

PHYTOSEIID MITES (ACARI: PHYTOSEIIDAE) OF KENYA, WITH DESCRIPTIONS OF FIVE NEW SPECIES AND COMPLEMENTARY DESCRIPTIONS OF EIGHT SPECIES

G. J. de Moraes¹, J. A. McMurtry², H. van den Berg³ and J. S. Yaninek⁴

1. CNPDA/EMBRAPA, 13820 Jaguariuna, SP, Brazil; 2. Department of Entomology, University of California, Riverside, 92521 USA; 3. C.A.B. International, Kenya Station; 4. Africa-wide Biological Control Program, International Institute of Tropical Agriculture, Cotonou, Benin.

ABSTRACT - New records of phytoseiid mites from Kenya are given. Five new species are described: *Amblyseius msabahaensis*, *Euseius minutisetus*, *Phytoseius kisumuensis*, *Phytoseius neohongkongensis*, *Phytoseius neomontanus*. The descriptions of eight species are complemented.

INTRODUCTION

Considerable attention has been given in recent years to the knowledge of the predaceous phytoseiid mites in Africa, in relation to an on going multi-national effort for the biological control of the cassava green mite, *Mononychellus tanajoa* (Bondar), in Africa (Yaninek & Herren, 1988). This paper refers to phytoseiids collected on plants in Kenya in sporadic surveys conducted from 1984 to 1986. Prior to this paper, Moutia (1958), Swirski & Ragusa (1978) and Moraes & McMurtry (1988) reported on phytoseiids from this country.

All measurements are given in micrometers. For all species, the width of the dorsal shield refers to the widest level of the proscutum. The setal nomenclature follows that of Rowell et al. (1978) and Chant & Hansell (1971) for dorsal and ventral surfaces, respectively. The classification system adopted is that of Chant (1965) as modified by Chant et al. (1978), McMurtry (1983) and Chant & Yoshida Shaul (1986). The distance between sternal setae ST1 and ST3 refers to the distance of ST1 to its projection on an imaginary line linking ST3 setae of both sides. Unless otherwise specified, the collector was H. van den Berg, the host plant was cassava (*Manihot esculenta* Crantz) and previous records mentioned under each species are based on Moraes et al. (1986).

Genus *Amblyseius* Berlese

Amblyseius Berlese, 1914: 143; Chant, 1965: 371.

Amblyseius adathodae Muma

Amblyseius adathodae Muma, 1967: 268.

SPECIMENS EXAMINED: Karachi, Pakistan, *Adathoda vasica*, 4-IX-1964, M.A. Ghani (holotype); Kilifi, *Asystasia gangetica*, X-1984.

PREVIOUS RECORDS: India and Pakistan.

REMARKS: The specimens collected agree well with our measurements of the holotype. The ranges of 2 females collected (in parentheses) and the corresponding measurements of the female holotype are: dorsal shield length (360-374) 377, width (240-264) 258, j1 (26-31) 36, j3 (50-53) 52, j4 and j5 (5) 4, j6 (5) 5, J2 (10) 6, J5 (10-12) 10, z2 (7) 7, z4 (7) 8, z5 (5) 5, Z1 (10) 8, Z4 (127-132) 142, Z5 (283-305) 312, s4 (108-110) 133, S2 and S4 (12) 11, S5 (10) 10, r3 (12-14) 14, R1 (10) 10, SgeI (38-41) 46, SgeII (34-38) 37, SgeIII (48-50) 58, StiIII (43-46) 47, SgeIV (122-132) 152, StiIV (86-91) 112, StIV (79-82) 74, ST1-ST3 (62-65) 66, ST2-ST3 (67-72) 72, G-G (70) 74, ventrianal shield length (108) 120, width at ZV2 level (62) 66, width at anus level (77) 84, cervix of spermatheca (36-41) (not measured in holotype), fixed digit (31) 30, movable digit (34) 32. The specimens collected have ca. 10 and 3 teeth on the fixed and movable digits, respectively.

Amblyseius herbicolus (Chant)

Typhlodromus (Amblyseius) herbicolus Chant, 1959: 84.

Amblyseius herbicolus, Daneshvar & Denmark, 1982: 5; McMurtry & Moraes, 1984: 34.

Amblyseius deleoni Muma & Denmark, in Muma et al., 1970: 68; Schicha, 1981: 107 (synonymy according to Daneshvar & Denmark, 1982).

SPECIMENS EXAMINED: Tsavo National Park, West Kilaguni, unidentified tree, II-1985, J.A. McMurtry.

PREVIOUS RECORDS: Angola, Guatemala, Iran, New Caledonia, Papua New Guinea, Puerto Rico, West Indies, South Africa and USA; Australia, Brazil, China, Colombia, Indonesia, Japan, Madagascar, Taiwan and Thailand (as *A. deleoni*).

Amblyseius aff. *marginatus* Wainstein

Amblyseius marginatus Wainstein, 1961: 158; Livshitz & Kuznetsov, 1972: 25; Wainstein & Shcherbak, 1972: 38.

Amblyseius polyporus Wainstein, 1962a: 143 (synonymy, according to Wainstein, 1975).

Typhlodromus subtilisetosus Beglyarov, 1962: 199 (synonymy, according to Wainstein, 1975).

SPECIMENS COLLECTED: Kakamega, *Triumfetta* sp., IX-1985.

PREVIOUS RECORDS: Algeria and USSR.

REMARKS: The only female specimen collected has generally shorter dorsal shield setae, especially j1, j3, z2, z4, s4, Z4 and Z5. Further collections may prove that it belongs to a new species. The measurements of this specimen are: dorsal shield length 336, width 187, j1 17, j3 26, j4 14, j5 and j6 12, J2 14, J5 10, z2 and z4 24, z5 12, Z1 17, Z4 50, Z5 62, s4 36, S2 34, S4 24, S5 19, r3 and R1 22, StIV 74, ST1-ST3 58, ST2-ST2 65, G-G 65, ventrianal shield length 110, width at ZV2 level 108, width at anus level 91, cervix of spermatheca 24 (cup-shaped distal portion 14 long, and constrict proximal portion 10 long), movable and fixed digits 31 each, with 1 and 3 teeth, respectively.

Amblyseius msabahaensis Moraes & McMurtry, n. sp.

(Figs. 1-8)

DIAGNOSIS - This species is similar to *Amblyseius makuwa* Ehara but has the margins of the dorsal shield striated and z2, Z4, s4, S2 and r3 longer. *Amblyseius dimidiatus* DeLeon differs from *A. msabahaensis* by having shorter s4 and Z4, and z2 about as long as z4. *Amblyseius reptans* Blommers is also similar to this new species, but has shorter j3, s4, r3, SgeIV and StIV. In addition, the male of *A. reptans* has only 3 pairs of preanal setae.

FEMALE - (Figs. 1-5) (6 specimens measured).

Dorsum - Dorsal shield with a few striae on the margins, 347 (343-353) long and 208 (199-216) wide. Setae j1 22 (22-24), j3 27 (24-31), j4 and j5 9 (6-10), j6 8

(6-10), J2 10 (8-12), J5 9 (7-10), z2 20 (19-22), z4 13 (12-14), z5 8 (7-8), Z1 12 (10-12), Z4 56 (50-58), Z5 70 (65-72), s4 41 (38-46), S2 22 (22-26), S4 13 (12-15), S5 11 (10-12), r3 28 (24-31), R1 17 (14-17). All setae smooth, except for Z4 and Z5 which are very lightly barbed.

Peritreme - Extending forward to level of j1.

Venter - All shields well distinguishable. Sternal shield with 3 pairs of setae. Distances between sternal setae ST1-ST3 63 (60-67), ST2-ST2 65 (65-67), and genital setae G-G 63 (60-65). Ventrianal shield striated, 124 (120-130) long, 89 (88-91) wide at ZV2 level and 85 (84-86) wide at anus level; with 3 pairs of preanal setae and a pair of preanal pores ca. in line with JV2.

Chelicera - Movable digit 34 long, with 1 tooth; fixed digit 31 (29-31) long, with 5 teeth.

Spermatheca - Cervix trumpet-like, 52 (48-55) long, including the flared distal portion which is 8 (7-10) long.

Legs - With setiform macrosetae only on leg IV: Sge 49 (48-50), Sti 29 (26-31), St 52 (48-55). Chaetotaxy of GeII 2, 2/1, 2/0, 1; GeIII 1, 2/1, 2/0, 1.

MALE - (Figs. 6-8) (2 specimens measured).

Dorsum - Dorsal shield with a few striae on the margins, 264-286 long and 180-187 wide. Setae j1 18-19, j3 22, j4, j5, j6 and J2 10, J5 7, z2 14-17, z4 14, z5 8-10, Z1 12, Z4 38-41, Z5 48-50, s4 26-29, S2 14-17, S4 12-13, S5 10-11, r3 17, R1 12-14. All setae smooth, except for Z4 and Z5 which are barbed.

Peritreme - Extending forward to j1.

Venter - Ventrianal shield sub-triangular, with 6 pairs of preanal setae and a pair of pores; 108-120 long and 134-142 wide at anterior corners.

Spermatodactyl - Shaft 31 long.

Legs - With setiform macrosetae only on leg IV: Sge 34, Sti 19, St 41.

LOCALITY AND TYPE MATERIAL - Holotype female (EMBRAPA), Msabaha, *Triumfetta rhomboidea*, 10-IX-1985, H. van den Berg; 6 paratype females, 1 allotype male and 2 paratype males (EMBRAPA), Msabaha, *Indigofera hirsuta*, *Pseudovigna argentea*, *Tephrosia villosa*, *Teramnus labiatus*, 10-IX-1985, H. van den Berg.

Amblyseius olombo Pritchard & Baker

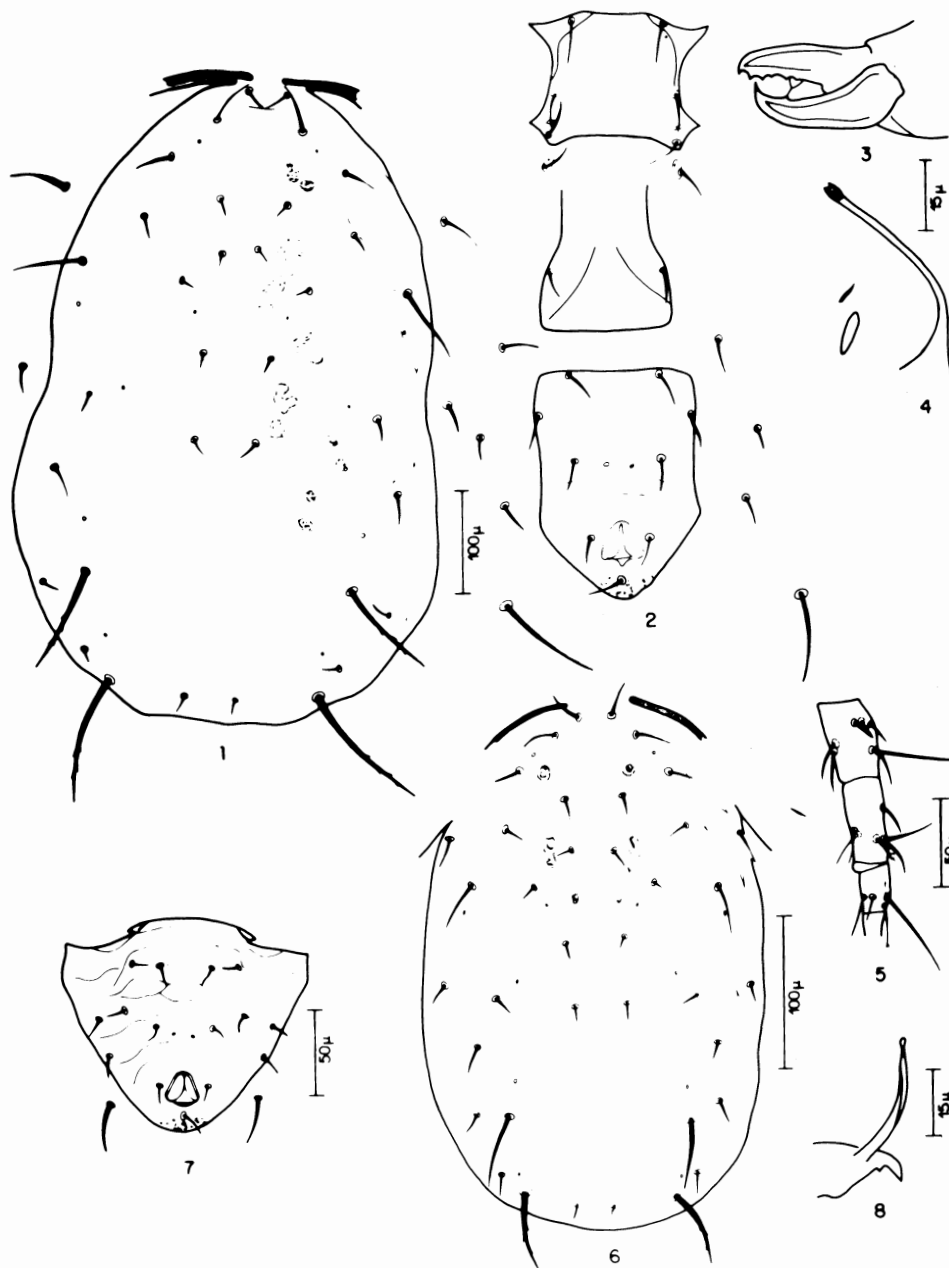
(Fig. 9)

Amblyseius (*Amblyseius*) *olombo* Pritchard & Baker, 1962: 252.

SPECIMENS EXAMINED: Stanleyville (now Kisangani), Zaire, *Vilex congolensis*, 18-V-1955, E.W. Baker (paratype); Saiwa, *Momordica foetida*, IX-1986.

PREVIOUS RECORDS: Zaire.

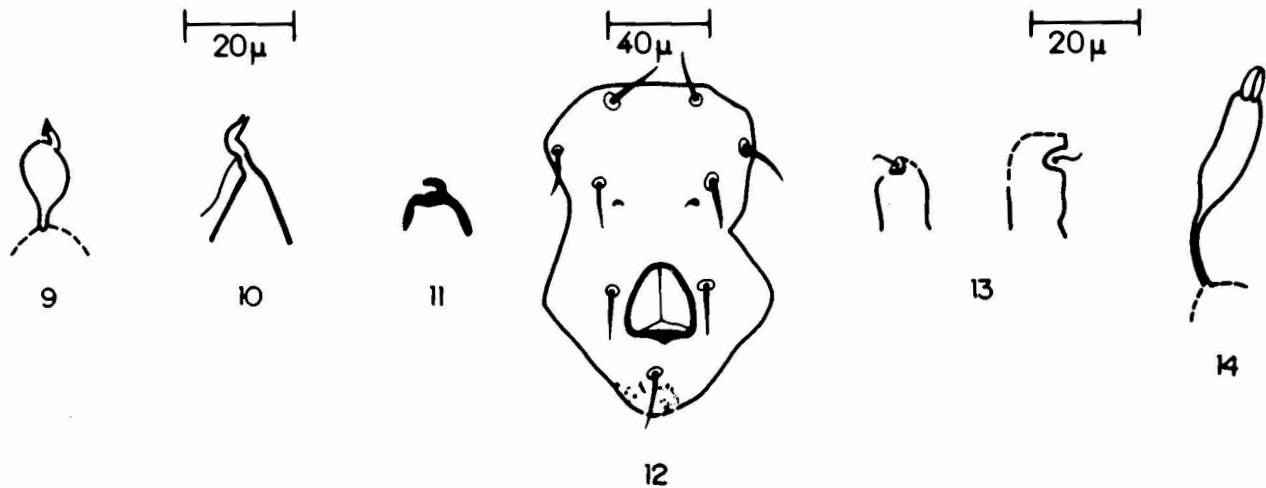
REMARKS: The specimens collected are close to the paratype examined. The average measurements of the 4



Figs. 1-8. *Amblyseius msabahaensis* n. sp.. FEMALE: 1. dorsal shield; 2. ventral surface; 3. chelicera; 4. spermatheca; 5. genu, tibia and basitarsus of leg IV. MALE: 6. dorsal shield; 7. ventrianal shield; 8. spermatochea.

females collected followed by the respective ranges and the measurements of the female paratype are: dorsal shield length 370 (348-379) 283, width 234 (230-238) 180, j1 33 (31-34) 33, j3 44 (43-46) 42, j4 and j5 15 (14-17) 16, j6 20 (17-22) 20, J2 22 (22) 21, J5 10 (10) not measured, z2 22 (22-24) 18, z4 40 (36-43) 38, z5 14 (14) 14, Z1 22 (21-24) 17, Z4 52 (50-53) 45, Z5 79 (77-82) 71, s4 53 (53-55) 52, S2 48 (46-50) 47, S4 21 (19-22) 29, S5 12 (10-12) 8, r3 24

(22-26) 22, R1 17 (14-18) 13, SgeI 27 (26-29) 23, SgeII 28 (26-29) 27, SgeIII 35 (34-36) 34, SgeIV 58 (55-60) 53, StiIV 36 (36-38) 31, StiV 84 (82-84) 65, ST1-ST3 72 (70-72) 63, ST2-ST2 72 (70-72) 69, G-G 83 (79-84) not measured, ventrianal shield length 118 (113-122) 123, width at ZV2 level 64 (58-67) 66, width at anus level 72 (67-74) 63, fixed and movable digits ca. 38 each (not measured in paratype), cervix of spermatheca 24, (bulbous



Figs. 9-14. SPERMATHECAE: 9. *Amblyseius olombo* Pritchard & Baker (paratype from Stanleyville, now Kisangani, Zaire); 10. *Amblyseius rykei* Pritchard & Baker (specimen collected in Katumani, Kenya); 11. *Amblyseius shi* Pritchard & Baker (paratype from Mulunga, Zaire); 13. *Euseius dossei* (Pritchard & Baker) (paratype from Leopoldville, now Kinshasa, Zaire); 14. *Euseius hima* (Pritchard & Baker) (holotype). VENTRIANAL SHIELD: 12. *A. shi* (holotype).

proximal portion 17 (14-19) 14, constrict intermediate portion 2 (2) 2, conic distal portion 5 (2-7) not measured). In some specimens, the conic portion of the spermatheca is not distinguishable.

Amblyseius rykei Pritchard & Baker

(Fig. 10)

Amblyseius (Amblyseius) rykei Pritchard & Baker, 1962: 249.

Amblyseius rykei, Schicha, 1983: 108.

Typhlodromips rykei, Matthyse & Denmark, 1981: 346.

SPECIMENS EXAMINED: Katumani, IX-1985, VI-, VII- and VIII-1988, C.W. Kariuki, H. van den Berg.

PREVIOUS RECORDS: India, Kenya, Nigeria and Zaire.

REMARKS: The specimens collected are somewhat larger than the paratype described by Schicha (1983), which we also have seen. Consequently some of the setae of the specimens collected are longer. Thus z2, Z4, s4 and SgeIV are 14, 74, 82 and 70 in the collected specimens, and 8, 64, 66 and 60 in the paratype, respectively. The spermatheca of the specimens collected (fig. 10) has a constricted proximal portion (ca. 2 long) and a conic distal portion (ca. 12 long).

Amblyseius saltus (Denmark & Matthyse)

Euseius saltus Denmark & Matthyse, in Matthyse

& Denmark, 1981: 348.

SPECIMENS EXAMINED: Moor Plantation, Ibadan, Nigeria, *Solanum incanum*, 12-IV-1974, J.G. Matthyse (holotype); Msabaha, IX-1985; Kilifi, IX-1985; Margarini, *Melhanian velutina*, IX-1985.

PREVIOUS RECORDS: Nigeria.

REMARKS: Measurements of the specimens collected are close to our measurements of the holotype, which are somewhat different from the measurements given in the original description of the species. All shields are lightly sclerotized. All setae have very sharp tips; this often makes them difficult to measure. The ranges of the measurements of 2 females collected (in parentheses) followed by our measurements of the female holotype are: dorsal shield length (360) 330, width (235) 228, j1 (24) 24, j3 (24-26) 22, j4 (5-6) 7, j5 (5) 8, j6 (10-12) 8, J2 (14) 12, J5 (10) 8, z2 (17-19) 16, z4 (15-19) 16, z5 (7-10) 8, Z1 (12-17) 14, Z4 (17-19) 17, Z5 (24) 22, s4 (19) 17, S2 (17-19) 18, S4, S5 and r3 (17) 17, R1 (17-19) 17, SgeI (not distinguishable) 24, SgeII (14) 16, SgeIII (24-26) 24, StiIII (34-36) 30, SgeIV (26-34) 30, StiIV (55-58) 44, SiIV (55-58) 48, ST1-ST3 (55-60) 60, ST2-ST2 (65-67) 62, G-G (60-65) 62, ventrianal shield length (96-101) 102, width at ZV2 level (53-60) 52, width at anus level (70-79) 68, fixed digit (31) 26, movable digit (31) 30. Cervix of spermatheca (24) 26 (bulbous proximal portion (12) 10, constrict portion (12) 16). In one of the specimens collected there is a distal conic portion ca. 7 long. The fixed digit has ca. 8 teeth.

Amblyseius shi Pritchard & Baker

(Figs. 11, 12)

Amblyseius (Amblyseius) shi Pritchard & Baker, 1962: 252.

SPECIMENS EXAMINED: Stanleyville (now Kisangani), Zaire, *Aframomum* sp., 20-IV-1955, E.W. Baker (holotype); Kakamega, *Triumfetta* sp., *Ipomoea* sp., IX- and XI-1985.

PREVIOUS RECORDS: Nigeria and Zaire.

REMARKS: The specimens collected have some setae longer than the holotype. The average measurements of the 3 females collected, followed by the respective ranges and the measurements of the female holotype are: dorsal shield length 346 (329-355) 330, width 224 (216-230) 204, j1 17 (17) 16, j3 21 (19-22) 19, j4 10 (9-12) 11, j5 9 (9-10) 10, j6 11 (10-12) 11, J2 14 (12-14) 12, J5 9 (9-10) 8, z2 12 (12-13) 13, z4 12 (12-13) 13, z5 10 (10) 9, Z1 14 (12-14) 14, Z4 39 (36-41) 31, Z5 79 (77-82) 67, s4 29 (26-31) 18, S2 10 (10-12) 12, S4 10 (10) 11, S5 9 (7-10) 9, r3 17 (17) 14, R1 12 (12) 10, SgeI 31 (30-31) 27, SgeII 28 (26-29) 24, SgeIII 32 (30-34) 28, StiIII 26 (24-26) 24, SgeIV 53 (50-53) 41, StiIV 41 (41) 34, StIV 65 (62-67) 46, ST1-ST3 55 (55) 53, ST2-ST2 62 (62) 63, G-G 67 (67-70) 66, ventrianal shield length 115 (113-115) 110, width at ZV2 level 94 (91-98) 78, width at anus level 86 (84-91) 82, fixed and movable digits 26 (26) (not measured in the holotype), cervix of spermatheca with a cup-shaped distal portion (5 long) and a constrict proximal portion (ca. 2 long). The ventrianal shield of the holotype has a much more pronounced constriction behind the preanal pores (fig. 12) than shown in the original description.

Amblyseius tamatavensis Blommers

Amblyseius (Amblyseius) tamatavensis Blommers, 1974: 144.

Amblyseius tamatavensis, Schicha, 1981: 40.

SPECIMEN EXAMINED: Machakos/Katumani, VI-1988, C.W. Kariuki.

PREVIOUS RECORDS: Australia, Indonesia, Madagascar, Papua New Guinea, New Hebrides, South Africa and Western Samoa.

Amblyseius teke Pritchard & Baker

Amblyseius (Amblyseius) teke Pritchard & Baker, 1962: 239; Van der Merwe, 1968: 141.

SPECIMENS EXAMINED: Kilifi, *Manihot esculenta*, *Sida rhombifolia*, IX-1985; Siaya, IX-1985; Nkubu, Meru, *Pseudotrachia hookeri*, X-1985; Msabaha, IX-1985.

PREVIOUS RECORDS: Kenya, Mozambique, South Africa and Zaire.

Genus *Euseius* Wainstein

Amblyseius (Amblyseius) section *Euseius* Wainstein, 1962b: 15.

Euseius, DeLeon, 1966: 86; McMurtry, 1983: 257.

Euseius africanus (Evans)

Typhlodromus africanus Evans, 1954: 524.

Euseius africanus, Moraes & McMurtry, 1988: 15.

SPECIMENS EXAMINED: Msabaha, IX-1985, *Markhamia* sp.; East Kilaguni, Tsavo National Park, *Citrus* sp., II-1985, J.A. McMurtry; West Kilaguni, Tsavo National Park, unknown tree, II-1985, J.A. McMurtry.

PREVIOUS RECORDS: Kenya and Tanzania.

Euseius albizziae (Swirski & Ragusa)

Amblyseius albizziae Swirski & Ragusa, 1978: 398.

SPECIMENS EXAMINED: Rusinga Island, *Ricinus communis* and unknown tree, IX-1986, G.J. Moraes.

PREVIOUS RECORDS: Kenya.

REMARKS: The specimens collected have setae z2 (34-36), z4 (50-53), Z5 (67), s4 (72-79), SgeIV (65) and StIV (70-72) longer than mentioned in the original description (22-23, 40-45, 56-60, 58-61, 51-53 and 61, respectively). The cone-shaped portion of the spermatheca is not distinctly sclerotized in some specimens.

Euseius dossei (Pritchard & Baker)

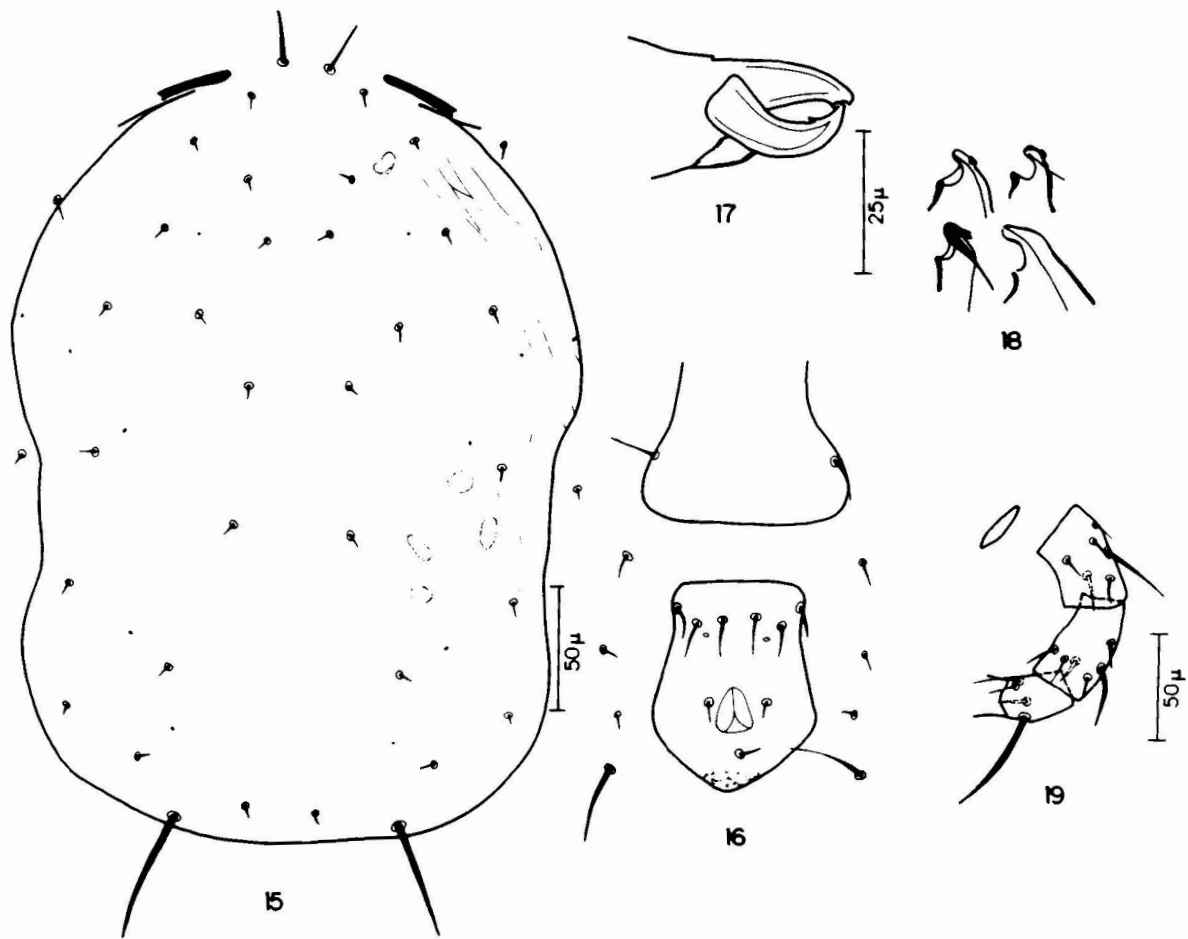
(Fig. 13)

Amblyseius (Amblyseius) dossei Pritchard & Baker, 1962: 286.

SPECIMENS EXAMINED: Leopoldville (now Kinshasa), Zaire, lemon leaf, 14-IV-1955, E.W. Baker (paratype); Kisiani, 15 km west of Kisumu, *Psidium guajava*, I-1985, G.J. Moraes & J.A. McMurtry.

PREVIOUS RECORDS: Nigeria and Zaire.

REMARKS: The ranges of the measurements of 2 females collected (in parentheses) and our corresponding measurements of the female paratype are: dorsal shield length (324-326) 298, width (240) 219, j1 (26-34) 31, j3 (29-31) 31, j4 and j5 (12) 9, j6 (17) 11, J2 (17-19) 11, J5 (5-7) 5, z2 (24) 25, z4 (31) 34, z5 (12) 9, Z1 (17-19) 13, Z4 (19) 11, Z5 (67) 75, s4 (53) 55, S2 (26-29) 25, S4 (29) 27, S5 (29-31) 20, r3 (17-19) 16, R1 (12) 11, SgeI (26-29) 28, SgeII (29) 28, SgeIII (36-38) 36, StiIII (24-26) 22, SgeIV (48-50) 50, StiIV (29-31) 31, StIV (53) 64, ST1-ST3 (55) 48, ST2-ST2 (72) 59, G-G (77-84) 77, ventrianal shield length (98-103) 99, width at ZV2 level (50-53) 45, width at anus level (79) 69, cervix of spermatheca (13) 11. The peritreme extends forward up to between j3 and z2. Macrosetae of all legs are knobbed.



Figs. 15-19. *Euseius minutisetus* n. sp.. FEMALE: 15. dorsal shield; 16. ventral surface; 17. chelicera; 18. spermatheca; 19. genu, tibia and basitarsus of leg IV.

The measurements of a single adult male collected are: dorsal shield length 259, width 180, j1 and j3 29, j4 and j5 12, j6 and J2 17, J5 5, z2 26, z4 31, z5 12, Z1 17, Z4 19, Z5 48, s4 41, S2 and S4 26, S5 31, r3 17, R1 12, SgeI and SgeII 24, SgeIII 29, StiIII 22, SgeIV 38, StiIV 29, StiV 46, ST1-ST3 60, ST2-ST2 62, length of ventrianal shield 103, width of ventrianal shield at anterior corners 154. Macrosetae of legs I and II setaceous; macrosetae of other legs knobbed.

Euseius fustis (Pritchard & Baker)

Amblyseius (Amblyseius) fustis Pritchard & Baker, 1962: 283.

Euseius fustis, Matthyse & Denmark, 1981: 348; Moraes & McMurtry, 1988: 15.

SPECIMENS EXAMINED: Yala, 30 km from Kisumu, I-1985, G.J. Moraes & J.A. McMurtry; Nyatoto, Lambwe Valley, IX-1986, G.J. Moraes.

PREVIOUS RECORDS: Kenya, Nigeria and Zaire.

Euseius hima (Pritchard & Baker)

(Fig. 14)

Amblyseius (Amblyseius) hima Pritchard & Baker, 1962: 257; Blommers, 1976: 89.

SPECIMENS EXAMINED: Astrida, Rwanda, cherimoya, 22-V- 1955, E.W. Baker (holotype); Nkubu, Meru, *Triumfetta rhomboidea*, X-1985; Machakos/Katumani, weeds, IX-1988, J.S. Yaninek.

PREVIOUS RECORDS: India, Madagascar and Rwanda.

REMARKS: This species fits the description of the genus *Euseius* as given by McMurtry (1983), except for the position of the preanal setae (not on a transverse line, but with JV1 close to anterior margin of ventrianal

shield). The specimens collected agree well with our measurements of the holotype. The average measurements of 4 females collected, the corresponding ranges (in parentheses) and the measurements of the female holotype are: dorsal shield length 271 (259-281) 275, width 171 (168-173) 173, j1 23 (22-26) 22, j3 24 (22-26) 26, j4 18 (17-19) 18, j5 16 (14-18) 18, j6 17 (17) 19, J2 18 (17-19) 19, J5 7 (7-8) 6, z2 25 (24-27) 26, z4 28 (26-30) 27, z5 16 (14-17) 19, Z1 18 (17-20) 22, Z4 21 (19-22) 24, Z5 46 (43-48) 45, s4 32 (31-34) 30, S2 22 (22-24) 24, S4 22 (22-23) 22, S5 22 (22-24) 22, r3 23 (22-24) 24, R1 14 (12-15) 16, Sge IV 25 (24-27) (not seen in holotype), StiIV 24 (24-26) (not seen in holotype), StIV 43 (41-48) 34, ST1-ST3 54 (53-57) 53, ST2-ST2 58 (58-60) 60, G-G 51 (48-52) 52, ventrianal shield length 88 (84-91) 86, width at ZV2 level 43 (41-45) 42, width at anus level 51 (50-54) ca. 45, cervix of spermatheca 24 (20-26) 24, fixed digit 22 (22) (not measured), movable digit 21 (19-22) (not measured). The cervix of the spermatheca of the holotype, shown in figure 14, has an inflated proximal portion (18 long) and a constrict distal portion (6 long). In the specimens collected, there is no abrupt transition from an inflated to a constrict condition; instead, the cervix turns progressively narrower from the proximal to the distal portion.

Van der Merwe (1965) described *Euseius natalensis* (Van der Merwe) based on specimens collected from South Africa. We have not seen the types of this species, but from the original description, it seems that *E. natalensis* differs from *E. hima* basically by having somewhat longer z4 (38) and s4 (42) and by having spermatheca similar to what was mentioned in the previously paragraph for specimens collected in this study. Swirski & Ragusa reported *E. natalensis* from Nairobi- and Thika- Kenya, but made no comments as to setal lengths or shape of spermatheca. Blommers (1976) reported *E. hima* from Madagascar (intermediate latitude to Kenya and South Africa) and gave measurements and drawings of the specimens collected. His measurements are intermediate to the types of *E. hima* and *E. natalensis*, but the spermatheca is similar to the latter's and the specimens collected in this study. Considering the similar lengths of the cervix of both species and that possibly there is an intraspecific variation, it appears that *E. natalensis* is a junior synonym of *E. hima*, which could be confirmed by further collections around the type localities of both species.

Euseius kenya (Swirski & Ragusa)

Amblyseius kenya Swirski & Ragusa, 1978: 398.

SPECIMEN EXAMINED: Nairobi, unknown tree, II-1985, G.J. Moraes & J.A. McMurtry.

PREVIOUS RECORDS: Kenya.

Euseius lokele (Pritchard & Baker)

Amblyseius (Amblyseius) lokele Pritchard & Baker, 1962: 271.

Amblyseius lokele, Swirski & Ragusa, 1978: 405.

SPECIMENS EXAMINED: Stanleyville (now Kisangani), Zaire, *Manihot esculenta*, 19-IV-1955, E.W. Baker (holotype); Kilifi, *Asystasia gangetica*, X-1984; Embu, X-1985; Nairobi, Leguminosae, I-1985, G.J. Moraes & J.A. McMurtry.

PREVIOUS RECORDS: Kenya and Zaire.

REMARKS: All specimens collected are larger than the holotype, and thus have dorsal shield setae generally longer. The smallest specimen and the closest to the holotype was collected in Kilifi, on the coast of Kenya. The average measurements of 5 females collected, the corresponding ranges (in parentheses) and the measurements of the holotype are: dorsal shield length 346 (334-355) 320, width 233 (228-240) 220, j1 29 (26-31) 33, j3 17 (10-22) 8, j4 9 (7-12) 8, j5 10 (7-12) 8, j6 11 (10-12) 8, J2 12 (10-12) 9, J5 7 (5-10) 6, z2 12 (10-14) 9, z4 13 (10-17) 8, z5 10 (7-12) 8, Z1 11 (10-12) 10, Z4 12 (10-14) 8, Z5 57 (53-58) 47, s4 21 (14-26) 13, S2 13 (12-14) 11, S4 and S5 12 (10-14) 11, r3 15 (12-17) 16, R1 12 (12) not measured in holotype, SgeI 25 (22-29) 19, SgeII 32 (29-36) 28, SgeIII 37 (36-41) 33, StiIII 32 (31-34) 24, SgeIV 66 (60-74) 58, StiIV 42 (41-43) 39, StIV 76 (67-82) 66, ST1-ST3 61 (55-62) 53, ST2-ST2 72 (65-77) 66, G-G 78 (77-79) 65, ventrianal shield length 91 (86-96) 88, width at level of ZV2 48 (48-50) 44, width at level of anus 70 (65-72) 65, cervix of spermatheca 18 (17-22) 16, fixed digit of chelicera 29 (29) not measured in holotype, movable digit of chelicera 26 (26) not measured in holotype. Peritreme extending forward to level of j1 in the holotype and up to j1 or j3 in the specimens from Kenya. The major differences between the specimens collected and the holotype refer to setae j3 and s4: although longer in the former specimens, they are close to the measurements of a paratype from Lwiro-Zaire (17 and 20, respectively) given by Swirski & Ragusa (1978). A single specimen reported by those authors from Nairobi had relatively short j1 (23) and long j3 and s4 (22 and 28, respectively).

Euseius magucii (Meyer & Rodrigues)

Amblyseius magucii Meyer & Rodrigues, 1966: 223.

SPECIMENS EXAMINED: Kisumu (by Lake Victoria), unidentified hairy-leaved herbs, I-1985, J.A. McMurtry & G.J. Moraes.

PREVIOUS RECORDS: Mozambique.

REMARKS: The specimens collected have shorter j3, z4 and SgeIV (31-34, 43 and 29-38) than the

type material (43-49, 50-58 and 40-46, respectively). This was expected because the specimens collected are smaller (269-278) than the type specimens (284-311). As in *E. hima*, the ventrianal shield of this species is not typical for the genus, with preanal setae not on a transverse line, but with JV1 close to anterior margin of ventrianal shield.

Euseius minutisetus Moraes & McMurtry, n. sp.

(Figs. 15-19)

DIAGNOSIS - This species differs from *Euseius baetae* (Meyer & Rodrigues) and *Euseius lokele* (Pritchard & Baker) by the shorter macrosetae and cervix of spermatheca. It differs from *Euseius aizawai* (Ehara & Bhandhufalck), *Euseius ovalis* (Evans) and *Euseius noumeae* (Schicha) by having a wider cervix of the spermatheca.

FEMALE - (Figs. 15-19) (8 specimens measured).

Dorsum - Dorsal shield 322 (312-336) long and 222 (197-240) wide, with a few striae by the margins. Setae j1 11 (7-17), j3 11 (7-17), j4 6 (5-10), j5 6 (5-7), j6 7 (5-10), J2 8 (7-10), J5 5 (5-7), z2 9 (5-12), z4 8 (5-14), z5 7 (5-10), Z1 and Z4 8 (5-10), Z5 47 (43-50), s4 12 (7-22), S2, S4 and S5 8 (5-12), r3 11 (5-17), R1 7 (5-10). All setae smooth.

Peritreme - Extending forward to level of j3 in the specimens with shorter dorsal shield setae, and to the level of j1 in others.

Venter - Distance between ST1-ST3 55 (53-55), ST2-ST2 65 (62-72) and G-G 77 (70-82). Ventrianal shield vase-shaped, with 3 pairs of preanal setae and a pair of pores postero-laterad to JV2, 94 (91-101) long, 56 (53-60) wide at ZV2 level and 73 (65-77) wide at anus level.

Chelicera - Movable and fixed digits 25 (24-26) long each, with 1 and 2 teeth, respectively.

Spermatheca - Cervix as shown in figure 18, 10 (10-12) long.

Legs - Macrosetae present on legs III and IV, blunt in specimens with shorter setae and knobbed in others: SgeIII 18 (14-22), SgeIV 35 (29-41), StiIV 24 (19-26), StIV 50 (48-53). Chaetotaxy of GeII 2, 2/0, 2/0, 1; GeIII 1, 2/1, 2/1, 1.

MALE - Unknown.

LOCALITY AND TYPE MATERIAL -

Holotype female and 5 paratype females, 150 km south of Nairobi, Mombasa Highway, *Acacia* sp., 6-II-1985, J.A. McMurtry; 1 paratype female, 40 km east of Kisumu, *Acacia* sp., 1-II-1985, J.A. McMurtry and G.J. Moraes.

Euseius neofustis Moraes & McMurtry

Euseius neofustis Moraes & McMurtry, 1988: 16.

SPECIMENS EXAMINED: Msambaweni, IX-1984; Matuga, X-1985.

PREVIOUS RECORDS: Kenya.

Euseius papayana (Van der Merwe)

Amblyseius papayana Van der Merwe, 1965: 57.

SPECIMENS EXAMINED: Machakos/Katumani, *Manihot esculenta*, weeds, VIII-, IX- and X-1985, V-, VI-, VII-, VIII- and IX-1988, C.W. Kariuki, D.D. Mutiso, J.S. Yaninek, H. van den Berg; Machakos/Maruba, VIII-1988, D.D. Mutiso.

PREVIOUS RECORDS: Mozambique and South Africa.

REMARKS: This species is distinct in the genus *Euseius* by lacking seta Z1.

Genus *Iphiseius* Berlese

Iphiseius Berlese, 1916: 33 (*nomen nudum*); Berlese, 1921: 95; Evans, 1954: 517; Van der Merwe, 1968: 104.

Iphiseius degenerans (Berlese)

Seius degenerans Berlese, 1889: 9.

Iphiseius degenerans, Berlese, 1921: 95; Evans, 1954: 518; McMurtry, 1977: 24.

Iphiseius (Iphiseius) degenerans, Van der Merwe, 1968: 105.

SPECIMENS EXAMINED: Machakos/Katumani, VII-1985, VIII-1985, IX-1988, J.S. Yaninek, H. van den Berrg; Machakos/Maruba, VIII- and IX-1988, D.D. Mutiso; Nakuru, *Ricinus communis*, I-1985, G.J. Moraes & J.A. McMurtry; East Kilaguni, Tsavo National Park, *Citrus* sp., II-1985, J.A. McMurtry; Rusinga Island, unknown tree, IX-1986, G.J. Moraes.

PREVIOUS RECORDS: Algeria, Egypt, Greece, Israel, Italy, Kenya, Lebanon, Madeira Island, Madagascar, Portugal, Rwanda, South Africa, Tanzania, Turkey, USSR and Zaire.

Genus *Kampimodromus* Nesbitt

Kampimodromus Nesbitt, 1951: 52.

Amblyseius (Kampimodromus), Pritchard & Baker, 1962: 294; Van der Merwe, 1968: 160.

Kampimodromus spinosus (Meyer & Rodrigues)

Amblyseius spinosus Meyer & Rodrigues, 1966: 224.

SPECIMEN EXAMINED: Nairobi, *Lycopersicon esculentum*, I-1985, G.J. Moraes & J.A. McMurtry.

PREVIOUS RECORDS: Mozambique.

Genus *Paraphytoseius* Swirski & Shechter

Paraphytoseius Swirski & Shechter, 1961: 113.

Paraphytoseius multidentatus Swirski & Shechter

Paraphytoseius multidentatus Swirski & Shechter, 1961: 113; Blommers, 1976: 87; McMurtry & Moraes, 1984: 27.

Amblyseius (Paraphytoseius) multidentatus, Ehara & Lee, 1971: 69; Ehara & Bhandhufalck, 1977: 79.

Amblyseius (Ptenoseius) horrifera Pritchard & Baker, 1962: 295 (synonymy, according to Matthyse & Denmark, 1981).

Amblyseius (Paraphytoseius) horrifera, Van der Merwe, 1968: 169.

SPECIMENS EXAMINED: Msabaha, *Waltheria indica*, *Vernonia aemulans*, IX-1985; Siaya, unknown host, IX-1985; Matuga, *W. indica*, *V. aemulans*, *Triumfetta rhomboidea*, X-1985; Margarini, unknown host, X-1985.

PREVIOUS RECORDS: Brazil, China, Hong Kong, India, Madagascar, New Caledonia, Nigeria, Pakistan and Thailand; Madagascar, Mozambique, South Africa and Zaire (as *P. horrifera*).

Genus *Phytoseius* Ribaga

Phytoseius Ribaga, 1902: 177; Denmark, 1966: 6.

Phytoseius amba Pritchard & Baker

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

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

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

SPECIMENS EXAMINED: Beni, Zaire, *Tithonia speciosa*, 7-V-1955, E.W. Baker (holotype); Katumani, *Solanum nigrum*, weeds, IX-1985, IX-1988, J.S. Yaninek, H. van den Berg; Alupe, Busia, *Triumfetta* sp., *Leonotis* sp., *Pseudathria hookeri*, Compositae, *Tephrosia nana*, IX-1985; Embu, *Physalis peruviana*, *Hibiscus* sp., *Neotonia wightii*, X-1985; Nkubu, Meru, *Triumfetta rhomboidea*, X-1985; Siaya, *Tephrosia* sp., *Solanum nigrum*, X-1985; Saiwa, *Ocimum lamifolium*, IX-1986; Maseno, 30 km northwest of Kisumu, Compositae, I-1985, G.J. Moraes & J.A. McMurtry; Rusinga Island, *Solanum incanum*, IX-1986, G.J. Moraes; Kamata, unknown host, IX-1986, G.J. Moraes.

PREVIOUS RECORDS: Kenya, Madagascar, Mozambique, Nigeria, Rwanda, South Africa and Zaire.

REMARKS: Most of the specimens collected have longer j3, z3, SgeIV, fixed and movable digits of

chelicera, and cervix of spermatheca when compared to the holotype. The average measurements and respective ranges of 8 females collected (in parentheses), followed by our measurements of the female holotype are: dorsal shield length 288 (271-312) 283, width 144 (139-149) 165, j1 24 (22-26) 24, j3 50 (41-60) 42, j4 4 (2-5) 3, j5 4 (2-5) 3, j6 5 (2-7) 4, J2 5 (5) 6, J5 11 (10-12) 11, z2 7 (5-10) 5, z3 24 (19-29) 17, z4 8 (5-12) 5, z5 5 (2-5) 5, Z4 62 (55-67) 64, Z5 75 (67-82) 83, s4 76 (70-86) 81, s6 78 (67-86) 79, r3 39 (34-43) 41, R1 14 (12-17) 12, SgeIV 26 (24-34) 21, StIV 33 (29-38) 31, StIV 33 (26-43) 39, ST1-ST3 59 (53-60) 60, ST2-ST2 70 (67-72) 79, G-G 69 (67-72) 63, ventrianal shield length 99 (84-108) 100, width at ZV2 level 60 (55-67) 53, width at anus level 49 (48-53) 46, cervix of spermatheca 20 (17-24) 12, fixed digit 20 (17-24) 17, movable digit 24 (24) 17. The specimens from Saiwa are the closest to the holotype.

Phytoseius hongkongensis Swirski & Shechter

Phytoseius (Phytoseius) hongkongensis Swirski & Shechter, 1961: 99; Denmark, 1966: 44.

Phytoseius (Pennaseius) hongkongensis, Ehara & Lee, 1971: 70; Blommers, 1976: 85.

Phytoseius hongkongensis, Schicha, 1984: 126.

SPECIMENS EXAMINED: Msabaha, *Tephrosia villosa*, *Waltheria indica*, IX-1985; Margarini, *Melhanina velutina*, IX-1985; Arabuko/Sokoke, *W. indica*, X-1985; Matuga, *W. indica*, X-1985.

PREVIOUS RECORDS: Australia (Schicha, 1984), Hong Kong, Japan, Madagascar, Papua New Guinea, Taiwan and Thailand.

Phytoseius kisumuensis Moraes & McMurtry, n. sp.

(Figs. 20-23)

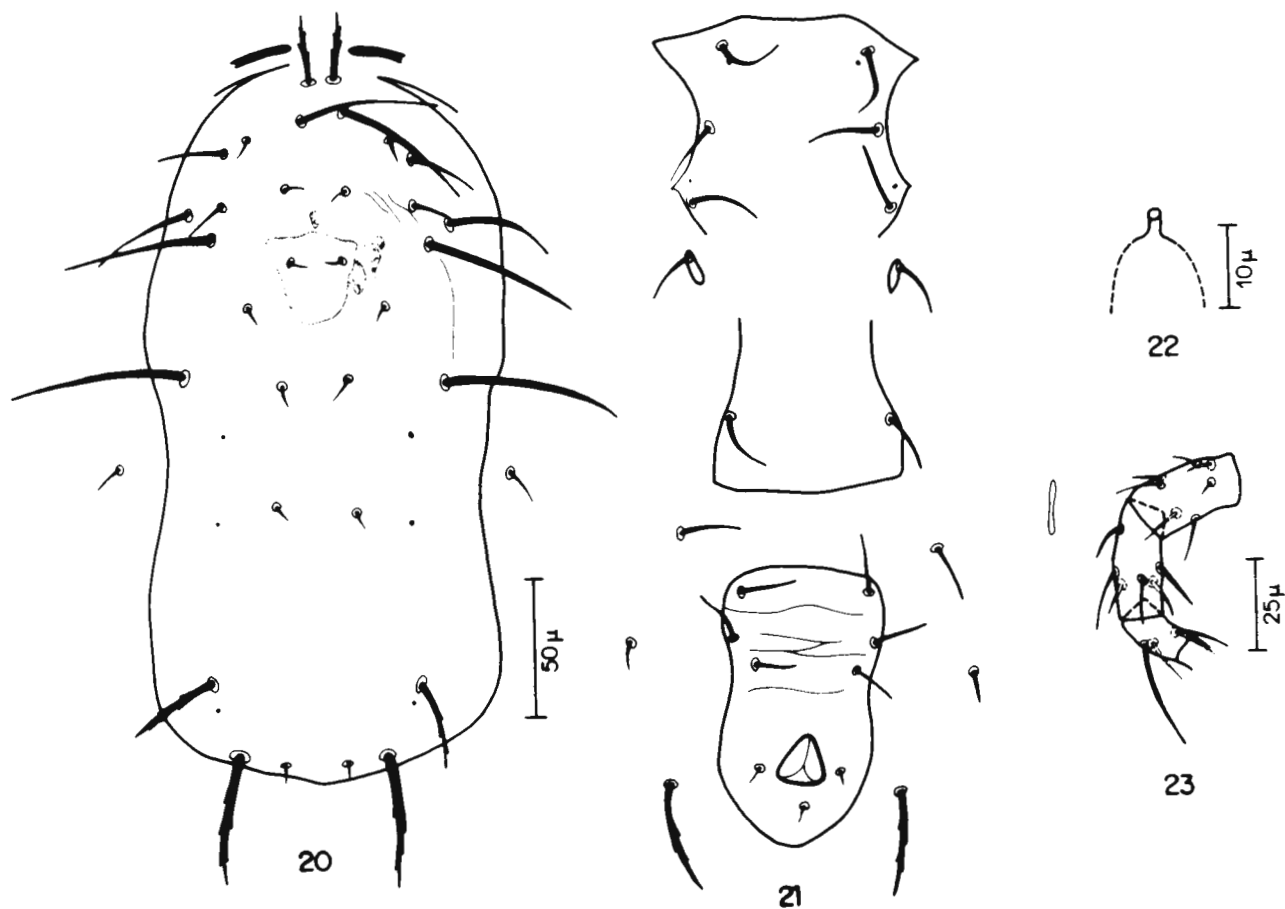
DIAGNOSIS - This species differs from *Phytoseius bulgariensis* Wainstein by having shorter setae s4, s6, Z4, Z5, and cervix of spermatheca. It also differs from *Phytoseius subtilis* Wu & Li and *Phytoseius taianensis* Liang & Ke by having seta J2.

FEMALE - (Figs. 20-23) (2 specimens measured).

Dorsum - Dorsal shield smooth, 276 long and 132 wide. Setae j1 23 (22-24), j3 54 (53-55), j4 9 (7-10), j5 10, j6 11 (10-12), J2 11 (10-12), J5 7, z2 12, z3 30 (29-31), z4 23 (22-24), z5 10, Z4 41, Z5 48, s4 60, s6 67, r3 41, R1 15 (12-17). Setae j1, j3, s4, s6, Z4, Z5 and r3 barbed; other setae smooth.

Peritreme - Extending forward to level of j1.

Venter - Sternal shield with 3 pairs of setae. Distances between sternal setae ST1-ST3 60 (58-62), ST2-ST2 65, and genital setae G-G 62. Ventrianal shield with a few transverse striae, 106 long, 60 wide at ZV2 level



Figs. 20-23. *Phytoseius kisumuensis* n. sp.. FEMALE: 20. dorsal shield; 21. ventral surface; 22. spermatheca; 23. genu, tibia and basitarsus of leg IV.

and 53 wide at anus level; with 3 pairs of preanal setae and no pores.

Chelicera - Not possible to observe.

Spermatheca - With a cup-shaped distal portion, ca. 5 long.

Legs - With setiform macrosetae only on leg IV: Sge 22, Sti 24, St 29-34.

MALE - Unknown.

LOCALITY AND TYPE MATERIAL - Holotype female and 1 paratype female, Kisumu, by Lake Victoria, on hairy-leaved unidentified herbs, 30-I-1985, G.J. Moraes & J.A. McMurtry.

Phytoseius neohongkongensis Moraes & McMurtry, n. sp.

(Figs. 24-31)

DIAGNOSIS - This species differs from *Phytoseius hongkongensis* Swirski & Shechter by having shorter z3 and longer Z5 setae, and shorter cervix of

spermatheca. It also differs from *Phytoseius amba* Pritchard & Baker by having generally longer dorsal shield setae and shorter cervix of spermatheca.

FEMALE - (Figs. 24-28) (2 specimens measured).

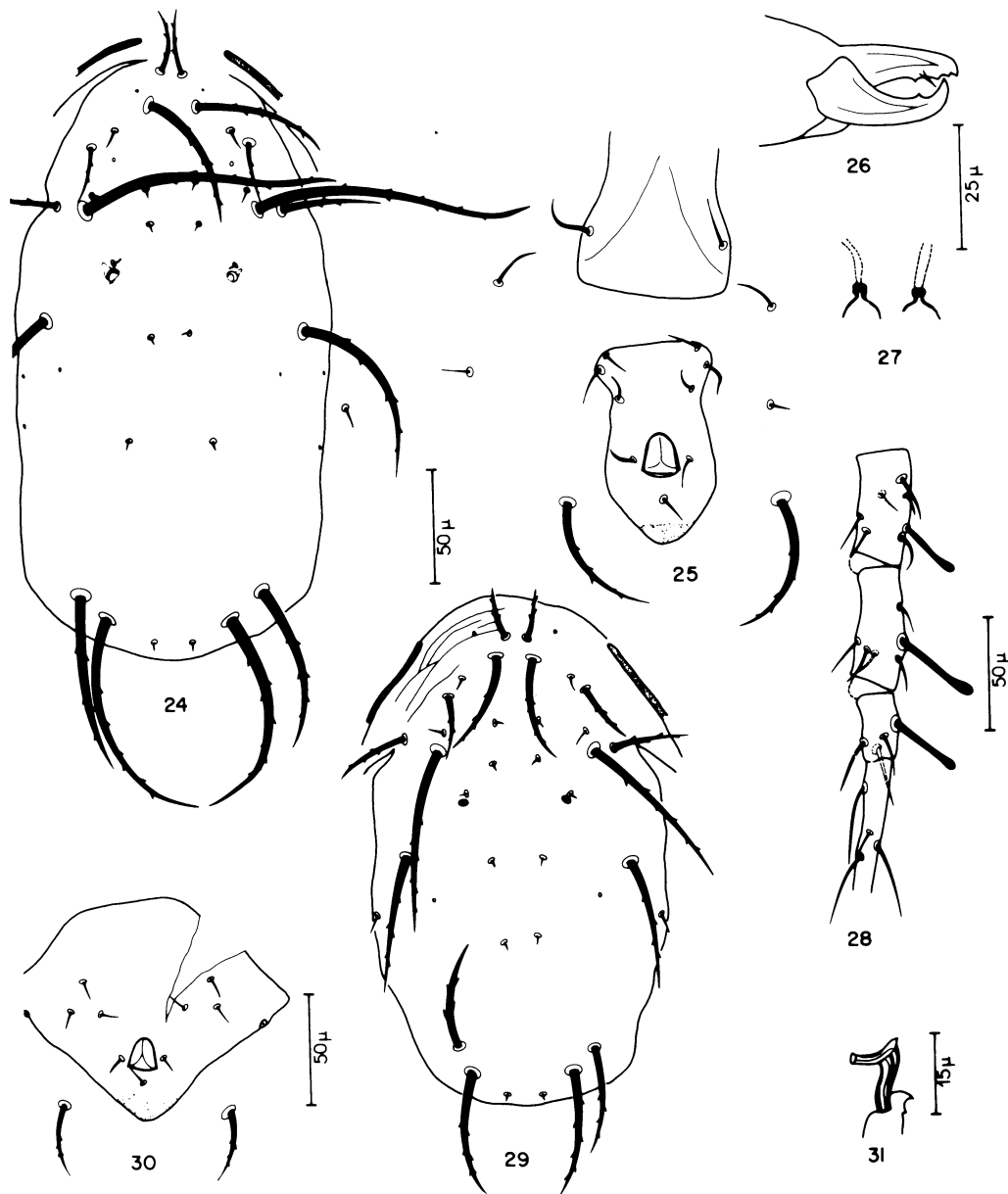
Dorsum - Dorsal shield smooth, 270 (252-288) long, 149 (146-151) wide, with a large pore posterior to z5. Setae j1 29 (26-31), j3 62, j4, j5 and j6 5, J2 6 (5-7), J5 5, z2 9 (8-10), z3 28 (26-29), z4 7, z5 5, Z4 80 (77-84), Z5 97 (91-103), s4 114 (108-120), s6 88 (82-94), r3 46, R1 11 (10-12). Setae j1, j3, z3, Z4, Z5, s4, s6 and r3 barbed.

Peritreme - Extending forward to level of j1.

Venter - Sternal shield very lightly sclerotized. Distances between ST1-ST3 61 (60-62), ST2-ST2 66 (65-67) and G-G 66 (65-67). Ventrianal shield vase-shaped, with 3 pairs of preanal setae and no visible pores, 95 (94-96) long, 56 (55-58) wide at ZV2 level and 52 (50-53) wide at anus level.

Chelicera - Movable digit 28 (26-29) long, with 1 tooth; fixed digit 24 long, with 3 teeth.

Spermatheca - Cervix cup-shaped, 4-5 long, with a very short constriction close to the minute atrium.



Figs. 24-31. *Phytoseius neohongkongensis* n. sp.. FEMALE: 24. dorsal shield; 25. ventral surface; 26. chelicera; 27. spermatheca; 28. genu, tibia and basitarsus of leg IV. MALE: 29. dorsal shield; 30. ventrianal shield; 31. spermatodactyl.

Legs - With spatulate macrosetae only on leg IV: Sge 32 (31-34), Sti 38, St 35 (34-36). Chaetotaxy of GeII 2, 2/0, 2/0, 1; GeIII 1, 2/0, 2/0, 1.

MALE - (Figs. 29-31) (2 specimens measured).

Dorsum - Dorsal shield smooth, 228 (223-234) long and 135 (134-137) wide, with a large pore posterior to z5. Setae j1 21 (19-22), j3 52 (50-53), j4 and j5 2, j6 3 (2-5), J2 5, J5 2, z2 10, z3 29, z4 9 (7-10), z5 4 (2-5), Z4 53 (50-55), Z5 50, s4 85 (84-86), s6 62, r3 38, R1 9 (7-10).

Setae j1, j3, z3, Z4, Z5, s4, s6 and r3 barbed.

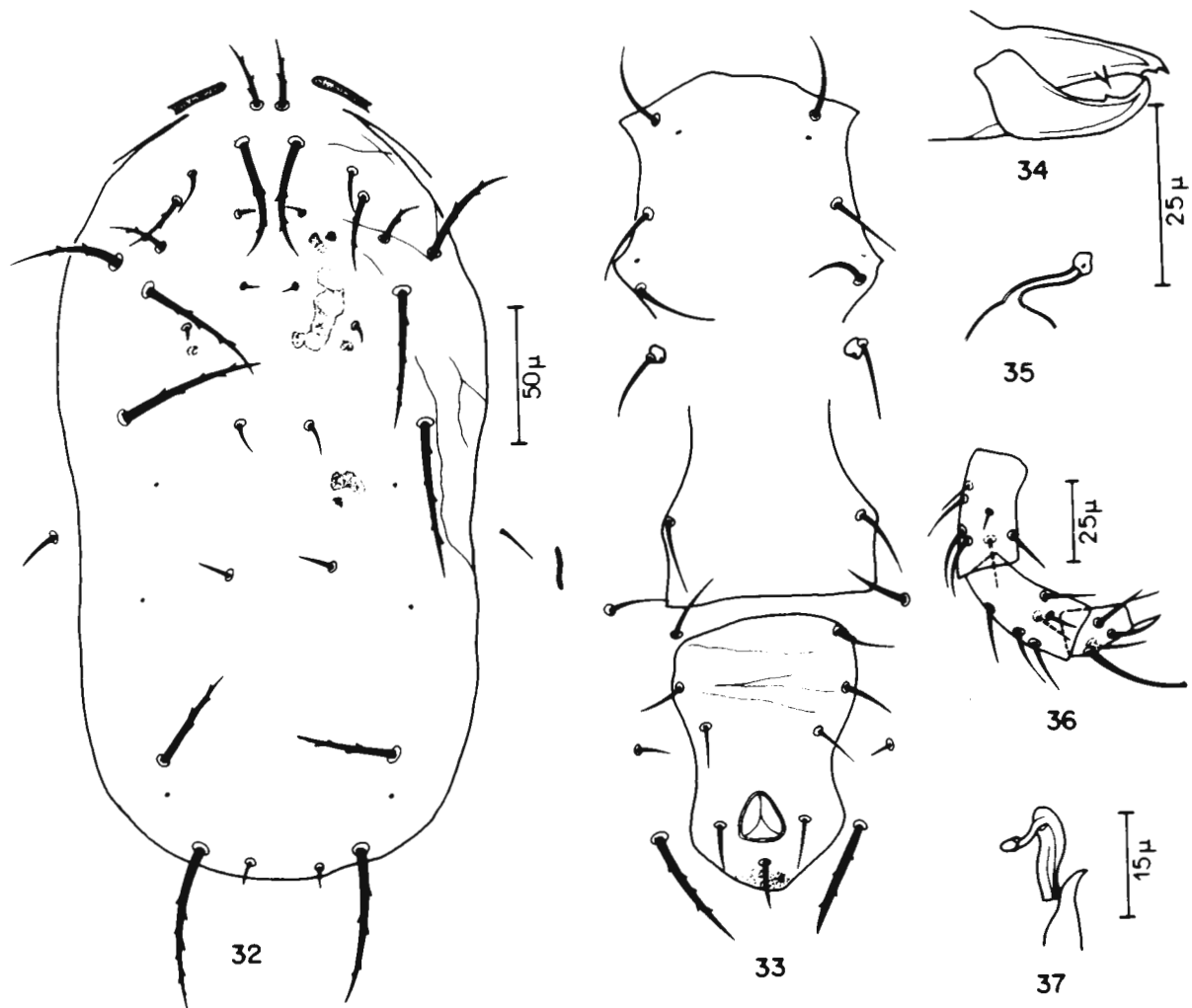
Peritreme - Extending forward to level of z2.

Venter - Ventrianal shield with anterior margin considerably convex, with 3 pairs of preanal setae; 99 (96-103) long and 120 wide at anterior corners.

Spermatodactyl - Shaft 13 long.

Legs - With spatulate macrosetae only on leg IV: Sge 23 (22-24), Sti 24 (22-26), St 26.

LOCALITY AND TYPE MATERIAL -



Figs.32-37. *Phytoseius neomontanus* n. sp.. FEMALE: 32. dorsal shield; 33. ventral surface; 34. chelicera; 35. spermatheca; 36. genu, tibia and basitarsus of leg IV. MALE: 37. Spermatodactyl.

Holotype female, allotype male and 1 paratype male, Matuga, *Solanum nigrum*, 17-X-1985, H. van den Berg; 1 paratype female, Margarini, *Melhania velutina*, 11-IX-1985, H. van den Berg.

Phytoseius neomontanus Moraes & McMurtry, n. sp.

(Figs. 32-37)

DIAGNOSIS- This species is similar to *Phytoseius montanus* DeLeon, but the spermatheca is not trumpet-shaped, j4 is ca. twice as long and StIV is ca. 40% shorter than in *P. montanus*.

FEMALE - (Figs. 32-36) (3 specimens measured).

Dorsum - Dorsal shield with a few striae on the margins, 286 (276-300) long and 144 (134-154) wide. Setae j1 23 (22-24), j3 41, j4 and j5 7, j6 11 (10-12), J2 13

(12-14), J5 10, z2 13 (10-17), z3 26 (24-29), z4 22 (19-24), z5 7, Z4 36, Z5 58 (55-60), s4 48 (46-50), s6 54 (53-55), r3 36 (36-38), R1 14 (12-17). Setae j4, j5, j6, J2, J5, z2, z5 and R1 smooth; all others barbed.

Peritreme - Extending forward to level of j1.

Venter - Sternal shield with posterior margin not clearly distinguishable; with 3 pairs of setae. Distances between ST1-ST3 58 (58-62), ST2-ST3 65 (62-67), G-G 65 (62-67). Ventrianal shield 82 long, 63 (60-65) wide at level of ZV2 and 60 wide at level of anus; with 3 pairs of preanal setae and no pores.

Chelicera - Fixed and movable digits 24 and 26 long, respectively.

Spermatheca - Cervix with a cup-shaped distal portion (5 long) and a cylindrical proximal portion (12 long).

Legs - Distinguishable macroseta only on tarsus IV, 34 (31-36) long with a small knob at tip. Chaetotaxy

of GeII 2, 2/0, 2/0, 1; GeIII 1, 2/0, 2/0, 1.

MALE - (Fig. 37) (1 specimen measured).

Dorsum - Dorsal shield 240 long, with a few striae by the margins. Setae j1 22, j3 62, j4 and j5 7, j6 10, J2 12, J5 10, z2 8, z3 26, z4 19, z5 5, Z4 26, Z5 36, s4 and s6 41, r3 34, R1 7. Setae j4, j5, j6, J2, J5, z2, z5 and R1 smooth; all others barbed.

Legs - Distinguishable macroseta only on tarsus IV, 31 long.

Spermatodactyl - Shaft 14 long.

LOCALITY AND TYPE MATERIAL -

Holotype female, allotype male and 2 paratypes from Kericho, on hairy-leaved Malvaceae, 30- I-1985, G.J. Moraes & J.A. McMurtry.

Phytoseius intermedius Evans & MacFarlane

Phytoseius (Dubininellus) intermedius Evans & MacFarlane, 1961: 587; Denmark, 1966: 70.

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

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

SPECIMENS EXAMINED: Nairobi, unidentified Leguminosae, I-1985, J.A. McMurtry & G.J. Moraes.

PREVIOUS RECORDS: India, Japan, Madagascar, Pakistan and Zimbabwe; Zaire (as *P. yira*).

Genus *Typhlodromus* Scheuten

Typhlodromus Scheuten, 1857: 111; Chant, 1965: 368.

Typhlodromus magdalenae Pritchard & Baker

Typhlodromus (Typhlodromus) magdalenae Pritchard & Baker, 1962: 218; Van der Merwe, 1968: 65; Chant & Yoshida Shaul, 1987: 1774.

SPECIMENS EXAMINED: Rusinga Island, unknown tree, IX- 1986, G.J. Moraes.

PREVIOUS RECORDS: Kenya, Rwanda, South Africa and Zaire.

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