimens from Eastern Cape for which macrosetae are sharp-tipped on all legs. Sge II 33(28–35) [35], Sge III 41(35–44) [44], Sti III 33(28–35) [32], Sge IV 98(79–107) [101], Sti IV 79(60–85) [79], St IV 78(71–82) [82]; presence of a prominent erect seta at base of tarsus I.

MALE—(Specimens measured—South Africa: 2).

Dorsum—Dorsal shield pattern as in female, 259(252–265) long and 173(170–176) wide. Setae j1 19, j3 27(25–28), j4 6, j5 6, j6 6, J2 6, J5 6, z2 6, z4 6, z5 6, Z1 8(6–9), Z4 109(104–114), Z5 189(186–192), s4 84(82–85), S2 9, S4 6, S5 6, r3 13, R1 9. Setae smooth, except Z4 and Z5, serrate.

Peritreme—Extending forward to level of j1.

Venter—Ventrianal shield subtriangular, reticulate; 113 long and 139(132–145) wide at anterior corners; other characters not visible because the shield is broken.

Spermatodactyl (Fig. 13F)—L-shaped, shaft 16 long.

Legs—Macrosetae sharp-tipped on legs II and III and with tiny knobs on leg IV: Sge II 25. Sge III 30(28–32), Sti III 27(25–28), Sge IV 76(70–82), Sti IV 52(47–57), St IV 63.

SPECIMENS EXAMINED—**South Africa:** Pretoria, Gauteng Province, holotype and 1 paratype female, on *Mesembryanthemum crystallinum*, 12-XII-1973, F.W. Schultz; Adelaide, Eastern Cape Province, 1 paratype female, on *Setaria sphacelata*, 6-II-1974, F.W. Schultz; Fort Beaufort, Eastern Cape Province, one paratype female from *Convolvulus sagittatus*, 6-II-1974, M.K.P. Smith Meyer; Pineapple Research Station, East London, Eastern Cape Province, 1 paratype female, on *Plectranthus* sp., 6-II-1974, M.K.P. Smith Meyer; 1 female, Golden Gate, Free State Province, on *Helichrysum pilosellum*, 8-II-1982, E.A. Ueckermann; 1 female, Gaint's Castle, Kwazulu/Natal, on *Inulanthera calva*, 3-II-1982, M.K.P. Smith Meyer; 1 female, Golden Gate Highland National Park, Free State Province, on *Conyza podocephala*, 6-II-1982, M.K.P. Smith Meyer; 1 female, Golden Gate Highland National Park, Free State Province, on *Cineraria lyrata*, 9-II-1982, E.A. Ueckermann; 1 female, Roodeplaat Vegetable and Ornamental Plant Institute, near Pretoria, Gauteng Province, on *Chrysanthemum* sp., 27-XII-1979, M. Bolten; 2 males, Gaint's Castle, Kwazulu/Natal Province, on unidentified plant, 2-II-1982, M.K.P. Smith Meyer.

REMARKS—This species is widely distributed in South Africa and the spermatheca shows variation, from cup to bell-shaped and in specimens, mainly from the Western and Eastern Cape, the major duct is rather broad as opposed to slender in specimens from the Northern provinces.

WORLD DISTRIBUTION—Lesotho and South Africa.

### *Amblyseius chanti* Zannou, Moraes & Oliveira, n. sp.

(Fig. 14)

DIAGNOSIS—Seta Z1 present; setae Z5 shorter than distance between their bases; ratios s4:Z1 = 5.7, s4:S2 = 5.7. Ventrianal shield subtriangular. Fixed cheliceral digit with 10 teeth. Genu of leg I with a macroseta. Spermatheca with calyx cup-shaped; atrium nodular, excentrically connected to calyx and tilted towards it, apposing surface of insertion of minor duct to adjoining calyx extremity.

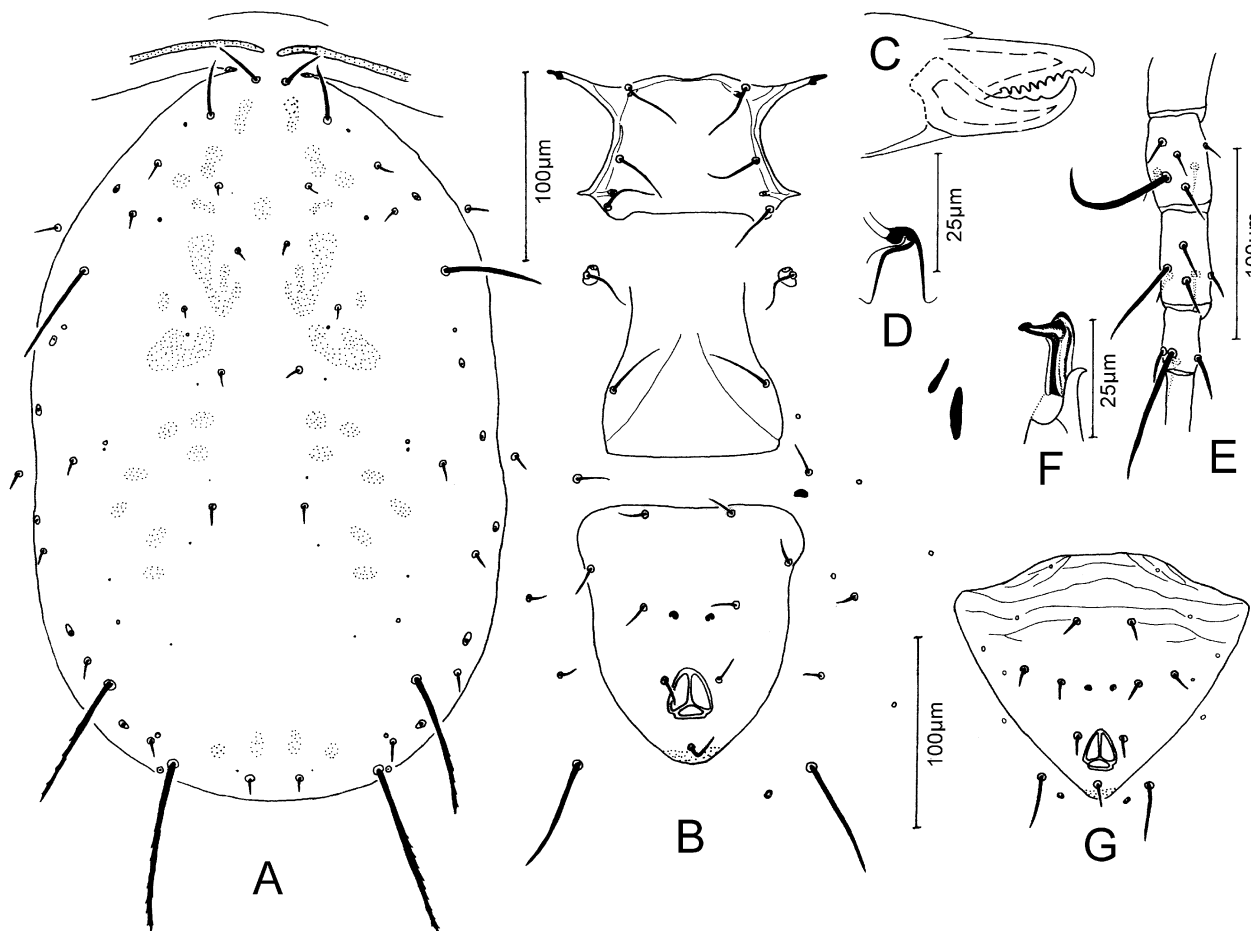
FEMALE—(Specimens measured—Zambia: 9). Idiosomal setal pattern 10A:9B/JV-3:ZV.

Dorsum (Fig. 14A)—Dorsal shield smooth, 375(355–400) long and 246(239–269) wide. Setae j1 24, j3 30(27–35), j4 7(6–7), j5 6(6–7), j6 8, J2 9(7–10), J5 7(7–8), z2 9(8–10), z4 8(7–9), z5 6(6–7), Z1 9(8–11), Z4 73(71–78), Z5 86(82–93), s4 51(48–55), S2 9(8–10), S4 10(10–12), S5 8(8–9), r3 12(11–12), R1 9(8–10). Setae smooth, except Z4 and Z5, serrate.

Peritreme—Extending beyond level of j1.

Venter (Fig. 14B)—Sternal shield mostly smooth, with few lateral striae; posterior margin straight; distances between St1–St3 62(60–63), St2–St2 69(67–72). Genital shield smooth; distance between St5–St5

75(72–79). Ventrianal shield smooth, subtriangular, anterior margin slightly concave, 124(119–130) long, 107(102–115) wide at level of Zv2 and 93(85–98) wide at level of anus; preanal pores elliptical, mesad and slightly posterior to Jv2. Two pairs of metapodal shields.



**FIGURE 14.** *Amblyseius chanti* Zannou, Moraes & Oliveira, n. sp.: A. Female dorsal shield; B. Female ventral surface; C. Female chelicera; D. Spermatheca; E. Female leg IV; F. Spermatodactyl; G. Male ventrianal shield.

Chelicera (Fig. 14C)—Movable digit 33(32–35) long, with 3 teeth; fixed digit 26(26–28) long, with 10 teeth and a *pilus dentilis*.

Spermatheca (Fig. 14D)—Calyx cup-shaped, 12(10–14) long; atrium nodular, excentrically connected to calyx and tilted towards it, apposing surface of insertion of minor duct to adjoining calyx extremity.

Legs—Sharp-tipped macrosetae: Sge I 29(28–31), Sge II 28(25–30), Sge III 32(29–36), Sti III 22(20–24), Sge IV 62(57–67), Sti IV 43(40–45), St IV 62(59–67); presence of a prominent erect seta at base of tarsus I.

MALE—(Specimen measured—Zambia: 1).

Dorsum—Dorsal shield pattern as in female, 295 long and 216 wide. Setae j1 19, j3 19, j4 5, j5 5, j6 broken, J2 6, J5 6, z2 7, z4 8, z5 6, Z1 7, Z4 54, Z5 58, s4 35, S2 7, S4 7, S5 6, r3 10, R1 7. Setae smooth, except Z4 and Z5, serrate.

Peritreme—Extending beyond level of j1.

Venter (Fig. 14G)—Ventrianal shield subtriangular, with transverse striae anterior to Jv1, 122 long, 150 wide at the anterior corners; with 4 pairs of lyrifissures (1 laterad and well anterior to Jv1, 1 laterad and slightly anterior to Jv1, 1 laterad and well anterior to Zv2 and 1 laterad and slightly posterior to Zv2) and a pair of elliptical preanal pores, mesad and slightly posterior to Jv2.

Spermatodactyl (Fig. 14F)—L-shaped; shaft 17 long.

Legs—Sharp-tipped macrosetae: Sge I 24, Sge II 21, Sge III 19, Sti III 19, Sge IV 41, Sti IV 31, St IV 55.

LOCALITY AND TYPE MATERIAL—Holotype female from *Citrus aurantium*, 50 km SE Mporokoso, **Zambia**, 15-VI-1992, J.S. Yaninek, deposited at ESALQ-USP; 1 paratype female from *Julbernardia globiflora*, 50 km SE Mporokoso, **Zambia**, 15-VI-1992, A. Onzo, deposited at ESALQ-USP; 1 paratype female from *Uvariastrum hexaloboides*, Lumangwe Falls, **Zambia**, 14-VI-1992, A. Onzo, deposited at IITAIM; 3 paratype females from *Monotes angolensis*, Lumangwe Falls, **Zambia**, 14-VI-1992, A. Onzo, deposited at IITAIM; 2 paratype females and 1 allotype male from *Uapaca kirkiana*, Lumangwe Falls, **Zambia**, 14-VI-1992, A. Onzo, deposited at ESALQ-USP; 1 paratype female from *Combretum mechowianum*, 63 km E Kawambua, **Zambia**, 14-VI-1992, A. Onzo, deposited at ESALQ-USP.

ETYMOLOGY—This species is named in honor of the eminent acarologist Donald A. Chant, for his outstanding contribution to the knowledge of the phytoseiid taxonomy.

REMARKS—*Amblyseius andersoni* (Chant, 1957) and *A. swirskii* Athias-Henriot, 1962 differ from this species by having dorsal shield with some lateral striae, Z4 and s4 sub-equal in length and ventrianal shield subpentagonal. In addition, the former species has Z5 at least twice as long as Z4 and s4. *Amblyseius genya* Pritchard & Baker, 1962, *A. neorykei* Gupta, 1977 and *A. tsugawai* Ehara, 1959 also differ from this new species by having ventrianal shield subpentagonal. Furthermore, *A. genya* has j3 more than twice as long as j1 and Sge IV at least ca. twice as long as Sti IV and St IV; *A. neorykei* has j1 ca. 0.5 times as long as j3; while *A. tsugawai* has ventrianal shield reticulate, Z4 as long as s4 and Z5 ca. 2.5 times as long as Z4 and s4.

### ***Amblyseius sundi* Pritchard & Baker**

(Fig. 15)

*Amblyseius (Amblyseius) sundi* Pritchard & Baker, 1962: 244.

*Amblyseius sundi*, Moraes et al. 1989a: 97; Chant & McMurtry, 2004: 212; Moraes et al. 2004: 52.

*Amblyseius (Proprioseiopsis) sundi*, Matthysse & Denmark, 1981: 344.

FEMALE—(Specimens measured—Burundi: 1; Ghana: 3; Ivory Coast: 1; Kenya: 4; Malawi: 1; Rwanda: 2; Sierra Leone: 1; Uganda: 1). Idiosomal setal pattern 10A:8A/JV3:ZV.

Dorsum (Fig. 15A)—Dorsal shield smooth, 373(318–421) [348] long and 272(248–304) [266] wide. Setae j1 39(32–45) [37], j3 48(40–56) [50], j4 5(4–5) [2], j5 4(3–5) [2], j6 6(5–8) [4], J2 6(5–8) [5], J5 7(6–8) [6], z2 7(5–8) [8], z4 7(5–14) [6], z5 5(4–5) [4], Z4 172(144–208) [174], Z5 445(366–547) [450], s4 165(133–206) [158], S2 7(5–8) [8], S4 7(6–8) [6], S5 6(5–8) [6], r3 14(10–16) [13], R1 8(5–11) [8]. Setae smooth, except Z4 and Z5, serrate. Seta Z1 absent.

Peritreme—Extending forward to level of j1.

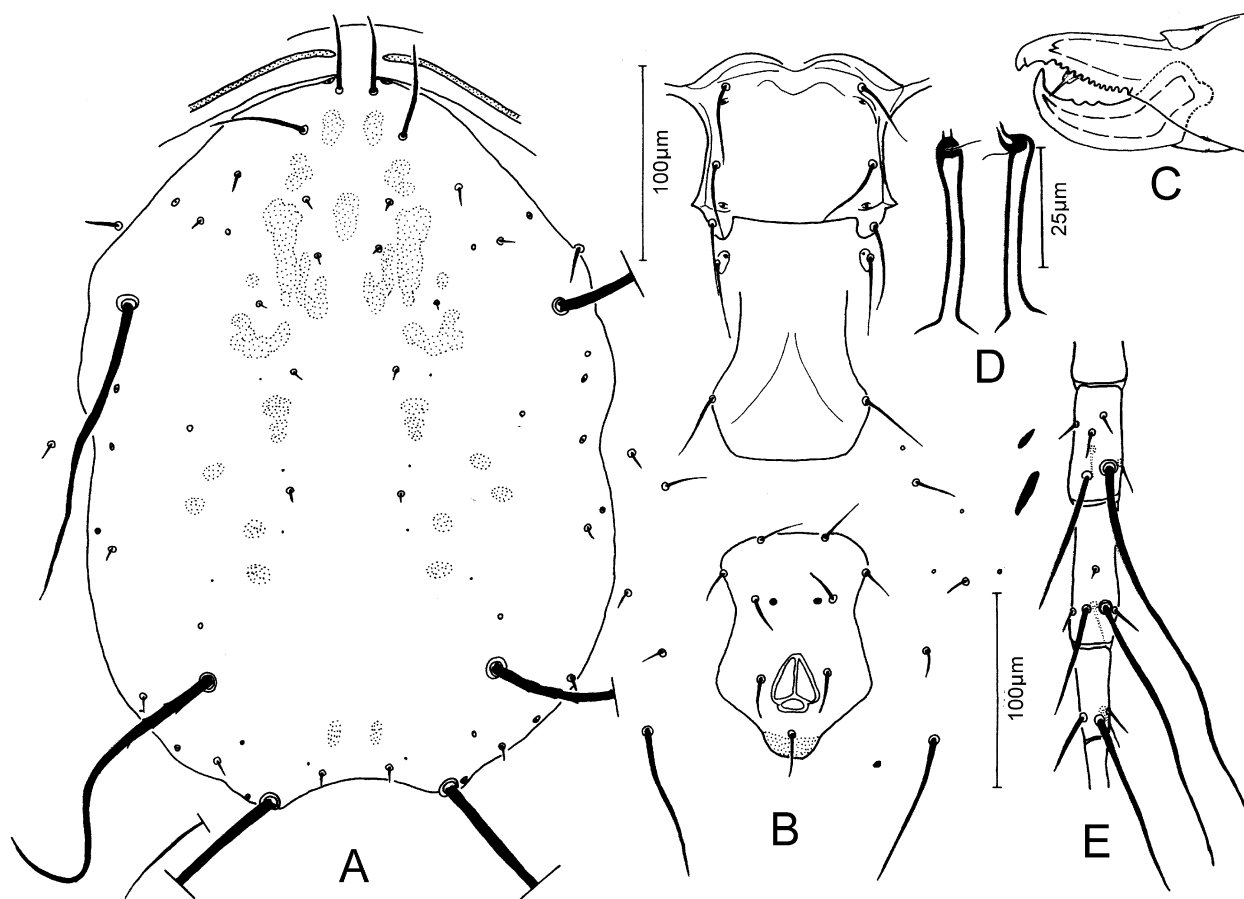
Venter (Fig. 15B)—Sternal shield mostly smooth, with few lateral striae; posterior margin almost straight; distances between St1–St3 69(62–82) [66], St2–St2 79(73–88) [78]. Genital shield smooth; distance between St5–St5 78(72–85) [78]. Ventrianal shield smooth, vase-shaped, anterior margin slightly convex, 122(100–141) [126] long, 73(64–85) [70] wide at level of Zv2 and 80(69–91) [79] wide at level of anus; preanal pores elliptical mesad and in line with Jv2. Two pairs of metapodal shields.

Chelicera (Fig. 15C)—Movable digit 38(37–39) [36] long, with 3 teeth; fixed digit 34(33–36) [34] long, with 13 to 14 [12–13] teeth and a *pilus dentilis*.

Spermatheca (Fig. 15D)—Calyx tubular, 40(34–48) [31] long; atrium as wide as calyx.

Legs—Sharp-tipped macrosetae: Sge I 74(61–96) [72], Sge II 49(40–59) [48], Sge III 72(50–88) [66], Sti III 56(43–67) [53], Sge IV 209(157–270) [186], Sti IV 156(112–208) [134], St IV 99(69–141) [85] ); presence of a prominent erect seta at base of tarsus I.

MALE—Not encountered in this study.



**FIGURE 15.** *Amblyseius sundi* Pritchard & Baker (Female): A. Dorsal shield; B. Ventral surface; C. Chelicera; D. Spermatheca; E. Leg IV.

**SPECIMENS EXAMINED**—Two females, **Benin**: Ouidah, Department of Atlantic, on *Elaeis guineensis*, 28-X-1989, G.J. Moraes. One female, **Burundi**: 17 km SW Makamba, on unknown plant, 14-XII-1989, J.S. Yaninek. Three females, **Cameroon**: 37 km E Bertoua, East Province, on *E. guineensis*, 3-II-1991, A. Onzo; 52 km N Kribi, Southern Province, on *Sida corymbosa*, 8-II-1991, A. Onzo. Five females, **Ghana**: 28 km S Dunkwa, Western Region, on unknown plant, 11-XI-1989, J.S. Yaninek; 6 km N Assin Darmang, Central Region, on *Citrus* sp., 4-IV-1990, B. Haruna and K. Antwi. Two females, **Ivory Coast**: 20 km SW Yopougon, on *Eucommia ulmoides*, 8-I-1999, B. Ojo. Six females, **Kenya**: 14 km W Kwale, Coastal Province, on *Ceiba pentandra*, 27-XI-1989, J.S. Yaninek; 27.9 km S Mombasa, Coastal Province, on *Citrus* sp., and on unknown plant, 28-XI-1989, J.S. Yaninek. Two females, **Malawi**: 11 km W Nkhata-Bay, Northern Province, on *Mangifera indica*, 18-V-2001, I.D. Zannou. Two females, **Mozambique**: Movia, Nacala-Velha, Nampula, on *Anacardium occidentale*, 4-V-2002, I.D. Zannou. Three females, **Rwanda**: 5 km N Ruhengeri, on *Markhamia lutea*, 8-XII-1989, J.S. Yaninek; 35 km SE Ruhengeri, on *Persea Americana*, 8-XII-1989, J.S. Yaninek. Two females, **Sierra Leone**: Bo China farm, on *Anacardium occidentale*, 14-XII-1991, B. Kristensen. Two females, **Uganda**: 25 km N Bundibugyo, on *E. guineensis*, 9-X-1990, J.S. Yaninek.

**REMARKS**—Most of the specimens collected are larger than the holotype of *A. sundi*; concurrently, they also have setae Z4, s4 and leg macrosetae distinctly longer; the largest differences refer to macrosetae of leg IV, which are, on average, ca. 40% longer. An analysis of the holotypes of *A. sundi*, *Amblyseius parasundi* Blommers, 1974 and *Amblyseius solus* Denmark & Matthyse, in Matthyse & Denmark (1981), showed that they are very similar, suggesting that those species could be synonyms. The first of those species was described from Democratic Republic of Congo and has been reported from several other countries in the Afri-

can continent, as well as in Cape Verde and Madagascar. The second was described from Madagascar and has never been reported from other countries. The third was described from Nigeria and has never been reported later in the literature. According to Blommers (1974), *A. parasundi* differs from *A. sundi* by its shorter Z5 and shorter macrosetae on leg IV, and by being thelytokous. The holotype of *A. sundi* has j3, Z5, s4 and macrosetae of leg IV ca. 20% longer as well as macrosetae of leg III at least 30% longer than the holotype of *A. solus*. However, given the variation of the measurements of the specimens collected in this study, we feel that those differences could represent intra-specific variation, and thus, *A. solus* is not included in the key provided later in this paper.

The specimens from Burundi, Ghana, Ivory Coast, Malawi, Sierra Leone and Uganda are smaller than the others examined in this study, whereas those from Kenya, Malawi and Rwanda have the longest setae Z4, Z5 and s4.

WORLD DISTRIBUTION—Benin, Burundi, Cameroon, Cape Verde, Congo, Democratic Republic of Congo, Ghana, Ivory-Coast, Kenya, Madagascar, Malawi, Mozambique, Nigeria, Rwanda, Sierra Leon, Uganda and Zimbabwe.

### ***Amblyseius swirskii* Athias-Henriot**

(Fig. 16)

*Amblyseius swirskii* Athias-Henriot, 1962: 5; Swirski et al. 1998: 102; Chant & McMurtry, 2004: 201.

*Typhlodromips swirskii*, Moraes et al. 2004: 227.

*Amblyseius (Amblyseius) rykei* Pritchard & Baker, 1962: 249 (new synonym)

FEMALE—(Specimens measured—Benin: 2; Burundi: 1; Ghana: 4; Democratic Republic of Congo: holotype of *A. (A.) rykei*; Israel: 2, indicated in the text in curly brackets). Idiosomal setal pattern 10A:9B/JV-3:ZV.

Dorsum (Fig. 16A)—Dorsal shield mostly smooth, with some lateral striae anterior to S2; 338(326–352) [345] {347} long and 205(202–208) [210] {216} wide. Setae j1 29(24–32) [31] {32}, j3 53(48–56) [50] {54}, j4 8 [7] {8}, j5 8 [6] {7}, j6 9(8–10) [9] {9}, J2 9(8–10) [9] {9}, J5 7(6–8) [8] {8}, z2 12(11–16) [14] {13}, z4 13(10–16) [13] {14}, z5 7(6–8) [8] {7}, Z1 9(8–10) [9] {10}, Z4 73(69–78) [69] {72}, Z5 110(106–115) [110] {116}, s4 75(70–82) [72] {79}, S2 13(11–14) [14] {19}, S4 9(8–10) [9] {13}, S5 7(6–8) [8] {11}, r3 20(19–21) [20] {25}, R1 11(10–13) [13] {15}. Setae smooth, except Z4 and Z5, serrate.

Peritreme—Extending beyond level of j1.

Venter (Fig. 16B)—Sternal shield mostly smooth, with few lateral striae, posterior margin straight; distances between St1–St3 62 [63] {66}, St2–St2 70(69–70) [75] {77}. Genital shield smooth; distance between St5–St5 73(67–78) [75] {75}. Ventrianal shield smooth, subpentagonal, slightly constricted at level of preanal pores, anterior margin slightly convex, 115(110–120) [118] {131} long, 79(72–86) [78] {93} wide at level of Zv2 and 79(78–80) [81] {88} wide at level of anus; preanal pores elliptical, mesad and slightly posterior to Jv2. Two pairs of metapodal shields.

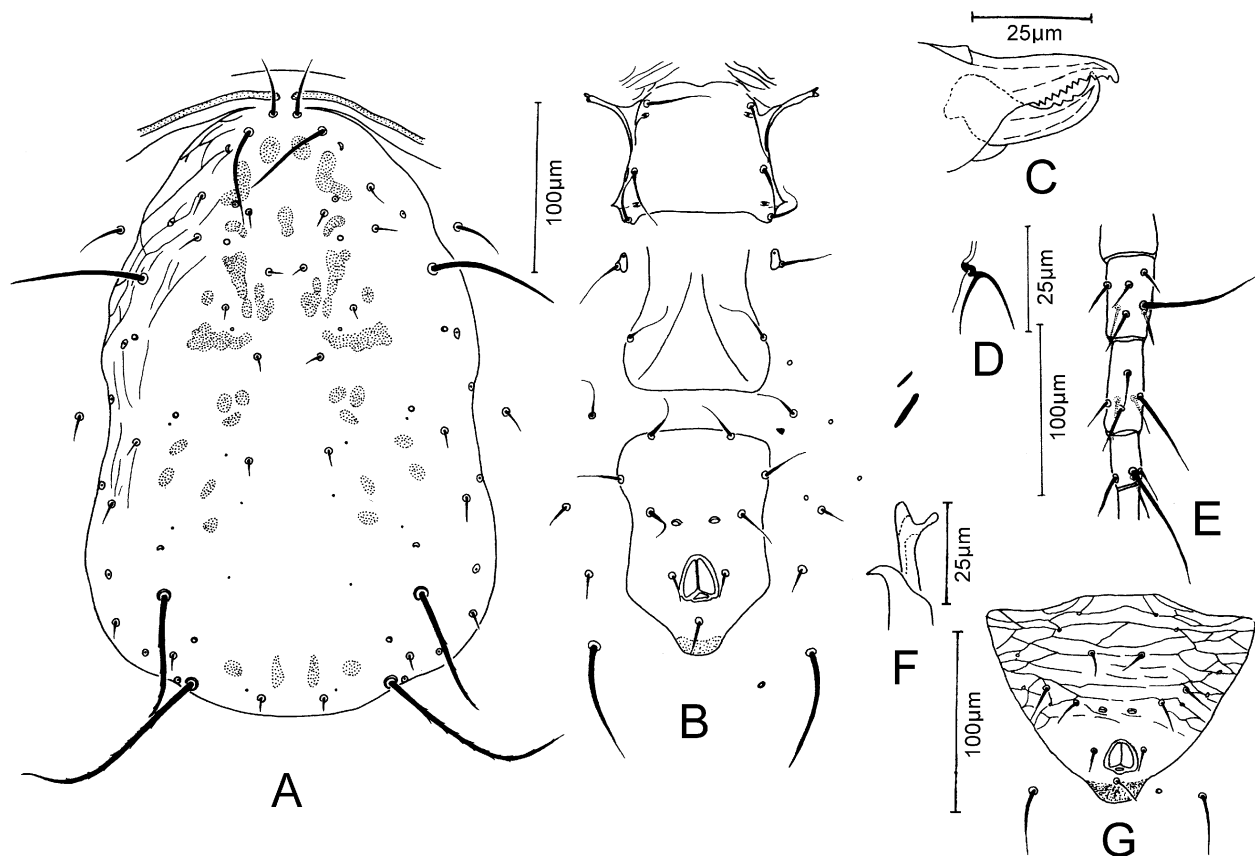
Chelicera (Fig. 16C)—Movable digit 33(33–35) {34} long with 3 teeth; fixed digit 28(28–30) {29} long with 9–10 {9} teeth and a *pilus dentilis*.

Spermatheca (Fig. 16D)—Calyx cup-shaped, 10 {8–9} long; atrium nodular.

Legs—Sharp-tipped macrosetae: Sge I 24 [24] {27–28}, Sge II 28(27–29) [24] {31–34}, Sge III 32 [31] {34–36}, Sti III 22(21–24) [22] {25–26}, Sge IV 61(56–66) [60] {61–62}, Sti IV 44(40–51) [41] {43–48}, St IV 59(53–64) [56] {64–65}; presence of a prominent erect seta at base of tarsus I.

MALE—(Specimen measured—Ghana: 1).

Dorsum—Dorsal shield pattern as in female, 258 long and 190 wide. Setae j1 25, j3 43, j4 7, j5 7, j6 8, J2 7, J5 8, z2 13, z4 13, z5 6, Z1 8, Z4 52, Z5 80, s4 59, S2 14, S4 9, S5 9, r3 20, R1 14. Setae smooth, except Z4 and Z5, serrate.



**FIGURE 16.** *Amblyseius swirskii* Athias-Henriot: A. Female dorsal shield; B. Female ventral surface; C. Female chelicera; D. Spermatheca; E. Female leg IV; F. Spermatodactyl; G. Male ventrianal shield.

Peritreme—Extending forward to level between j1 and j3.

Venter (Fig. 16G)—Ventrianal shield subtriangular, reticulate anteriorly to preanal pores, 113 long, 145 wide at the anterior corners, with 5 pairs of lyrifissures (2 anterior to Jv1, 1 lateral and slightly posterior to Jv1, 1 lateral and slightly posterior to Zv2 and 1 lateral and posterior to Jv2); preanal pores elliptical and posteromesad to Jv2.

Spermatodactyl (Fig. 16F)—L-shaped; shaft 19 long.

Legs—Sharp-tipped macrosetae: Sge II 25, Sge III 24, Sti III 20, Sge IV 39, Sti IV 35 and St IV 50.

**SPECIMENS EXAMINED**—Four females, **Benin**: Département de l'Atacora, 14 km NW Djougou, on *Gmelina arborea*, 20-XI-1989, unknown collector; Glazoue, on unknown plant, 10-VI-1991, A. Onzo. Two females, **Burundi**: 16 km NW Bujumbura, on *Solanum capsicoides*, 11-XII-1989, J.S. Yaninek. Holotype female of *A. (A.) rykei*, **Democratic Republic of Congo (Belgian Congo)**: Lake Edward, Kivu, on *Hoslundia opposita*, 15-IV-1955, E.W. Baker. Six females and 1 male, **Ghana**: Legon University, Accra, on *Euphorbia heterophylla*, 08-XI-1989, J.S. Yaninek; Legon University, Accra, on *Lantana camara*, 8-XI-1989, G.J. Moraes; Somanya, on *Manihot esculenta*, 13-XI-1989, unknown collector; 3 km W Anomabu, on unknown weed, 2-IV-1990, B. Haruna and K. Antwi. Four females, **Israel**, Magen-Michael, on *Citrus* sp., 18-IX-1963, A. Poroth; Berot-Yzhak, on *Citrus* sp., 25-IX-1963, A. Poroth. Two females, **Kenya**: Mwea, on *Lycopersicum esculentum*, 28-XII-1999, I. Sarr. Two females, **Tanzania**: 6 km N Songa, on *Securinega virosa*, 18-VIII-1994, A. Onzo.

**REMARKS**—The specimens collected in this study seem close to the descriptions of *A. rykei* and *A. swirskii*. One of us (GJM) was able to examine the holotype female of the former, but we were not able to borrow types of the latter for examination. Based on the exam of two female specimens collected from Israel (the

country from where *A. swirskii* was described), that had been identified by E. Swirski as *A. swirskii*, we concluded that *A. rykei* is a junior synonym of *A. swirskii*.

WORLD DISTRIBUTION—Azerbaijan, Cape Verde, Egypt, Gaza Strip, Georgia, Israel, Italy, Turkey and Yemen (for specimens mentioned as *A. swirskii*); Benin, Burundi, Democratic Republic of Congo, Ghana, India, Kenya, Malawi, Nigeria, Tanzania and Zimbabwe (for specimens mentioned as *A. rykei*).

### *Amblyseius tamatavensis* Blommers

(Fig. 17)

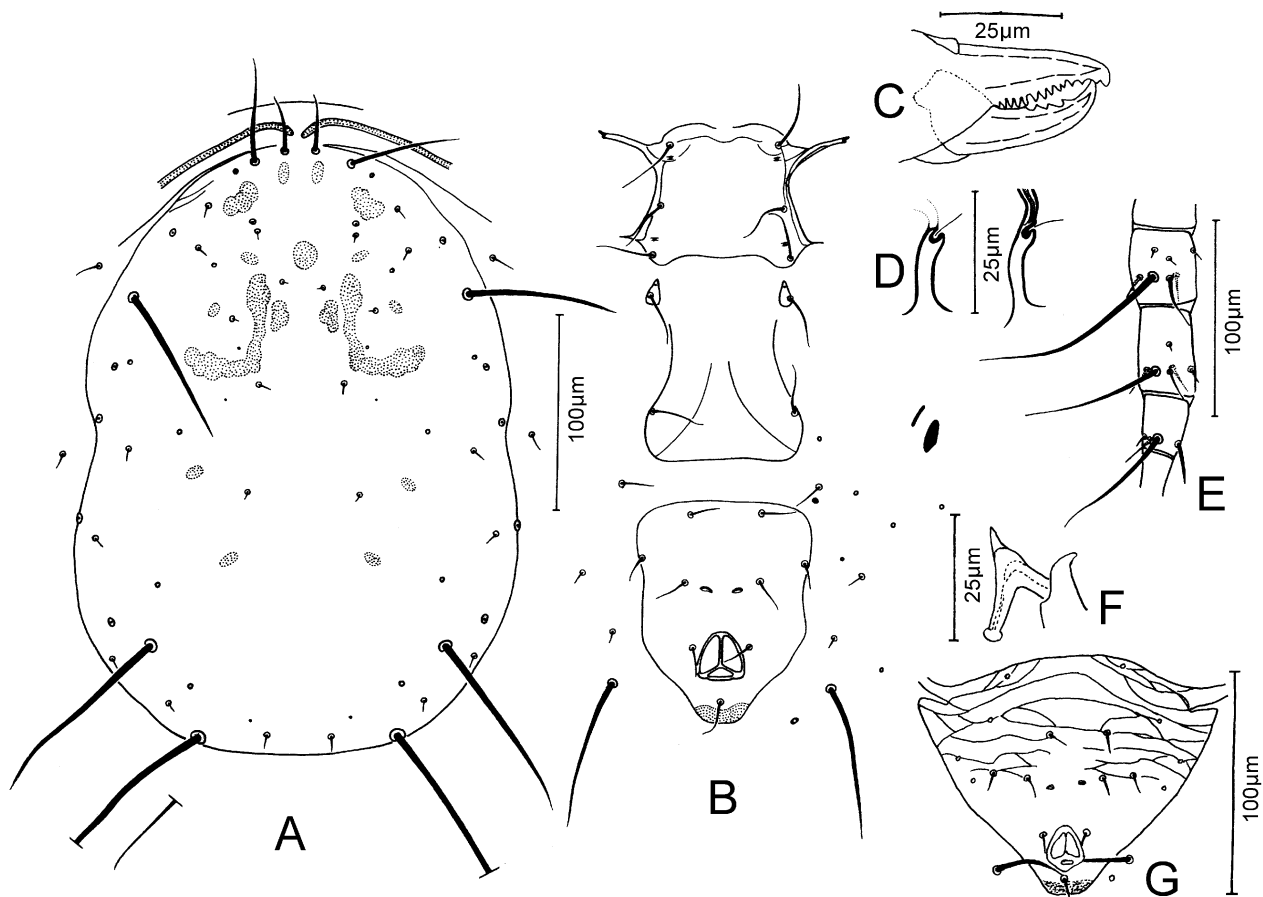
*Amblyseius* (*Amblyseius*) *tamatavensis* Blommers, 1974: 144.

*Amblyseius tamatavensis*, Moraes et al. 1989a: 83; Chant & McMurtry, 2004: 203; Moraes et al. 2004: 52.

*Amblyseius aegyptiacus* Denmark & Matthyse, in Matthyse & Denmark (1981): 343 (synonymy according to Denmark & Muma, 1989).

*Amblyseius maai* Tseng, 1976: 123 (synonymy according to Denmark & Muma, 1989)

FEMALE—(Specimens measured—Benin: 2; Burundi: 1; Cameroon: 2; Democratic Republic of Congo: 1; Ghana: 2; Rwanda: 1; Uganda: 1). Idiosomal setal pattern 10A:9B/JV-3:ZV.



**FIGURE 17.** *Amblyseius tamatavensis* Blommers: A. Female dorsal shield; B. Female ventral surface; C. Female chelicera; D. Spermatheca; E. Female leg IV; F. Spermatodactyl; G. Male ventrianal shield.

Dorsum (Fig. 17A)—Dorsal shield mostly smooth, with few anterolateral striae, 354(328–390) long and 237(218–256) wide. Setae j1 31(26–40), j3 50(38–59), j4 5(5–8), j5 4(3–5), j6 6(5–8), J2 7(5–8), J5 8(5–10), z2 9(8–11), z4 8(6–10), z5 5(3–6), Z1 7(5–8), Z4 108(94–125), Z5 250(221–272), s4 87(77–96), S2 8(6–10),

S4 8(6–10), S5 8(6–10), r3 15(14–18), R1 8(6–10). Setae smooth, Z4 and Z5 slightly serrate in South African specimens.

Peritreme—Extending beyond level of j1.

Venter (Fig. 17B)—Sternal shield mostly smooth, with few anterior and lateral striae; posterior margin almost straight; distances between St1–St3 63(59–66), St2–St2 72(67–77). Genital shield smooth; distance between St5–St5 73(69–77). Ventrianal shield smooth, subpentagonal, slightly constricted at level of preanal pores, anterior margin slightly convex, 122(110–136) long, 90(75–101) wide at level of Zv2 and 84(69–102) wide at level of anus; preanal pores elliptical, mesad and slightly posterior to Jv2. Two pairs of metapodal shields.

Chelicera (Fig. 17C)—Movable digit 39(39–40) long, with 3 teeth; fixed digit 34(34–35) long, with 13 teeth and a *pilus dentilis*.

Spermatheca (Fig. 17D)—Calyx elongate, tubular, 23(18–32) long; atrium small; major duct approximately of the same diameter as calyx.

Legs—Sharp-tipped macrosetae: Sge I 39(35–45), Sge II 38(35–42), Sge III 58(48–70), Sti III 46(34–53), Sge IV 106(85–126), Sti IV 69(54–86), St IV 71(58–86); presence of a prominent erect seta at base of tarsus I.

MALE—(Specimen measured—Ghana: 1).

Dorsum—Dorsal shield pattern as in female, 273 long and 187 wide. Setae j1 25, j3 42, j4 5, j5 5, j6 5, J2 5, J5 5, z2 6, z4 5, z5 5, Z1 6, Z4 86, Z5 164, s4 62, S2 6, S4 6, S5 6, r3 11, R1 broken. Setae smooth.

Peritreme—Extending forward to level between j1 and j3.

Venter (Fig. 17G)—Ventrianal shield subtriangular, reticulate anteriorly to Jv2; 109 long, 145 wide at the anterior corners, with 4 pairs of lyrifissures (2 anterior to Jv1, 1 lateral and posterior to Jv1 and 1 lateral and posterior to Zv2); preanal pores elliptical and posteromesad to Jv2.

Spermatodactyl (Fig. 17F)—L-shaped, shaft 17 long.

Legs—Sharp-tipped macrosetae: Sge I 30, Sge II 28, Sge III 41, Sti III 31, Sge IV 62, Sti IV 39 and St IV 51.

SPECIMENS EXAMINED—Four females, **Benin**: Département de l'Atlantique, International Institute of Tropical Agriculture, Abomey-Calavi, on *Mallotus oppositifolius*, 1989, G.J. Moraes; Agbotagon, on *Byrsocarpus coccineus*, 18-XI-1991, B. Eklou. Two females, **Burundi**: 16 km NW Bujumbura, on *Elaeis guineensis*, 11-XII-1989, J.S. Yaninek. Three females, **Cameroon**: 8 km E Nanga-Eboko, Central Province, on *Chromolaena odorata*, 4-II-1991, A. Onzo; 14 km SW Mvieng, Southern Province, on *C. odorata*, 7-II-1991, A. Onzo. Three females, **Democratic Republic of Congo**, 1 km E Songololo, Bas-Congo, on *C. odorata*, 11-VII-1991, A. Onzo. Five females and 2 males, **Ghana**: 2 km W Breman Asikuma, on unknown plant, 4-IV-1990, J. Gyamenah; Assin Darmang, Central Region, on *Musa paradisiaca*, 4-IV-1990, J. Gyamenah; 3 km N Breman Kokoso, Central region, on *E. guineensis*, 5-IV-1990, B. Haruna and K. Antwi. Two females, **Rwanda**: Gakenke, 55 km SE Ruhengeri, on *Musa sapientum*, 8-XII-1989, J.S. Yaninek. Three females, **Uganda**: Kamengo, Mpigi, on *Xanthomonas* sp., 6-X-1990, J.S. Yaninek.

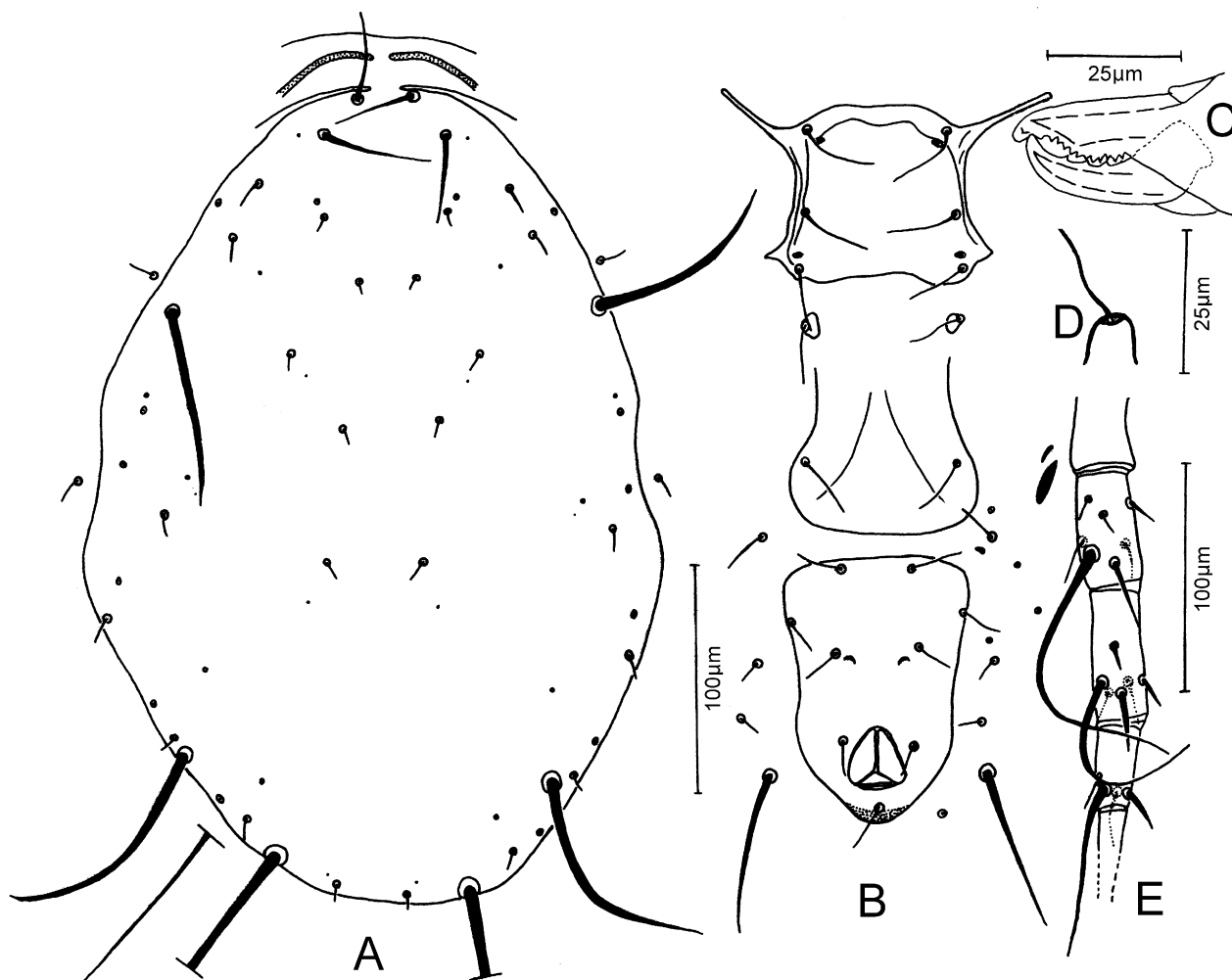
WORLD DISTRIBUTION—Benin, Brazil, Burundi, Cameroon, Cuba, Democratic Republic of Congo, Fiji, Ghana, Guadeloupe, Indonesia, Japan, Kenya, Madagascar, Malaysia, Marie Galante, Martinique, Nigeria, Papua New Guinea, Philippines, Reunion Island, Rwanda, Singapore, South Africa, Uganda, Vanuatu and Western Samoa.

### *Amblyseius victoireae* Zannou, Moraes & Oliveira, n. sp.

(Fig. 18)

DIAGNOSIS—Seta Z1 present; setae Z5 much longer than distance between their bases; setae Z4 and Z5 smooth; ratios s4:Z1 = 11.3, s4:S2 = 10.1; seta j3 ca. 1.4 as long as j1. Ventrianal shield subpentagonal,

smooth. Fixed cheliceral digit with 13 teeth. Genu of leg I with a macroseta; all macrosetae sharp-tipped. Spermatheca with calyx cup-shaped; atrium very small.



**FIGURE 18.** *Amblyseius victoireae* Zannou, Moraes & Oliveira, n. sp. (female): A. Dorsal shield; B. Ventral surface; C. Chelicera; D. Spermatheca; E. Leg IV.

**FEMALE**—(Specimens measured—Kenya: 4 and Uganda: 1. Idiosomal setal pattern 10A:9B/JV-3:ZV.

**Dorsum** (Fig. 18A)—Dorsal shield smooth, 354(320–370) long and 259(232–278) wide. Setae j1 35(32–37), j3 47(42–51), j4 6(5–6), j5 5(3–8), j6 6(5–8), J2 8(8–10), J5 6(5–8), z2 9(6–11), z4 7(5–8), z5 6(3–8), Z1 8(8–10), Z4 103(94–109), Z5 297(272–317), s4 91(86–98), S2 9(8–11), S4 9(8–10), S5 8(5–10), r3 10(6–13), R1 8(6–10). Setae smooth.

**Peritreme**—Extending beyond level of j1.

**Venter** (Fig. 18B)—Sternal shield mostly smooth, with few lateral striae; posterior margin slightly concave; distances between St1–St3 62(59–66), St2–St2 70(66–74). Genital shield smooth; distance between St5–St5 73(70–80). Ventrianal shield smooth, subpentagonal, slightly constricted at level of preanal pores, anterior margin slightly convex, 122(112–131) long, 83(75–96) wide at level of Zv2 and 73(66–82) wide at level of anus; preanal pores elliptical, mesad and slightly posterior to Jv2. Two pairs of metapodal shields.

**Chelicera** (Fig. 18C)—Movable digit 36(35–37) long, with 3 teeth; fixed digit 31(30–32) long, with 13 teeth and a *pilus dentilis*.

**Spermatheca** (Fig. 18D)—Calyx cup-shaped, 10(8–11) long; atrium very small.

**Legs**—Sharp-tipped macrosetae: Sge I 45(43–46), Sge II 40(37–43), Sge III 59(51–64), Sti III 41(38–43),

Sge IV 131(120–144), Sti IV 90(86–96), St IV 74(69–78); presence of a prominent erect seta at base of tarsus I.

MALE—Unknown.

LOCALITY AND TYPE MATERIAL—Holotype female from *Combretum* sp., 25 km S Malindi, **Kenya**, 11-XII-1989, J.S. Yaninek, deposited at ESALQ-USP; 1 paratype female from unknown plant, 25 km S Malindi, **Kenya**, 11-XII- 1989, J.S. Yaninek, deposited at ESALQ-USP; 4 paratype females from *Acacia brevispica*, 25 km S Malindi, **Kenya**, 11-XII- 1989, J.S. Yaninek, deposited at ESALQ-USP; 2 paratype females from unknown plant, Fedi Zuimi, Coastal Province, **Uganda**, 12-XII-1989, J.S. Yaninek, deposited at IITAIM; 1 paratype female from *Theobroma cacao*, 22 km N Bundibugyo, **Uganda**, 9-X-1990, J.S. Yaninek, deposited at IITAIM.

ETYMOLOGY—This species is named in honor of Victoire O. Ahouantchessou Zannou, spouse of the first author of this paper.

REMARKS—*Amblyseius pretoriaensis* Ueckermann & Loots, 1988 differs from this species by having j3 ca. twice as long as j1; Z5 ca. twice and ca. 2.5 times as long as Z4 and s4, respectively; Z4 and Z5 serrate and atrium of spermatheca nodular. *Amblyseius comatus* Ueckermann & Loots, 1988 differs by having Z4 and Z5 serrate, ventrianal shield with transverse striae anteriorly to anus and macrosetae of leg IV with small knobs. *Amblyseius haleakalus* Prasad, 1968 differs from the new species by having j3 about as long as j1 and Sge IV ca. 1.3 times as long as St IV. *Amblyseius kaguya* Ehara, 1966 also differs by having j3 ca. 1.5 times as long as j1, Z4 ca. 1.5 times as long as s4 and Sge IV twice as long as St IV.

### ***Graminaseius* Chant & McMurtry**

*Graminaseius* Chant & McMurtry, 2004: 215.

Stable characters mentioned by Chant & McMurtry 2004 for species of this genus are: idiosoma usually brownish or tan in color; dorsal shield well sclerotized, broad, convex; female idiosomal setal pattern 10A:9B/JV-3:ZV; setae s4, Z4 and Z5 markedly longer than other dorsal setae; ratio between the length of seta s4 and that of seta Z1 greater than 6.0:1.0 (this ratio is ca. 4.0:1.0 in *Graminaseius lippiai* n. sp.); s4 longer than z4; peritreme extending to level of j1 [in *G. bufortus* (Ueckermann & Loots), extending to level between j1 and j3]; sternal shield with 3 pairs of sternal setae; 3 pairs of preanal setae and a pair of preanal pores; spermatheca with atrium bifurcate or with major duct thick-walled, fusiform and vacuolated where it joins atrium; chelicerae with few teeth; leg I without macrosetae; leg IV with at least 2 strong macrosetae; spermatodactyl T-shaped.

Three species of this genus are reported in this study. They have 2 pairs of metapodal shields; caudovertral setae smooth and sharp-tipped; male ventrianal shield with 3 pairs of preanal setae; chaetotaxy of genua II and III 2-2/0, 2/0-1 and 1-2/1, 2/0-1, respectively.

### ***Graminaseius bufortus* (Ueckermann & Loots)**

(Fig. 19)

*Amblyseius* (*Amblyseius*) *bufortus* Ueckermann & Loots, 1988: 71.

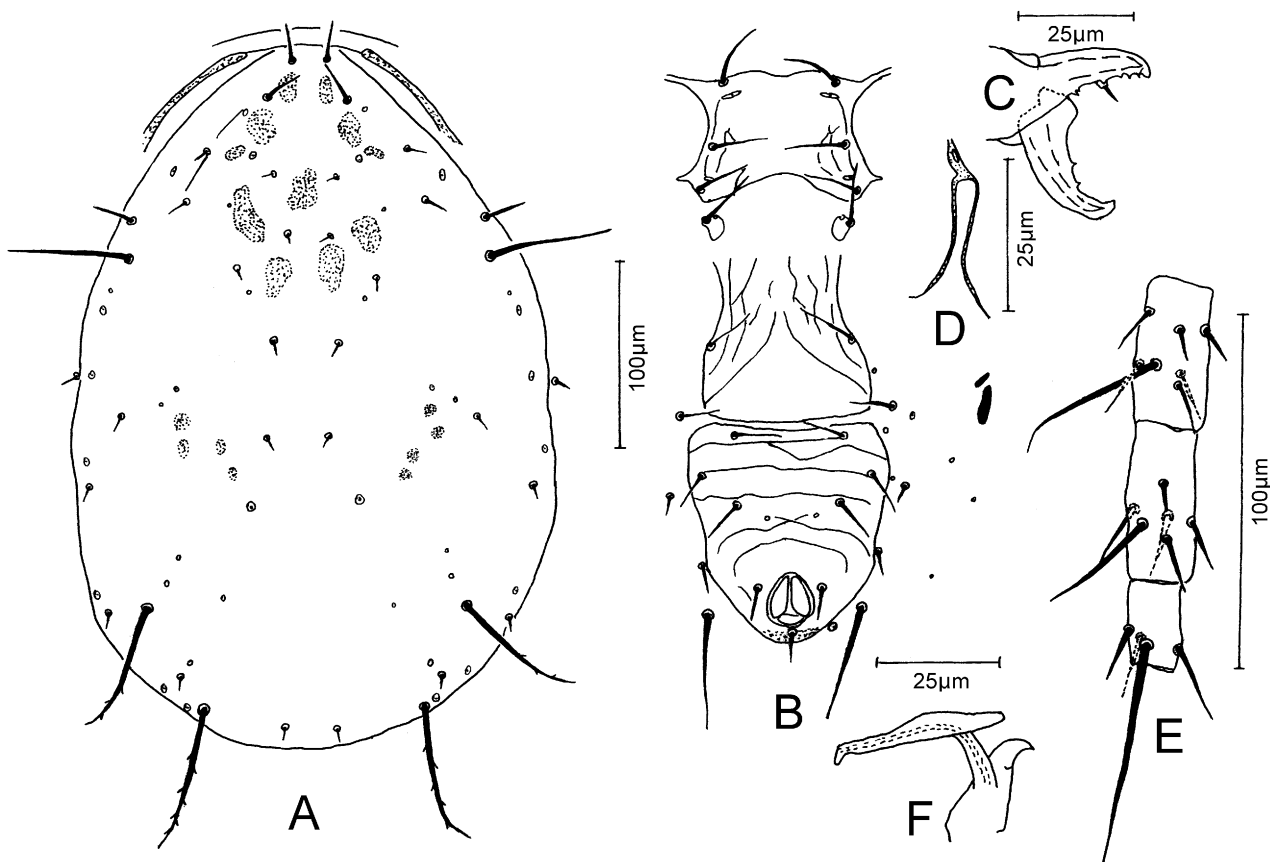
*Amblyseius bufortus*, Moraes et al. 2004: 18.

*Graminaseius bufortus*, Chant & McMurtry, 2004: 219.

FEMALE—(Specimens measured—South Africa: holotype and 2 paratypes).

Dorsum (Fig. 19A)—Dorsal shield smooth, 336(334–340) [334] long and 209(202–217) [208] wide.

Setae j1 19 [19], j3 22(21–22) [21], j4 6 [6], j5 6 [6], j6 8(6–9) [9], J2 6 [6], J5 9 [9], z2 8(6–9) [9], z4 11(9–13) [13], z5 6 [6], Z1 8(6–9) [9], Z4 66(63–69) [66], Z5 74(73–76) [73], s4 60 [60], S2 9 [9], S4 9(8–9) [9], S5 9 [9], r3 21(20–22) [22], R1 9 [9]. Seta r3 on the shield. Setae smooth, except Z4 and Z5, serrate.



**FIGURE 19.** *Graminaseius bufortus* (Ueckermann & Loots): A. Female dorsal shield; B. Female ventral surface; C. Female chelicera; D. Spermatheca; E. Female leg IV; F. Spermatodactyl.

Peritreme—Extending to level between j1 and j3.

Venter (Fig. 19B)—Sternal shield with lateral striae, posterior margin concave; distances between St1–St3 53(50–54) [50], St2–St2 61(60–63). Genital shield with longitudinal striae; distance between St5–St5 66(65–67) [66]. Ventrianal shield pentagonal, with transverse striae, anterior margin slightly concave, 98(95–101) [98] long, 96(95–98) [95] wide at level of Zv2 and 79 [79] wide at level of anus; preanal pores small and posteromesad to Jv2.

Chelicera (Fig. 19C)—Movable digit 32 [32] long, with 2 teeth; fixed digit 32 [32] long, with 6 teeth, 2 of which basal and distant from others, and a *pilus dentilis*.

Spermatheca (Fig. 19D)—Calyx swollen basally, bladder-like, then narrowing and flaring distally, 22 [22] long; atrium vacuolate.

Legs—Macrosetae: Sge II 27(25–28) [28], Sge III 22 [22], Sge IV 51(50–54) [50], Sti IV 37(35–38), St IV 63 [63].

MALE—(Specimens measured—South Africa: 3).

Dorsum—Dorsal shield pattern as in female, 270(261–274) long and 165(158–170) wide. Setae j1 19, j3 24(22–25), j4 8(6–9), j5 7(6–8), j6 9, J2 6, J5 9, z2 12(11–13), z4 13, z5 6, Z1 8(6–9), Z4 49(47–50), Z5 56(54–57), s4 46(44–47), S2 8(6–9), S4 6, S5 6, r3 15(13–16), R1 11(9–13).

Peritreme—Extending to level between j1 and j3.

Venter—Ventrianal shield subtriangular, reticulate, 110(107–113) long and 130(129–132) wide at ante-

rior corners; preanal pores small and posteromesad to Jv2, 4 pairs of lyrifissures (1 anterior to Jv1, 1 slightly posterior to Jv1, 1 laterad and almost in line with Zv2, 1 posterolaterad to Zv2).

Spermatodactyl (Fig. 19F)—T-shaped; shaft 17(16–19) long.

Legs—Macrosetae: Sge II 21(19–22), Sge IV 40(38–41), Sti IV 29(25–32), St IV 54(50–57). Chaetotaxy of genua II and III same as in female.

**SPECIMENS EXAMINED**—**South Africa:** Gaint's Castle Nature Reserve. Kwazulu/Natal Province, holotype female, 1 paratype female and 2 paratype males, on *Chlorophytum krookianum*, 3-II-1982, E.A. Ueckermann; Giant's Castle Nature Reserve, Kwazulu/Natal Province, 1 paratype male, on *Inulanthera calva*, 3-II-1982, M.K.P. Smith Meyer; Giant's Castle Nature Reserve, Kwazulu/Natal Province, 1 paratype female on grass, 3-II-1982, M.K.P. Smith Meyer.

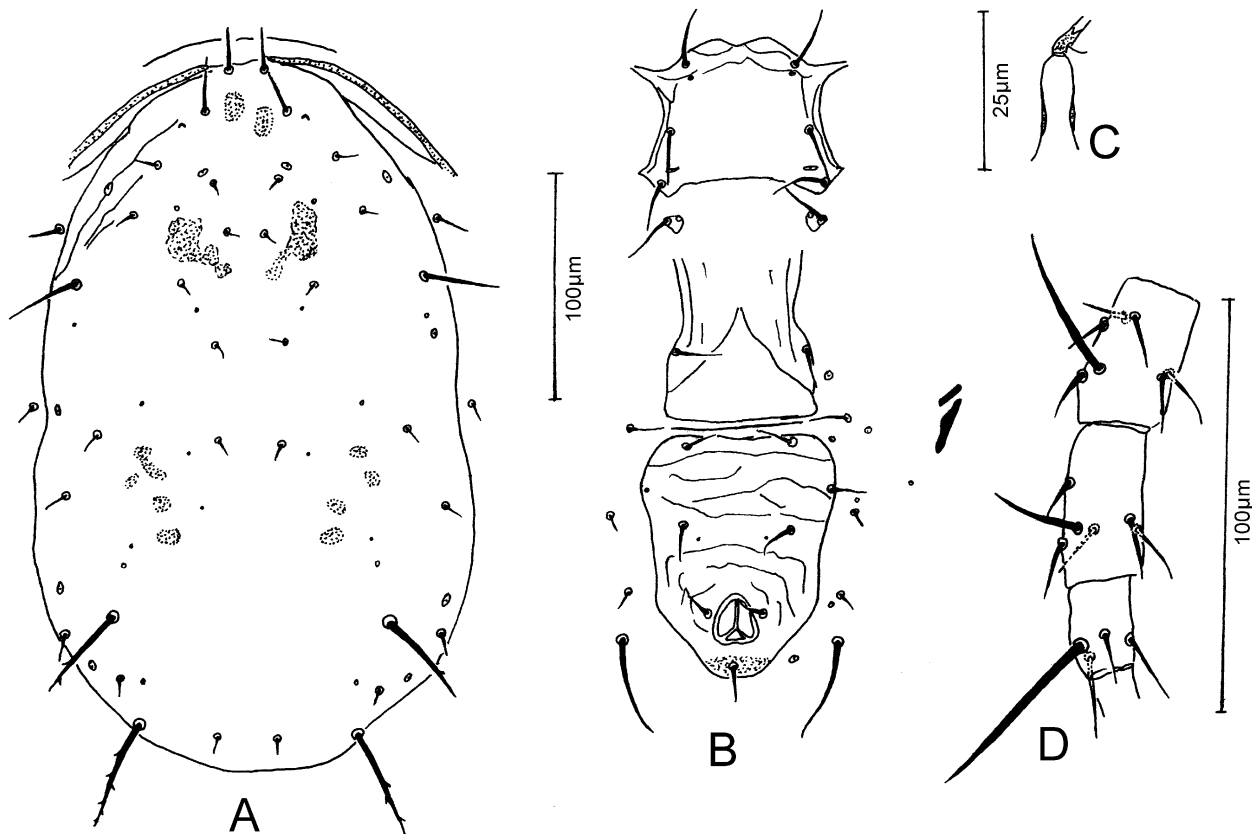
**REMARKS**—The macroseta on genu III is not distinctly longer than other setae on the segment.

**WORLD DISTRIBUTION**—South Africa.

***Graminaseius lippiai* Ueckermann, Zannou & Moraes, n. sp.**

(Fig. 20)

**DIAGNOSIS**—Seta S2 as long as Z1; ratios  $s4:S2 = 4$ , length of dorsal shield : S2 = 34; setae z2 and z4 short, the latter much shorter than distance between its base and that of s4. Fixed cheliceral digit with 4 teeth. Spermatheca with calyx saccular; atrium bifurcate.



**FIGURE 20.** *Graminaseius lippiai* Ueckermann, Zannou & Moraes, n. sp. (female): A. Dorsal shield; B. Ventral surface; C. Spermatheca; D. Leg IV.

**FEMALE**—(Specimens measured—South Africa: 3).

Dorsum (Fig. 20A)—Dorsal shield mostly smooth, with few anterolateral striae, 309 (302–315) long and

177(173–180) wide. Setae j1 19, j3 24(22–25), j4 6, j5 6, j6 9, J2 9, J5 9, z2 12(11–13), z4 9, z5 6, Z1 9, Z4 46(44–50), Z5 48(47–50), s4 35, S2 9, S4 9, S5 9(8–9), r3 16, R1 9. Setae smooth, except Z4 and Z5, serrate.

Peritreme—Extending forward to level of j1.

Venter (Fig. 20B)—Sternal shield mostly smooth, with anterior and lateral striae, posterior margin concave; distances between St1–St3 49(47–50), St2–St2 57. Genital shield with few longitudinal striae; distance between St5–St5 55(54–57). Ventrianal shield pentagonal, with transverse striae, anterior margin slightly concave, 106(104–107) long, 84(82–86) wide at level of Zv2 and 70(66–76) wide at level of anus; preanal pores small mesad and slightly posterior to Jv2.

Chelicera—Movable digit 29(28–30) long (teeth could not be counted due to position of chela); fixed digit 25 long, with 4 teeth and a *pilus dentilis*.

Spermatheca (Fig. 20C)—Calyx saccular, slightly flared distally, 16 long; atrium bifurcate.

Legs—Macrosetae: Sge IV 36(35–37), Sti IV 23(22–25), St IV 42 (38–44).

LOCALITY AND TYPE MATERIAL—Holotype female and two paratype females, from *Lippia rehmannii*, Vygeboom Dam, near Badplaas, Mpumalanga, South Africa, 3-II-1982, E.A. Ueckermann, deposited at NCA-PPRI.

ETYMOLOGY—The epithet *lippiai* refers to the genus of the plant on which the types of this species were collected.

REMARKS—There are indications of macrosetae on genua II and III, but they are not distinctly longer than other setae on the segments, only slightly stouter. This species is placed in the genus *Graminaseius* on a provisional basis, pending description of the male to determine whether its spermatodactyl is T-shaped, typical for the species in this genus.

This species was found amongst the type specimens of *G. bufortus* and it is closely related to the latter. However, *G. bufortus* has Z4, Z5 and s4 ca. 1.5 times longer; fixed cheliceral digit with 6 teeth; calyx of spermatheca swollen basally, bladder-like, then narrowing and flaring distally, more distinctly flaring near vesicle; atrium vacuolate and genua II and III with distinct macrosetae.

### ***Graminaseius occidentafricanus* (Moraes, Oliveira & Zannou)**

*Typhlodromips occidentafricanus* Moraes, Oliveira & Zannou, 2001a: 3; Moraes et al. 2004: 219.

*Amblyseius occidentafricanus*, Chant & McMurtry, 2004: 201.

REMARKS—Chant & McMurtry (2004) placed this species in genus *Amblyseius* in the *nicola* species subgroup Chant & McMurtry of the *obtusus* species group Chant. However, considering that it has spermatheca with thick-walled major duct, bifurcate at juncture with atrium, it seems that it is more appropriate to place this species in the genus *Graminaseius* Chant & McMurtry. This species is unique within the *Graminaseius* in having idiosomal setal pattern 10A:8C/JV-3:ZV. It was described from specimens collected in Okigwe, Nigeria, on *Synedrella nodiflora*. No additional specimens were collected in the present study.

WORLD DISTRIBUTION—Nigeria.

### ***Transeius* Chant & McMurtry**

*Transeius* Chant & McMurtry, 2004: 181.

Stable characters mentioned by Chant & McMurtry (2004) for species of this genus are: female idiosomal setal pattern 10A:9B/JV-3:ZV; ratio between the length of seta s4 and that of seta Z1 greater than 3.0:1.0; ratio between the length of seta s4 and that of seta S2 smaller than 2.7:1.0; setae S4, S5 and dorsocentral setae

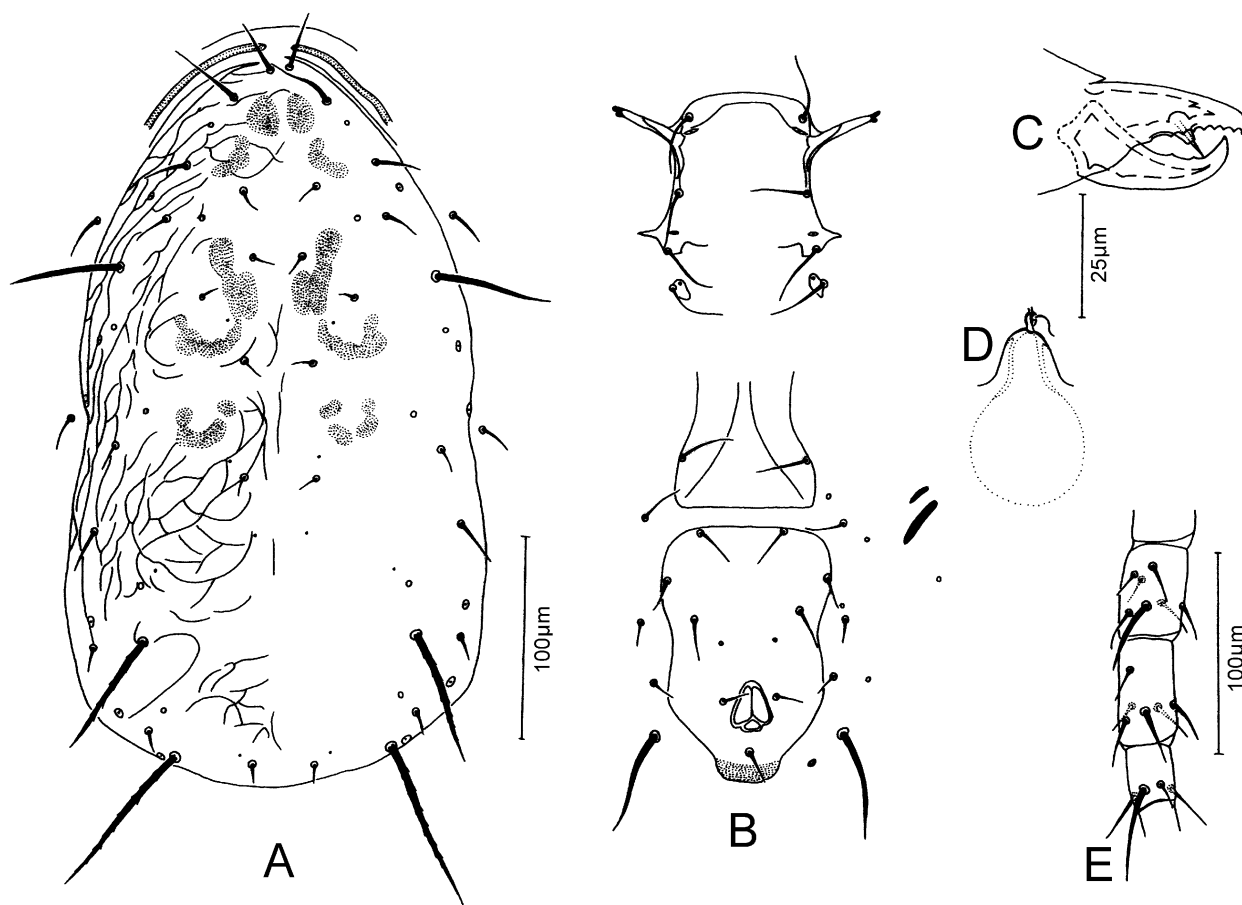
short/minute; ventrianal shield pentagonal, with 3 pairs of preanal setae and a pair of preanal pores; peritreme extending to level of j1; macrosetae always present on leg IV.

Five species of this genus are reported in this study. They all have 2 pairs of metapodal shields, except *Transeius violini* (Meyer & Rodrigues) in which those are not apparent, and caudoventral setae smooth and sharp-tipped.

***Transeius katumaniensis* Zannou, Moraes & Oliveira, n. sp.**

(Fig. 21)

DIAGNOSIS—Dorsal shield mostly reticulate; ratios  $s4:Z1 = 4.2$ ,  $s4:S2 = 2.4$ ; seta z4 shorter than z2 and about half as long as distance between its base and that of s4. Spermatheca with calyx bell-shaped.



**FIGURE 21.** *Transeius katumaniensis* Zannou, Moraes & Oliveira, n. sp. (female): A. Dorsal shield; B. Ventral surface; C. Chelicera; D. Spermatheca; E. Leg IV.

FEMALE—(Specimen measured—Kenya: 1).

Dorsum (Fig. 21A)—Dorsal shield mostly reticulate, except for the smooth anterocentral region, 349 long and 187 wide. Setae j1 26, j3 37, j4 13, j5 13, j6 11, J2 11, J5 10, z2 22, z4 18, z5 10, Z1 13, Z4 64, Z5 83, s4 54, S2 22, S4 13, S5 11, r3 26, R1 18. Setae smooth, except Z4 and Z5, serrate.

Peritreme—Extending forward to level of j1.

Venter (Fig. 21B)—Sternal shield mostly smooth, with few lateral striae; posterior margin indistinct; distances between St1-St3 64, St2-St2 64. Genital shield smooth; distance between St5-St5 62. Ventrianal shield smooth, anterior margin slightly convex, 120 long, 85 wide at level of Zv2 and 77 wide at level of anus; preanal pores small and posteromesad to Jv2.

Chelicera (Fig. 21C)—Movable digit 34 long, with 2 teeth; fixed digit 29 long, with 7 teeth and a *pilus dentilis*.

Spermatheca (Fig. 21D)—Calyx bell-shaped, 10 long and ca. 11 in diameter near vesicle; atrium nodular.

Legs—Macrosetae: Sge II 18, Sge III 18, Sge IV 34, Sti IV 22, St IV 42. Chaetotaxy: genu II: 2-2/1,2/0-1; genu III: 1-2/1,2/0-1.

MALE—Unknown.

LOCALITY AND TYPE MATERIAL—Holotype female from unknown plant, Machakos, Katumani, Kenya, 30-IX-1990, C. Kariuki, deposited at ESALQ-USP.

ETYMOLOGY—The epithet *katumaniensis* refers to the location (Katumani) where the type of this species was collected.

REMARKS—*Transeius bellottii* (Moraes & Mesa, 1988) differs from this species by having j3 and s4 serrate and macrosetae only on leg IV. *Transeius jailensis* (Kolodochka, 1981), *T. tuvinensis* (Beglyarov & Meshkov, 1988) and *T. violini* (Meyer & Rodrigues, 1966) differ by having dorsal shield mostly smooth, with some lateral striae. In addition, *T. jailensis* has Z5 ca. 1.8 and ca. 2.7 times as long as Z4 and s4, respectively; *T. tuvinensis* has ventrianal shield striate and calyx of spermatheca narrower (ca. 0.5 time as wide as long); and *T. violini* has ventrianal shield also striate and calyx of spermatheca swollen basally, bladder-like, then narrowing and flaring distally.

### ***Transeius msabahaensis* (Moraes & McMurtry)**

(Fig. 22)

*Amblyseiulus msabahaensis* Moraes & McMurtry, in Moraes et al. 1989b: 80.

*Neoseiulus msabahaensis*, Moraes et al. 2004: 134.

*Transeius msabahaensis*, Chant & McMurtry, 2004: 185.

FEMALE—(Specimens measured—Kenya: 2).

Dorsum (Fig. 22A)—Dorsal shield smooth, 342(328–355) long and 203 wide. Setae j1 17(14–19), j3 27(26–29), j4 10, j5 10, j6 10, J2 6(5–8), J5 7(6–8), z2 21(19–22), z4 14(13–14), z5 8, Z1 10(10–11), Z4 52(51–53), Z5 67, s4 40, S2 22(21–24), S4 13(11–14), S5 10, r3 24, R1 13(11–14). Setae smooth, except Z4 and Z5, serrate.

Venter (Fig. 22B)—Sternal shield smooth, posterior margin slightly concave; distances between St1–St3 62, St2–St2 67. Genital shield smooth; distance between St5–St5 67. Ventrianal shield smooth, anterior margin almost straight, 122 long, 98 wide at level of Zv2 and 83 wide at level of anus; preanal pores mesad and about in line with Jv2.

Chelicera (Fig. 22C)—Movable digit 34 long, with 1 tooth; fixed digit 31 long, with 5 teeth and a *pilus dentilis*

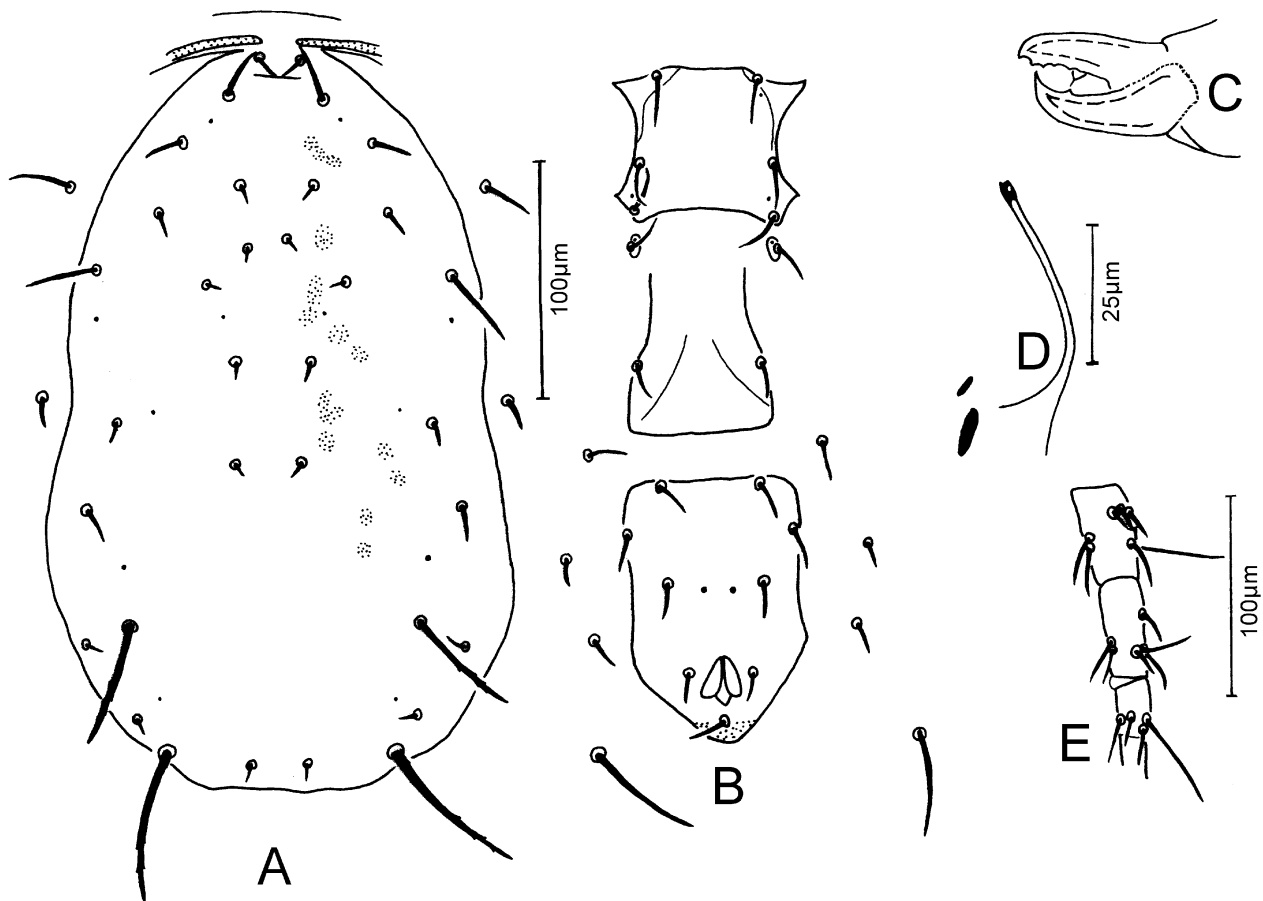
Spermatheca (Fig. 22D)—Calyx elongate, trumpet-shaped, 51 long; atrium about as wide as nearby portion of calyx.

Legs—Macrosetae: Sge IV 47(45–50), Sti 26(26–27), St IV 51(50–53). Chaetotaxy: genu II: 2-2/1,2/0-1; genu III: 1-2/1,2/0-1.

MALE—Not encountered in this study.

SPECIMENS EXAMINED—Two females, **Kenya**: Malindi, on *Eragrostis ciliaris*, 30-XI-1989, J.S. Yaninek; 19 km N Kilifi Ferry, on *Commelina* sp., 30-XI-1989, C. Kariuki.

WORLD DISTRIBUTION—Kenya.



**FIGURE 22.** *Transeius msabahaensis* (Moraes & McMurtry) (female): A. Dorsal shield; B. Ventral surface; C. Chelicera; D. Spermatheca; E. Leg IV.

***Transeius soniae* Zannou, Moraes & Oliveira, n. sp.**  
(Fig. 23)

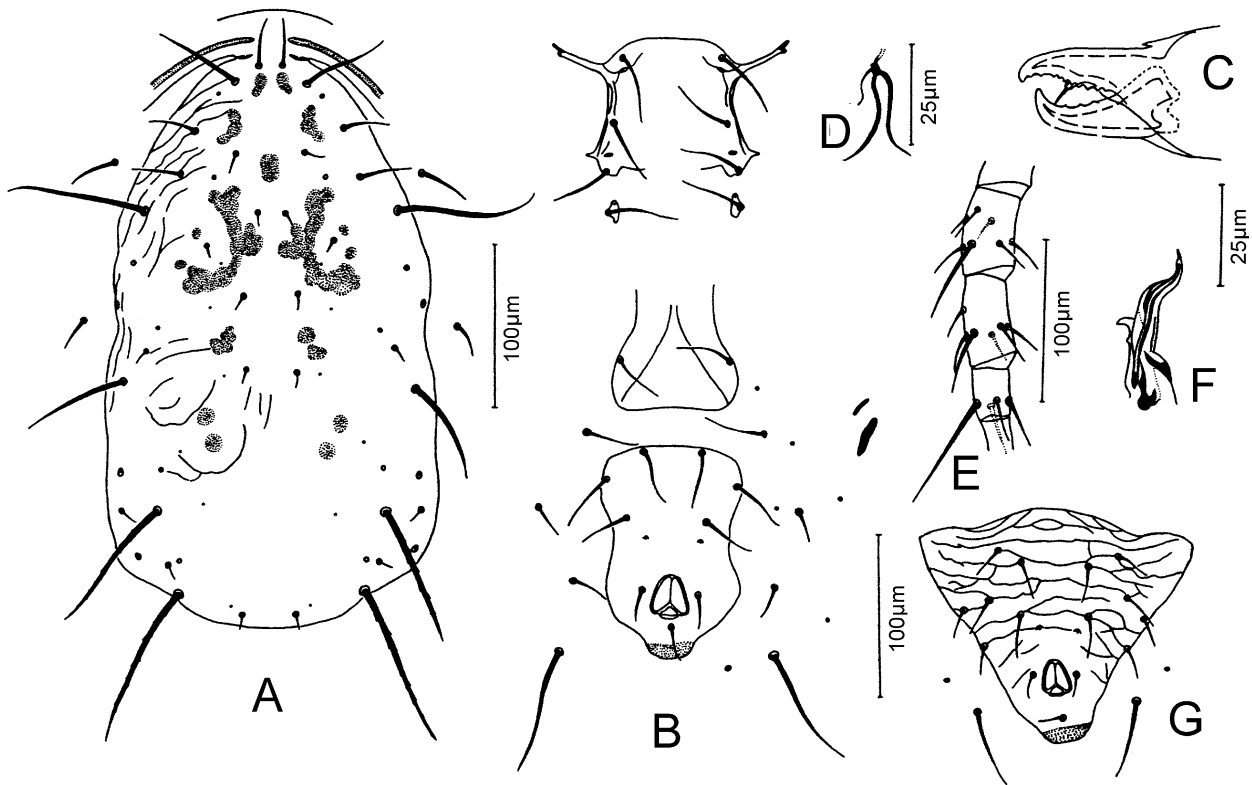
**DIAGNOSIS**—Dorsal shield mostly smooth; ratios  $s4:Z1 = 8.2$ ,  $s4:S2 = 1.4$ ; seta  $j3$  ca. twice as long as  $j1$ ; seta  $z4$  about as long as distance between its base and that of  $s4$ . Ventrianal shield smooth, subpentagonal. Spermatheca with calyx swollen basally, bladder-like, then narrowing and flaring distally. Male ventrianal shield with 6 pairs of preanal setae.

**FEMALE**—(Specimens measured—Kenya: 7).

**Dorsum** (Fig. 23A)—Dorsal shield mostly smooth, striated anterolaterally and in region between  $Z1$  and  $Z4$ , 346(336–358) long and 202(194–208) wide. Setae  $j1$  29(27–30),  $j3$  55(51–59),  $j4$  14(13–16),  $j5$  12(10–13),  $j6$  10(8–13),  $J2$  9(8–10),  $J5$  9(8–10),  $z2$  28(26–30),  $z4$  33(30–37),  $z5$  9(8–10),  $Z1$  11(11–13),  $Z4$  85(82–90),  $Z5$  99(96–104),  $s4$  90(82–104),  $S2$  63(59–66),  $S4$  12(11–13),  $S5$  10(8–13),  $r3$  34(32–37),  $R1$  19(19–21). Setae smooth, except  $Z4$  and  $Z5$ , lightly serrate.

**Peritreme**—Extending forward to level of  $j1$ .

**Venter** (Fig. 23B)—Sternal shield mostly smooth, with few lateral striae; posterior margin indistinct; distances between,  $St1-St3$  67(64–70),  $St2-St2$  71(70–74). Genital shield smooth; distance between  $St5-St5$  71(67–77). Ventrianal shield smooth, subpentagonal, with slight constriction at level of preanal pores, anterior margin slightly convex, 129(120–138) long, 89(83–96) wide at level of  $Zv2$  and 83(80–88) wide at level of anus; preanal pores elliptical and posteromesad to  $Jv2$ .



**FIGURE 23.** *Transeius soniae* Zannou, Moraes & Oliveira, n. sp.: A. Female dorsal shield; B. Female ventral surface; C. Female chelicera; D. Spermatheca; E. Female leg IV; F. Spermatodactyl; G. Male ventrianal shield.

Chelicera (Fig. 23C)—Movable digit 34(34–35) long, with 3 teeth; fixed digit 30 long, with 10 teeth and a *pilus dentilis*.

Spermatheca (Fig. 23D)—Calyx of spermatheca swollen basally, bladder-like, then narrowing and flaring distally, 19(16–21) long; atrium nodular.

Legs—Macrosetae: Sge I 26(22–29), Sge II 28(24–32), Sge III 24(22–26), Sti III 23(21–24), Sge IV 51(50–54), Sti IV 38(35–42), St IV 69(66–70). Chaetotaxy: genu II: 2-2/1,2/1-1; genu III: 1-2/1,2/0-1.

MALE—( Specimen measured—Kenya: 1).

Dorsum—Dorsal shield pattern as in female, 295 long and 183 wide. Setae j1 25, j3 48, j4 13, j5 10, j6 10, J2 8, J5 8, z2 23, z4 33, z5 8, Z1 15, Z4 68, Z5 73, s4 68, S2 45, S4 10, S5 11, r3 28, R1 15. Setae smooth, except Z4 and Z5, lightly serrate.

Peritreme—Extending forward to level between j1 and j3.

Venter (Fig. 23G)—Ventrianal shield subtriangular and reticulate, 135 long, 175 wide at the anterior corners, with 6 pairs of preanal setae, 1 pair of lateral lyrifissures posterior to Zv2; preanal pores elliptical and posteromesad to Jv2.

Spermatodactyl (Fig. 23F)—Without heel or toe, sinuous; shaft 23 long.

Legs—Macrosetae: Sge I 20, Sge II 20, Sge III 18, Sge IV 40, Sti IV 30 and St IV 55. Chaetotaxy of genua II and III same as in female.

LOCALITY AND TYPE MATERIAL—Holotype female, 8 paratype females and 1 allotype male from unknown plant, Machakos, Katumani, Kenya, 30-IX-1990, C., Kariuki, deposited at ESALQ-USP.

ETYMOLOGY—This species is named in honor of Sonia Albigesi de Moraes, spouse of the second author of this paper.

REMARKS—This species fits the characteristics given by Chant & McMurtry (2004) for their *proximus* species subgroup of the *ablusus* species group. *Transeius avetianae* (Arutunjan & Ohandjanian, 1972) differs

from this species by having dorsal shield totally smooth,  $j_3$  ca. 1.5 as long as  $j_1$ ;  $s_4$  and  $S_2$  subequal in length. *Transeius infundibulatus* (Athias-Henriot, 1961) and *Transeius proximus* (Kolodochka, 1991) differ from the new species here described by having dorsal shield totally smooth and ventrianal shield pentagonal with transverse striae.

***Transeius ventriconstrictus* Zannou, Moraes & Oliveira, n. sp.**

(Fig. 24)

**DIAGNOSIS**—Dorsal shield mostly smooth; ratios  $s_4:Z_1 = 8.5$ ,  $s_4:S_2 = 1.8$ ; seta  $j_3$  ca. twice as long as  $j_1$ ; seta  $z_4$  longer than distance between its base and that of  $s_4$ . Ventrianal shield reticulate, with strong lateral constriction at level of preanal pores. Macroseta of genu IV as long as macroseta of tibia IV. Spermatheca with calyx bell-shaped.

**FEMALE**—(Specimens measured—Sierra-Leone: 2).

**Dorsum** (Fig. 24A)—Dorsal shield mostly smooth, with some anterolateral striae, 378(365–392) long and 214(213–214) wide. Setae  $j_1$  31(30–32),  $j_3$  63(62–64),  $j_4$  10,  $j_5$  9(8–10),  $j_6$  11,  $J_2$  11,  $J_5$  8,  $z_2$  24,  $z_4$  52(48–56),  $z_5$  8,  $Z_1$  11,  $Z_4$  78(77–80),  $Z_5$  63(62–64),  $s_4$  94(86–101),  $S_2$  52(51–53),  $S_4$  12(11–13),  $S_5$  12(11–13),  $r_3$  33(32–34),  $R_1$  21(19–22). Setae smooth, except  $Z_4$  and  $Z_5$ , serrate.

**Peritreme**—Extending forward to level of  $j_1$ .

**Venter** (Fig. 24B)—Sternal shield mostly smooth, with few lateral striae; posterior margin straight; distances between,  $St_1$ – $St_3$  73(72–74),  $St_2$ – $St_2$  84(82–86). Genital shield smooth; distance between  $St_5$ – $St_5$  73(70–75). Ventrianal shield vase-shaped, anterior margin slightly concave, lateral margins strongly constricted at level of preanal pores, with transverse striation anteriorly to  $Jv_2$  and reticulate near preanal pores, 115 long, 74 wide at level of  $Zv_2$  and 70(67–72) wide at level of anus; preanal pores elliptical and posteromesad to  $Jv_2$ .

**Chelicera**—Movable digit 32 long, apparently with 3–4 teeth; fixed digit 27 long, apparently with 10–12 teeth and a *pilus dentilis*.

**Spermatheca** (Fig. 24C)—Calyx saccular, 22 long; atrium nodular.

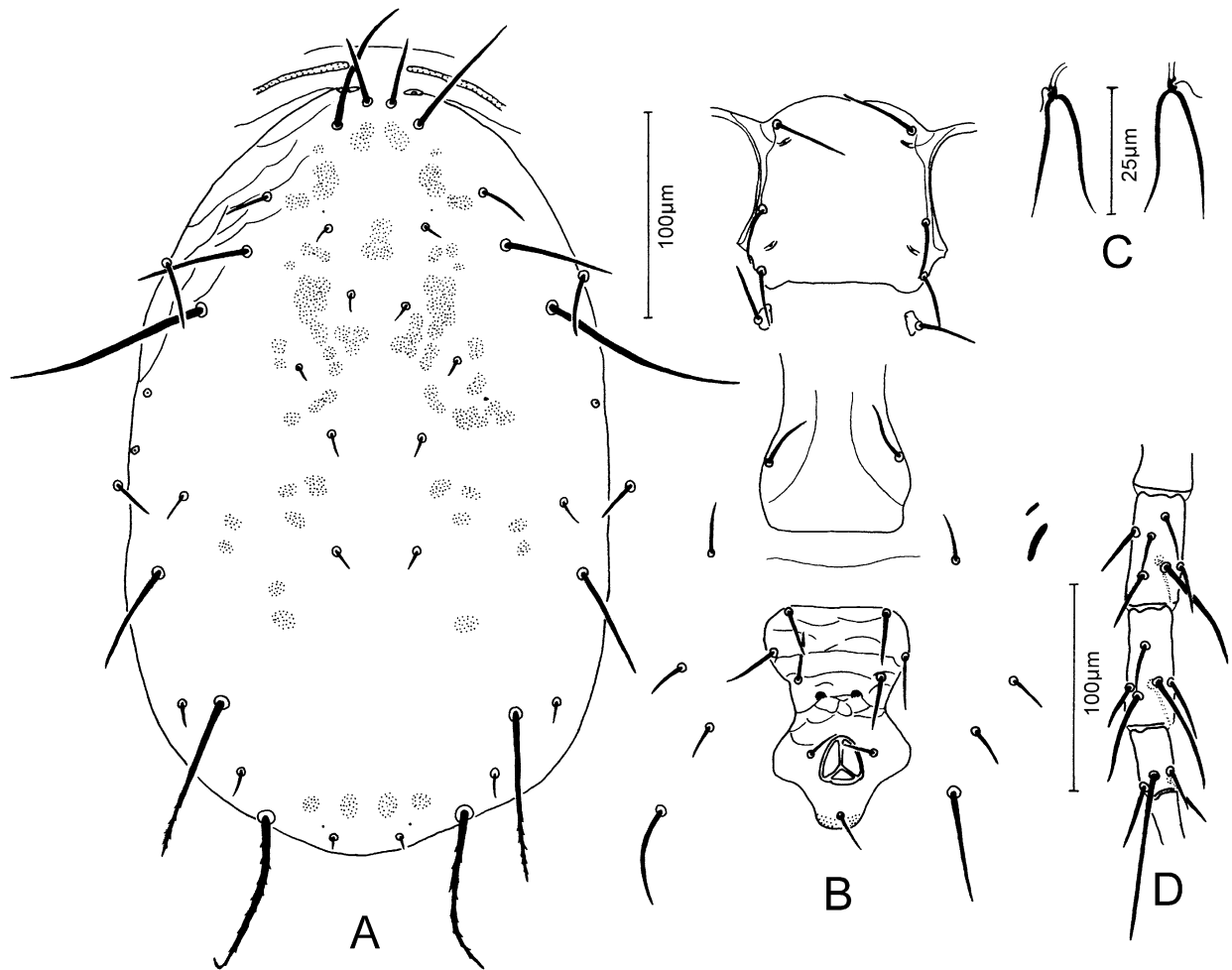
**Legs**—Macrosetae sharp-tipped; Sge I 14, Sge II 34(32–37), Sge III 42(40–45), Sti III 34, Sge IV 57(56–58), Sti IV 55(54–56), St IV 82(82–83). Chaetotaxy: genu II: 2-2/0,2/0-1; genu III: 1-2/1,2/0-1.

**MALE**—Unknown.

**LOCALITY AND TYPE MATERIAL**—Holotype female from *Elaeis guineensis*, Masiaka, Sierra Leone, 14-I-1992, B. I. Kamara, deposited at ESALQ-USP; 1 paratype female from *Artocarpus heterophyllus*, 10 miles W Limbacorner, Sierra-Leone, 14-I-1992, B. I. Kamara, deposited at ESALQ-USP.

**ETYMOLOGY**—The epithet *ventriconstrictus* refers to the pronounced lateral constriction of the ventrianal shield of the types of this species.

**REMARKS**—This species fits the characteristics given by Chant & McMurtry (2004) for their *chorites* species subgroup of the *ablusus* species group. *Transeius aciculus* (De Leon, 1967), *Transeius jilinensis* (Wu, 1987) and *Transeius mountus* (Ryu, 1995) differ from this species by having  $j_1$  at most 0.7 time as long as  $j_3$ ,  $s_4$  at most sub-equal to  $Z_5$  and ventrianal shield without strong lateral constriction. In addition *T. aciculus* and *T. mountus* have smooth ventrianal shields, the former has Sge IV and St IV subequal in length and each at least 1.5 times as long as Sti IV, the latter has totally smooth dorsal shield and Sti IV and St IV subequal in length and each at most 0.6 time as long as Sge IV, while *T. jilinensis* has ventrianal shield about as long as wide.



**FIGURE 24.** *Transeius ventriconstrictus* Zannou, Moraes & Oliveira, n. sp. (female): A. Dorsal shield; B. Ventral surface; C. Spermatheca; D. Leg IV.

***Transeius violini* (Meyer & Rodrigues)**

(Fig. 25)

*Amblyseius violini* Meyer & Rodrigues, 1966: 27.

*Typhlodromips violini*, Moraes et al. 2004: 229.

*Transeius violini*, Chant & McMurtry, 2004: 187.

FEMALE—(Specimen measured—Mozambique: 1 paratype).

Dorsum (Fig. 25A)—Dorsal shield smooth, 343 long and 214 wide. Setae j1 22, j3 19, j4 9, j5 9, j6 9, J2 9, J5 9, z2 16, z4 13, z5 9, Z1 13, Z4 54, Z5 69, s4 47, S2 22, S4 9, S5 6, r3 25, R1 13. Setae smooth, except Z4 and Z5, serrate.

Venter (Fig. 25B)—Sternal shield smooth, posterior margin concave; distances between St1-St3 60, St2-St2 60. Genital shield smooth; distance between St5-St5 59. Ventrianal shield pentagonal, with transverse striae, anterior margin almost straight, 117 long, 98 wide at level of Zv2 and 76 wide at level of anus; preanal pores posteromesad to Jv2.

Chelicera—Movable digit 32 long, fixed digit 28 long (due to position of chelae teeth cannot be counted; however, according to Meyer & Rodrigues (1966) the movable digit has 2 teeth and the fixed digits has 6 teeth and a *pilus dentilis*).

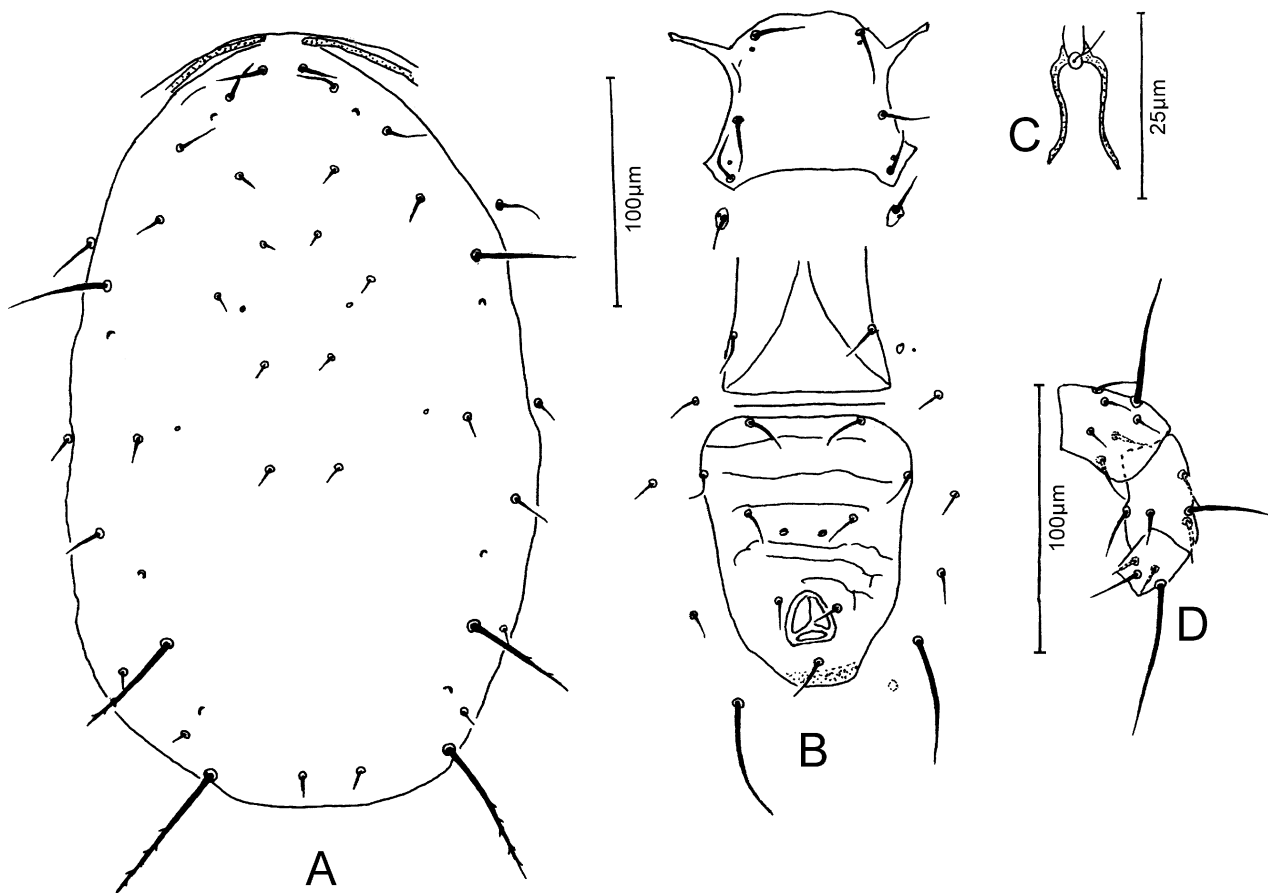
Spermatheca (Fig. 25C)—Calyx swollen basally, bladder-like, then narrowing and flaring distally, 13 long; atrium bifurcate.

Legs—Macrosetae: Sge IV 44, Sti IV 28, St IV 57. Chaetotaxy: genu II: 2-2/0, 2/0- 1; genu III: 1-2/1, 2/0- 1.

MALE—Not encountered in this study.

SPECIMEN EXAMINED—**Mozambique:** Nhacoongo, paratype female, on *Gossypium* sp., II-1961, M.C. Rodrigues.

WORLD DISTRIBUTION—Mozambique.



**FIGURE 25.** *Transeius violini* (Meyer & Rodrigues) (female): A. Dorsal shield; B. Ventral surface; C. Spermatheca; D. Leg IV.

**Key to the genera and species of the subtribe Amblyseiina treated in this paper**

- 1 Macroseta present or absent on leg I; spermatheca with atrium usually not bifurcate/vacuolate at junction with major duct (if bifurcate/vacuolated, then macroseta present on leg I); spermatodactyl not T-shaped . . . . . 2
- Macroseta not present on leg I; spermatheca with atrium bifurcate/vacuolate at junction with major duct; spermatodactyl T-shaped . . . . . *Graminaseius* Chant & McMurtry...24
- 2 Ratios s4:Z1 and s4:S2 > 3.0:1.0 (except in *A. neoankaratrae* Ueckermann & Loots in which both ratios are smaller than 3.0:1.0) . . . . . *Amblyseius* Berlese...3
- Ratio s4:Z1 > 3.0:1.0; ratio s4:S2 < 2.7:1.0 . . . . . *Transeius* Chant & McMurtry...26
- 3 Seta Z1 absent . . . . . *sundi* species group Denmark & Muma, *A. suni* Pritchard & Baker

- Seta Z1 present .....	4
4 Female ventrianal shield vase-shaped .....	<i>largoensis</i> species group McMurtry & Moraes...5
- Female ventrianal shield not vase-shaped .....	<i>obtusus</i> species group Chant...9
5 Ratio s4:Z1 ca. 2.0:1.0; Z4 short, as long as z2, z4, Z1, S2, S4, S5 and dorsocentral setae, and ca. 0.5 time as long as s4.....	<i>A. neoankaratrae</i> Ueckermann & Loots
- Ratio s4:Z1 > 3.0:1.0; Z4 long, at least twice as long as z2, z4, Z1, S2, S4, S5 and dorsocentral setae, and usually longer than s4 .....	6
6 Calyx of spermatheca ca. 3 times as long as its mean diameter .....	<i>A. duplicesetus</i> Moraes & McMurtry
- Calyx of spermatheca at least 8 times as long as its mean diameter .....	7
7 Calyx of spermatheca trumpet-shaped .....	<i>A. herbicolus</i> (Chant)
- Calyx of spermatheca tubular, parallel sided .....	8
8 Seta Z5 3 times as long as Z4 and s4; calyx of uniform diameter .....	<i>A. largoensis</i> (Muma)
- Seta Z5 twice as long as Z4 and 2.5 times as long as s4; calyx swollen near atrium .....	<i>A. neolargoensis</i> Van der Merwe
9 Major duct of spermatheca with thick walls, bifurcate at juncture with atrium .....	10
- Spermatheca with major duct different from above .....	12
10 Ventrianal shield with 1 pair of preanal setae (Jv1 and Zv2 off ventrianal shield), Jv4 absent; calyx cup-shaped .....	<i>A. brachyscutatus</i> <b>n. sp.</b>
- Ventrianal shield with 3 pairs of preanal setae (Jv1 and Zv2 on ventrianal shield), Jv4 present; calyx sac-cular .....	<i>ovalitectus</i> species subgroup Chant & McMurtry...11
11 Setae Z5 shorter than distance between their bases; ventrianal shield subtriangular, without lateral con- striction .....	<i>A. ovalitectus</i> van der Merwe
- Setae Z5 longer than distance between their bases; ventrianal shield subpentagonal, with distinct con- striction at level of Jv2.....	<i>A. curticalyx</i> <b>n. sp.</b>
12 Spermatheca with calyx swollen basally, bladder-like, then narrowing and flaring distally.....	<i>pamperisi</i> species subgroup Chant & McMurtry... <i>A. lumangweensis</i> <b>n. sp.</b>
- Spermatheca with calyx different .....	13
13 Spermatheca with calyx tubular.....	<i>aerialis</i> species subgroup Denmark & Muma...14
- Spermatheca with calyx cup- or cone-shaped .....	<i>andersoni</i> species subgroup Denmark & Muma...17
14 Seta Z5 ca. 1.5 times as long as Z4.....	<i>A. hurlbutti</i> Denmark & Muma
- Seta Z5 at least ca. twice as long as Z4 .....	15
15 Calyx of spermatheca swollen near atrium.....	<i>A. adhatodae</i> Muma
- Calyx of spermatheca not distinctly swollen near atrium.....	16
16 Major duct distinctly sclerotized near atrium for an extension almost as long as length of calyx, and about as wide as the latter.....	<i>A. tamatavensis</i> Blommers
- Major duct not distinctly sclerotized and considerably narrower than calyx .....	<i>A. jamesi</i> <b>n. sp.</b>
17 Seta Zv3 absent .....	18
- Seta Zv3 present .....	19
18 Setae Z5 longer than distance between their bases; calyx of spermatheca funnel-shaped .....	<i>A. anomalus</i> Van der Merwe
- Setae Z5 shorter than distance between their bases; calyx of spermatheca cone-shaped .....	<i>A. genya</i> (Pritchard & Baker)
19 Seta Z5 at least 1.8 times as long as Z4 and at least 2.3 times as long as s4.....	20
- Seta Z5 at most 1.6 times as long as Z4 and at most 1.7 times as long as s4 .....	22
20 Seta Z5 ca. 1.8 and ca. 2.3 times as long as Z4 and s4, respectively <i>A. pretoriaensis</i> Ueckermann & Loots	
- Seta Z5 at least 2.8 and at least 3 times as long as Z4 and s4, respectively .....	21
21 Ventrianal shield smooth; macrosetae of leg IV sharp-tipped .....	<i>A. victoireae</i> <b>n. sp.</b>

- Ventrianal shield with transverse striae; macrosetae of leg IV with small knobs at tips ..... *A. comatus* Ueckermann & Loots
- 22 Seta z4 ca. twice as long as S2; ventrianal shield reticulate ..... *A. cameroonensis* (Zannou, Zundel, Hanna & Moraes)
- Seta z4 at most as long as S2; ventrianal shield smooth..... 23
- 23 Seta j3 ca. 1.2 times as long as j1; ventrianal shield subtriangular, wider at level of preanal pores than at level of anus ..... *A. chanti* **n. sp.**
- Seta j3 at least 1.5 times as long as j1; ventrianal shield subpentagonal, narrower at level of preanal pores than at level of anus ..... *A. swirskii* Athias-Henriot
- 24 Seta S4 absent ..... *G. occidentafricanus* (Moraes, Oliveira & Zannou)
- Seta S4 present ..... 25
- 25 Setae Z4 ca. 7, Z5 ca. 8 and s4 ca. 7 times as long as S2; calyx swollen basally, bladder-like, then narrowing and flaring distally; atrium vacuolated ..... *G. bufortus* (Ueckermann & Loots)
- Setae Z4 ca. 5, Z5 ca. 5 and s4 ca. 4 times as long as S2; calyx saccular, slightly flared distally; atrium bifurcate ..... *G. lippiai* **n. sp.**
- 26 Calyx of spermatheca cup-shaped ..... *T. katumaniensis* **n. sp.**
- Calyx of spermatheca not cup-shaped ..... 27
- 27 Seta z4 at most 0.3 times as long as distance between its base and that of s4..... 28
- Seta z4 at least as long as distance between its base and that of s4..... 29
- 28 Ventrianal shield smooth, calyx of spermatheca elongate and trumpet-shaped ..... *T. msabahaensis* (Moraes & McMurtry)
- Ventrianal shield transversely striate; calyx of spermatheca swollen basally, bladder-like, then narrowing and flaring distally ..... *T. violini* (Meyer & Rodrigues)
- 29 Ventrianal shield reticulate, with strong lateral constriction at level of preanal pores; calyx of spermatheca saccular; Sti IV as long as Sge IV ..... *T. ventriconstrictus* **n. sp.**
- Ventrianal shield smooth, with slight lateral constriction at level of preanal pores; calyx of spermatheca swollen basally, bladder-like, then narrowing and flaring distally; Sti IV ca. 0.8 time as long as Sge IV ...  
..... *T. soniae* **n. sp.**

## Acknowledgements

To J.A. McMurtry for his critical review of this manuscript. To A. Onzo and B. Eklou, International Institute of Tropical Agriculture, Cotonou, Benin, for their invaluable help in the collection of the specimens considered in this study. Funding for the initial phase of the development of this work was provided by IITA core funds and special project funds provided by IFAD (International Fund for Agricultural Development) and DANIDA (Danish International Development Agency). Funding for the final phase of this work was provided by FAPESP (Fundação de Amparo à Pesquisa do Estado de São Paulo, Brazil), through a Post-Doctoral fellowship to the first author of this paper.

## References

- Amitai, S. & Swirski, E. (1981) A new species of *Amblyseius* (Acarina: Phytoseiidae) from the Far East. *Israel Journal of Entomology*, Israel, 15, 59–66.
- Arutunjan, E.S. & Ohandjanian, A.M. (1972) New species of predaceous mites of the genus *Amblyseius* Berlese, 1914 (Parasitiformes, Phytoseiidae) [in Russian]. *Doklady Akademii Nauk Armyanskoi SSR*, Armenia, 54(5), 268–271.
- Athias-Henriot, C. (1961) Mésostigmates (Urop. excl.) edaphiques Méditerranéens (Acaromorpha, Anactinotrichida).

- Acarologia*, France, 3, 381–509.
- Athias-Henriot, C. (1962) *Amblyseius swirskii*, un nouveau phytoséiide voisin d' *A. andersoni* (Acariens anactinotriches). *Annales de l'Ecole Nationale d'Agriculture d'Alger*, Algeria, 3, 1–7.
- Beglyarov, G.A. & Meshkov, Yu.I. (1988) A new species of the genus *Amblyseius* (Parasitiformes, Phytoseiidae) from Tuva [in Russian]. *Zoologicheskii Zhurnal*, Russia, 7, 1079–1080.
- Berlese, A. (1914) Acari nuovi. Manipulus IX. *Redia*, Italy, 10, 113–150.
- Bhattacharyya, S.K. (1968) Two new phytoseiid mites from eastern India (Acarina: Phytoseiidae). *Journal of Bombay Natural History Society*, India, 65, 677–680.
- Blommers, L. (1974) Species of the genus *Amblyseius* Berlese, 1914, from Tamatave, east Madagascar (Acarina: Phytoseiidae). *Bulletin Zoologisch Museum Universiteit van Amsterdam*, The Netherlands, 3, 143–155.
- Blommers, L. (1976) Some Phytoseiidae (Acarina: Mesostigmata) from Madagascar, with descriptions of eight new species and notes on their biology. *Bijdragen tot Dierkunde*, The Netherlands, 46(1), 80–106.
- Blommers, L. & Chazeau, J. (1974) Two new species of predator mites of the genus *Amblyseius* Berlese (Acarina: Phytoseiidae) from Madagascar. *Zeitschrift für Angewandte Entomologie*, Germany, 75, 308–315.
- Chant, D.A. (1957) Descriptions of some phytoseiid mites (Acarina, Phytoseiidae). Part I. Nine new species from British Columbia with keys to the species of British Columbia. Part II. Redescriptions of eight species described by Berlese. *The Canadian Entomologist*, Canada, 89(7), 289–308.
- Chant, D.A. (1959) Phytoseiid mites (Acarina: Phytoseiidae). Part I. Bionomics of seven species in southeastern England. Part II. A taxonomic review of the family Phytoseiidae, with descriptions of thirty-eight new species. *The Canadian Entomologist*, Canada, Supplement 12, 166 pp.
- Chant, D.A. & McMurtry, J.A. (2004) A Review of Subfamily Amblyseinae Muma (Acari: Phytoseiidae): Part III. The tribe Amblyseiini Wainstein, subtribe Amblyseiina n. subtribe. *International Journal of Acarology*, USA, 30(3), 171–228.
- Chant, D.A. & McMurtry, J.A. (2006) A review of subfamily Amblyseinae Muma (Acari: Phytoseiidae): Part IX. An overview. *International Journal of Acarology*, USA, 33(2), 125–152.
- Chant, D.A. & Yoshida-Shaul, E. (1991) Adult ventral setal patterns in the family Phytoseiidae (Acari: Gamasina). *International Journal of Acarology*, USA, 17(3), 187–199.
- Chant, D.A. & Yoshida-Shaul, E. (1992) Adult idiosomal setal patterns in the family Phytoseiidae (Acari: Gamasina). *International Journal of Acarology*, USA, 18(3), 177–193.
- Chant, D.A., Hansell, R.I.C., Rowell, H.J. & Yoshida-Shaul E. (1978) A study of the family Phytoseiidae (Acarina: Mesostigmata) using the methods of numerical taxonomy. *Canadian Journal of Zoology*, Canada, 56, 1330–1347.
- Chaudhri, W.M. (1968) Six new species of mites of the genus *Amblyseius* (Phytoseiidae) from Pakistan. *Acarologia*, France, 10, 550–562.
- Daneshvar, H. & Denmark, H.A. (1982) Phytoseiids of Iran (Acarina: Phytoseiidae). *International Journal of Acarology*, USA, 8, 3–14.
- De Leon, D. (1967) *Some mites of the Caribbean Area. Part I. Acarina on plants in Trinidad, West Indies*. Allen Press Inc., Lawrence, Kansas, USA, pp. 1–66.
- Denmark, H.A. & Muma, M.H. (1989) A revision of the genus *Amblyseius* Berlese, 1914 (Acari: Phytoseiidae). *Occasional Papers of the Florida State Collection of Arthropods*, USA, 4, 149 pp.
- Denmark, H.A., Evans, G.A., Aguilar, H., Vargas, C. & Ochoa, R. (1999) *Phytoseiidae of Central America (Acari: Mesostigmata)*. Indira Publishing House, West Bloomfield, Michigan, USA, 125 pp.
- Ehara, S. (1959) Some predatory mites of the genera *Typhlodromus* and *Amblyseius* from Japan (Phytoseiidae). *Acarologia*, France, 1, 285–295.
- Ehara, S. (1966) A tentative catalogue of predatory mites of Phytoseiidae known from Asia, with descriptions of five new species from Japan. *Mushi*, Japan, 39, 9–30.
- Garman, P. (1948) Mite species from apple trees in Connecticut. *Connecticut Agricultural Experiment Station, Bulletin*, New Haven, USA, 520, 1–27.
- Gupta, S.K. (1977) Description of four species of *Amblyseius* Berlese (Acarina: Phytoseiidae) from India. *Entomologist's Monthly Magazine*, United Kingdom, 112, 53–58.
- Gupta, S.K. (1981) On a collection of Phytoseiidae (Acari: Mesostigmata) from Himachal Pradesh (India), with descriptions of two new species. *Indian Journal of Acarology*, India, 5, 32–36.
- Gupta, S.K. (1985) *Plant mites of India*. Zoological Survey of India Handbook Series, Calcutta, India, 5, 1–520.
- Gupta, S.K. (1986) *Fauna of India (Acari: Mesostigmata) Family Phytoseiidae*. Zoological Survey of India, Calcutta, India, 350 pp.
- Hirschmann W. (1962) Gangsystematik der Parasitiformes. *Acarologie Schriftenreihe für Vergleichende Milbenkunde*, Hirschmann-Verlag, Fürth/Bay, Germany, 5(5–6), 80 pp.+ 32 plates.
- Karg, W. (1983) Systematische untersuchung der Gattungen und Untergattungen der Raubmilbenfamilie Phytoseiidae Berlese, 1916, mit der beschreibung von 8 neuen Arten. *Mitteilungen Zoologisches Museum in Berlin*, Germany, 59(2) 293–328.

- Karg, W. (1991) Die Raubmilbenarten der Phytoseiidae Berlese (Acarina) Mitteleuropas sowie angrenzender Gebiete. *Zoologische Jahrbücher Systematik*, Germany, 118(1), 1–64.
- Karg, W. (1994) Raubmilben der Cohors Gamasina Leach (Acarina, Parasitiformes) vom Galapagos-Archipel *Mitteilungen Zoologisches Museum in Berlin*, Germany, 70(2), 179–216.
- Kolodochka, L.A. (1981) New phytoseiid mites from Crimea (Parasitiformes: Phytoseiidae). I [in Russian]. *Vestnik Zoologii*, Ukraine, (1), 18–22.
- Kolodochka, L.A. (1991) New phytoseiid mite species of the genus *Amblyseius* (Parasitiformes, Phytoseiidae) [in Russian]. *Vestnik Zoologii*, Ukraine, (3), 17–26.
- Matthysse, J.G. & Denmark, H.A. (1981) Some phytoseiids of Nigeria (Acarina: Mesostigmata). *The Florida Entomologist*, USA, 64, 340–357.
- McMurtry, J.A. & Moraes, G.J. de (1984) Some phytoseiid mites from the South Pacific, with descriptions of new species and a definition of the *Amblyseius largoensis* species group. *International Journal of Acarology*, USA, 10, 27–37.
- McMurtry, J.A. & Moraes, G.J. de (1985) Some phytoseiid mites (Acari) of Papua New Guinea, with descriptions of six new species. *International Journal of Acarology*, USA, 11, 75–88.
- Meyer, M.K.P. & Rodrigues, M.C. (1966) Acari associated with cotton in southern Africa (with reference to other plants). *Garcia de Orta, Revista Junta Investigações de Ultramar*, Portugal, 13(2), 195–226.
- Moraes, G.J. de & McMurtry, J.A. (1988) Some phytoseiid mites from Kenya, with description of three new species. *Acarologia*, France, 29(1), 13–18.
- Moraes, G.J. de & Mesa, N.C. (1988) Mites of the family Phytoseiidae (Acari) in Colombia, with descriptions of three new species. *International Journal of Acarology*, USA, 14(2), 71–88.
- Moraes, G.J. de, McMurtry, J.A. & Yaninek, J.S. (1989a) Some phytoseiid mites (Acari, Phytoseiidae) from tropical Africa with description of a new species. *International Journal of Acarology*, USA, 15(2), 95–102.
- Moraes, G.J. de, Oliveira, A.R. & Zannou, I.D. (2001a) New phytoseiid mites (Acari: Phytoseiidae) from tropical Africa. *Zootaxa*, New Zealand, 8, 1–10.
- Moraes, G.J. de, McMurtry, J.A., van den Berg, H. & Yaninek, J.S. (1989b) Phytoseiid mites (Acari: Phytoseiidae) of Kenya, with descriptions of five new species and complementary descriptions of eight species. *International Journal of Acarology*, USA, 15(2), 79–93.
- Moraes, G.J. de, McMurtry, J.A., Denmark, H.A., Campos, C.B. (2004) A revised catalog of the mite family Phytoseiidae. *Zootaxa*, New Zealand, 434, 1–494.
- Moraes, G.J. de, Ueckermann, E.A., Oliveira, A.R. & Yaninek, J.S. (2001b) Phytoseiid mites of the genus *Euseius* (Acari: Phytoseiidae) from Sub-Saharan Africa. *Zootaxa*, New Zealand, 3, 1–70.
- Moraes, G.J. de, Zannou, D.I., Oliveira, A.R., Yaninek, J.S. & Hanna R. (2006) Phytoseiid mites of the subtribes Typhlodromalina and Euseiina (Acari: Phytoseiidae: Euseiini) from sub-Saharan Africa. *Zootaxa*, New Zealand, 1114: 1–52.
- Moraes, G.J. de, Zannou, D.I., Oliveira, A.R., Hanna, R. & Yaninek, J.S. (2007) Species of the subtribes Arrenoseiina and Proprioseiopsina (tribe Amblyseiini) and the tribe Typhlodromipsini (Acari: Phytoseiidae) from sub-Saharan Africa. *Zootaxa*, New Zealand, 1448: 1–39.
- Moutia, L.A. (1958) Contribution to the study of some phytophagous Acarina and their predators in Mauritius. *Bulletin of Entomological Research*, United Kingdom, 49, 59–75.
- Muma, M.H. (1955) Phytoseiidae (Acarina) associated with citrus in Florida. *Annals of the Entomological Society of America*, USA, 48, 262–272.
- Muma, M.H. (1961) Subfamilies, genera, and species of Phytoseiidae (Acarina: Mesostigmata). *Florida State Museum Bulletin*, USA, 5(7), 267–302.
- Muma, M.H. (1967) New Phytoseiidae (Acarina: Mesostigmata) from southern Asia. *The Florida Entomologist*, USA, 50, 267–280.
- Muma, M.H., Denmark, H.A. & De Leon, D. (1970) Phytoseiidae of Florida. Arthropods of Florida and neighboring land areas, 6. *Florida Department of Agriculture and Consumer Services, Division of Plant Industry*, Gainesville, USA, 150 pp.
- Nyiira, Z.M. (1972) Report of investigation of cassava mite, *Mononychellus tanajoa* (Bondar). Kawanda Research Station, Kampala, Uganda, Unpublished report 14 pp.
- Papadoulis, G.T. (1997) Two new species of the genus *Amblyseius* Berlese (Acari: Phytoseiidae) from Greece. *International Journal of Acarology*, USA, 23(2), 133–138.
- Prasad, V. (1968) *Amblyseius* mites from Hawaii. *Annals of the Entomological Society of America*, USA, 61(6), 1514–1521.
- Pritchard, A.E. & Baker W.E. (1962) Mites of the family Phytoseiidae from Central Africa, with remarks on genera of the world. *Hilgardia* 33: 205–309.
- Rowell, H.J., Chant, D.A. & Hansell, R.I.C. (1978) The determination of setal homologies and setal patterns on the dorsal shield in the family Phytoseiidae (Acarina: Mesostigmata). *The Canadian Entomologist*, Canada, 110, 859–876.

- Ryu, M.O. (1995) Four phytoseiid mites of the genus *Amblyseius* from Korea (Phytoseiidae, Acari). *Korean Journal of Entomology*, South Korea, 25(1), 77–84.
- Schicha, E. (1981) Two new species of *Amblyseius* Berlese from Queensland and New Caledonia compared with *A. largoensis* (Muma) from the South Pacific and *A. deleoni* Muma and Denmark from New South Wales (Acari: Phytoseiidae). *Journal of the Australian Entomological Society*, Australia, 20, 101–109.
- Schuster, R.O. (1966) Phytoseiidae of the Galapagos Islands (Acarina: Mesostigmata). *Pacific Insects*, Hawaii, 8, 319–339.
- Swirski, E., S. Ragusa di Chiara & H. Tsolakis. 1998. Keys to the phytoseiid mites (Parasitiformes, Phytoseiidae) of Israel. *Phytophaga*, 8: 85-154.
- Tseng, Y.H. (1976) Systematics of the mite family Phytoseiidae from Taiwan, with a revised key to genera of the world (II). *Journal of the Agricultural Association of China, New Series*, Taiwan, 94, 85–128.
- Ueckermann, E.A. & Loots, G.C. (1988) The African species of the subgenera *Anthoseius* De Leon and *Amblyseius* Berlese (Acari: Phytoseiidae). *Entomology Memoir, Department of Agriculture and Water Supply, Republic of South Africa*, South Africa, 73, 168 pp.
- Van der Merwe, G.G. (1965) South African Phytoseiidae (Acarina). I. Nine new species of the genus *Amblyseius* Berlese. *Journal of the Entomological Society of South Africa*, South Africa, 28, 57–76.
- Van der Merwe, G.G. (1968) A taxonomic study of the family Phytoseiidae (Acari) in South Africa with contributions to the biology of two species. *Entomology Memoirs*, South Africa Department of Agricultural Technical Services, South Africa, 18, 1–198.
- Wainstein, B.A. (1962) Révision du genre *Typhlodromus* Scheuten, 1857 et systématique de la famille des Phytoseiidae (Berlese 1916) (Acarina: Parasitiformes). *Acarologia*, France, 4, 5–30.
- Wainstein, B.A. (1975) Predatory mites of the family Phytoseiidae (Parasitiformes) of Yaroslavl Province. *Entomologicheskoe Obozrenie*, Russia, 54(4), 914–922 [in Russian]; *Entomological Review*, Russia, 54(4), 138–143 [English translation].
- Womersley, H. (1954) Species of the subfamily Phytoseiinae (Acarina: Laelaptidae) from Australia. *Australian Journal of Zoology*, Australia, 2, 169–191.
- Wu, W.N. (1987) New species and new records of phytoseiid mites from northeast China II. *Amblyseius* Berlese (Acarina: Phytoseiidae) [in Chinese]. *Acta Zootaxonomica Sinica*, China, 12(3), 260–270.
- Wu, W.N., Lan, W.M. & Liu, Y.H. (1995) Four new species of phytoseiid mites (Acari: Phytoseiidae) [in Chinese]. *Acta Zootaxonomica Sinica*, China, 20(3), 299–305.
- Yaninek, J.S. & Herren, H.R. (1988) Introduction and spread of cassava green mite, *Mononychellus tanajoa* (Acari: Tetranychidae), an exotic pest in Africa and the search for appropriate control methods: a review. *Bulletin of Entomological Research*, USA, 78, 1–13.
- Zannou, D.I., Zundel C., Hanna, R. & Moraes G.J. de (2005) Two new species of phytoseiid mites (Acari: Phytoseiidae) from Cameroon, Central Africa. *Zootaxa*, New Zealand, 1093, 55–59.
- Zannou, D.I., Moraes, G.J. de, Ueckermann, E.A., Oliveira, A.R., Yaninek, J.S. & Hanna R. (2006) Phytoseiid mites of the genus *Neoseiulus* Hughes (Acari: Phytoseiidae) from sub-Saharan Africa. *International Journal of Acarology*, USA. 32(3), 241–276.

