

SURVEY OF PREDACIOUS PHYTOSEIID MITES (ACARI : PHYTOSEIIDAE) INHABITING COFFEE TREES IN KENYA WITH DESCRIPTIONS OF SOME NEW SPECIES

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SUMMARY: During a comprehensive survey of predacious mites in the different coffee zones of Kenya 33 species of phytoseiid mites were reported from 122 coffee farms: eight species of *Euseius* Wainstein, three *Ueckermannseius* Chant & McMurtry, seven *Amblyseius* Berlese, two *Typhlodromalus* Muma, nine *Typhlodromus* Scheuten, and four species from different genera. The number of species and abundance of mites greatly varied among coffee agrozones: 14 species in UMI, 22 in UMII, and 21 in UMIII. The predacious mite *E. kenyae* Swirski & Ragusa was the most common species in any zone. Although *Typhlodromus* species showed a greater diversity, they were recorded at low abundance. The study included the description of 6 new species: *Amblyseius hamisi* n. sp., *Euseius majengo* n. sp., *Ueckermannseius lugula* n. sp., *Transeius maragoli* n. sp., *Phytoseius kaimosi* n. sp. and *Typhlodromus ruiru* n. sp.; *Amblyseius italicus* Chant and *A. sundi* (Pritchard & Baker) were reported for the first time from Kenya and descriptions are included.

INTRODUCTION

In Kenya, coffee is of economic importance, as it contributes about 11% of total export earning and more than 10% of Kenyans derive their income from coffee (MASABA et al., 1990). Primary pests like coffee berry borer, *Hypothenemus hampei* (Ferri) and the secondary pests like the green scale, *Coccus alpinus* Delotto, the thrips, *Diarthrothrips coffee* Williams and several red spider mites are greatly constrain economic production, unless they are controlled.

Coffee farmers depend heavily on pesticides to control the pests, while other control tactics are almost ignored. For example, proper nutrition (Nitrogen: Phosphorus: Potassium) improves plant tolerance to pest attack and decrease substantially the damage caused by several pests like scale insects (BRUNING & VEBEL, 1969). On the other hand, a number of problems are associated with the continuous use of pesticides e.g. increase environmental contamination, elimination of natural enemies and the increase of pest pressure (WHEATLY, 1963, CROWE, 1964).

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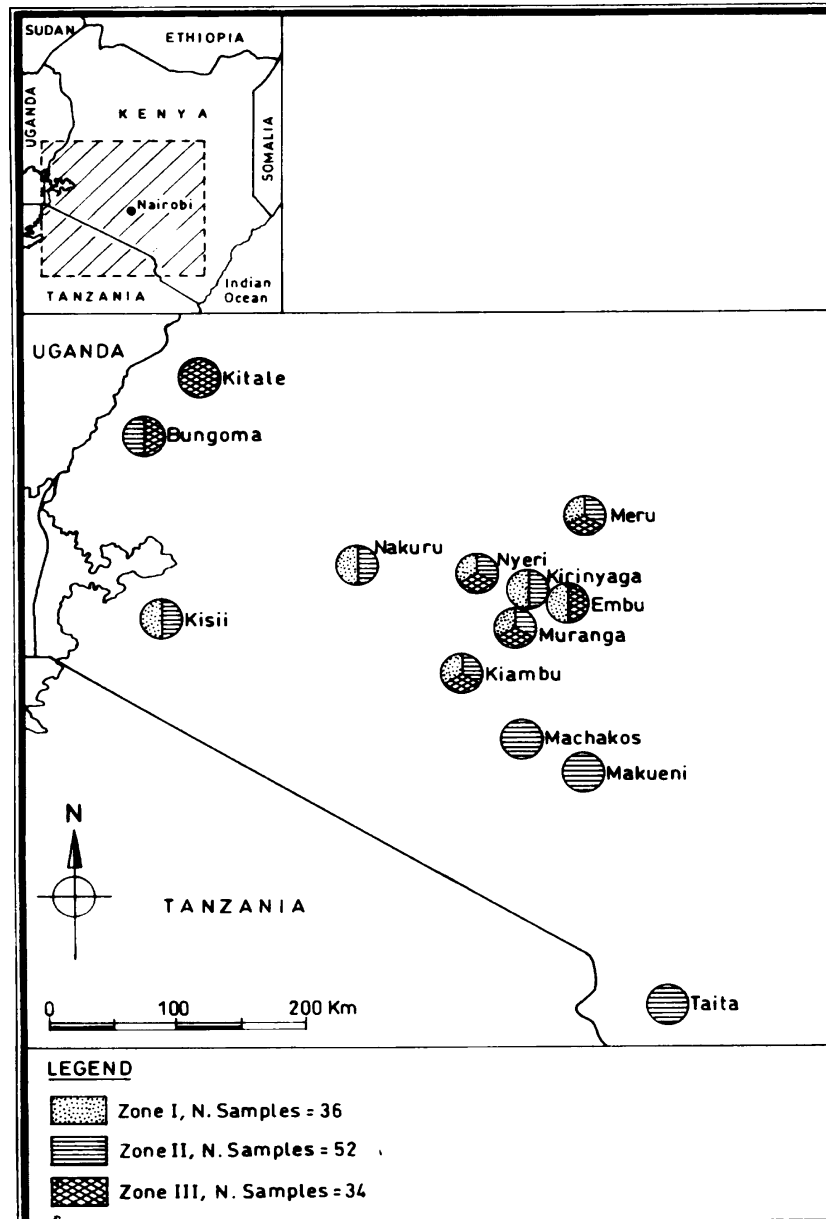


FIG. 1. — Coffee agrozones of Kenya sampled for predacious phytoseiid mites.

Integrated pest management has successfully been applied in agrosystems such as apple trees in Michigan (USA) and citrus orchards in Cape Province (South Africa). In these systems, selected broad spectrum insecticides were used to control the primary pests like the codling moth on apple and the Mediterranean fruit fly on citrus. Meanwhile, the secondary pests like spider mites are biologically controlled by predacious mites (*Amblyseius fallacis* Garman on apple and *Euseius addoensis* (Van der Merwe) on citrus) provided that these chemicals are less disruptive to predacious mite populations (CROFT, 1982, EL BANHAWY, 1997).

In the coffee agrosystem, similar integrated approach is suggested when coffee trees were properly fertilized in either mineral or organic forms (MUGO, pers. com). To achieve these objectives a comprehensive survey for predacious mites inhabiting coffee tress in various coffee agrozones has been conducted. The study includes identification of predacious mite taxa, measure of specific diversity and of the abundance of mites.

MATERIALS AND METHODS

Coffee is grown in the upper midland (UM) of Kenya, which is subdivided into three subzones (UMI, UMII, and UMIII). Phytoseiid mites have been sampled from coffee farms in three respective subzones:

Zone	culture	altitude (m)	annual mean temperature (t°C)	rainfall per year (mm)
UMI	coffee – tea zone	1570- 1810	18.4	1650
UMII	main coffee zone	1395- 1675	19.4	1465
UM III	marginal coffee zone	1330- 1560	18.9	1270

Samples were taken from selected coffee farms at each subzone: 36 in subzone I (UMI), 52 in subzone II, and 34 in subzone III; e.g. a total of 122 farms representing coffee agrozones (FIG. 1).

Predacious mites were collected by beating the plants with a stick over a rigid plastic board. Individuals of predacious mites accumulated on the board were removed with a fine hair brush and preserved in 70% alcohol. Mites were cleared in 90% lactic acid for 48 hours, mounted in

HOYER's medium and dried in an oven at 40°C, for 7 successive days.

Identification was carried out according to CHANT & MCMURTRY (1994; 2004a; 2005a; 2006) and terminology of spermatodactyle after BEARD (2001). For comparative purposes, illustration of the new taxa were drawn at the same magnifications, (objective X eyepiece X drawing tube); dorsal view, ventral view and legs (X 250), cheliceral digits and spermatheca (X 1200, with oil immersion). Measurements are in microns and type material will be deposited in the collection of the International Centre of Insect Physiology and Ecology (ICPE), Nairobi.

RESULTS

Thirty three species of phytoseiid mites were reported from coffee trees in the three respective coffee agrozones (UMI, UMII, UMIII). Eight species belong to the genus *Euseius* Wainstein; three *Ueckermannseius* Chant & McMurtry, seven *Amblyseius* Berlese, two *Typhlodromalus* Muma, nine *Typhlodromus* Scheuten, and four species from different genera (TABLE 1).

Species abundance greatly varied according to the species group. For example, eight species of *Euseius* represented 63% of the total number of the sampled mites, and nine species of *Typhlodromus* represented only 4.1%, indicating a community with higher diversity and low abundance of every species of *Typhlodromus*.

Regardless of the coffee agrozones, *E. kenya* Swirski & Ragusa, *E. africanus* (Evans), *E. albizziae* (Swirski & Ragusa) and *Ueckermannseius macrosetosus* (Van der Merwe) represented 50%, 11.3%, 9.7%, and 5.5% (76.5%) of the total number of the sampled mites respectively. In contrast, *E. lokele* (Pritchard & Baker) and *E. rhusi* (Van der Merwe) represented only 5% and the remaining 27 species about 19% (FIG. 2). There were variations in the number of species sampled from the different agrozones e.g. 14 in UMI, 22 in UMII, and 21 in UMIII. The number of individuals at which every species was collected differ according to the agrozone. In UMI 3.3 individuals/species, UMII 4.7 and UMIII 5.8. it was obvious that *E. kenya* is a common species and dominated the three different agrozones (FIG. 3). Out

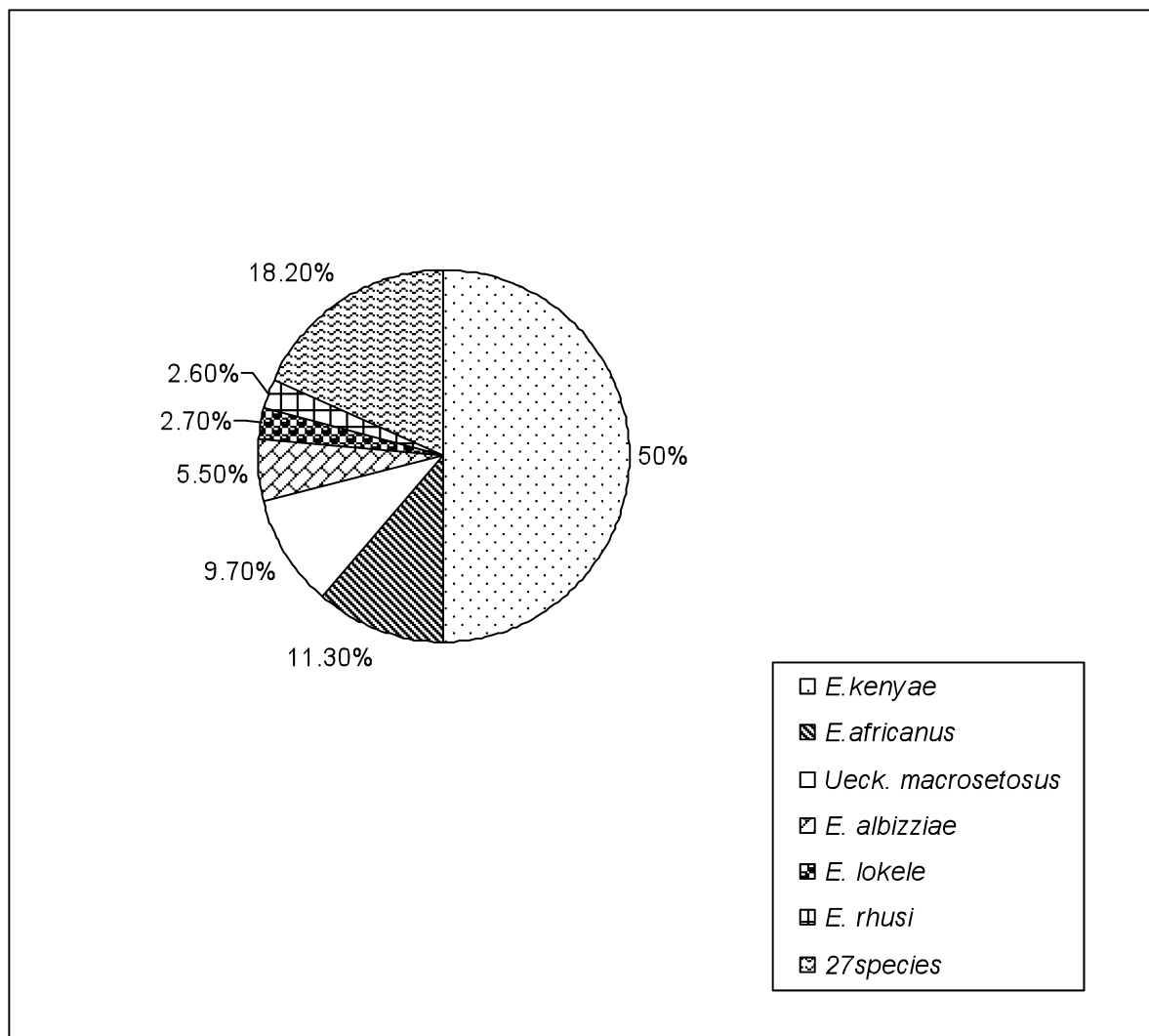


FIG. 2. — Species and percentages of predacious phytoseiid mites sampled from the different coffee agrozones of Kenya.

of 122 farms, *E. kenya* was collected from 48 farms, however; other *Euseius* species such as *E. africanus* and *E. albizziae* were reported from only eleven and 7 farms respectively (TABLE 1).

DESCRIPTIONS

Amblyseius hamisi El Banhawy & Irungu, n. sp.
(FIG. 4).

FEMALE: Dorsal shield smooth with four pairs of pores, 300 long, 190 wide. Measurements of dorsal

setae: *j1* 32, *j340* *j* 4, *j5*, *j6*, *J2*, *J5* 4–6, *z2*, *z4*, *z5*, *Z1*, 4–6, *Z4* 150, *Z5* 370, *s4* 125, *S2*, *S4*, *S5* 4–6, *r3*, *R15*, *JV5* 90. *Z4*, *Z5* slightly serrated. Peritreme fused anteriorly with dorsal shield and reaching level *j1*. Sternal shield smooth, posterior margin straight, distances between *St* I – *St* III 65, *St* II – *St* II 74, *St* IV on small platelets. Genital shield smooth, 87 wide. Ventrianal shield longer than wide 115 long 83 wide at level of anus and with a pair of crescentic preanal pores. Two pairs of metapodal platelets, 9 pairs of small rounded platelets, 2 pairs of thin elongate sigillar sclerites and 4 pairs of setae surrounding ventrianal shield. Fixed digit of chelicera with

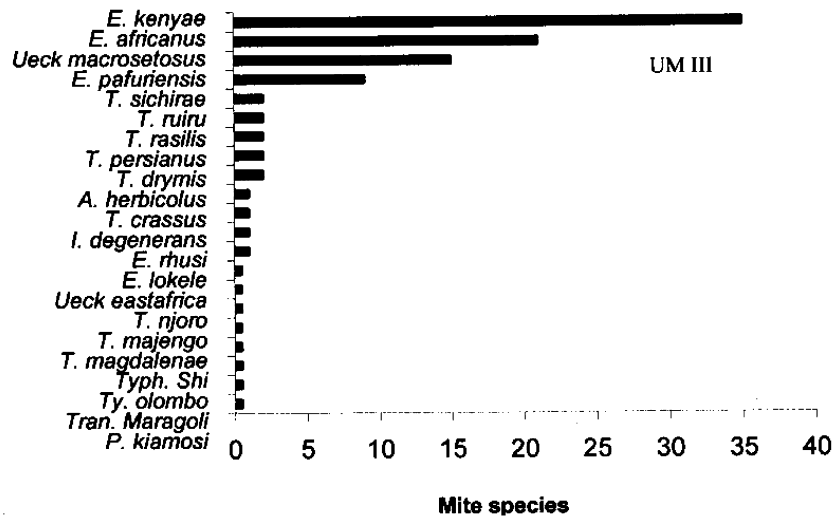
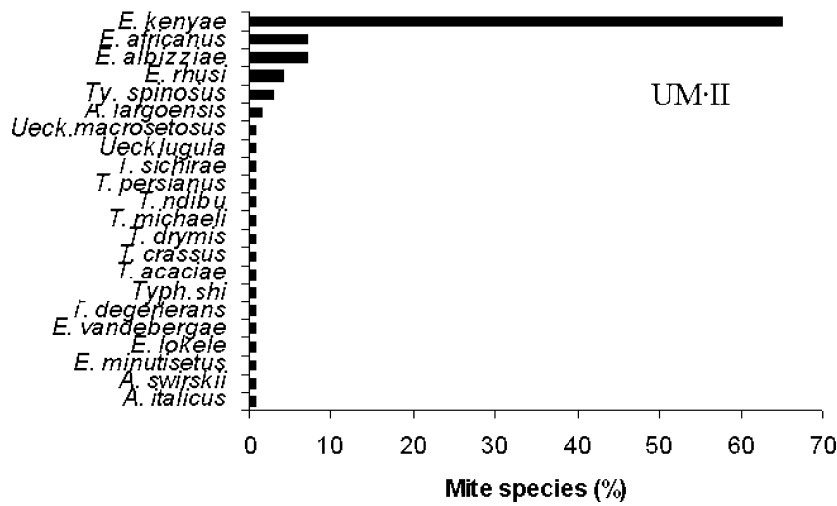
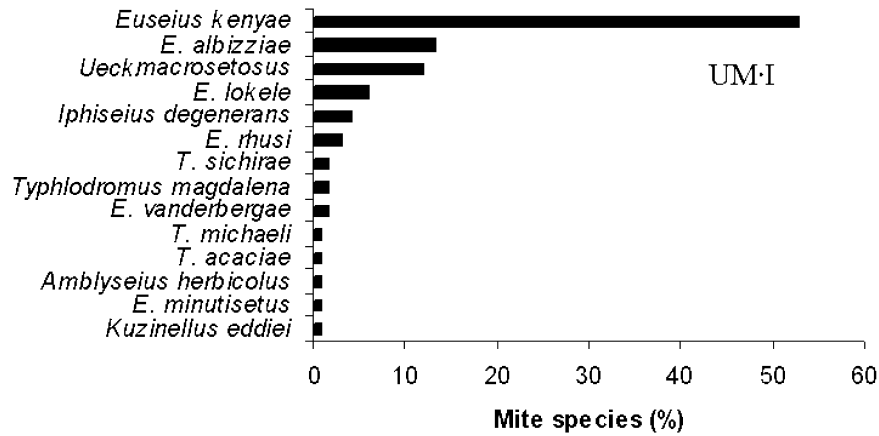


FIG. 3. — Distribution of predacious phytoseiid mites sampled from coffee farms in the three coffee agrozones of Kenya.

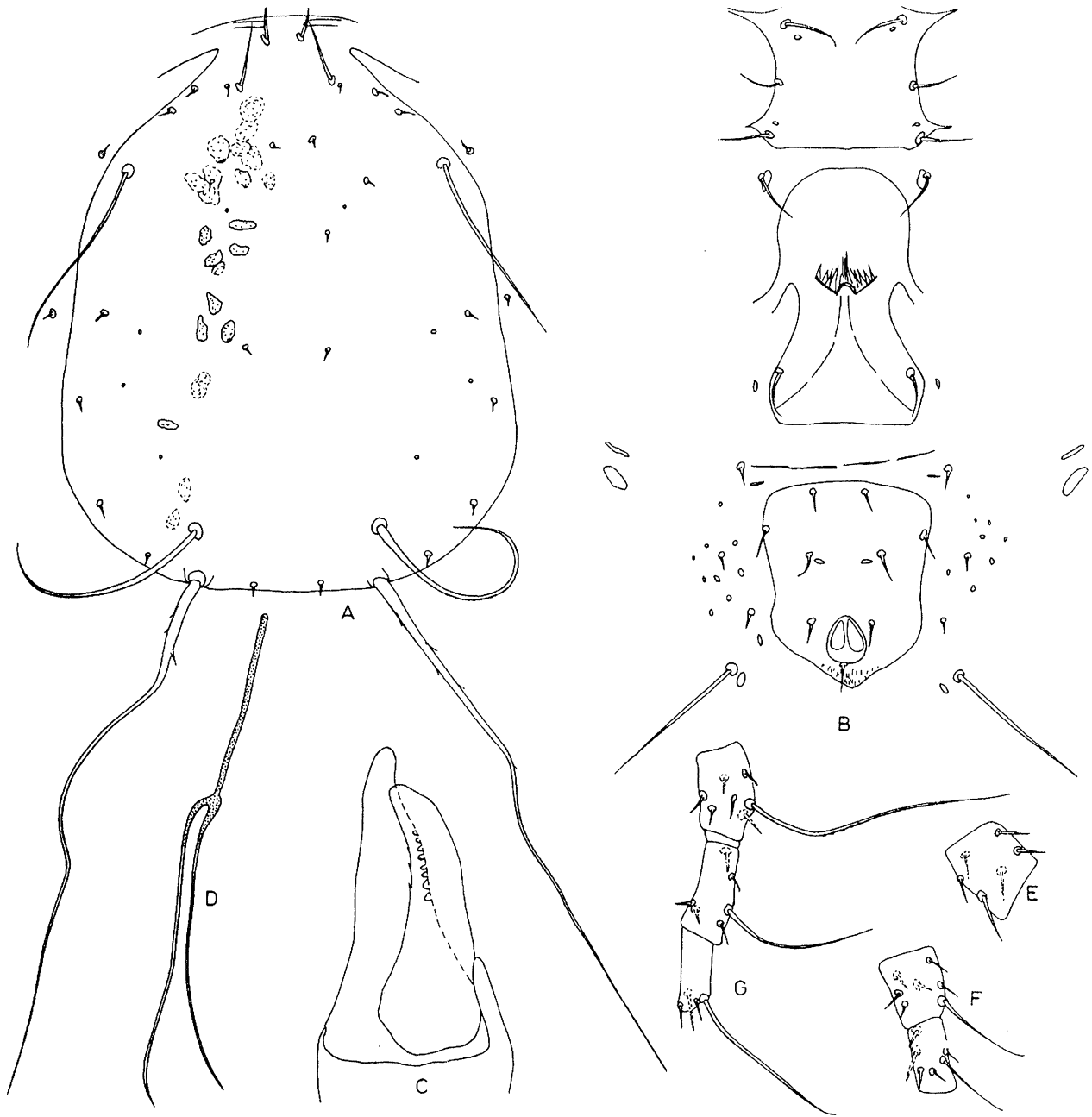


FIG. 4. — *Amblyseius hamisi* El Banhawy & Irungu n. sp. A. — Dorsal shield; B. — Ventral surface; C. — Chelicera; D. — Spermatheca; E. — Genu II, F. — Genu and tibia III; G. — Leg IV.

Genus	Species	No. individuals	% presence	No. farms where species present	Coffee agrozones
<i>Euseius</i> Wainstein	<i>E. kenya</i> (Swirski & Ragusa)	228	50	48	I, II, III
	<i>E. africanus</i> (Evans)	52	11.3	11	II, III
	<i>E. albizziae</i> (Swirskii & Ragusa)	25	5.5	7	I, II
	<i>E. rhusi</i> (Van der Merwe)	12	2.6	5	I, II, III
	<i>E. lokele</i> (Pritchard & Baker)	11	2.4	6	I, II, III
	<i>E. van denbergae</i> (Ueckermann & Loots)	3	0.7	2	I, II
	<i>E. minutisetus</i> Moraes and McMurtry	2	0.4	2	I, II
	<i>E. majengo</i> nsp	1	0.2	1	III
<i>Ueckermannseius</i> Chant & McMurtry	<i>Ueck. macrosetosus</i> (Van der Merwe)	44	9.7	10	I, II, III
	<i>Ueck. lugula</i> nsp	1	0.2	1	II
	<i>Ueck. eastafrica</i> deMoraes, Zannou & Oliveira	1	0.2	1	III
<i>Iphiseius</i> Berlese	<i>I. degenerans</i> (Berlese)	8	1.7	6	I, II, III
<i>Amblyseius</i> Berlese	<i>A. herbicolus</i> Chant	5	1.7	6	I, II, III
	<i>A. largoensis</i> (Muma)	1	0.2	1	II
	<i>A. hamisi</i> nsp	1	0.2	1	II
	<i>A. italicus</i> Chant	2	0.2	2	II
	<i>A. sundi</i> (Pritchard & Baker)	1	0.2	1	II
	<i>A. swirskii</i> Athia-Henriot	1	0.2	1	II
<i>Typhlodromalus</i> Muma	<i>Ty. spinosus</i> (Meyer & Rodrigues)	4	0.9	1	II
	<i>Ty. olombo</i> Pritchard & Baker	1	0.2	1	III
<i>Typhlodromus</i> Scheuten	<i>T. drymis</i> Ueckermann & Loots	51	1.0	3	I, III
	<i>T. rasilis</i> Van der Merwe	4	0.9	2	III
	<i>T. sichirae</i> nsp	3	0.6	2	I, II
	<i>T. crassus</i> Van der Merwe	2	0.4	2	I, II
	<i>T. michaeli</i> Ueckermann & Loots	1	0.2	1	III
	<i>T. ndibu</i> Pritchard & Baker	1	0.2	1	II
	<i>T. njoro</i> nsp	1	0.2	1	II
	<i>T. ruiro</i> nsp	1	0.2	1	III
	<i>T. persianus</i> McMurtry	1	0.2	1	II
<i>Typhlodromips</i> Deleon	<i>Typh. shi</i> (Pritchard & Baker)	2	0.4	2	II, III
<i>Transeius</i> Chant & McMurtry	<i>Tran. maragoli</i> nsp	1	0.2	1	III
<i>Kuzinellus</i> Wainstein	<i>K. eddiei</i> Ueckermann & Loots	1	0.2	1	I
<i>Phytoseius</i> Ribaga	<i>P. kaimosi</i> nsp	1	0.2	1	III
Total 33		459	100	122	I, II, III

TABLE 1: Zoogeographical distribution of phytoseiid predacious mites in the different coffee agrozones of Kenya

8 teeth, movable with 3 teeth. Spermatheca long and slender (44) with enlarged atrium, cervix constricted midway, flared distally and with conspicuous major duct. Macrosetae pointed distally, *Sge* II 37, *Sge* III 65, *Sti* III 44, *Sge* IV 165, *Sti* IV 97, *St* IV 110. Chaetotaxy : genu II 1-2/1, 2/0-1; genu III 1-2/1, 2/0-1.

The female holotype was collected from a coffee farm in Embu, Eastern Province (UM3), December 2006 (EL BANHAWY). The male is unknown. This species belongs to *obtus* species group, *pamperisi* species subgroup CHANT & MCMURTRY (2003a). Details of spermatheca and length of Z5 (longer than dorsal shield) differentiate it from similar species.

Amblyseius sundi (Pritchard & Baker)
(FIG. 5)

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

Amblyseius (Proprioiseiopsis) sundi Mathysse & Denmark, 1984: 344.

FEMALE: Dorsal shield anteriorly straited 360 long, 250 wide. Measurements of dorsal setae: *j1* 35, *j346*, *j4*, *j5*, *j6*, *J2*, *J5*, *z2*, *z4*, *z5* 4-6, *Z4* 170, *ZS* 440, *s4* 132, *S2*, *S4*, *S5* 4-6, *r3*, *R1* 8, *JV5* 92. Setae *Z4*, *Z5* slightly serrated. peritreme fused anteriorly with dorsal shield and reaching level *j1*. Sternal shield smooth,

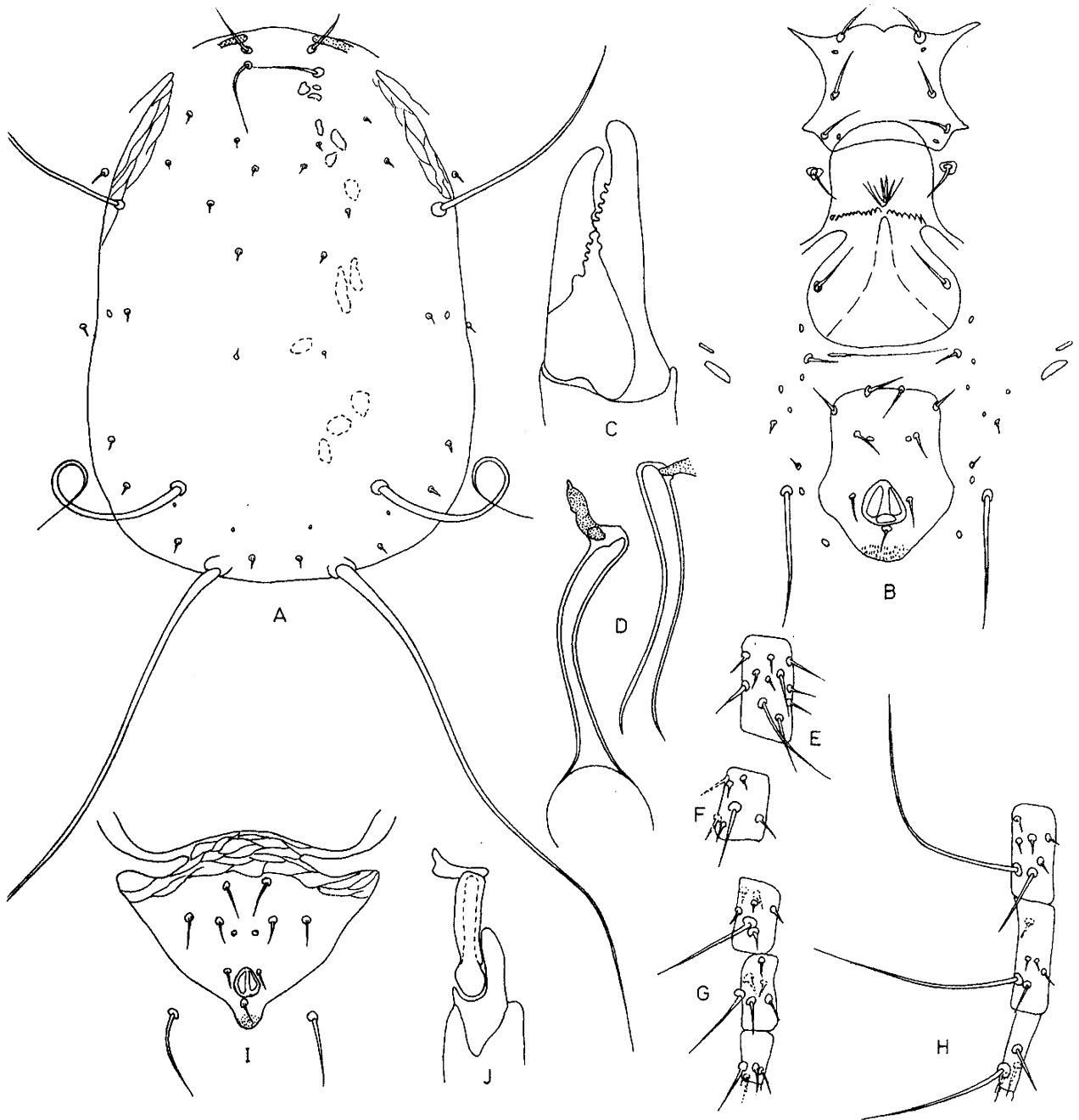


FIG. 5. — *Amblyseius sundi* (Pritchard and Baker), A. — Dorsal shield; B. — Ventral surface; C. — Chelicera; D. — Spermatheca; E. — Genu I; F. — Genu II; G. — Leg III; H. — Leg IV; I. — Male. Ventrianal shield; J. — Spermatodactyle.

posterior margin straight, distance between *St* I – *St* III 62, *St* II – *St* III 76, *St* IV on small platelets. Genital shield smooth 85 wide. Ventrianal shield longer than wide, 125 long, 78 wide and with a pair of crescentic preanal pores. Two pairs of metapodal platelets, 7 pairs of small, rounded platelets, a long thin sigillar sclerite and 4 pairs of setae surrounding ventrianal shield. Fixed digit of chelicera with 10 teeth, movable with 4 teeth. Spermatheca very long (48) with two parallel sides, enlarged atrium (4 long and 3–4 wide). Macrosetae pointed distally, *Sge* I 60, *Sge* II 46, *Sti* II 58; *Sge* III 72, *Sti* III 60, *Sge* IV 180, *Sti* IV 140, *St* IV 95. Chaetotaxy: genu II 1–2/1, 2/0 – 1, genu III 1–2/1, 2/0–1.

MALE: Chaetotaxy of dorsal shield as in female. Ventrianal shield anteriorly striated with 3 pairs of preanal setae arranged in pentagonal pattern, a pair of rounded preanal pores close to each other, 180 long, 110 wide. Spermadactyle L shape, shaft 17 long, foot 5 and heel 3.

The female holotype was collected from Leopoldville, Democratic Republic of Congo, April 10, 1955 (E. W. Baker). The male allotype and a female paratype were collected from a coffee farm, Taita Hills, Coast Province, Kenya, July 2006 (El-Banhawy). This species has also been collected from Benin, Burundi, Cameroon, Ghana, Ivory Coast, Kenya, Malawi, Mozambique, Rwanda, Sierra Leone, Uganda. This species belongs to *sundi* species group Denmark & Muma (CHANT & MCMURTRY, 1984).

Amblyseius italicus Chant
(FIG. 6)

FEMALE: Dorsal shield smooth with 7 pairs of pores, 420 long, 240 wide. Measurements of dorsal setae: *j*1 48, *j*3 54, *j*4 4, *j*5 12, *j*6 12, *J*2 12, *J*5 7, *z*2 26, *z*4 41, *z*5 5, *Z*1 9, *Z*4 173, *Z*5 290, *s*4 155, *S*2 12, *S*4 12, *S*5 12, *r*3 16, *R*1 8, *JV*5 103, *Z*5 slightly serrated. Peritreme fused anteriorly with dorsal shield and reaching level *j*1. Sternal shield smooth, distance between *St* I–*St* III 78, *St* II–*St* II 78, *St* IV on small platelets. Genital shield smooth, 96 wide. Ventrianal shield longer than wide 142 long, 95 wide with a pair of crescentic preanal pores. Two pairs of metapodal platelets, 5 pairs of small rounded platelets, 2 pairs of

thin sigillar sclerites and 4 pairs of setae surrounding ventrianal shield. Fixed digit of chelicera with 10 teeth, movable with 4 teeth. Spermatheca short (22 long), constricted midway between atrium and cervix and flared distally towards vesicle. Macrosetae pointed distally, *Sge* II 46; *Sge* III 62, *Sti* III 46, *Sge* IV 138, *Sti* IV 98, *St* IV 100. Chaetotaxy: genu II 1–2/1, 2/0–1, genu III 1–2/1, 2/0–1.

In the Kenyan specimen *ZV*2 is on the ventrianal shield, other diagnostic characters are identical with the holotype.

The female holotype was reported on beach leaves at the port of New York September, 1950 and described (CHANT, 1959). Other collection records include Algeria, ATHIAS–HENRIOT, 1966; Italy, IVANCICH–GAMBARO (1975), MCMURTRY, 1977. It has also been reported from a coffee farm in Taita Hills, Kenya, November 2005 (H. MUGO).

Euseius majengo El-Banhawy & Irungu n. sp.
(FIG. 7)

FEMALE: Dorsal shield smooth with 10 pairs of pores, 360 long, 230 wide. Measurements of dorsal setae: *j*1 28, *j*3 40, *j*4 25, *j*5 21, *j*6 23, *J*2 25, *J*5 7, *z*2 30, *z*4 44, *z*5 24, *Z*1 35, *Z*4 30, *Z*5 48, *s*4 46, *S*2 40, *S*4 40, *S*5 37, *r*3 32, *R*1 32, *JV*5 70. Peritreme fused anteriorly with dorsal shield and reaching level *z*2. Sternal shield smooth, posterior margin with medium lobe, distance between *St* I – *St* III 70, *St* II – *St* II 70, *St* IV free on integument. Genital shield smooth, 87 wide. Ventrianal shield much longer than wide, 120 long, 60 wide and with a pair of crescentic preanal pores. One pair of metapodal platelets a long thin sigillar sclerites and 4 pairs of setae surrounding ventrianal shield. Fixed digit of chelicera small with 4 apical teeth, movable with one tooth. Spermatheca long (50), atrium (10), cervix enlarged anteriorly (12) and with posterior filaments (36) branched distally. Macrosetae pointed distally on *Sge* II (30), *Sti* III (35) and enlarged on *Sge* III (35) *Sge* IV (60), *Sti* IV (50), *St* IV (60). Chaetotaxy: genu II 1–2/1, 2/0–1, genu III 1–2/1, 2/0–1.

The female holotype was collected from a coffee farm in Embu (UM2), Eastern Province, Aug. 2005 (EL BANHAWY). The male allotype is unknown.

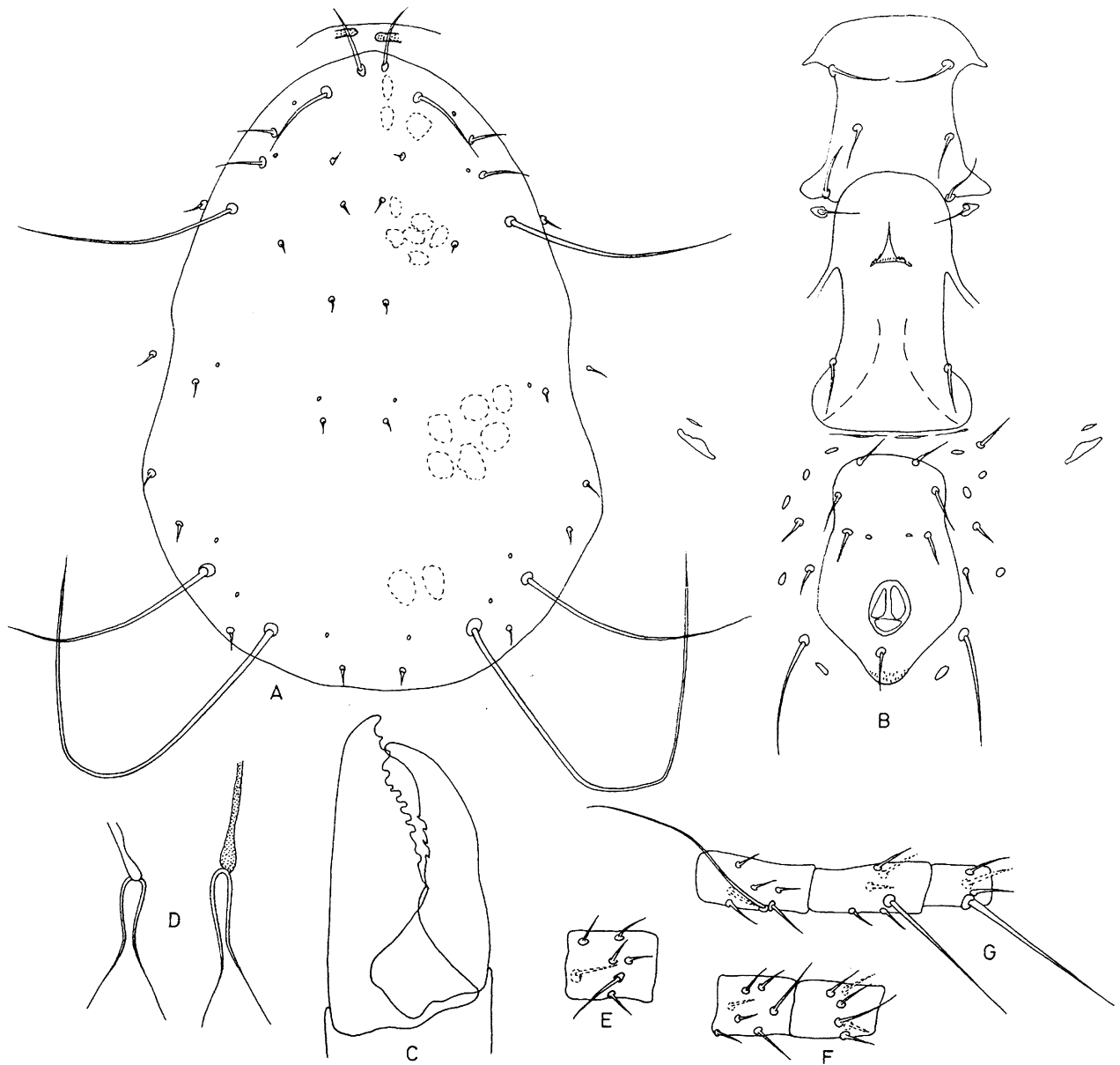


FIG. 6. — *Amblyseius italicus* Chant. A. — Dorsal shield; B. — Ventral surface; C. — Chelicerae; D. — Spermatheca; E. — Genu II, F. — Genu and Tibia III; G. — Leg IV.

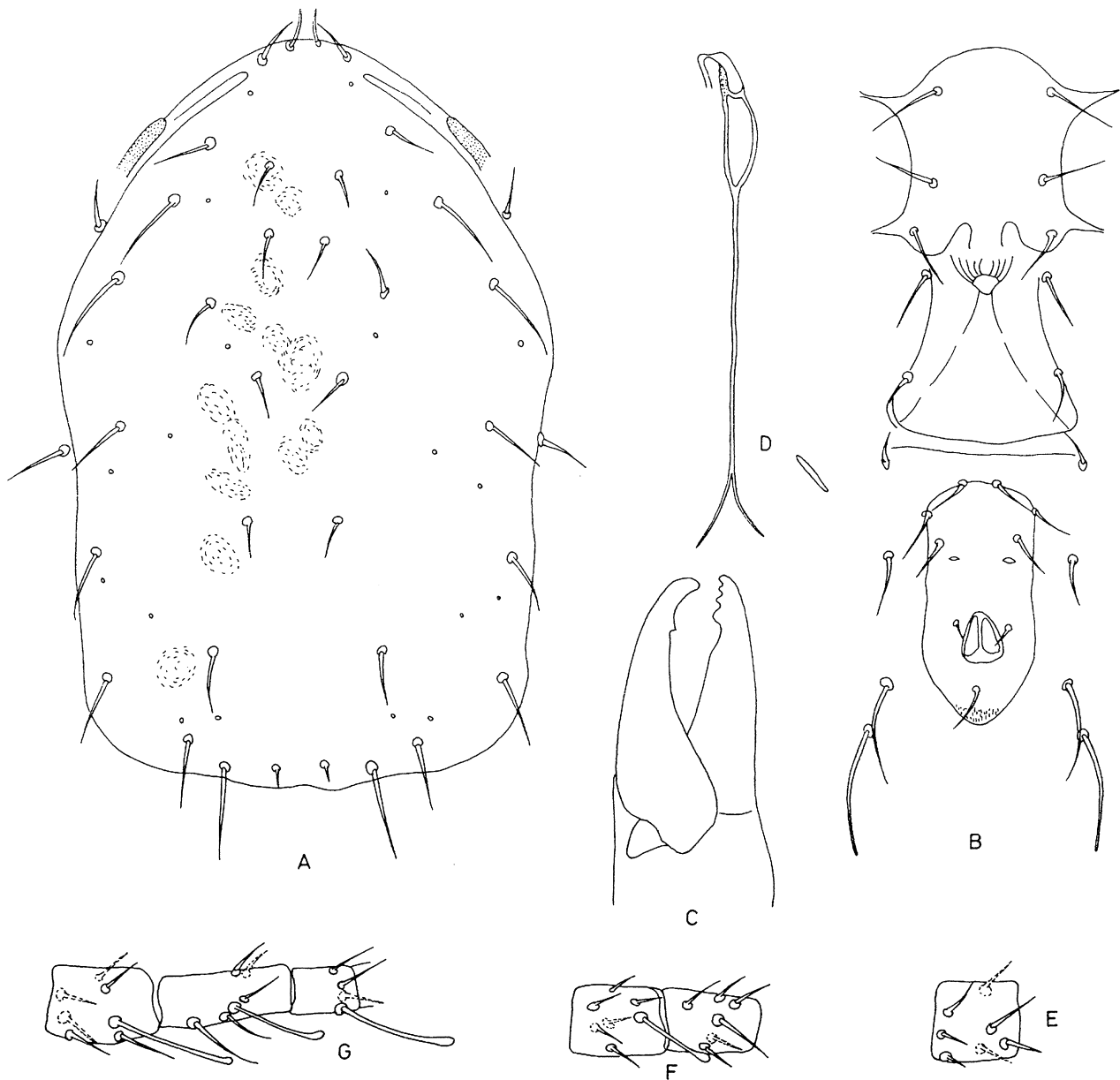


FIG. 7. — *Euseius majengo* El Bahawy & Irungu n. sp. A. — Dorsal shield; B. — Ventral surface; C. — Chelicera; D. — Spermatheca; E. — Genu II, F. — Genu and Tibia III; G. — Leg IV.

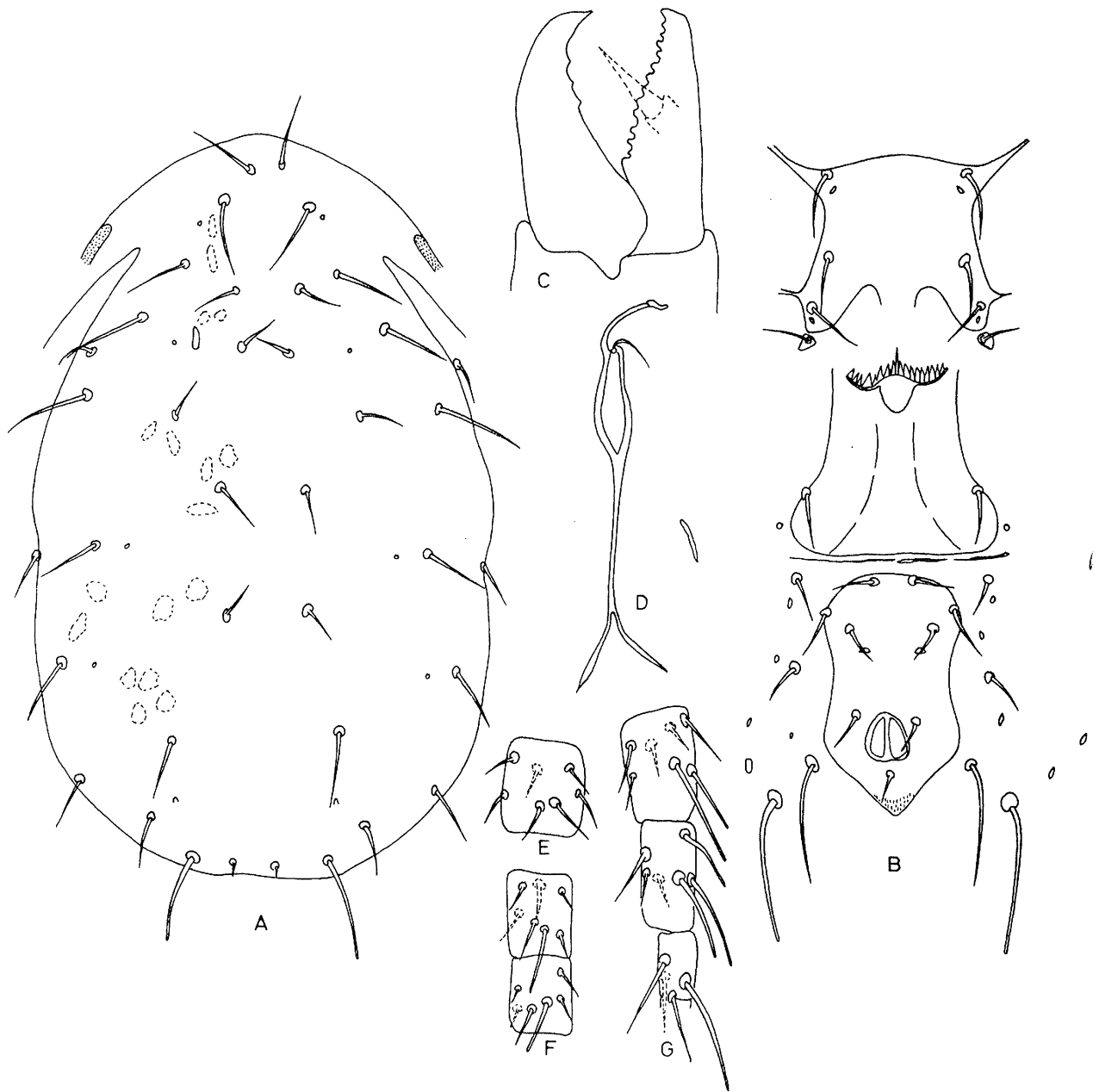


FIG. 8. — *Ueckermannseius lugula* El Bahawy & Irungu n. sp. A. — Dorsal shield; B. — Ventral surface; C. — Chelicera; D. — Spermatheca; E. — Genu II, F. — Genu and Tibia III. G. — Leg IV.

E. majengo is similar to *E. hima* (Pritchard & Baker) in the details of chelicerae and number of teeth on both digits, although spermatheca is different, dorsal setae are longer and macrosetae on leg IV, genu III with enlarged tip and on tibia III and genu II with sharp tip.

Ueckermannseius lugula El Banhawy & Irungu n. sp.
(FIG. 8)

FEMALE: dorsal shield smooth with 5 pairs of pores, 350 long, 180 wide. Measurements of dorsal setae: *j1* 32, *j3* 38, *j4* 25, *j5* 25, *j6* 28, *J2* 27, *J5* 5, *z2* 32, *z4*, 46, *z5* 27, *Z1* 32, *Z4* 35, *Z5* 58, *s4* 53, *S2* 32, *S4* 32, *S5* 32, *r3* 28, *R1* 23, *JV5* 80. *Z5*, *JV5* blunt distally. Peritreme fused anteriorly with dorsal shield and reaching level *z2*. Sternal shield smooth, posterior margin with medium lobe, distance between *St I–St III* 69, *St II–St II* 69, *St IV* on small platelets. Genital shield smooth 125 wide, ventrianal shield longer than wide, 115 long, 70 wide, with a pair of crescentic preanal pores. A pair of metapodal platelets, 5 pairs of small rounded platelets, 2 pairs of sigillar sclerites and 4 pairs of setae surrounding ventrianal shield. Fixed digit of chelicerae with 12 teeth, movable with 3 teeth. Spermatheca long 42, cervix enlarged anteriorly (14) and with posterior filament (28) branched distally. Macrosetae pointed distally on *Sge II* (32), blunt on *Sge III* (32), *Sti III* (32), *Sge IV* (58, 40), *Sti IV* (52, 51, 40), *St IV* (62). Chaetotaxy: genu II 1–2/1, 2/0–1, genu III 1–2/1, 2/0–1.

The female holotype was collected from a coffee farm in Nyeri, Central Province (UM2), June 2006 (H. MUGO). The male allotype is unknown.

The number of macrosetae (2 on genu IV, 3 on tibia IV, shape of macrosetae (blunt on leg III and IV) and the short pretreme differentiate this species from the related ones in the genus.

Transeius maragoli El Banhawy & Irungu n. sp.
(FIG. 9)

FEMALE: Dorsal shield smooth, with 8 pairs of pores, 318 long, 210 wide. Measurements of dorsal setae: *j1* 28, *j3* 30, *j4* 14, *j5* 9, *j6* 10, *J2* 10, *J5* 5, *z2* 14, *z4* 28, *z5* 10, *Z1* 9, *Z4* 70, *Z5* 102, *s4* 65, *S2* 32, *S4* 7, *S5* 7, *r3* 21, *R1* 9, *JV5* 48. Setae *Z4*, *Z5* serrated. Peri-

treme fused anteriorly with dorsal shield and reaching level *j1*. Sternal shield smooth, posterior margin straight, distance between *St I–St III* 62, *St II–St II* 55, *St IV* on small platelets. Genital shield smooth, 64 wide. Ventrianal shield 105 long, 75 wide, with a pairs of large preanal pores close to each other. Two pairs of metapodal platelets, a thin longitudinal sigillar sclerite and 4 pairs of setae surrounding ventrianal shield. Fixed digit of chelicerae with 8 teeth, movable with 3 teeth. Spermatheca short cup shaped 7 long, with enlarged atrium and long major duct. Macrosetae pointed distally, *Sge II* 20, *Sge III* 21, *Sge IV* 58, *Sti IV* 50, *St IV* 85. Chaetotaxy: genu II 1–2/1, 2/1, 1, genu III 1–2/1, 2/0–1.

The female holotype was collected from a coffee farm in Embu Eastern Province, Kenya (UM3), December 2006 (EL BANHAWY). The male allotype is unknown.

Tran. maragoli belongs to *ablosus* species group (CHANT & MCMURTRY) and is similar to *Tran. montorensis* Schicha (SCHICHA, 1987). The major difference is that *j3*, *s4*, *Z4* are shorter, the macrosetae on leg IV are longer and genu II with 8 setae.

Phytoseius kaimosi El Banhawy & Irungu n. sp.
(FIG. 10)

FEMALE: Dorsal shield smooth, 285 long, 120 wide, with 6 pairs of pores, a pair of notocephalic pores associated with *z5*, and with a lateral incision at the level of *r3*. measurements of dorsal setae: *j1* 24, *j3* 58, *j4*, *j5*, *j6*, *J2* 5–6, *J5* 10, *z2* 4, *z3* 23, *Z4*, *Z5*, 4 75, *Z5* 67, *s4* 97, *s6* 70, *r3* 40, *R16*, *JV5* 52. *s4*, *Z4*, *Z5* strongly serrated and arising from tubercles, *r3* serrated and on dorsal shield. Peritreme fused anteriorly with dorsal shield and reaching level *j1*. Sternal shield smooth, distance between *St I–St III* 58, *St II–St II* 64, *St IV* on small platelets. Genital shield 95 wide. Ventrianal shield two times longer than wide, 108 long, 46 wide with lateral tiny preanal pores mesad to *JV2*. A pair of metapodal platelets, a thin sigillar sclerite, 3 pairs of setae surrounding ventrianal shield. Fixed digit of chelicerae with 3 teeth, movable with 2 teeth. Spermatheca with enlarged atrium (4) and long slender cervix (22). Macrosetae blunt distally, *Sge IV* 28, *Sti IV* 36, *St IV* 42; on teletarsus 37. Chaetotaxy: genu II 1–2/1, 2/0–1, genu III 1–2/0.2/0–1.

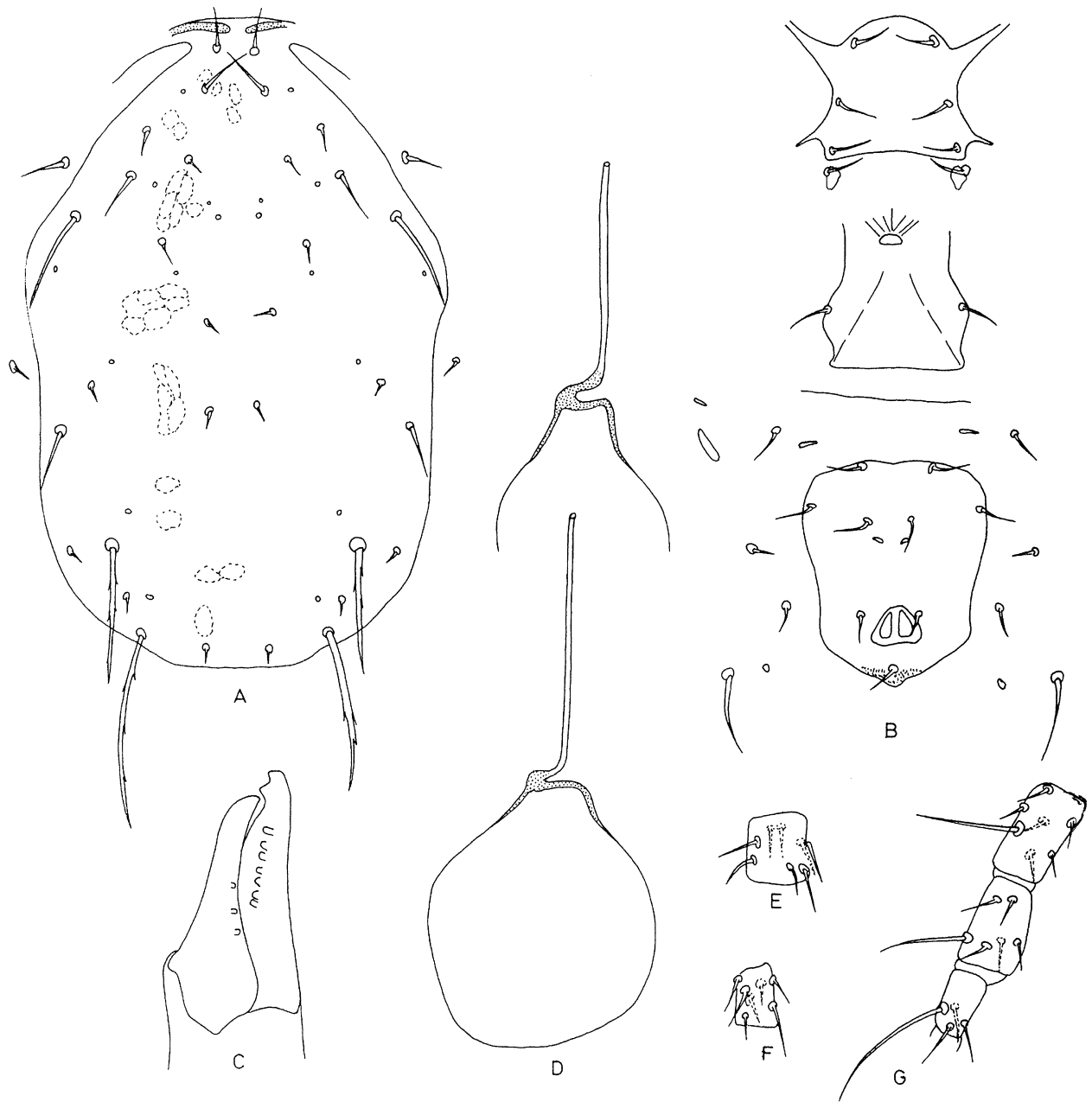


FIG. 9. — *Transeius maragoli* El Banhawy & Irungu n. sp.; A. — Dorsal shield; B. — Ventral surface; C. — Chelicera; D. — Spermatheca; E. — Genus II, F. — Genus III; G. — Leg IV.

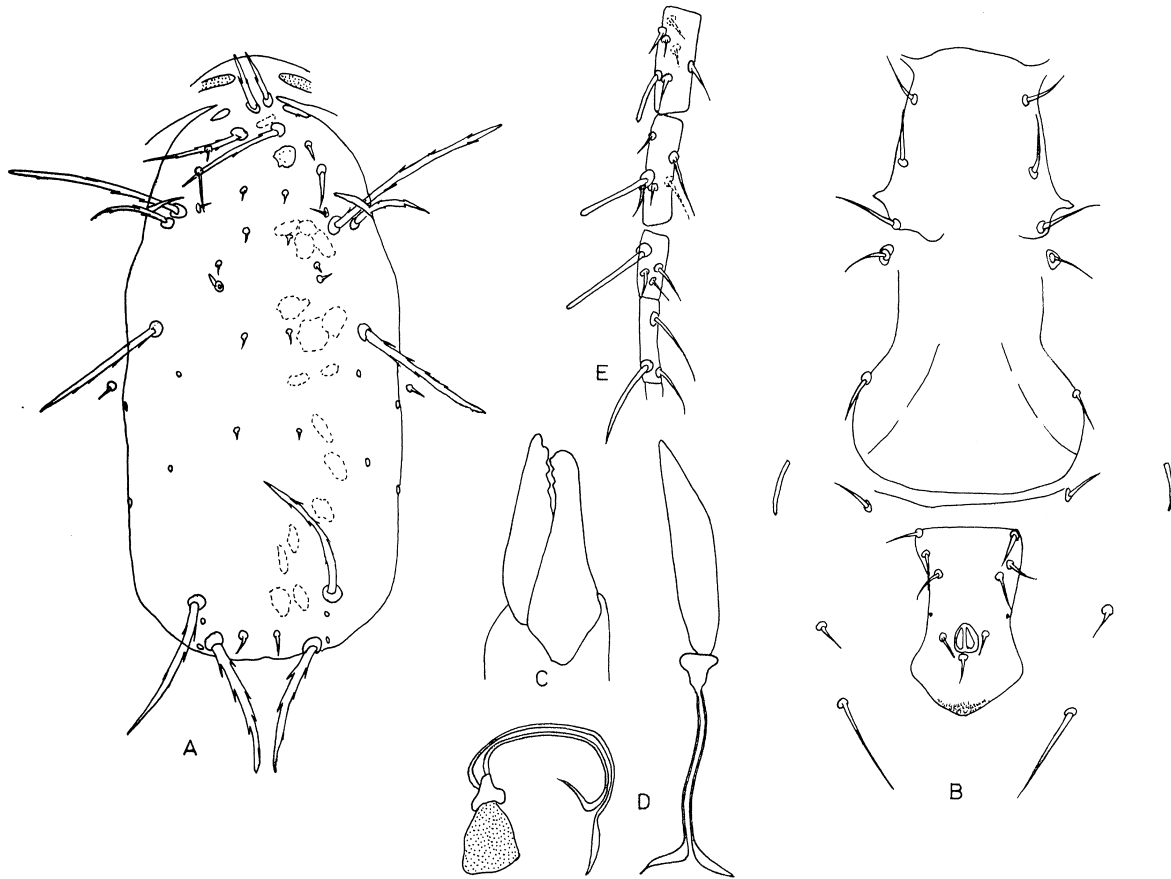


FIG. 10. — *Phytoseius kaimosi* El Banhawy & Irungu n. sp., A. — Dorsal shield B. — Ventral surface; C. — Chelicera; D. — Spermatheca, E. — Leg IV.

The female holotype was collected from a coffee farm in Embu, Eastern Province (UM3), December 2006 (EL BANHAWY). The male allotype is unknown. The presence of lateral incision on dorsal shield, very long cervix and long blunt macrosetae differentiate it from other related species.

Typhlodramus ruiru El Banhawy & Irungu n. sp.
(FIG. 11)

FEMALE: Dorsal shield reticulated, with 5 pairs of pores, 310 long, 175 wide. Measurements of dorsal setae: *j1* 20, *j3* 22, *j4* 17, *j5* 18, *j6* 18, *J2* 21, *J5* 9, *z2* 18, *z3* 20, *z4* 16, *z5* 18, *Z4* 25, *Z5* 35, *s4* 22, *s6* 23, *S2* 25, *S4* 40, *S5* 52, *r3* 18, *R1* 18, *JV5* 41. Peritreme fused anteriorly with dorsal shield and reaching level *j1*.

Sternal shield smooth, distance between *St* – *St* II 50, *St* II – *St* II 62, *St* III free on integument, *St* IV on small platelets. Genital shield smooth, 70 wide. Ventrianal shield as long as wide at level of *ZV2* (95), 70 wide at level of anus, with a pair of rounded preanal pores mesad to *JV2*. Two pairs of metapodal platelets, 7 pairs of small rounded platelets, and 4 pairs of setae surrounding ventrianal shield. Fixed digit of chelicera with 2 teeth, moveable with 2 teeth. Spermatheca short cup shaped, 3 long, 7 wide, atrium enlarged. Macrosetae enlarged distally, *Sge* IV 12, *Sti* IV 25, *St* IV 40. Chaetotaxy: genu II 1–2/1, 2/1–1, genu III, 1–2/1, 2/0–1.

The female holotype was collected from a coffee farm in Kirinyaga, Central province (UM3), December 2006 (EL BANHAWY). The male allotype is unknown.

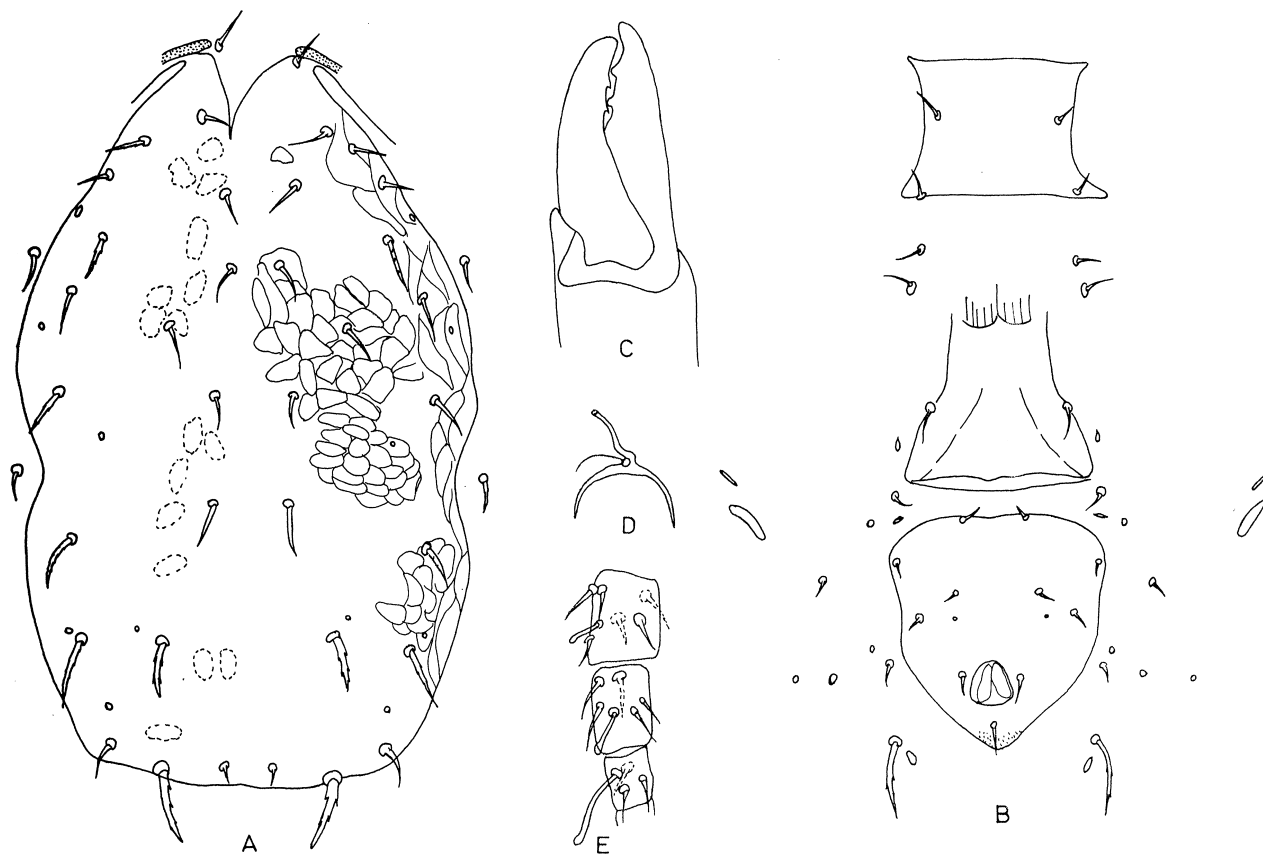


FIG. 11. — *Typhlodromus ruiro* El Banhawy & Irungu n. sp. A. — Dorsal shield; B. — Ventral surface; C. — Chelicera; D. — Spermatheca; E. — Leg IV.

T. ruiro is similar to *Tagyronamus* Ueckermann & Loots and *T. drymis* Ueckermann & Loots. The serrated dorsal setae and the short cup shaped spermatheca separate it from the former and shape of ventrianal shield, serrated dorsal setae and the shorter distally pointed tip Z5 separate it from the later.

DISCUSSION

In the present work the genera *Euseius* and *Typhlodromus* were common and widely distributed than other genera like *Transeius* Chant & McMurtry and *Typhlodromips* Deleon. Among the two common genera *Euseius* species were reported at higher numbers, while *Typhlodromus* species reported at low numbers. In general, increasing the diversity of natural enemies increase the pest stability and reduce the

possibility of outbreaks (ALTIERI & NICOLLS, 1999). Therefore, in coffee farms where phytoseiid species are abundant, chances of spider mites or thrips to reach damaging levels are minimum and reduce the need for insecticide applications.

Phytoseiids are sensitive to the majority of insecticides and continuous application of these chemicals greatly reduces population of predacious mites (McMURTRY *et al.*, 1970). However, in their absence the secondary pests are likely to increase (EL BANHAWY, 1997). In the commercial coffee farms under chemical control treatment, the abundance of predacious mites was negligible and incidence of secondary pest infestations were frequently observed. On the other hand, in small scale coffee farms, particularly in UMIII, predacious mites were more numerous and secondary pest infestations were not observed.

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