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FOUR NEW SPECIES OF PHYLLOCOPTINE MITES (ACARI: ERIOPHYOIDEA) FROM NORTHEAST INDIA WITH A DISCUSSION ON GENUS TETRA KEIFER AND KEY TO INDIAN SPECIES

PAR B. DAS *, and S. CHAKRABARTI *

ABSTRACT: Four new species of Tetra Keifer viz., T. cassiae infesting Cassia fistula, T. brideliae infesting Bridelia stipularis, T. shoreacola infesting Shorea robusta and T. triflorae infesting Desmodium triflorum are described from the khasi hills in Meghalaya state of Northeast India. A brief discussion on the genus Tetra is provided and a key to the Indian species of Tetra included.

INTRODUCTION

A survey was conducted for eriophyid mites in Burhihat valley (circa 900 m above m.s.l.), lying on the eastern slopes of the Khasi hills of Meghalaya, during the months of October and November, 1985. A detailed study of the collection made yielded five species under Tetra Keifer (1944), out of which four were new to science. This brought the number of Tetra species in India to ten and that in the world to twenty six. Descriptions, drawings, diagnoses and other relevant data on the four new species are provided in this paper.

The genus Tetra Keifer (1944) shows interesting relationships with its sister genera, viz., Paratetra on the one hand and Phyllocoptruta Keifer (1938) on the other. Paratetra Channabasavanna (1966) may be a synonym of Tetra or at best a subgenus of the same, since the direction of dorsal tubercles and their hairs are variable. A brief discussion on the current concept of Tetra with relation to the two other genera precedes the species descriptions in this paper. The discussion is based on published records only. In conclusion, a key to distinguish the Indian species of Tetra has been included to aid scientific workers in the Indian subcontinent.

All measurements are expressed in micrometers. The ranges given include the holotypes and six para­types.

All the slides bearing the type material are presently deposited in the collections of the Biosystematics Research Unit, Department of Zoology, University of Kalyani, Kalyani 741235, India.

* Biosystematics Research Unit, University of Kalyani, Kalyani 741235, West Bengal, India. Correspondence: Dr. S. Chakrabarti. Acarologia, t. XXXV, fasc. 4, 1994.
Genus *Tetra*

Keifer (1944) erected the genus *Tetra* to hold pyllocoptine rust and vagrant mites having dorsal thanosomal concavity and dorsal shield tubercles placed on the rear shield margin with their basal axes transverse to body axis, subtending setae caudad. *Phyllocoptura* has the dorsal tubercles set ahead of the margin and with basal axes longitudinal. Newkirk and Keifer (1975), in a synoptic key to the world's eriophid genera, added that *Tetra* may be a polyphyletic taxon. A current study of the genus reveals that the interspecific variations within *Tetra* are few when compared intuitively with the wide range of variations observed in some eriophid genera. The only noteworthy exception under *Tetra* is *T. rhodesiae* Keifer (1963). This mite has the dorsal tubercles placed on the rear shield margin but with their bases oriented slightly diagonally and with setae produced distinctly dorsal. The location of the dorsal shield tubercles and direction of their setae generally show a high degree of consistency within the currently conceived eriophid genera. Therefore it is not only a good key-character to distinguish a genus, but may also be regarded as a stable plesiomorphic character. Another eriophid resembling *T. rhodesiae* closely was assigned to *Paratetra* by Chakrabarti and Roy (1980). This species, viz. *P. himalayana* (whose generic status was considered doubtful) is incompatible with its congeners that have dorsal tubercles with transverse bases, subtending setae noticeably laterad.

It appears that the two exceptional species mentioned above deserve the erection of a new genus. It may be pointed out in retrospect that three other, closely related phyllocoptine genera, viz., *Vasates* Shimer, 1869 (Keifer, 1944), *Phyllocopites* Nalepa 1889 (Keifer 1944) and *Aculops* Keifer (Keifer 1966, 1959a) are separable on the basis of the dorsal-tubercle character. While in *Vasates* the tubercle bases are diagonal, in *Phyllocopites* and *Aculops* they are longitudinal and transverse respectively. Although *Vasates* has successfully withstood the test of time, for the present species it may be prudent to await further additions to the same group, before considering a separate generic status.

**Tetra cassiae** sp. nov. (Fig. 1)

Female: Body 125.3 (125-140) long, 8.7 (46-49) wide, wedge shaped and a little flattened dorsoventrally. Colour in life whitish. Rostrum 20.9 long, pointed downwards, subapical seta 4.6 long. Shield 32.2 (32.5-35.0) long, 46.0 (41.9-46.0) wide, broadly triangular with a wide anterior cephalic lobe over rostrum base; shield design characteristic; median line present, twisted at about 0.5; admedian lines gently sinuate, arising from lateral margin of cephalic lobe, running back to meet rear shield margin differently, connected to median line by cross lines at 0.3, 0.5 and a little ahead of rear shield margin; submedian lines faint, on pair, originating laterad of admedian lines in shield margin, running along lateral border of shield, cross-connected to admedians anteriorly, sending out an inner branch at about 0.3, a pair of faint discontinuous lines join admedians to branch of submedian lines; posterolateral angle of shield bears two rows of granules; dorsal tubercles rectangular, on rear shield margin, 23.0 (20.9-25.0) apart, their bases transverse, subtending 4.6 long dorsal seta divergently caudad.

Foreleg 27.8 long; femur 7.0 long with seta 4.6 (4.6-7.0) long; patella 4.6 long with seta 20.9 (18.6-20.9) long; tibia 5.8 (5.8-7.0) long with setae 4.6 (2.3-4.6) long, located in proximal 0.25; tarsus 4.6 long with two dorsal setae 10.5 and 19.8 long and a fine ventral seta; claw 7.0 long, gently, arched, unknobbed; featherclaw 6-rayed. Hindleg 23.2 (23.2-25.5) long; femur 7.0 (5.8-7.0) long with seta 9.3 (9.3-11.6) long; patella 4.6 long with 9.3 (4.6-9.3) long seta; tibia 4.6 long without any seta; tarsus 4.6 long with two dorsal setae of 11.5 and 9.8 long, and a thin ventral seta; claw 4.6 (4.6-7.0) long; other details as in the foreleg. Forecoxae connate posteriorly along a midventral line; both the coxae nearly smooth, except for a few scattered granules around bases; first coxal setae 9.3 (9.3-11.6) long, opposite anterior coxal approximation; second coxal setae setae 18.6 (11.6-18.6) long, below first coxal setae and above transverse line passing through third coxal setae; third coxal setae 23.0 (23.0-25.5) long; hind coxae separated from genitalia by 3 (2-3) sternal rings.
Opisthosoma characterized by moderately wide tergites and less wide sternites; dorsum with a wide median longitudinal concavity arising on about tergite 3 behind rear shield margin, and ending just above third ventral seta region, bounded on either side by low, wide subdorsal ridges; thanosome with nearly 37 (35-38) tergites and 59 (58-60) sternites; tergites smooth except for faintly indicated microtubercles on the ridges and first two tergites; telosome with obscure microtubercles dorsally, microstriate ventrally, lateral seta 41.8 (30.2-41.8) long on about sternite 6 from rear shield margin; first ventral seta 35.0 (35.0-37.1) long on sternite 18 (16-20), second ventral seta 9.3 (9.3-11.6) long on sternite 33 (33-37); third ventral seta 32.5 (30.2-35.0) long on sternite 54 (53-54) or ring 5 (4-5) from caudal lobe. Genitalia 11.6 (11.6-15.1) long, 20.9 (18.6-20.9) wide, coverflap with 10 (10-12) longitudinal ribs in single row; internal apodeme of normal width; genital seta 18.6 (16.2-18.6) long.

Males observed, 140 long, 51 wide.

Material studied: Holotype: female (marked), on slide (No. 1167/102/85), India: Meghalaya: Bijnihat, 24.11.85 ex Cassia fistula Linn. (Fabaceae), coll. B. Das. Paratypes: 65 females and many males on slide bearing holotype and four other slides (1168-1171/102/85), data as for holotype.
Distribution: India: Meghalaya.

Relationship with host plant: Mites found as vagrants among whitish pubescence on undersurface of leaflets.

Remarks: There are three other species of *Tetra* that possess a broad shield with complex armature, viz. *T. limonis* Ghosh et al. (1984), *T. aeglis* Ghosh et al. (1984), *T. lanneansis* Chakrabarti et al. (1981), all from Northeast India.

The present species and *T. shoreacola* sp. nov., whose description follows, appear close to these three species on account of the shield characters. *T. cassiae* comes particularly close to *T. aeglis* in the details of shield design, but the former remains distinct from it and the two other related species in having 6-rayed featherclaws.

*Tetra brideliae* sp. nov.

(Fig. 2)

Female: Body 153 (118-153) long, 52 (52-54) wide, wedge shaped and a little flattened dorsally. Colour in life pinkish, with abundant white dusty wax on the dorsum. Rostrum 16.5 long, curved down, with antapical seta 4.7 long. Shield 47.0 wide, 35.3 (30.6-35.3) long, with a broad based, acute anterior lobe over rostrum base, shield...
with clear design, median line incomplete, present on posterior 0.5, admedian lines sinuate curving out prominently from 0.3 to 0.5, converging to meet the median line at posterior 0.25, connected to each other by transverse cross-line at anterior 0.25 and by diagonal lines to median line at its points of origin; a pair of curved lines radiate from admedian lines at each side posteriorly; submedian lines originate in admedians, run parallel to lateral shield margin, forming three vertical cells with it, an indistinct pattern of curved cells lies along the rear border of the shield between the dorsal tubercles; posterolateral angle of shield with few rows of granules; dorsal tubercles prominent, elongate, 32.9 (30.6-32.9) apart, inclined dorsad over the rear shield margin, their bases transverse and projecting 7.0 (6.0-7.0) long, dorsal setae outwardly caudad.

Foreleg 23.5 long; femur 7.0 long, with a seta 7.0 (7.0-9.4) long, patella with seta 11.8 (11.8-16.5) long; tibia 5.9 (4.7-5.9) long, with setae 2.4 long located at proximal 0.3; tarsus 4.7 long, with two long dorsal setae of 16.5 (14.0-16.5) and 21.2 and a short ventral seta; claw 7.1 (4.7-7.1) long, gently curved and tapering; featherclaw eight rayed. Hindleg 23.5 (21.2-23.5) long; femur 7.1 long, with seta 16.1 (16.1-21.2) long; patella 4.7 long, with seta 11.8 (7.1-11.8) long; tibia 4.7 long; tarsus 4.7 long, two setae 18.8 (18.8-23.5) and 9.4 long and one fine ventral seta; claw 9.4 (7.1-9.4) long; other details as in the foreleg. Forecoxae ornamented with whorls of fine dashes around setal bases; first coxal setae 3.5 (2.0-4.7) long, opposite anterior coxal approximation; second coxal setae 14.1 (11.8-14.1) long, well below first coxal setae, and distinctly above transverse line through third coxal setae. Third coxal setae 18.8 (17.7-20.2) long.

Opisthosoma characterized by wide tergites and less wide sternites; dorsum with a prominent median longitudinal trough extending from tergites 2-3 behind shield margin to that above third ventral seta, flanked on either side by subdorsal ridges; margins of ridges thickened for wax production; thanasome with 30 (30-34) smooth tergites and 45 (42-46) microtuberculate sternites; microtubercles small, bead-like, tending to become elongate on posterior rings, and aligned on rear margins; telosome smoothly dorsally and microstriate ventrally. Lateral seta 30.6 (18.8-30.6) long on about sternite 4 (4-8), first ventral seta 47.0 (40.0-54.1) long on sternite 16; second ventral seta 16.5 (16.5-23.5) long on sternite 32 (30-33); third ventral seta 30.6 (23.5-32.9) long on sternite 45 (42-48) or ring 5 from the base of caudal lobe; caudal and accessory setae present. Genitalia 16.5 wide, 11.8 long; genital cover flap with a row of 9 (9-10) ribs that are thickened posteriorly; internal apodeme of normal width; genital seta 14.1 (11.8-16.5) long.

Males observed; 108 long, 47 wide. Genitalia 11.8 wide, 7.1 long; genital seta 11.8 long.

Material studied: Holotype female (marked), on slide (No. 1061/77/85). India: Meghalaya: Burnihat, 24.10.87, ex. Bridelia stipularis Bl. (Fabaceae), coll. B. Das. Paratype: 45 females and a few males on slide bearing holotype and on four other slides (Nos. 1062-1065/77/85), data as for holotype.

Distribution: India, Meghalaya.

Relationship with the host plant: Mites were found as vagrants, matching in colour and shape the whitish pubescence on the undersurface of leaflets, and causing no apparent damage to the host.

Remarks: Tetra brideliae differs from all its congeners by having eight-rayed featherclaws; a clear pattern of lines on the dorsal shield; wax secreting nature; and by the direction of dorsal tubercles and hairs.

Tetra shoreacola sp. nov. (Fig. 3)

Female: Body 168 (165-176) long, 70 wide, compressed dorsoventrally, wedge shaped. Colour in life whitish. Rostrum 25.5 (23.0-25.5) long, curved down, with apex turned inward; subapical seta 4.6 (4.6-7.0) long. Shield 48.7 (39.7-48.7) long, 70.0 (62.6-70.0) wide, broadly subtriangular, with semicircular anterior lobe over the rostrum base, tip of lobe acute in lateral view; shield design a pattern of wavy lines; median line absent; admedian lines strongly sinuate, arising close together on the
anterior margin of cephalic lobe, diverging from base of lobe till 0.4, running inward, then curving out again at 0.6 and meeting rear shield margin divergently; a transverse line from vertex of the admedian lines at 0.4 runs outward towards the margin of the shield, this line gives off a short anteriorly directed branch proximally and a curved posterior branch distally; another pair of lines on each side from the admedian lines unite in the rear 0.5 part of shield to form a short line that ends inside, and ahead of, the dorsal tubercles; lateral area of shield noticeably smooth; dorsal tubercles squarish, located on the rear shield margin, 39.4 (39.4-44.0) apart; dorsal setae 14.0 (14.0-18.6) long, projecting a little upward and pointing divergently caudad.

Foreleg 27.8 (23.0-27.8) long; femur 7.0 (7.0-9.3) long, with seta 9.3 (9.3-11.6) long; patella 4.6 (3.5-4.6) long, with seta 23.0 (20.9-25.0) long; tibia 5.8 (4.7-5.8) long, with seta 4.6 long, situated in about proximal 0.3; tarsus 4.6 (4.6-5.8) long, with two setae 23.0 and 16.3 long; claw 4.6 (4.6-5.8) long, gently curved, and little tapering; featherclaw 5-rayed. Hindleg 23.0 (20.9-25.7) long; femur 4.6 (4.6-7.0) long, with seta 11.6 (7.0-14.0) long; patella 2.3 (2.3-4.6) long, with seta 3.5 (2.3-4.6) long; tibia 4.6 long, without any seta; tarsus 7.0 (4.6-7.0) long,
with two setae 27.8 (25.5-27.8) and 14.2 long; claw 7.0 (7.0-9.3) long; other details as in the foreleg. Forecoxae briefly touching centrally along inner margins, no sternal thickening discernible; coxal surface smooth except for wavy ridges around setal bases; first coxal setae 5.8 (3.5-5.8) long; second coxal setae 11.6 (7.0-11.6) long, well below first coxal setae and above transverse line passing through third coxal setae; third coxal setae 27.8 (23.2-27.8) long. All three setae lying almost on a diagonal line.

Opisthosoma characterized by moderately wide tergites and narrow sternites; dorsum with a wide, shallow, median longitudinal trough extending from just behind rear shield margin to region above third ventral seta, flanked by low subdorsal ridges; thanosome with about 30 (30-35) tergites and 59 (56-59) sternites; both tergites and sternites microtuberculate; microtubercles on tergites faint, elongate, widely spaced, while those on sternites distinct, close set, oval in shape; telosome smooth dorsally and with fine microstriations ventrally.

Lateral seta 39.4 (32.5-39.4) long on about sternite 9 from rear shield margin; first ventral seta 46.0 (39.4-58.0) long on sternite 21 (20-21); second ventral seta 7.0 (4.6-7.0) long on sternite 34 (33-35); third ventral seta 25.5 (20.9-25.5) long on sternite 54 (53-54) or ring 5 from the caudal lobes. Genitalia 25.0 (23.0-25.5) wide, 19.6 (16.2-19.6) long; coverflap basally with a broad band of fine dashes, and apically with a pair of centrally notched semicircular lines; internal apodeme of usual width; genital seta 9.3 (7.0-9.3) long.

Males not observed.

Material studied: Holotype female (marked), on slide (No. 1150/98/85), India: Meghalaya: Burnihat, 3.11.85 ex. Shorea robusta Gaertn. (Dipterocarpaceae), coll. B. Das. Paratypes: 50 females on slide bearing holotype and three other slides (Nos. 1151-1153/98/85), data as in holotype.

Distribution: India: Meghalaya.

Relationship with host plant: Mites were found as vagrants on undersurface of young leaves.

Remarks: Tetra shoreacola sp. nov. is separable from all its congeners, mainly by the nature of coverflap texture. The rest have longitudinal scorings, except T. anisomelae Mohanasundaram (1984), which has a smooth genital coverflap.

Tetra triflorae sp. nov.
(Fig. 4)

Female: Body 128 (123-155) long, 42 (34-46) wide, curved, wedge shaped and a little dorsoventrally flattened. Colour in life whitish to yellowish. Rostrum 18.5 (16.2-18.5) long, curved downwards, subapical seta 4.6 (4.6-7.0) long. Shield 34.8 (32.5-34.8) long, 37.1 (37.1-44.1) wide, subtriangular with an acute anterior cephalic lobe; shield design faint; median line absent; admedian lines represented by a pair of lines running backwards and joined in a broad loop ahead of the rear shield margin; submedian lines arising on anterior shield margin lateral of admedian lines, running alongside lateral edge of shield, sending a short inner branch at about 0.5, and terminating well ahead of admedian lines posterior lateral angle of shield with a few curved dotted lines; dorsal tubercles with transverse bases 20.9 (18.5-20.9) apart, resting on rear shield margin, projecting, 16.2 (11.6-16.2) long, setae weakly converging caudad.

Legs slender; foreleg 30.2 (29.0-30.2) long; femur 9.3 (7.0-10.4) long, with seta 7.0 (4.6-7.0) long; patella 4.6 (4.6-5.8) long, with seta 4.6 (4.6-5.8) long; tibia 5.8 (5.8-8.2) long, with seta 4.6 long, situated in proximal 0.3; tarsus 4.6 long, with two dorsal setae 23.0 and 18.5 long, and one fine ventral seta; claw 7.0 long, curved, with blunt tip; featherclaw six rayed. Hindleg 25.2 (25.2-27.8) long; femur 7.0 (7.0-9.3) long, with seta 9.3 (9.3-13.9) long; patella 4.6 long, with seta 7.0 (7.0-9.3) long; tibia 5.8 (4.6-5.8) long, without any seta; tarsus 4.6 long, with two dorsal setae 23.0 and 11.6 long, and one fine ventral seta; claw 7.0 long; other details as in the foreleg. Forecoxae contiguous along a well developed sternal line; coxal surface smooth; first coxal setae 4.6 long, lying at level of anterior end of sternal line; second coxal setae 11.6 (9.6-13.9) long, opposite rear end of sternal line and the inside of diagonal line through first and third setae; third coxal setae 20.9 (20.9-25.5) long.
Opisthosoma characterized by moderately wide tergites and less wide sternites; dorsum with a median longitudinal concavity terminating in region above third ventral seta; thanosome with about 40 smooth tergites and 62 (62-65) microtuberculate sternites; sternal microtubercles granular, resting on rearing margin, those posteriorly tending to become elongate; telosome smooth dorsally, microstriate ventrally. Lateral seta 37.1 (37.1-48.7) long, on about sternite six from the rear shield margin; first ventral seta 27.8 (27.8-46.0) long on about sternite 20; second ventral seta 23.0 (18.5-27.5) long on about sternite 36; third ventral seta 18.5 (18.5-23.2) long on about sternite 57 or ring 5 (4-5) from base of caudal lobes. Genitalia 18.6 (16.2-18.6) wide, 13.9 (11.6-13.9) long, cover flap with 11 (10-12) longitudinal ribs; genital seta 20.9 (18.5-20.9) long; internal apodeme of normal width.

Males observed, about 105 long, 30 wide, with genitalia 12.0 wide, 8.0 long.

Material studied: Holotype female (marked), on slide (No. 1131/93/85), India: Meghalaya: Burnihat, 3.11.85, ex. *Desmodium triflorum* DC (Fabaceae), coll. B. Das. Paratypes: 30 females and several males on slide bearing the holotype and
threether slides (Nos. 1132-1135/93/85), data as in holotype.

**Distribution**: India: Meghalaya.

**Relationship with host plant**: Mites present as vagrants on undersurface of leaflets, apparently causing no damage.

**Remarks**: In possessing six-rayed featherclaws and weak shield lines, *Tetra triflorae* sp. nov. is close to *T. cercocarpi* Keifer (1948), *T. liriodendronis* Keifer (1959b), *T. pueraiae* Barke and Davis (1971), and *T. magnolifoliae* Keifer (1963). *T. cercocarpi* has a conspicuously raised anterior tergite and is from a Rosaceous host. *T. liriodendronis* and *T. magnolifoliae* belong to a complex of morphologically similar species on Magnoliaceae, and differ from *T. triflorae* in many characters. *T. pueraiae* has a distinctly different shield shape and armature. *T. triflorae* therefore appears somewhat unrelated to other species known in this genus.

### Key to Indians Species of Tetra Keifer (Females)

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