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DESCRIPTIONS OF FOUR NEW SPECIES OF PHYTOSEIID MITES (ACARI: MESOSTIGMATA) FROM WEST BENGAL, INDIA

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INTRODUCTION

The mites of the family Phytoseiidae have received worldwide attention because of their importance in biological control of not only mite pests but also of some of the soft-bodied insects attacking various crops. This is probably the most explored and exploited among all the predatory mites. In view of their importance, these mites have been explored from India and many new species have been described since 1960.

Gupta 1986, (2003), Moraes *et al.*, 2003, Chant and McMurtry 2007 listed most of the known India phytoseiid mites from India and recently, Gupta and Karmakar 2014-in press) updated the same. The four new species which are being described here will add to 207 species already listed in Gupta and Karmakar (2014-in press) raising the total species to 211 so far known from India. All the measurements given in the text are in microns. The entire collection was made by senior author and all the type materials are in the collection of AINP on Agricultural Acarology laboratory, Bidhan Chandra Krishi Viswavidyalaya, Kalyani-741235, to be deposited to the National Collection of Zoological Survey of India as well as National Bureau of Agriculturally Important Insect, Bangalore after acceptance of the paper.

Key words: Phytoseiidae, description, new species.

DESCRIPTIONS OF NEW SPECIES

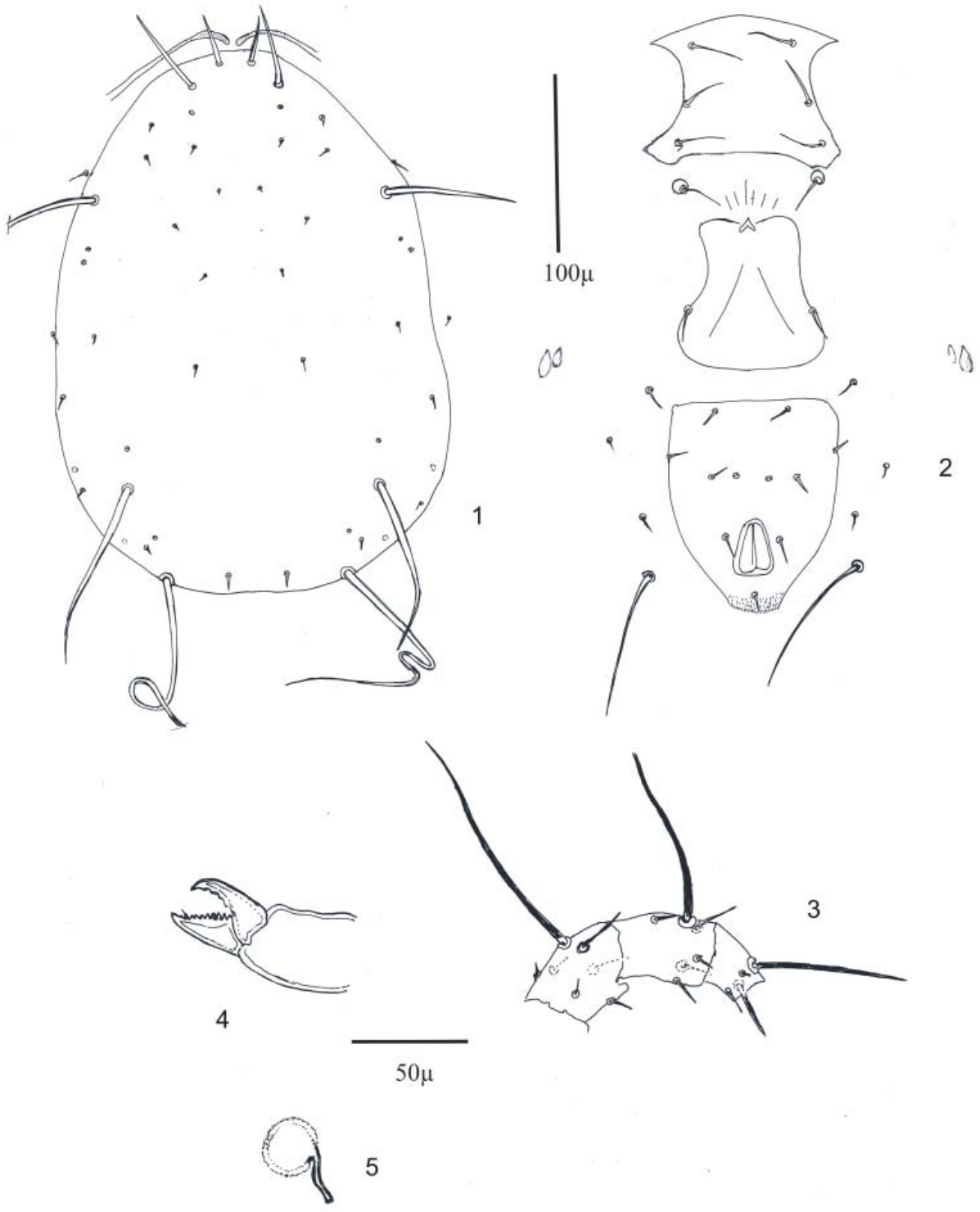
1. ***Amblyseius metaliensis*** sp. nov.

(Figs. 1–5, Plates-I)

Female: Dorsal shield ovoid, smooth, length 352 and width 251 (at the base of leg IV) with 17 pairs of setae and five pairs of pores, (Fig. 1, plate A). Seta j_3 longer than j_1 but shorter than s4, barring Z4 and Z5 all other setae are very short or minute, r_3 longer than R_1.

Measurements of setae: j_1 33, j_4, j_5, j_6, J_2, and J_5 almost equal, measuring 5–11, j_3 57, z_2 5, z_4 5, s_4 88, Z_1 6, S_2 9, S_4 6, S_5 6, Z_5 226 (setae characteristically looped), z_5 5, Z_4 127, r_3 14, R_1 6, last two on interscutal membrane. The setae on dorsal shield are smooth.

Ventrally (Fig. 2), sternal shield wider than long, 75 long and 79 width with three pairs of sternal setae, measuring ST_1, ST_2, ST_3 each measuring 34, metasternal plate absent, metasternal seta ST_4 34, present on interscutal membrane, genital shield 86 long and 79 wide with ST_5 measuring 34. A fold present between genital and ventrianal shields. Ventrianal shield much longer than wide 123 long and 94 wide, with three pairs of preanal setae in triangular line, measuring JV_1 14, JV_2 13, ZV_2 13, pair of paraanal a_1, a_2 and one postanal seta a_3 present each measuring 16,



Figs 1-5. *Amblyseius metaliensis* Karmakar & Gupta sp. nov., Female holotype, 1. Dorsal view of idiosoma, 2. Ventral view of idiosoma, 3. Genu, tibia and tarsus of leg IV, 4. Chelicera, 5. Spermatheca.

one pair of crescent shaped preanal pores present; setae around ventrianal shield measuring ZV_1 15, ZV_3 8, JV_4 8, JV_5 94; metapodal plate not discernible due to position of leg IV. Spermatheca with looped cervix, peritreme extend anteriorly beyond j_1 seta. Macroseta on leg IV genu 112, tibia 73 and besitarsus 75. The tip of the macroseta pointed. Fixed digit of chelicera with two apical teeth followed by 10 sharp teeth, pilus dentilis not discernible, movable digit with four teeth placed medially. Leg chaetotactic formula genu II-2 2/0, 2/0-1, genu III 2 2/1, 2/1 1, tibia III 1 1/1, 2/1 1.

Male: Unknown.

Collection record–Holotype (female) – India, West Bengal, District Jalpiguri, Metali tea garden, on tea (*Thea chinensis* L.) (coll. K. Karmakar) in association with tea red spider mite, *Oligonychus coffeae* (Nietner) 7 May 2009 (Acc. No. AINP/ Acar. Lab./BCKV/5138/2009, deposited in the collection of AINP, Acarology Laboratory, BCKV.

Etymology: The species was named after the type locality- Metali Tea Garden, Jalpiguri.

Remarks: Because of having tubular looped cervix in this new species it is very close to *Ablyseius paraarealis* but differs in dentition pattern of chelicerae, in leg chaetotactic formula where genu III 1 2/0 2/1 1 in *A. paraarealis* Muma (1967) whereas in this new species it is 2 2/1, 2/1 1. Metapodal plate clearly discernible in case of *A. paraarealis* but not discernible in this new species.

2. ***Euseius sativum*** sp. nov.

(Figs. 6-9, Plates-II)

Female: Dorsal shield highly reticulated and fish-scale-like, (Fig. 6, Plate C), 355 long, 267 wide, with 17 pairs of setae and five pairs of pores. Seta j_1 and j_3 almost of same length. j_3 slighly longer than j_1, j_3 slightly longer or of same length as that of s_4, but longer than z_2 and z_4 which are equal, Z_1 shorter than S_2 and S_4, the later two are of almost the same length, S_5 longer than S_2 and S_4, Z_4 longer than Z_1 but shorter than S_2 and S_4, Z_5 being the longest seta and gently barbed, r3, and R_1 are almost of same length.

Measurements of setae: j_1 33, j_4, j_5, j_6, 13–14 each J_2 20, J_5 6, j_3 36, z_2 24, z_4 28, s_4 39, Z_1 20, S_2 28, S_4 31, S_5 38, Z_5 68, z_5 16, Z_4 27, r_3 20, R_1 22, both on interscutal membrane on the right hand side but on the left r_3 appears to be on dorsal shield. All the setae on dorsal shield smooth, but s_4, S_4, S_5, and Z_5 weakly serrated.

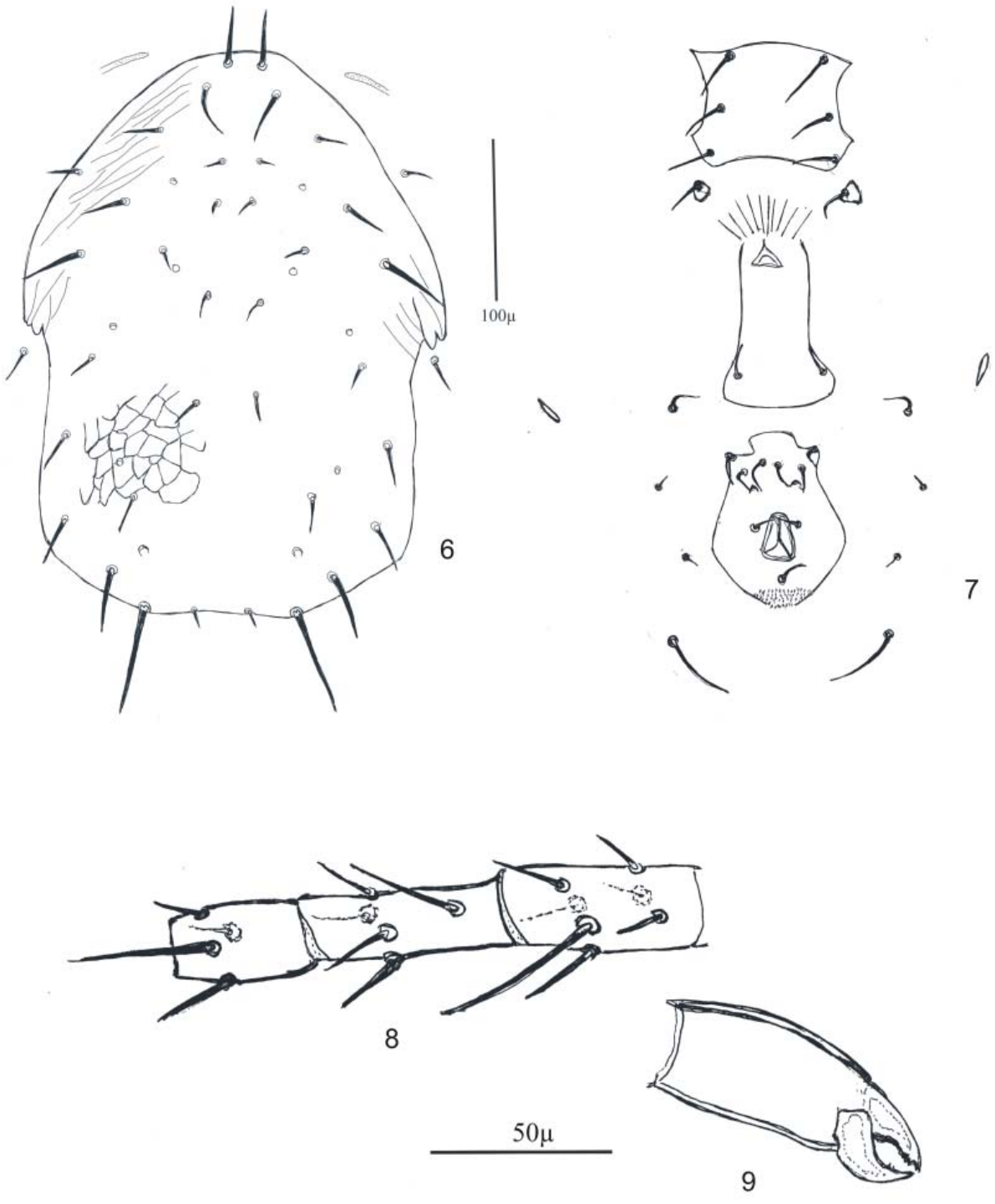
Ventrally (Fig. 7, Plate D), sternal shield with three pairs of sternal setae, measuring ST_1-35, ST_2-31, ST_3-31, metasternal plate absent, metasternal seta (ST_4) present on interscutal membrane, measuring 25, genital shield wide with ST_5 measuring 24. Ventrianal shield characteristically shaped, 111 long 84 wide, with three pairs of preanal setae almost in transverse line, measuring JV_1 22, JV_2 22, ZV_2 20, pair of paraanal setae a_1 14, a_2 14 and one post anal seta a_3 15 also present, one pair of crescent-shaped preanal pores present; setae around ventrianal shield measure ZV_1 27, ZV_3 11, JV_4 9, JV_5 39. Metapodal plate one pair, measuring 30, peritreme extends anteriorly and ends before the base of seta j_3. Macro setae on genu, tibia and tarsus of leg IV (Fig. 8) genu 46, tibia 36, and besitarsus 57. The tip of the macro setae gently spatulate. Chelicerae (Fig. 9, Plate F) fixed digit with two teeth, *pilus dentilis* not discernable, moveable digit with a tiny tooth. Leg chaetotactic formula genu II-2 2/0, 2/0-1, tibia II 1 1/1, 2/1 1, genu III 1 2/1, 2/1 1, tibia III 1 1/1, 2/1 1.

Male: Unknown.

Collection record–Holotype (female) – India, West Bengal, District Nadia, Kalyani, District Seed Farm of Bidhan Chandra Krishi Viswavidyalaya, on garlic, (*Allium sativum* L.) in association with *Aceria tulipae* (Keifer) which was found severely infested, 22 February 2011 (coll. K. Karmakar), deposited in the collection of AINP, (Acc. No. AINP/Acar. Lab./BCKV/5116/2011.

Etymology: The species was named after the name of the host plant on which it was collected.

Remarks: This species is very close to *Euseius ahaioensis* (Gupta, 1992), described from West Bengal, in having tubular spermathecae but it differs in having deeply indented anterior margins



Figs 6-9. *Euseius sativum* Karmakar & Gupta sp. nov., Female holotype, 6. Dorsal view of idiosoma, 7. Ventral view of idiosoma, 8. Genu, tibia and tarsus of leg IV, 9. Chelicera.

of ventrianal shield, Z_4 much longer than that in *E. ahaioensis* and in dentition pattern of chelicerae as this new species has two teeth on fixed digit and one minute tooth on movable digit whereas, in *E. ahaioensis* there are three teeth on the fixed digit and two teeth on the movable digit, in addition the macrosetae on genu and tibia IV, which are almost of same length in *E. ahaioensis* and in the new species the macrosetae on genu IV are much longer than that of tibia IV. This new species is also close to *E. alstoniae* (Gupta, 1975) but differs in spermathecal character and in the shape of ventrianal shield.

3. ***Euseius vikrami*** sp. nov.

(Figs. 10–14, Plates-III)

Female: Dorsal shield (Fig. 10, Plate G) 369 long and 267 wide, narrow anterior lateral region with longitudinal striation but absent dorsocentrally and posterolaterally, with five pairs of pores and 17 pairs of setae, all short or minute except j_1 and Z_5, which are the only long and stout setae.

Measurements of setae: j_1 41, j_4, j_5, j_6, J_2, J_5 8–11each j_3 17, z_2 13, z_4 13, s_4 15, Z_1 9, S_2 11, S_4 12, S_5 11, Z_5 55, z_5 7, Z_4 13, r_3 11, R_1 11, the last two on lateral interscutal membrane. The setae on dorsal shield smooth, Z_5 thick and weakly barbed.

Ventrally (Fig. 11, Plate H) sternal shield barely visible with three pairs of setae, measuring ST_1 33, ST_2 31, ST_3 32, metasternal plate absent, setae present on interscutal membrane measuring ST_4 25, genital shield present with one pair of setae measuring ST_5 25. The region between ventrianal and genital shields transversely striated and region lateral to that longitudinally striated. Ventrianal shield characteristically shaped having a depression at the anterior margin with three pairs of preanal setae measuring JV_1 35, JV_2 28, ZV_2 24 and with a pair of typical ellipsoidal preanal pores. Spermatheca minute, barely visible as figured (Fig. 14). Anal and postanal setae present as usual, measuring a_1 13, a_2 13, and a_3 17, four pairs of setae present around the ventrianal shield measuring ZV_1 24, ZV_3 16, JV_4 11, and JV_5 39. Metapodal plate one pair measuring 25.

Macrosetae on leg IV (Fig. 12) genu 41, tibia 44, and basitarsus 58, with tip spatulate. Leg chaetotactic formula, genu II 2, 2/0,2/0,1, tibia II 1,2/0,2/1,1, genu III 1,1/1,2/1 1, tibia III 1, 2/1, 1/1, 1. Chelicerae (Fig. 13) with two sharp teeth placed anteriorly on fixed digit, movable digit with one short tooth, peritreme extends anteriorly and terminate between z_2 and j_3 setae.

Male: Unknown.

Collection record–Holotype (female) – India, West Bengal, District Nadia Kalyani, District Seed Farm of Bidhan Chandra Krishi Viswavidyalaya, on Jute (*Chorchorus olitorius* L.) in association with jute yellow mite, *Polyphagotarsonemus latus* (Banks) (coll. K. Karmakar), 3 August 2010, deposited in the collection of AINP, (Acc. No. AINP/Acar. Lab./BCKV/5120/2010.

Etymology: The species was named honouring Dr. Vikram Prasad, recognizing his outstanding contribution in the field of world Acarology.

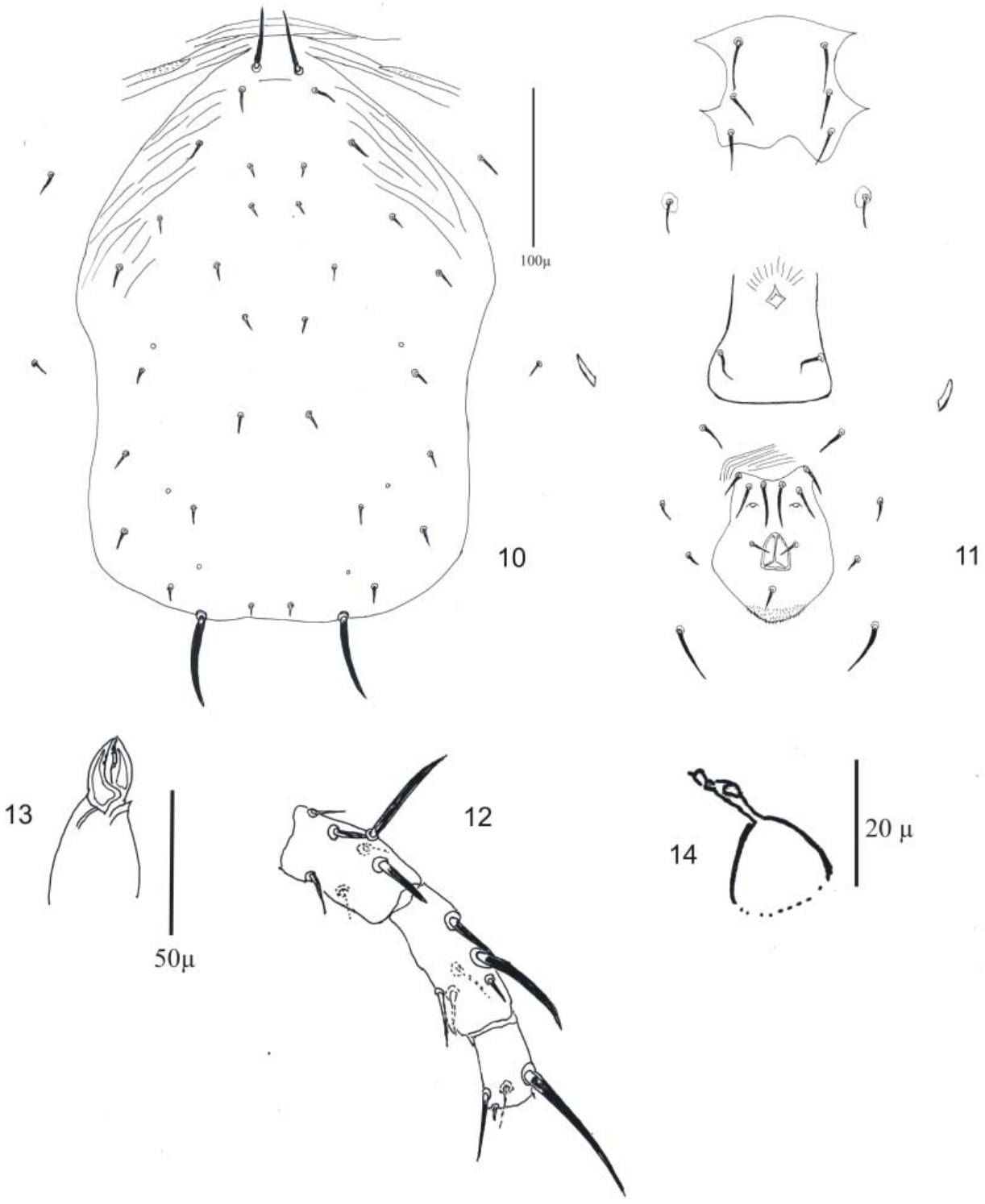
Remarks: This new species is close to *Euseius macrospatulatus* (Gupta, 1986) as well as *E. ovalis* (Evans, 1953). But from the former it differs in lacking spatulate macrosetae on leg IV and from the latter in having a difference in the leg chaetotactic formula. It differs from both species in having a ventrianal shield, the anterior margin of which is deeply depressed, and that is not found anywhere else.

5. ***Neoseiulus pranadae*** sp. nov.

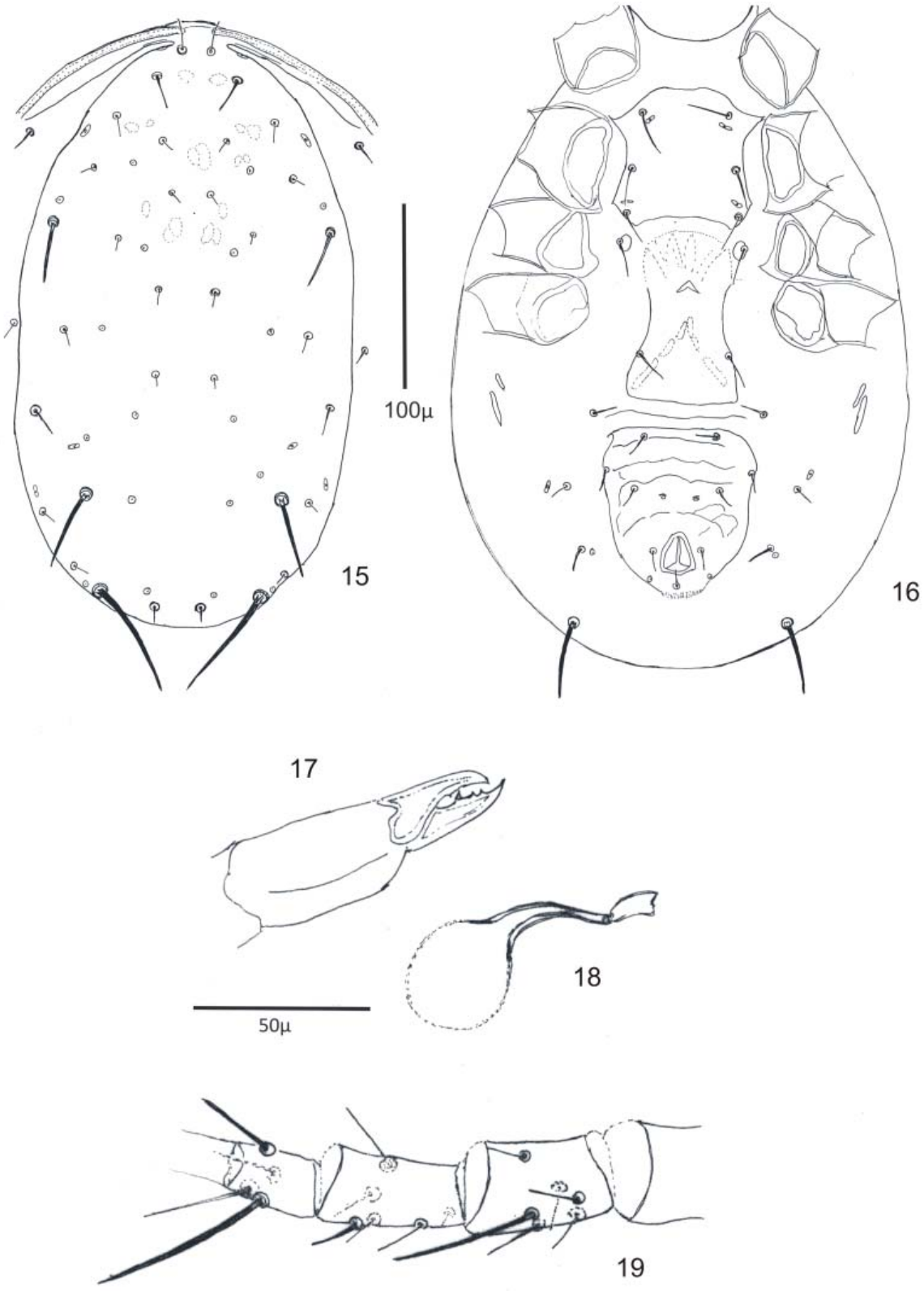
(Figs. 15–19, Plates-IV)

Female: Dorsal shield length 342 and width 184 smooth with 17 pairs of setae, three pairs of pores and two pairs of lyrifissures on propodosoma and opisthosoma with six pairs of pores and two pairs of lyrifisuures (Fig. 15, Plate I). Seta j_1 and j_3 almost of same length 20–22. j_1 slighly longer than j_3, s_4, longer than z_2 and z_4, the latter two being equal, Z_1 shorter than S_2 and S_4, S_5 shorter than S_2 and S_4, Z_4 shorter than Z_5, does not reach the base of Z_5, Z_5 being the longest seta, r_3 longer than R_1.

Measurements of setae: j_1 22, j_4, j_5, j_6, J_2, J_5



Figs 10-14. *Euseius vikrami* Karmakar & Gupta sp. nov., female holotype, 10. Dorsal view of idiosoma, 11. Ventral view of idiosoma, 12. Genu, tibia and tarsus of leg IV, 13. Chelicera, 14. Spermatheca.



Figs 15-19. *Neoseiulus pranadae* Karmakar & Gupta sp. nov., female holotype, 15. Dorsal view of idiosoma, 16. Ventral view of idiosoma, 17. Chelicera, 18. Spermatheca, 19. Genu, tibia and tarsus of leg IV.

8–11each j_3 20, z_2 16, z_4 16, s_4 38, Z_1 10, S_2 19, S_4 13, S_5 11, Z_5 47, z_5 9, Z_4 41, r_3 20, R_1 16, the latter two on interscutal membrane. Most of the setae on dorsal shield smooth only s_4, Z_4, and Z_5 gently barbed.

Ventrally sternal shield (Fig. 16, Plate J) with three pairs of sternal setae, measuring ST_1-27, ST_2-27, ST_3-24, with three pairs of pores and three pairs of lyrifissures, metasternal plate present oblong, metasternal setae ST_4 present on outer margin of metasternal plate, measuring 24, genital shield width 69 with ST_5 measuring 13. Ventrianal shield typically shield-shaped, transversely striated 110 long 90 wide with three pairs of preanal setae, measuring JV_1 20, JV_2 17, ZV_2 24, pair of paraanal a_1 25, a_2 25 and one postanal seta a_3 31 present, one pair of ellipsoidal preanal pores present; setae around ventrianal shield measure ZV_1 25, ZV_3 13, JV_4 11, JV_5 49. Metapodal plate two pairs, primary one measuring 24 and secondary 8. Spermatheca (Fig. 18, Plate L) with inflated major duct followed by horn-like cervix, peritreme extends anteriorly beyond j_1 setae. Macrosetae on leg IV (Fig. 19, Plate K) genu 52, tibia 25, and besitarsus 53. The tip of the macrosetae pointed. Chelicerae (Fig. 17) fixed digit with two large teeth apically followed by two small teeth and *pilus dentilis*, movable digit with one sharp tooth. Leg chaetotactic formula genu II-2 2/0, 2/0-1, tibia II 1 1/1, 2/1 1, genu III 1 2/1, 2/1 1, tibia III 1 1/1, 2/1 1.

Male: Unknown.

Collection records–Holotype (female)– India, West Bengal, District Nadia, Kalyani, on Rice (*Oryza sativa* L.) in association with rice sheath mite, *Steneotarsonemus spinki* Smiley 13 September 2011, (coll. K. Karmakar), deposited in the collection of AINP, (Acc. No. AINP/Acar. Lab./BCKV/5118/2011.

Paratypes (two females) : West Bengal, District Nadia, Kalyani, District Seed Farm of Bidhan Chandra Krishi Viswavidyalaya, one each on Jute (*Chorchorus olitorius* L.) (Acc. No. AINP/Acar. Lab./BCKV/5115/1/2011, 13 September 2011, and bean (*Phaseolus mungo* L.) in association with jute yellow mite, *Polyphagotarsonemus latus* (Banks), 24 April 2010, (coll. K. Karmakar): (Acc. No. AINP/Acar. Lab./BCKV/5115/2/2011., deposited in the collection of AINP, Acarology Laboratory, BCKV. **1 female:** District Murshidabad, Dhananjoypur, on garlic in association with *Aceria tulipae* (Keifer) (Acc. No. AINP/Acar. Lab./ BCKV/5115/3/2012, 25-02-2012.

Etymology: The species was dedicated in memory of the late mother of one of the authors (K. Karmakar).

Remarks: This new species is very close to *Neoseiulus cynodonae* (Gupta, 1977) but differs in having a narrower horn-like cervix on spermatheca rather than a wide funnel-shaped cervix as in *N. cynodonae*, Macrosetae on basitarsus IV little less than one and half times that on genu IV in case of *N. cynodonae* whereas, in new species the macrosetae on genu IV and basitarsus IV almost equal or the former is slightly shorter than that on basitarsus IV and in chaetotactic formula of genu III where it is 1 2/1 2/0 1 but in case of new species it is 1 2/1, 2/1 1.

SUMMARY

This paper provides description of four new species, one each under *Amblyseius* and *Neoseiulus* and two under *Euseius* from West Bengal, India.

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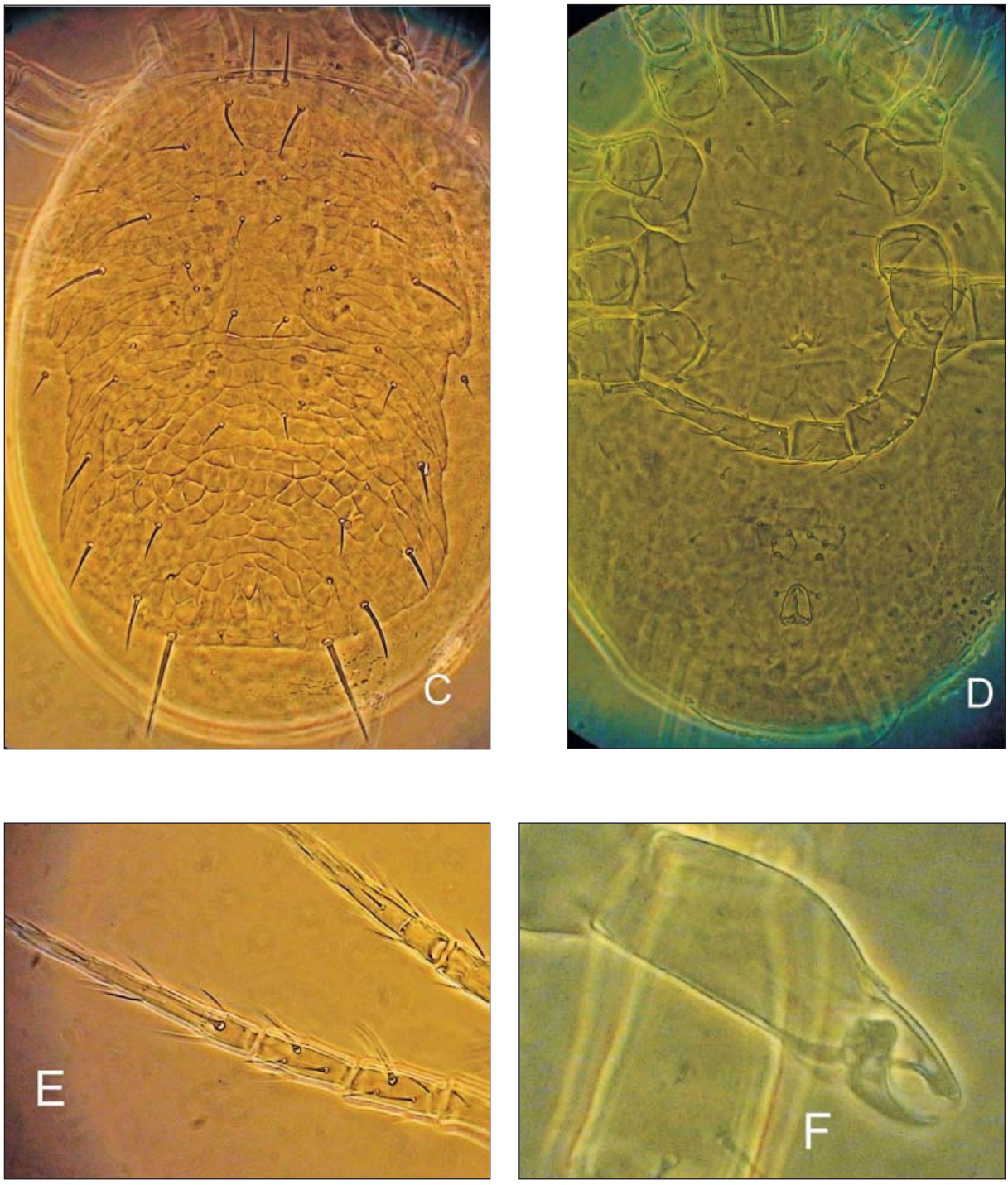
PLATE-I

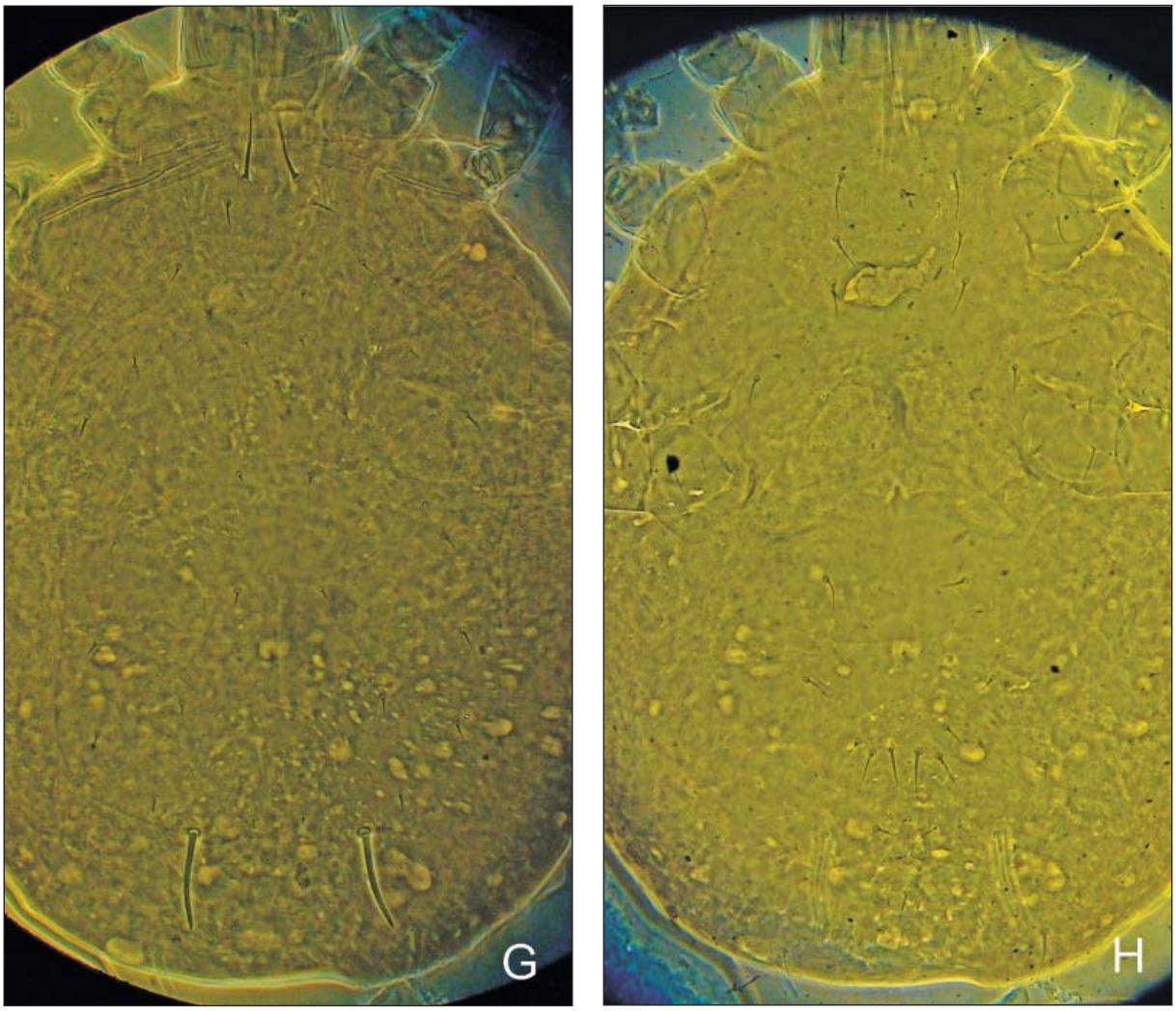
Amblyseius metaliensis Karmakar & Gupta sp. nov., female holotype, A. Dorsal view, B. Chelicera

PLATE-II



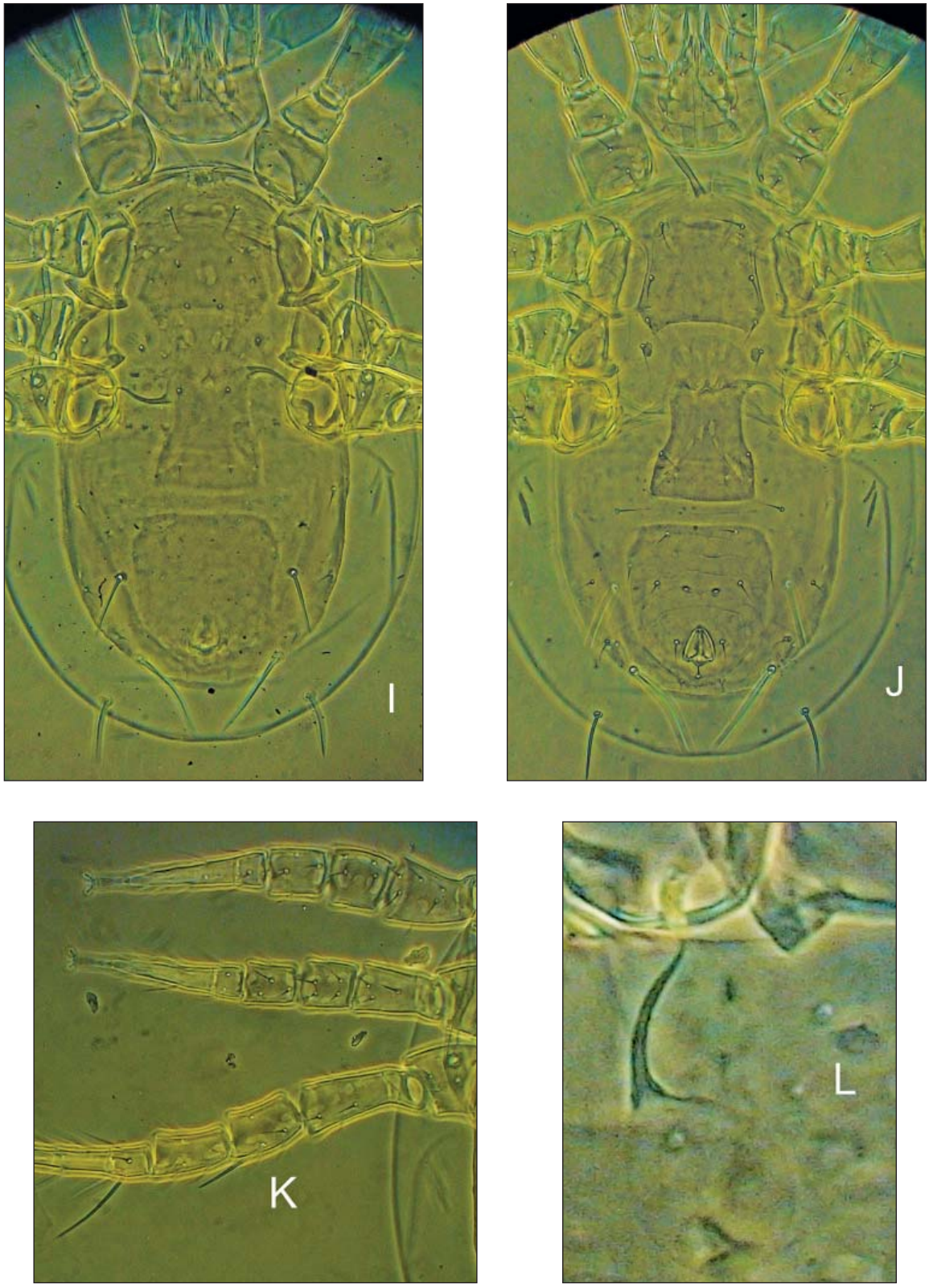
Euseius sativum Karmakar & Gupta sp. nov., female holotype, C. Dorsal view, D. Ventral view, E. Genu, tibia and tarsus of leg IV, F. Chelicera

PLATE-III



Euseius vikrami Karmakar & Gupta sp. nov., female holotype, G. Dorsal view, H. Ventral view.

PLATE-IV



Neoseiulus pranadae Karmakar & Gupta sp. nov., female holotype, I. Dorsal view, J. Ventral view, K. Leg II, III and IV, L. Spermatheca