

The second representative of the genus *Ceratoppiella* Hammer, 1977 (Acari: Oribatida) from Shikoku Island in Japan

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Received: 15 November 2015; Accepted: 12 January 2016

Abstract A new oribatid species of the genus *Ceratoppiella* was collected from the garden of the Negoroji temple in Kagawa Prefecture, Japan. The new species, *Ceratoppiella altera* n. sp. has prodorsum and hysterosoma that are triangular and adverse triangular in form, respectively, the rostral tip being dentate with a concave medial portion and a tubercle at the base of concavity, lamellae narrow and slightly converging, with cusps bearing dents at the anterior margin, an almost straight anterior notogastral margin, and one pair of relatively long notogastral setae p_1 and nine pairs of minute setae, subcapitulum of secondarily anarthric, pelopsiform, epimeral border bo sj. of complete transversal bar, pedipalp Acml, trochanter of leg III bearing a few dents dorsally, and heterotridactylous.

Key words: *Ceratoppiella*, new species, Oribatida, Shikoku Island, South Japan

Introduction

Soil microarthropods were collected from various materials in the gardens, grave yards and forests associated with the “Eighty-eight Holy places of Shikoku”, Japan from 2001 to 2005 (Nakamura *et al.*, 2006). To date, from Holy places (temples), 26 oribatid species were described as new species and another 19 known species were recorded for their morphological variations (Fujikawa, 2004, 2004 [2005], 2005a, b, 2007a, b, 2008, 2012; Fujikawa *et al.*, 2006; Nakamura *et al.*, 2006). In the present work, a species of oribatid mite was described from Negoroji (the 82nd temple for pilgrimage, called Shikoku Henro) in Takamatsu, Kagawa Prefecture.

Methods

Study site: The present sampling sites, Negoroji of No. 82 temple in Shikoku located (34°20'39"N; 133°57'38"E, about 360 m a.s.l.) at Takamatsu City, Kagawa Prefecture, in Shikoku Island, Japan.

Sampling: Litter, humus and soil of about 1 little were collected by hand to a polyethylene bag from the ground of the temple on 22 February 2003, by Nakamura, Y. and Fujikawa, T. Animals were extracted by means of a modified Tullgren apparatus. After extraction, mites were kept in lactic acid for clearing during about 100 days, and then mounted on glass slides for microscopic investigation.

Terminology and classification: The notations of

descriptions and figures in the work are according to Grandjean, 1953[1954] and Norton and Behan-Pelletier (2009) as follows, and about setal features and surface sculpturing after Mahunka and Zombori (1985): *ro*, *le*, *in*, *ex*: Rostral, lamellar, interlamellar and exobothridial setae, respectively; *bo*: bothridial setae; *c*, *la*, *lm*, *lp*, h_{1-3} , p_{1-3} : Notogastral setae; *ia*, *ih*, *im*, *ip*, *ips*, *iad*: Lyrifissures; *1a-c*, *2a*, *3a-c*, *4a-c*: Epimeral setae; *bo* 1, *bo* 2, *bo* sj.: Epimeral borders; *gla*: latero-opisthosomatic gland opening; *a*, *m*, *h*: Anterior, medial and posterior subcapitular setae, respectively; *acm*, ω : eupathidia and solenidion on tarsus of pedipalp, respectively; Acml: ω free from *acm*; g_{1-6} , *ag*, an_{1-2} , ad_{1-3} : Genital, aggenital, anal and adanal setae, respectively; ε : Famulus on tarsus of leg I; ω_{1-2} , φ_{1-2} , δ : Solenidia on tarsi, tibiae and genua of legs, respectively. The new species has a small protruding at the central portion of rostrum like in *Ceratorchestes* (*Paraceratochestes*) *variabilis* Ermilov & Kalúz, 2012, therefore the protruding was notated as *tb* after them. The given number of tarsal claws is common to all legs of a species. Measurements (μ m) in the description are, for the most part, according to holotype. Body color of mites in the description relate to the specimens after clearing in lactic acid. The types are deposited in the National Science Museum, Tokyo.

Description of a new species

Ceratoppiella altera n. sp.

[Japanese name: Sanuki-rikishidanimodoki]

(Figs. 1–4 and Tables 1, 2)

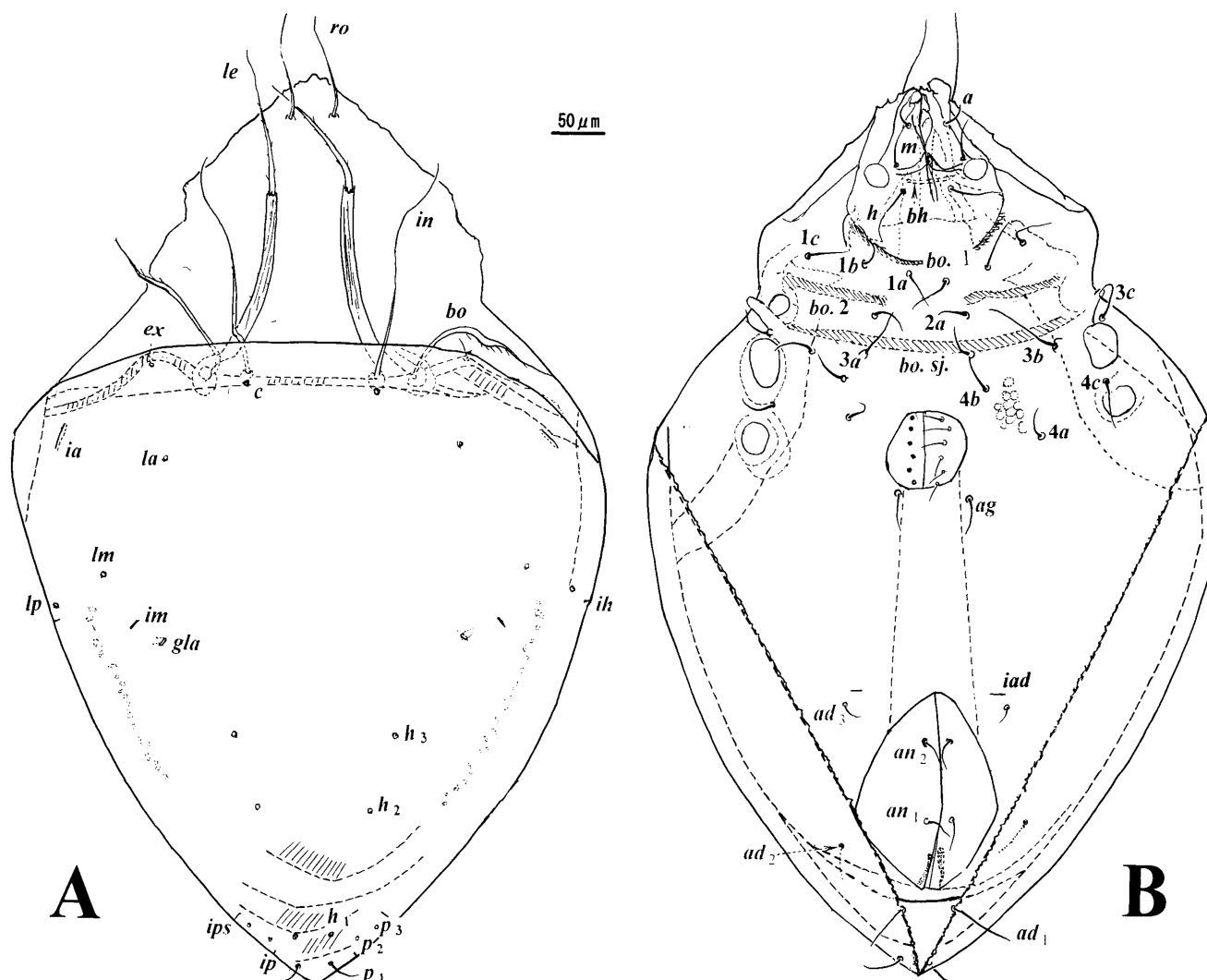


Fig. 1. *Ceratoppiella altera* sp. nov. Paratype (NSMT-Ac 12092): A, Dorsal view; B, Ventral view.

Diagnosis

Male: body length 593 μm ; width 464 μm ; females: body length, 657–664 μm ; width 464 μm . Prodorsum and hysterosoma triangular and adverse triangular in form, respectively. Cuticle lineolate on pedotectal region, lamellae, hysterosoma and epimerata. Body and legs covered by thin cerotegument with microtubercles. Rostral tip dentate, concave at the medial portion with a tubercle *tb* at the base of concavity. Lamellae narrow, slightly converging. Anterior margin of cusps bearing dents, extending behind half the length of prodorsum.

Interlamellar setae inserted between lamellae. Bothridial setae *bo* with mid-portion slightly expanded, ciliate at distal half. Notogastral anterior margin almost straight. Notogaster with ten pairs of setae, five pairs of lyrifissures,

and opisthonotal gland opening. Notogastral setae *p*₁ relatively long, but the other setae minute. Subcapitulum secondarily anarthric, pelopsiform. Epimeral borders *bo* 1 and *bo* sj. complete transversal bar; *bo* 2 interrupted; *bo* 4 absent. Epimeral setal formula: 3-1-3-3. Pedipalpe Acml. Genito-anal setal formula: 6-1-2-3. Trochantera III bearing a few dents dorsally. Legs heterotridactylous.

Material examined

Holotype: Adult female (NSMT-Ac 12090), from litter, humus and soil of Negoroji of No. 82 temple at Takamatsu City, Kagawa Prefecture, in Shikoku Island, Japan, on 22 February 2003, by Nakamura, Y. and Fujikawa, T.; 1 paratype, adult female (NSMT-Ac 12091), same data as holotype; 3 paratypes, 2 adult females and 1 adult male (NSMT-Ac 12092),

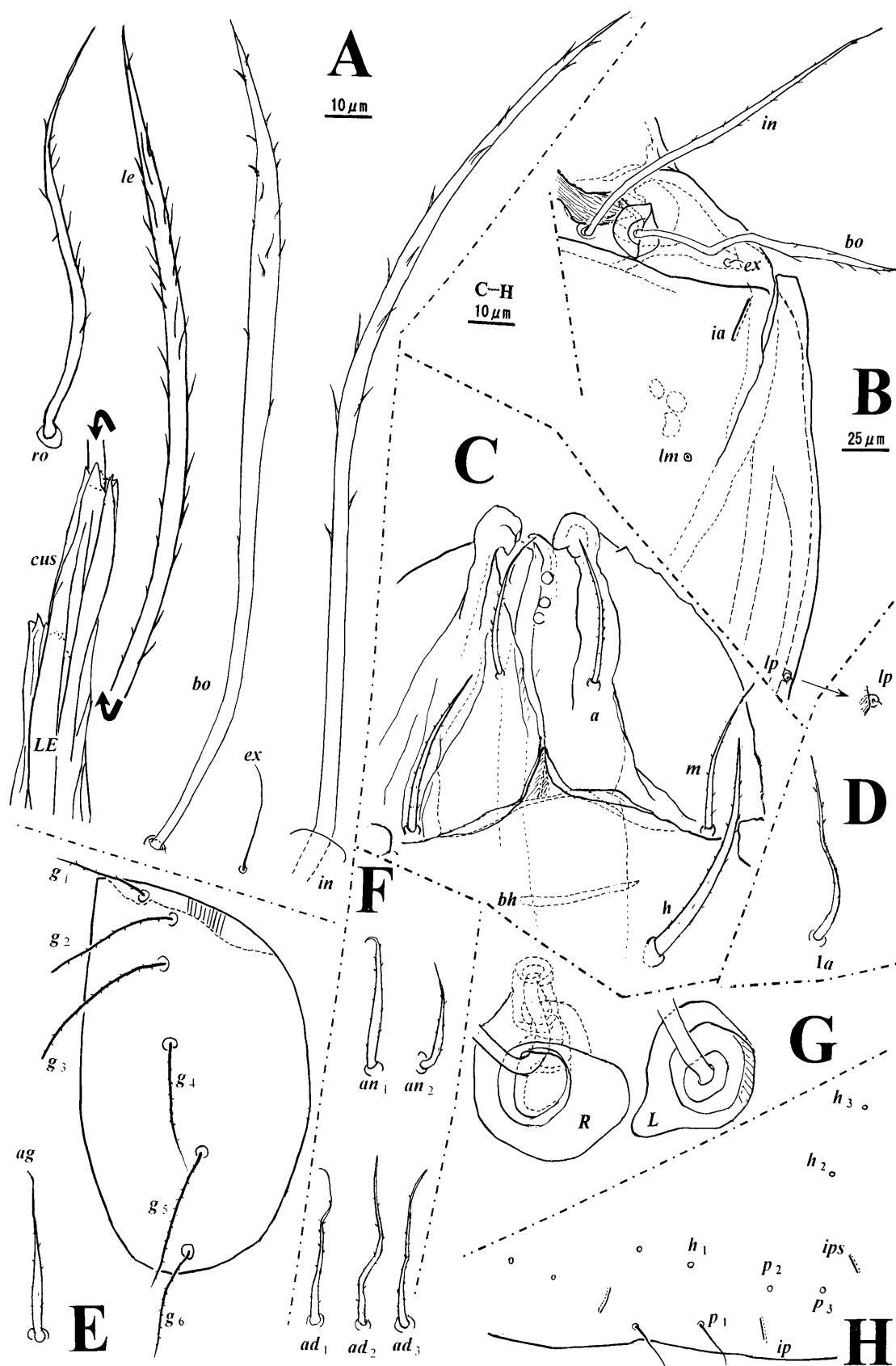


Fig. 2. *Ceratoppiella altera* sp. nov. A, Setae *ro*, *le*, *bo*, *in*, Holotype (NSMT-Ac 12090), seta *ex*, Paratype (NSMT-Ac 12092); B, Right bothridial region; C, Gnathothoma; D, Setae *lp*, *la*; E, Left genital plate and seta *ag*; F, Setae *an*_{1,2}, *ad*₁₋₃, B-F, Holotype (NSMT-Ac 12090); G, Right bothridium (R), Paratype (NSMT-Ac 12091) and left bothridium (L), Holotype (NSMT-Ac 12090); H, Posterial margin of notogaster, according to depressed specimen, Paratype (NSMT-Ac 12091).

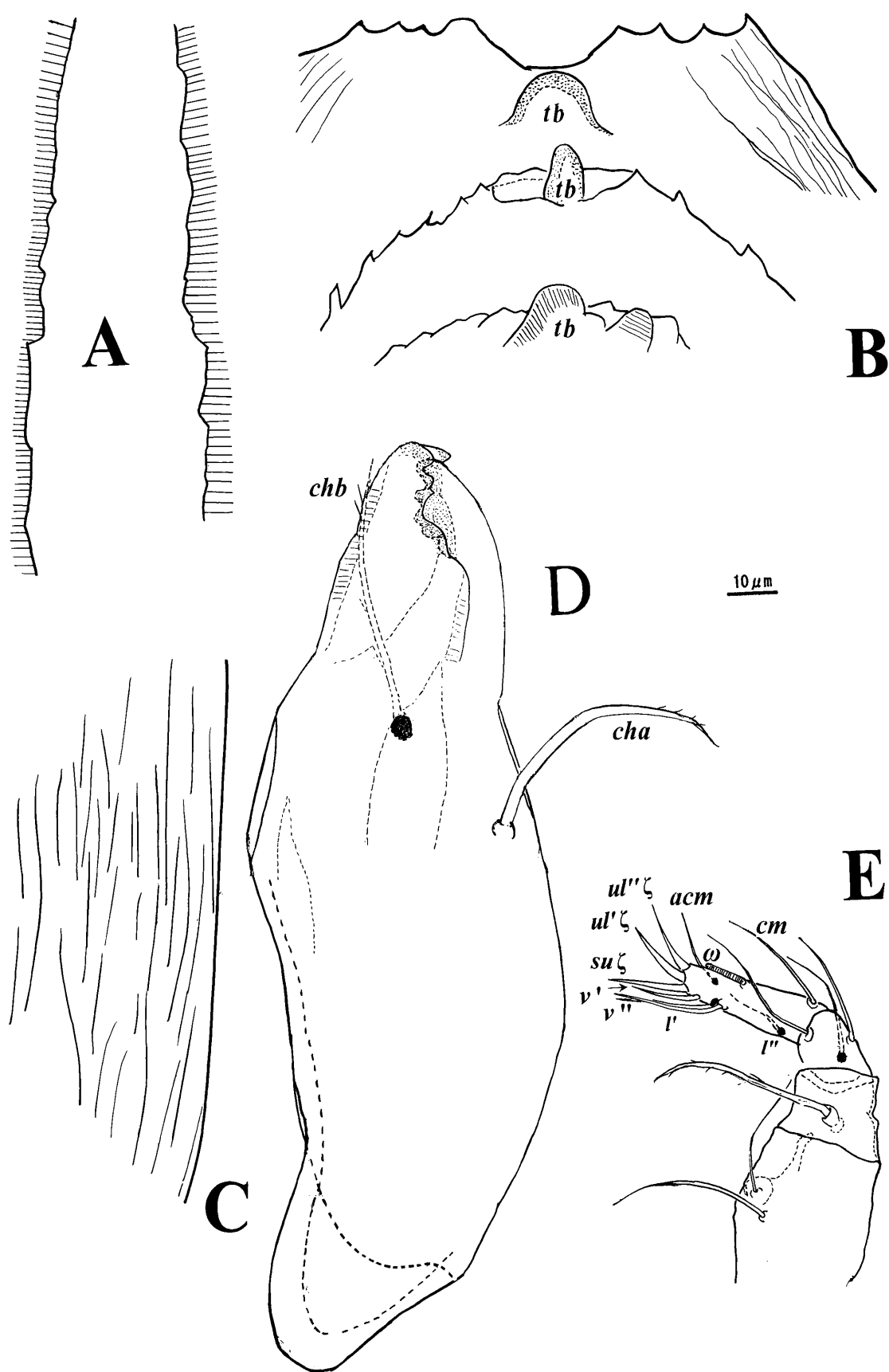


Fig. 3. *Ceratoppiella altera* sp. nov. A, Right and left lateral margins of cerotegument on hysterosoma, Paratype (NSMT-Ac 12092); B, Variation of rostral anterior margins, Upper-Paratype (NSMT-Ac 12092), middle-Paratype (NSMT-Ac 12092), down-Holotype (NSMT-Ac 12090); C, Notogastral surface, Paratype (NSMT-Ac 12092); D, Chelicera, Paratype (NSMT-Ac 12091); E, Pedipalp, Holotype (NSMT-Ac 12090).

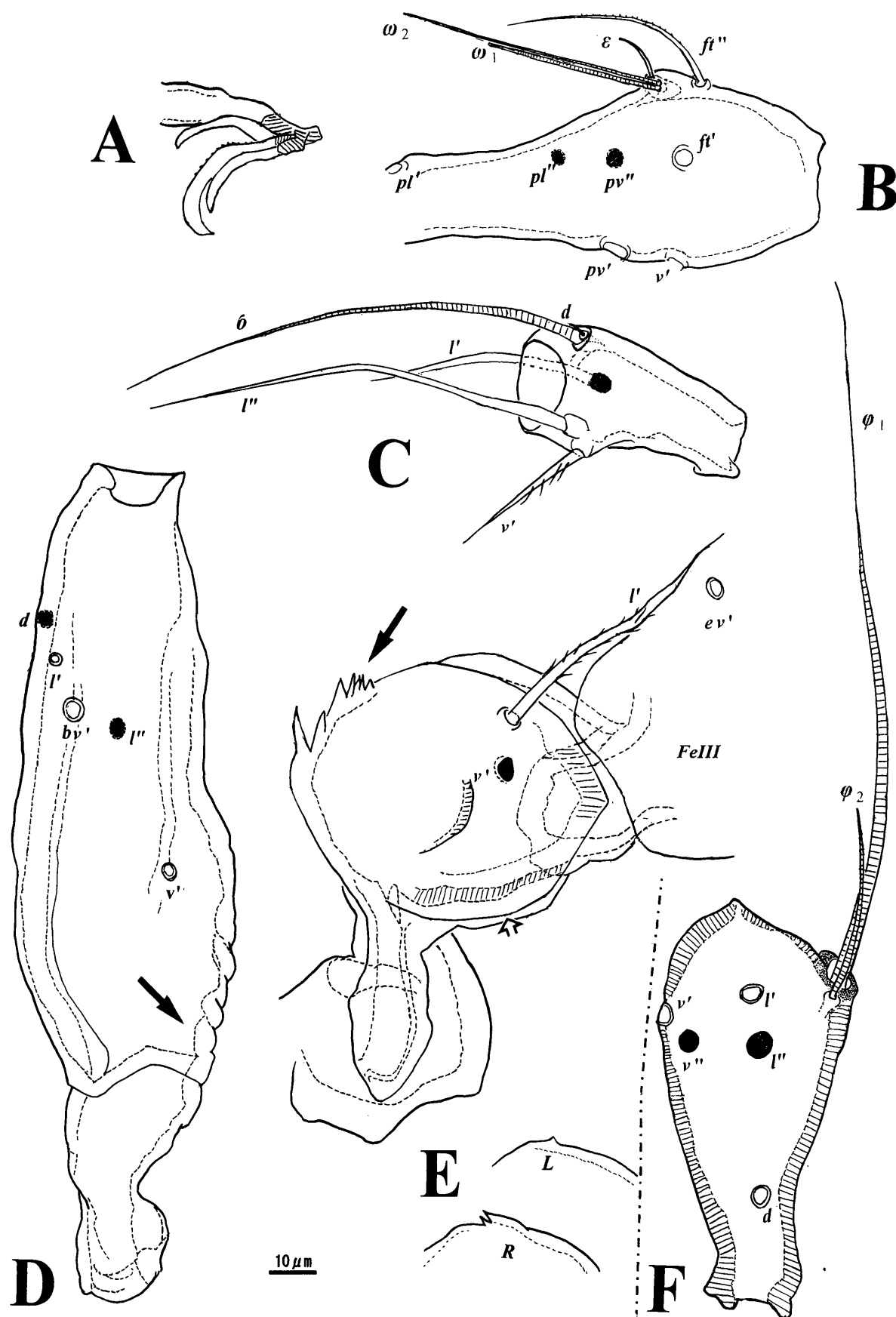


Fig. 4. *Ceratoppiella altera* sp. nov. A, Right claws of leg IV; B, Solenidial region of right tarsus I; C, Genu I; D, Femur I (arrow: ridges); E, Trochanter III (black arrow: dents; white arrow: carina) and variation of dorsal dents from Paratype (NSMT-Ac 12092); F, Tibia I. A, D, E, Paratype (NSMT-Ac 12091); B, C, F, Holotype (NSMT-Ac 12090).

Table 1. Leg setae and solenidia of *Ceratoppiella altera* n. sp.

| Leg | Trochanter | Femur | Genu | Tibia | Tarsus |
|-----|------------|---------------|------------------|------------------------------|---|
| I | v' | $v'(l) d bv'$ | $v'(l) d\bar{d}$ | $(v)(l) \varphi_1 \varphi_2$ | $v'(pv)(pl)(p)(it)(tc)(ft)(u)(a) s \varepsilon \omega_1 \omega_2$ |
| II | v' | $v'(l) d bv'$ | $v'(l) \bar{d}$ | $(v)(l) \varphi$ | $v'(pv)(p)(it)(tc)(ft)(u)(a) s \omega_1 \omega_2$ |
| III | $v' l'$ | $l' ev' d$ | $l' d \bar{d}$ | $v'(l) \varphi$ | $v'(p)(tc)(ft)(u)(a) s$ |
| IV | v' | $ev' d$ | $(l) d \bar{d}$ | $v'(l) \varphi$ | $(pv)(p)(tc) ft'(u)(a) s$ |

$d\bar{d}$: \bar{d} coupled with seta d .

Table 2. Length (μm) of leg segments *Ceratoppiella altera* n. sp.

| Leg | Trochanter | Femur | Genu | Tibia | Tarsus |
|-----|------------|-------|------|-------|--------|
| I | 43 | 139 | 34 | 131 | 137 |
| II | 51 | 129 | 41 | 81 | 133 |
| III | 92 | 102 | 33 | 124 | 132 |
| IV | 88 | 125 | 49 | 148 | 169 |

same data as holotype. The type specimens are deposited in the National Museum of Nature and Science, Tokyo.

Description

Measurements and body appearance: Male: body length 593 μm ; width 464 μm ; 4 females: body length 657–664 μm ; width 464 μm . Body colour light yellowish brown. Cuticle lineolate on pedotectal region, lamellae, hysterosoma and epimerata. Body and legs covered by thin cerotegument with microtubercles.

Prodorsum: Prodorsum triangular in form, about 207 μm in length and about 404 μm in greatest width (Fig. 1A). According to depressed specimen, rostral tip dentate, concave at medial portion with a tubercle *tb* at the base of concavity; *tb* about 9 μm in length and 6–13 μm in width (Fig. 3B). Prodorsum lineolate at the pedotectal region. Rostral setae *ro* (77 μm) thin setiform, sparsely bearing cilia throughout the length, inserted far from rostral tip, extending in front of the rostrum for a distance equal to about two-thirds of their length. Lamellae narrow, lineolate, slightly converging, fused with dorsal surface, bearing free raised cusps: the distance between inner sides of lamellae, 75 μm at the base, and 54 μm at the tip; the greatest distance between outer side of lamella and lateral margin of prodorsum, 100 μm . Anterior margin of cusps (29 μm) bearing dents: the distance between tip of cusps and rostral anterior margin, 89 μm ; the distance between tip of cusps and notogastral anterior margin, 118 μm . Lamellar

setae *le* (127 μm) and interlamellar setae *in* (170 μm) thick setiform, sparsely bearing cilia throughout the length (Fig. 2A). Setae *le* originating from cusps, extending in front of the rostrum for a distance equal to about one-third of their length. Seta *in* inserted near inner side of lamellae between bothridia situated at the base of lamellae. Bothridia and interlamellar insertions hidden under border of notogastral anterior margin. Bothridia opening dorsally, bearing a small lobe at outer lateral side (Fig. 2G). Bothridial setae *bo* (148 μm) with mid-portion slightly expanded, ciliate at distal half. Exobothridial setae (21 μm) thin, smooth, short setiform.

Notogaster: Notogastral anterior margin almost straight. Notogaster fold posterior ventral region and therefore seems inverse triangle in form, wider anteriorly than posteriorly: 471 μm in both length and greatest width (Fig. 1B). Surface longitudinally lineolate (Fig. 3C). Hysterosomal lateral margin dentate (Fig. 3A). Notogaster bearing ten pairs of notogastral setae, five pairs of lyrifissures, and opisthonotal gland opening. Notogastral setae p_1 relatively long (39 μm), roughened setiform, but other 9 pairs of setae smooth, minute (1 μm) (Fig. 2D). According to depressed specimen, setae p_1 inserted almost posterior to h_1 ; p_2 and p_3 inserted at the same level between levels of h_1 and p_1 (Fig. 2H). Lyrifissures *ia* (18 μm) aligned along notogastral outline (Fig. 2B); other lyrifissures (12 μm) aligned obliquely (*im*) or perpendicularly to notogastral outline (*ih*, *ip*, *ips*); *im* situated laterally to seta *la*, *ih* posteriorly to *lp*, *ip* laterally to p_1 , *ips* anterior-laterally to p_3 . Opisthonotal gland opening (*gla*) located postero-laterally to *im*.

Ventral region: Genital aperture (75 μm in length; 71 μm in greatest width) almost circular, and anal aperture (150 μm in length; 121 μm in greatest width) rhombic in form; distance 150 μm between them, almost as long as length of anal aperture. Genito-anal setal formula: 6-1-2-3; all setae thin setiform, sparsely barbed throughout length. Genital setae g_{1-6} variable in length (18–29 μm): g_3 longest, g_1 shortest (Fig.

2E). Aggenital setae *ag* (29 μ m) inserted posteriorly to genital aperture. Anal setae *an*₁ (26 μ m), *an*₂ (20 μ m) inserted near inner margin of anal plate. Adanal setae *ad*₁₋₃ almost equal in length (29–31 μ m), sparsely barbed (Fig. 2F). Lyrifissures *iad* aligned transversely at the level of anterior margin of anal aperture, anteriorly to anal setae *an*₃. Setae *ad*₁ aligned in post-anal position; *ad*₂, *ad*₃ in adanal position. Relative distances: (*ad*₂–*ad*₃) > (*ad*₃–*ad*₃) > (*ad*₂–*ad*₂) > (*ad*₁–*ad*₂) > (*ag*–*ag*) > (*ad*₁–*ad*₁). Subcapitulum secondarily anarthric, bearing 3 pairs subcapitular setae; *a* (29 μ m), *m* (29 μ m) and *h* (43 μ m), minutely barbed (Fig. 2C). Chelicerae elongate; 152 μ m in length, 51 μ m in greatest width; setae *cha* (49 μ m), *chb* (45 μ m) setiform, sparsely barbed throughout length (Fig. 3D). Pedipalpal setae: 0-2-1-3-9[1]; *w* (7 μ m) free from *acm* (13 μ m), *AcmL* (Fig. 3E). Epimerata lineolate; epimeral borders *bo* 1 and *bo* sj. complete transversal bar; *bo* 2 interrupted; *bo* 4 absent. Epimeral setal formula: 3-1-3-3; setae (34 μ m) thin setiform, sparsely barbed throughout length (Fig. 2D).

Legs: Heterotridactylous; median claw (31 μ m) slightly roughened dorsally; lateral claws (24 μ m) smooth; claws turned up, that is, the perpendicular claws on dorsal side of tarsus of each leg (Fig. 4A). Length (μ m) of segments, setae and solenidia of legs given in Tables 1 and 2. On tarsus of leg I, famulus ε (11 μ m) thin acuminate, not terminating in fine tip, situated just lateral to solenidium ω ₂. Solenidium ω ₁ (34 μ m) thin bacilliform; ω ₂ (49 μ m) thin setiform, situated lateral to ω ₁ (Fig. 4B). Anterior margin of tibiae acute. On tibiae I, solenidia φ ₁ (120 μ m) and φ ₂ (29 μ m) setiform; φ ₁ originating from apophysis (9 μ m in width, 4 μ m in length) situated close together at the tip of segment; φ ₂ without apophysis, inserted just behind apophysis of φ ₁ (Fig. 4F). On genu I, solenidium σ (89 μ m) coupled with seta *d* (2 μ m) (Fig. 4C). Femora I with transversal ridge and twisted-like ridge (Fig. 4D). Trochantera I and II hidden inside acetabula. Trochantera III with acute anterior margin, dorsally bearing a few (1–7) dents (1–9 μ m) (Fig. 4E). Femora and trochantera of legs III and IV bearing thin, narrow carina.

Remarks

Sellnick (1931) erected the genus *Peloppia*, designating *Peloppia serrata* Sellnick, 1931 as the type species, because the species had characteristics similar to those of members belonging to the genus *Ceratoppia* Berlese, 1908, however, the mandible showed different feature. Later, Sellnick (1955) treated *Peloppia* Sellnick, 1931 as a synonym of *Metrioppia* Grandjean, 1931, although, Balogh (1943) established the

family Peloppiidae for *Metrioppia* and *Peloppia*. Later, Balogh took the wrong family name, Metrioppiidae (Balogh, 1961; 1963; 1965; 1972; Balogh and Balogh, 1990). Woolley and Higgins (1969) adopted Metrioppiidae Balogh, 1961 instead of Peloppiidae. Kunst (1971) adopted Metrioppiidae for *Metrioppia*, and established the family Ceratoppiidae for *Ceratoppia*. However, Balogh and Balogh (1992) used the correct family name, Peloppiidae, and they placed it under the superfamily Gutavioidea. Subías (2014) adopted Metrioppiidae for *Ceratoppiella*, *Metrioppia* and *Paenoppia*, and Ceratoppiidae Kunst, 1971 for other genera cited by Balogh and Balogh (1992) except for *Furcoppia*. Norton and Behan-Pelletier (2009) and Ermilov and Kalúz (2012) adopted Balogh's (1943) view. The new species has characteristics of Peloppiidae as pointed out by Norton and Behan-Pelletier (2009), that is, brachypyline type, cerotegument weakly developed, prodorsum with true lamellae not positioned close to lateral margin of prodorsum, but without enantiophysis, notogaster with paired opisthonotal glands opening directly on notogaster and more or less ten pairs of setae including *p*-series recognizable as setae, but without scalps, octotaxic system, pteromorphs, dorsophragmata and pleurophragmata, humeral processes or tubercles, and humerosejugal porosae organ, subcapitulum pelopsiform, eupathidium *acm* of pedipalp tarsus not on tubercle, epimerata with transverse apodeme, discidium and circumpedal carina absent, genital plate without transverse scissure and neotrichy, distance between genital and anal apertures greater than length of anal aperture, anal plate with two pairs of setae, legs with femoral and trochanteral carina. In the present work, the new species was treated as a member of the monotypic genus *Ceratoppiella* Hammer, 1977 of the total 19 genera belonging to the families Ceratoppiidae and Metrioppiidae according to Subías (2014), because of the same features, that is, rostral anterior margin dentate, pedotectal region longitudinally lineolate, narrow lamellae fused with the dorsal surface, cusps with dents at anterior margin, bothridia hidden under anterior border of hysterosoma, bothridial setae long, barbed, dorso-sejugal suture present, lyrifissures *ia*, *im* recognizable, mandible peloptoid, epimeral border sj. complete transversal bar, genito-anal setae: 6-1-2-3, lyrifissures *iad* located anteriorly to *ad*₃, genua IV bearing solenidium and heterotridactylous. The new species differs from the type species, *Ceratoppiella lutea* Hammer, 1977, by the form of prodorsum, notogaster, tip of rostrum and cusp, length of lamellae, number of notogastral setae, direction of *ia*, *im*, *iad*, and insertion of aggenital and adanal setae.

Etymology

After the second species of the genus. The Latin word *alter* means one of two or second.

Acknowledgments

The author wishes to acknowledge her indebtedness to the chief priest, Mr. Ryoei Aomine of the 82nd temple, Negoroji for his kindness in allowing her sampling and valuable suggestion about geological, meteorological and historical information, and to Emeritus Prof. Dr. Yoshio Nakamura of Ehime University and Dr. Y-N. Nakamura of National Agricultural Research Center for Kyushu Okinawa Region (KONARC), NARO for their kind helps for sampling and advices.

摘要

藤川徳子 (〒 868-0423 熊本県球磨郡あさぎり町上南 1346 番地の 3) : 四国からのリキシダニモドキ属の二番目の種。

香川県根香寺境内からリキシダニモドキ属 (新称) の新種を採集し記載した。新種サヌキリキシダニモドキ *Ceratoppiella altera* n. sp. は三角形に見える前体部, 逆三角形に見える後体部, 前縁がぎざぎざとなりさらに中央部に凹みとその底に小さな突起を併せ持つ吻先, 前方へ向けてやや収斂する細い桁, 前縁に数個の小さな歯を持つ遊離棘, ほぼ直線状の後体部前縁, 一對の長い毛の p_1 と九対の微小な毛からなる胴背毛, 顎体部は無関節で筒状, 一直線をなす基節板境界 *bo* sj., 接着しない触肢の亜端毛と単条毛, 背側に数個の小さな突起を持つ第三脚の転節, そして幅, 長さ等の異なる三本爪を持つ。日本語の形態用語は鈴木 (1977) を参照した。キーワード: リキシダニモドキ属, 新種, ササラダニ, 四国, 南日本

References

- Balogh, J., 1943. Sistematische Studien über Siebenbürgische Moosmilben. *Annales Historico-Naturales Musei Nationalis Hungarici*, 36 Pars Zoologica: 34–42.
- Balogh, J., 1961. Identification keys of world oribatid (Acari) families and genera. *Acta Zoologica Academiae Scientiarum Hungaricae*, 7 (3-4): 243–344.
- Balogh, J., 1963. Identification keys of Holarctic oribatid mites (Acari) families and genera. *Acta Zoologica Academiae Scientiarum Hungaricae*, 9: 1–60.
- Balogh, J., 1965. A synopsis of the world oribatid (Acari) and genera. *Acta Zoologica Academiae Scientiarum Hungaricae*, 11 (1-2): 5–99.
- Balogh J., 1972. The oribatid genera of the world. *AKADÉMIAI KIADÓ BUDAPEST*, 9-188, plates 1–71.
- Balogh, J. and Balogh, P., 1990. Oribatid mites of the Neotropical Region II. *Budapest: Akadémiai Kiadó*: 5–333.
- Balogh, J. and Balogh, P., 1992. The oribatid mites genera of the world. Volumes 1, pp. 263 and 2, pp. 375. *Hungarian Natural History Museum. Printed in Hungary by The Hungarian National Museum Press.*
- Ermilov, S. G. and Kalúz, S., 2012. The oribatid mite genus *Ceratorchestes* (Acari: Oribatida: Peloppiidae). *Acarologia*, 52 (2): 165–172.
- Fujikawa, T., 2004. A new species of *Allonothrus* from Shikoku Island, Japan (Acari, Oribatei). *Edaphologia*, 74: 11–14.
- Fujikawa, T., 2004 [2005]. A new species Zetomotrichidae from Shikoku Island in Nippon (Acari: Oribatida). *Acarologia*, 46 (4): 341–347.
- Fujikawa, T., 2005a. Five new species of *Malaconothrus* (Acari, Oribatei) from Shikoku Island, Japan. *Edaphologia*, 76: 23–32.
- Fujikawa, T., 2005b. A new species of *Scapheremaeus* (Acari, Oribatida) from Shikoku Island, Japan. *Edaphologia*, 78: 1–4.
- Fujikawa, T. 2007a. Two new species of *Neoribates* (*Neoribates*) (Acari, Oribatida) from Shikoku Island, Japan. *Edaphologia*, 81: 1–7.
- Fujikawa, T., 2007b. Four new species of Galumnidae (Acari, Oribatida) from Shikoku Island, Japan. *Edaphologia*, 82: 25–39.
- Fujikawa, T., 2008. Eleven new species from Shikoku Island in Nippon (Acari, Oribatida). *Acarologia*, 48(1-2): 69–103.
- Fujikawa, T., 2012. A new species of *Odontocepheus* (Acari, Oribatida) from Shikoku Island, Japan. *Edaphologia*, 91: 1–7.
- Fujikawa, T., Ishikawa, K., Shiba, M., Morikawa, K. Tamura, H. and Nakamura, Y., 2006. Soil animals from 88 temples in Shikoku Island 4. Morphological variation in the nineteen known species of Oribatid mites. *Edaphologia*, 79: 1–22.
- Grandjean, F., 1953 [1954]. Essau de classification des Oribates (Acariens). *Extrait du Bulletin de la Société Zoologique de France*, 78 (5-6): 421–446.
- Kunst, M., 1971. Nadkohorta pancířníci - Oribatei. pp. 531–580. *In: Kličzvířeny ČSSR IV* (eds. Daniel, M. and Černý, V.), Academia Praha.
- Nakamura, Y., Ishikawa, K., Shiba, M., Fujikawa, T., Ono, H., Tamura, H. and Morikawa, K. 2006. Soil animals of the 88 Buddhist temples in Shikoku Island. *Memoirs of the Faculty of Agriculture, Ehime University*, 51: 25–48.
- Norton, R. A. and Behan-Pelletier, V. M., 2009. Suborder Oribatida. pp. 430–564, *In: A manual of Acarology -3rd*

- edition (eds. Krantz, G. W. and Walter D. E.), Texas Tech. University Press.
- Sellnick, M., 1931. Mexikanische Milben 1. *Zoologischer Anzeiger. Leipzig*, 95 (5-8): 179–186.
- Sellnick, M., 1955. Berichtigungen und Klarstellungen zu einigen meiner bisher beschriebenen Gattungen und Arten der Acari. *Entomologie Tijdschrift Argentina*, 76 H 1: 60–63.
- Subías L. S., 2014. Listado Sistemático, sinonímico y Biogeográfico de los Ácaros Oribátidos (Acariformes, Oribatida) del Mundo (1758-2002) — *Graellsia*, 60 (número extraordinario): 3–305.updated version 2014; <http://graellsia.revistas.csic.es>.
- Suzuki, K., 1977. Chaetotaxies of Japanese Oribatids (1) Introduction and glossary. *Atypus*, 70: 21–35.
- Woolley, T. A. and Higgins, H. G., 1969. *Metrioppia* in the Western United States (Acari: Cryptostigmata: Metrioppiidae). *Proceedings of the Entomological Society of Washington*, 71 (4): 580–582.