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THREE NEW SPECIES OF ERIOPHYID MITES (ACARI: ERIOPHYOIDEA) FROM MALDA DISTRICT, WEST BENGAL, INDIA

BY S. CHAKRABARTI¹, S. SARKAR¹ & R.K. PANDIT²

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Summary: Three new eriophyid mites were collected from Malda district of West Bengal and described adequately. These species are Phyllocoptes anisomelisis sp. nov. infesting Anisomelis indica, Calacarus vasicae sp. nov. infesting Adhatoda vasica and Diptilomiopus anthocephali sp. nov. infesting Anthocephalus chinensis. Relationships of new species with other species are also provided.

Introduction

During the surveys for eriophyid mites in Malda district of West Bengal, India three new species were collected and described here. All measurements are expressed in micrometers (μm). In the text, measurements of the holotype are followed by the range of measurements of the paratypes in the parentheses. All slides bearing the type material are deposited in the collection of laboratory in the Biosystematics Research Unit, Department of Zoology, University of Kalyani, Kalyani 741235, India.

Phyllocoptes anisomelisis sp. nov.
(Figs. 1-8)

Female: Body 195.9 (167.9-195.9) long, 63.4 (63.4-66.2) wide, vermiform, light orange in colour. Gnathosoma 22.4 (22.4-23.3) long, pointing downward with basal pedipalp genual seta of 2.8 (2.8-3.7) long; prodorsal shield subtriangular with pattern of wavy lines; median line sinuate extends from rear margin up to middle of the shield; admedian lines complete but discontinuous and divergent at the rear margin forming two posterior cells with median line, among 4 submedian lines two antero lateral run diagonally and meet admedian line; third submedian lines on each lateral half running diagonally and join each other at the middle bisecting admedian line to form a semi-lunar curve; fourth submedian lines originating from rear margin run upward and touch admedian just below the semi-lunar curve; two dorsal tubercles at the rear shield margin lie 29.8 (28.9-29.8) apart; scapular seta 12.1 (9.3-12.1) long pointing divergently backward. Leg I from base of trochanter 28.9 (27.9-28.9) long; femur 11.1 (10.9-11.1) long; basiventral femoral seta 10.2 (9.1-10.2) long; genu 4.6 (4.6-5.1) long; antaxial genual seta 21.4 (19.5-21.4) long; tibia 5.5 (5.5-6.0) long; paraxial tibial seta 2.7 (2.7-3.2) long; tarsus 6.5 (6.0-6.5) long; paraxial and antaxial fastigial tarsal setae of equal length, 20.5 (19.5) long; tarsal solenidion knobbed, curved and 8.3 (8.3-8.8) long; tarsal empodium 5-rayed and 6.5 (6.0-6.5) long, two paraxial unguinal tarsal setae of 4.6 (4.1-4.6) long. Leg II 27.9 (26.1-27.9) long, femur 13.0 (12.5-13.0) long; basiventral femoral seta 10.2 (9.7-10.2) long; genu 4.6 (4.1-4.6) long; antaxial

¹. Biosystematics Research Unit, Department of Zoology, University of Kalyani, Kalyani 741235, India. Email: chakrabarti32b@gmail.com
². Department of Zoology, Mahadevananda Mahavidyalaya, Kolkata - 700120 India.


genual seta 7.4 (6.5-7.4) long; tibia 4.6 (4.1-4.6) long without seta; tarsus 5.5 (5.5-6.0) long; paraxial fastigial tarsal seta 14.9 (12.5-14.9) long; antaxial tarsal seta 4.1 (4.1-4.6) long; tarsal solenidion curved, knobbed and 8.3 (8.3-8.8) long; 5-rayed empodium 6.5 long; paraxial unguinal tarsal seta 3.7 long. Coxa I smooth, fused at mid ventral line; coxa II ornamented with fine wavy lines; *1b* tubercles with seta set at the ahead of coxal plate I approximation; *1a* tubercles with seta placed well ahead of the line between *2a* tubercles with seta; *seta 1b* 5.5 (5.1-5.5); *seta 1a* 14.9 (14.4-14.9) long and *seta 2a* 41.0 (40.1-41.0) long. Opisthosoma with 37 (37-46) smooth dorsal annuli, 57 (57-69) micro tuberculated ventral annuli; micrtubercles rounded and on anterior margin of annuli; last 6-7 annuli show ridge-like micrtubercles; *seta c2* 18.6 (18.6-20.5) long on anulus 25 (23-25); *seta d* 50.3 (47.5-50.3) on ventral anulus 11 (10-12); *seta e* 18.6 (15.8-18.6) on ventral anulus 43 (41-45); *seta f* 24.2 (20.5-24.2) on ventral anulus 65 (63-68); *seta h1* 3.7 (3.2-3.7) long; *seta h2* 48.5 (48.5-53.1) long. Genitalia subtriangular with rounded corner and broad base, 12.1 (11.1-12.1) long, 20.5 (20.5-20.9) wide; epigynium shows 10 longitudinal scorings forming a spindle-like figure with wide equatorial region and two narrow polar regions; 5-6 wavy parallel lines run transversely along the anterior half of the genital cover flap. *Seta 3a* 17.7 (15.8-17.7) long.

**Male:** Not observed.

**Holotype:** Female (marked) on slide (no. 1269/51/2006), India: West Bengal: Malda, Englishbazar, 9. x. 2006 from *Anisomelis indica* (Labiatae), Coll.
S. SARKAR. Paratypes: 5 females on slide bearing holotype and 7 females on 2 slides (nos. 1270-1271/51/2006); collection data same as in holotype.

RELATION TO HOST: Mites are vagrants on under surface of leaf showing no apparent damage symptom.

REMARKS: So far, 160 species under the genus Phyllocoptes including 8 species from India (AMRINE Jr. et al 1994) are known. The new species Phyllocoptes anisomelisis sp. nov. comes close to P. abaenus Keifer (1940) and P. indicae Mohanasundaram (1981) by its similar type of shield structure, dorsal annuli without microtubercles and ventral annuli with microtubercles on anterior ring margin. However, the new species is distinct from P. abaenus in having 5-rayed tarsal empodium, smooth coxal plate I and divergently backward direction of prodorsal shield setae (centrad in P. abaenus) and from P. indicae in having knobbed tarsal solenidion and ornamented epigynum. In addition, dorsal annuli of new species is smooth while that of P. indicae having wavy dorsal annuli.

Calacarus vasicae sp nov.
(Figs. 9-16)

FEMALE: Body 151.1 (151.1-168.8) long, 62.2 (62.2-71.8) wide, fusiform, white, with ridges and furrows and has waxy layer. Gnathosoma 27.9 (27.9-33.5)
long, curved downward, large dorsal pedipalp genual seta and basal seta present. Dorsal pedipalp genual seta 9.3 (9.3-10.2) long; prodorsal shield 44.7 (44.7-48.5) long, 62.5 (62.5-64.3) wide, rectangular oval in shape; prodorsal shield design represents network of cells. Median line is faint, admedian line bifurcates posteriorly forming two cells, prodorsal shield contain 10 anterolateral cells, 5 in each half of pro-dorsal shield, prodorsal shield lobe present. Dorsal tubercles ahead of rear shield margin, 17.7 apart; scapular seta absent. Leg I from base of trochanter 34.5 (34.5-63.3) long, femur 13.9 (11.1-14.9) long, genu 5.5 (5.5-6.5) long, antaxial genual seta 26.1 (26.1-30.7) long, tibia 6.5 (6.5-7.4) long, paraxial tibial seta 4.1 (4.1-4.6) long, tarsus 6.5 (6.5-7.4) long, both paraxial and antaxial fastigial tarsal seta 26.1 (24.2-26.1) long, tarsal empodium 5.5 (5.5-6.5) and tarsal solenidion knobbed, gently curved and 7.4 (6.5-7.4) long, tarsal empodium 5-rayed. Leg II from base of trochanter 30.7 (6.5-7.4) long, femur 15.8 (14.9-15.8) long, basiventral femoral seta 11.1 (11.1-11.6) long, genu 2.7 (2.7-3.7) long, antaxial genual seta absent, tibia 6.5 (6.5-7.4) long, paraxial tibial seta absent; tarsus 6.5 long, both paraxial and antaxial fastigial tarsal setae 19.5 (19.5-20.5) long, 5-rayed tarsal empodium 5.5 (4.6-5.5) long, tarsal solenidion 7.4 (6.5-7.4) long. Coxae I connate anteriorly but free basally, smooth, 1b tubercles with seta placed above the level of coxal plates I approxima-
tions, 1a tubercles with seta a little ahead of the line between the 2a tubercles with seta; seta 1b 5.5 (5.5-8.3) long; seta 1a 14.9 (14.9-18.6) long and seta 2a 30.7 (30.7-32.6) long. Opisthosoma with ridges and furrows up to III ventral seta, wavy in cross section, 5 lateral ridges found, opisthosoma with 80 (80-85) dorsal annuli and 75 (73-75) ventral annuli. Ventral annuli microtuberculated on anterior margin of annuli whereas dorsal annuli devoid of microtu-
bercles, dorsal annuli broader and larger than ventral annuli, seta c2 39.1 (37.3-46.6) long on annulus 12 (11-13), seta d 54.1 (53.1-60.6) long on ventral annulus 30, seta e 33.5 (33.5-38.2) long on ventral annulus 52, seta f 29.8 (27.9-32.6) long on ventral annulus 72, seta h1 absent, seta h2 55.9 (55.9-60.6) long; last 3-4 annuli show ridge like microtubercles. Genitalia rec-
tangular oval, 19.5 (18.6-19.5) long and 26.1 (25.1-26.1) wide, epigynium smooth except a transverse line through 0.33 part of the length of genitalia, seta 3a 14.9 (13.0-14.9) long.

**Male**: Not observed.

**Holotype**: Female (marked) on slide (no. 1272/81/2006), India: West Bengal: Malda, English-bazar, 5.xi.2006 from *Adhatoda vasica* (Acantha-ceae), Coll. S. Sarkar. Paratypes: 4 females on slide bearing holotype and 5 females on 2 slides (nos. 1273-1274/81/2006); collection data same as in holo-
type.

**Relation to Host**: Mites are vagrants on under surface of leaf showing no apparent damage symp-
tom.

**Remarks**: So far, 29 species including 13 from India under the genus *Calacarus* are known (Amrine Jr. *et al* 1994). Among these species the new species comes close to *C. brionesae* Keifer (1963); *C. swietensis* Chakrabarti & Mandal (1979) and *C. quinsqualis* Chakrabarti & Mandal (1979) in having strong knob-
bed tarsal solenidion, network prodorsal shield pat-
tern and position of 1b tubercles with seta above the level of coxal plate I approximation. However, the new species differs from above species by in having 5 rayed tarsal empodium while *C. swietensis* and *C. quinsqualis* having 6 rayed and *C. brionesae* 4 rayed, epigynium smooth while above three species having ornamented and position of microtubercles on ante-
rior margin of ventral annuli while above three spe-
cies having on ventral annuli.

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**Diptilomiopus antocephali** sp. nov.

(Figs. 17-24)

**Female**: Body 147.4 (139.0-163.2) long, 79.3 (79.3-
83.9) wide, robust, fusiform, reddish orange in colour. Gnathosoma 37.3 (36.3-42.9) long, curved down, dorsal pedipalp genual seta 3.4 (3.4-3.7) long, 27.0 (27.0-28.9) wide, prodorsal shield design present network of 21 cells, median line distinct wavy and complete, admedian line bifurcates posteriorly, 12 almost rectangular cells found anterolaterally, two sub-triangular large sized posterolateral cells present; two anterior cells of lanceolate shape and orna-
mented with dotted lines are found; a small dorsal
tubercle without scapular seta slightly ahead of rear end is present on each side of the shield; dorsal tubercles lie 20.5 (19.5-20.5) apart. Leg I from base of trochanter 28.9 (27.0-28.9) long; femur 14.9 (14.9-16.7) long, without seta; genu fused with femur; tibia 4.6 (3.7-5.5) long, without seta; tarsus 7.4 (6.5-7.4) long; two identical tarsal setae paraxial and antaxial setae 32.6 (28.9-32.6) long; two unguinal setae 4.6 (3.7-4.6) long, tarsal solenidion straight, knobbed and 5.5 (4.6-5.5) long, 6-rayed divided tarsal empodium 6.5 (5.5-6.5) long. Leg II from base of trochanter 26.1 (26.1-26.0) long; genu fused with femur; femur 13.9 (13.0-13.9) long, without seta; tibia 3.7 (3.7-4.6) long, without seta; tarsus 5.5 (5.1-5.5) long, with two identical tarsal setae paraxial and antaxial fastigial setae 25.1 (25.1-29.8) long, length of two unguinal setae same as leg I; tarsal solenidion 5.5 (4.6-5.5) long; tarsal empodium 6.5 (6.5-7.4) long.

Coxae I connate basally; coxal surface smooth except wavy ridges around the base of proximal seta 2a; 1b tubercles and seta absent; 1a tubercles with seta present ahead of line across the 2a tubercles with seta; seta 1a 18.1 (17.7-18.6) long; seta 2a 35.4 (33.5-35.4) long. Opisthosoma with 63 (61-70) smooth dorsal annuli and 72 (71-76) microtuberculated ventral annuli; micro tubercles rounded and located on anterior margin of ventral annuli; seta c2 absent, seta d 13.0 (13.0-14.4) long on annulus 22 (22-23); seta e 9.3
(9.3-11.1) long on ventral annulus 42; seta f 27.9 (26.1-27.9) long on ventral annulus 62; seta h1 absent, seta h2 55.0 (46.6-55.0) long. Genitalia 20.5 (19.5-20.5) long, 22.3 (22.2-23.3) wide; epigynium ellipsoidal in shape, posterior end has cleft-like structure. Seta 3a 5.5 (4.6-5.5) long.

**Male:** Not observed

**Holotype:** Female (marked) on slide (no. 1275/29/2006), India: West Bengal: Malda, Kendumpur, 29.x.2006 from *Anthocephalus chinesis* (Rubiaceae), Coll. S. Sarkar. Paratypes: 5 females on slide bearing holotype and 6 females on 2 slides (nos. 1276-1277/29/2006), collection data same as in holotype.

**Relation to Host:** Mite occurs in considerable numbers on the ventral surface of leaves and associated with veins. No apparent damage symptom is observed due to their infestation.

**Remarks:** So far, 33 species including 15 species from India under the genus *Diptilomiopus* are known (Amrine Jr. et al 1994). The new species resembles *D. cocculae* Mohanasundaram (1986) and *D. holoptelus* Chakrabarti & Mandal (1983) in general appearance of complete median and admedian lines of network shield design and similar length (5-7) of seta 3a. But the new species can be differentiated from *D. cocculae* in having smooth dorsal annuli, smooth epigynium and shorter length of *seta d, seta e* and *seta f* and distinct from *D. holoptelus* in having 6 rayed tarsal empodium, smooth coxal plates and larger gnathosoma.

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