Two new species of *Pedrocortesella*,
with the checklist of oribatid mites from riverine substrata
in southern Vietnam

(*Acari, Oribatida, Pedrocortesellidae*)

Sergey G. Ermilov & Alexander E. Anichkin


An annotated checklist of oribatid mite taxa from riverine substrata near Dong Nai river in southern Vietnam is provided, which consisted of 37 species from 29 genera and 20 families. Four species, *Peloribates guttataoides*, *Phyllhermannia bimaculata*, *Transoribates agricola* and *Vesiculobates silvaticus*, and two genera, *Transoribates* and *Vesiculobates*, are recorded for the first time in Vietnam; of these, *Transoribates agricola* and *Transoribates* are recorded for the first time in the Oriental region. Two new species of the genus *Pedrocortesella* are described. *Pedrocortesella dongnaiensis* spec. nov. is morphologically most similar to *P. callitarsus* Hunt, 1996, however, the new species differs from the latter by the localization of notogastral foveolae and bothridia, length of notogastral ridge and subcapitular setae, and morphology of posterior part of notogaster. *Pedrocortesella vietnamica* spec. nov. is morphologically most similar to *P. anica* Hunt, 1996 and *P. bithongabela* Hunt, 1996, however, the new species differs from both mentioned species by body size, morphology of lamellar and notogastral setae, localization of bothridia, and morphology of notogastral longitudinal ridge. Juvenile instars of *Pedrocortesella dongnaiensis* spec. nov. are described and compared to known juveniles of *Pedrocortesella* (*P. africana*, *P. montis* and *P. monica*).

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Introduction

This work is part of our continuing study of the Southern Vietnamese mite fauna (see for example Ermilov & Anichkin 2011, 2013a,b; Ermilov et al. 2012a,b; Ermilov & Niedbała 2013) and includes data about oribatid taxa collected from some riverine substrata (epiphytic roots of trees, with ferns and mosses covered stones and bases of trunks of trees, leaf litter), which are located near to the Dong Nai river and flooded by water during a damp season annually (June–September). Earlier the oribatid mites of riverine substrata were not studied in Vietnam. A primary goal of our paper is to present an annotated checklist of oribatid mites from these substrata and also to annotate taxa, which are recorded for the first time from Vietnam and the Oriental region.

In the course of taxonomic identification, we found two new species of the genus *Pedrocortesella* Hammer, 1961. The second goal of our paper is to
describe and illustrate these species as *Pedrocortesella dongnaiensis* spec. nov. and *P. vietnamica* spec. nov. For the Vietnamese fauna *Pedrocortesella* has been recorded earlier, only represented by unidentified species (Ermilov et al. 2012b). Thus, the two new species are the first identified members of this genus recorded in Vietnam. We compared our present material with that of previously found specimens of *Pedrocortesella* sp. (Ermilov et al. 2012b), and clarified that *Pedrocortesella vietnamica* spec. nov. and the latter are the same species.

The genus *Pedrocortesella* of the family *Pedrocortesellidae* (see Paschoal 1988, Norton & Behan-Pelletier 2009, Schatz et al. 2011) was proposed by Hammer (1961) with *Pedrocortesella pulchra* Hammer, 1961 as type species. It comprises about 35 species (see different opinions on classification, for example: Hunt 1996, Bayartogtokh 2001, Subías 2004, updated 2013) with a semicosmopolitan distribution. The main morphological characters of *Pedrocortesella* were summarized, for example, by Paschoal (1988), Balogh & Balogh (1992), Hunt (1996), Bayartogtokh (2010). The identification keys to selective species of the genus have been presented earlier by, for example: Ryabinin (1986), Hunt (1996), Balogh & Balogh (2002), Bayartogtokh (2010).

Additionally, the juvenile instars of *Pedrocortesella dongnaiensis* spec. nov. were studied and described. The morphology of the juveniles in this genus was described for three species: *Pedrocortesella africana* (Pletzen, 1963), *P. monicaei* Eugaras, Martinez & Fernandez, 1990, and *P. montis* Fernandez, 1990 (see Ermilov et al. 2010, Eugaras et al. 1990, Fernandez 1990, respectively). Also, Hammer (1961) described a nymph (instar not identified) of *P. pulchra* Hammer, 1961.

### Materials and methods

**Material examined**

Southern Vietnam, Dong Nai Province, Dong Nai Biosphere Reserve, 11°26'N, 107°26'E, near Dong Nai river, riverine substrata flooded by water during a damp season, collected by A. E. Anichkin and S. G. Ermilov in October and November 2013.

**List of substrata**

- V-RS-1: mosses on bases of trunks of trees, 25.X.2013
- V-RS-2: mosses on bases of trunks of trees, 25.X.2013
- V-RS-3: leaf litter, 25.X.2013
- V-RS-4: epiphytic roots of trees, 25.X.2013
- V-RS-5: epiphytic roots of trees, 25.X.2013
- V-RS-6: mosses and ferns on stones, 25.X.2013
- V-RS-7: mosses and ferns on stones, 25.X.2013
- V-RS-a: mosses and ferns on stones, 28.XI.2013
- V-RS-b: soil, 28.XI.2013
- V-RS-c: leaf litter, 28.XI.2013
- V-RS-d: leaf litter, 28.XI.2013
- V-RS-e: mosses on bases of trunks of trees, 28.XI.2013
- V-RS-f: mosses on bases of trunks of trees, 28.XI.2013

The samples were put in zip-lock plastic bags, properly labelled and brought to laboratory for further examinations. In the laboratory the substrates (leaves, epiphytic roots, fern and moss) were immediately put in the Tullgren funnel and illuminated with a 40-watt bulb for 10 days to extract the mites into a small jar containing 70 % ethanol placed under each funnel.

Studied specimens were mounted in lactic acid on temporary cavity slides for measurement and illustration. The body length was measured in lateral view, from the tip of the rostrum to the posterior edge of the ventral plate. The notogastral width refers to the maximum width in dorsal aspect (without pteromorphs). Length of body setae were measured in lateral aspect. All body measurements are presented in micrometers. General terminology used in this paper follows that of F. Grandjean (summarized by Norton & Behan-Pelletier 2009) and Hunt (1996).

**Checklist of identified oribatid mite taxa**

1. **Lohmanniidae**

2. **Malaconothridae**

3. **Hermanniidae**

4. **Pedrocortesellidae**
   - *Pedrocortesella dongnaiensis* spec. nov. Locality: V-RS-a (1 ex.), V-RS-f (1 ex.).
   - *Pedrocortesella vietnamica* spec. nov. Locality: V-RS-2 (1 ex.), V-RS-a (1 ex.).

5. **Gymnodamaeidae**

6. **Oppiidae**

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1 The species which remained unidentified are not included in the checklist.
Neoamerioppia vietnamica (Mahunka, 1988). Locality: V-RS-2 (1 ex.), V-RS-a (2 ex.), V-RS-e (1 ex.), V-RS-f (1 ex.)

Taiwanoppia hungarorum (Mahunka, 1988). Locality: V-RS-2 (1 ex.)

Suctobelbidae
Suctobelbella (Ussuribata) variotetosa (Hammer, 1961). Locality: V-RS-a (1 ex.)

Otocepheidae
Basiceramerus igorotus Corpuz-Raros & Gruèzo, 2011. Locality: V-RS-a (1 ex.)

Carabodidae
Chistyakovella insolta Ermilov, Aoki & Anichkin, 2013. Locality: V-RS-6 (5 ex.)

Tectocepheidae
Tectocepheus velatus (Michael, 1880). Locality: V-RS-4 (1 ex.)

Idiozetidae

Licneremaedae
Licneremaecus polygonalis Hammer 1971. Locality: V-RS-6 (1 ex.)

Oribatellidae

Mycobatidae
Lamellobates molecula (Berlese, 1916). Locality: V-RS-2 (18 ex.), V-RS-3 (3 ex.), V-RS-6 (7 ex.), V-RS-7 (1 ex.), V-RS-a (7 ex.)

Mochlozetidae
Unguizetes clavatus Aoki, 1967. Locality: V-RS-6 (3 ex.)
Unguizetes cattienensis Ermilov & Anichkin, 2011. Locality: V-RS-e (4 ex.)

Caloppiidae
Zetorchella reticulata (Willmann, 1933). Locality: V-RS-3 (1 ex.)

Scheloribatidae
Scheloribates (Scheloribates) latipes (Koch, 1844). Locality: V-RS-b (8 ex.), V-RS-c (7 ex.)
Scheloribates (Scheloribates) praeincisus praeincisus (Berlese, 1910). Locality: V-RS-3 (3 ex.), V-RS-7 (3 ex.)
Vesiculobates silvaticus Hammer, 1979. Locality: V-RS-1 (1 ex.), V-RS-d (1 ex.)

Haplozetidae
Peloribates guttatoideus Hammer, 1979. Locality: V-RS-3 (2 ex.)
Peloribates rangiroaensis Hammer, 1972. Locality: V-RS-2 (1 ex.), V-RS-d (3 ex.)
Peloribates spiniformis Ermilov & Anichkin, 2011. Locality: V-RS-2 (1 ex.), V-RS-6 (1 ex.)
Peloribates stellatus Balogh & Mahunka, 1967. Locality: V-RS-6 (4 ex.), V-RS-a (2 ex.)
Protoribates paracapucinus (Mahunka, 1988). Locality: V-RS-1 (1 ex.)
Trachyoribates ovulum Berlese, 1908. Locality: V-RS-3 (1 ex.), V-RS-4 (3 ex.), V-RS-a (4 ex.)
Transoribates agricola (Nakamura & Aoki, 1989). Locality: V-RS-4 (1 ex.), V-RS-e (2 ex.)

Phenopelopidae

Galumniidae
Galumna (Cosmogalumna) dongnaiensis Ermilov & Anichkin, 2013. Locality: V-RS-2 (2 ex.), V-RS-6 (2 ex.), V-RS-e (4 ex.)
Pergalumna hauseri Mahunka, 1995. Locality: V-RS-2 (1 ex.)

Hence, we identified 37 species from 29 genera and 20 families. Four species, Peloribates guttatoideus (distribution: Indonesia), Phyllhermannia bimaculata (Java and Thailand), Transoribates agricola (Palaearctic region) and Vesiculobates silvaticus (Java), and two genera, Transoribates Pérez-Íñigo, 1992 and Vesiculobates Hammer, 1979, are recorded for the first time in Vietnam; of these, Transoribates agricola and Transoribates are recorded for the first time in the Oriental region.
Descriptions

Pedrocortesella dongnaiensis spec. nov.
Figs 1–14

Adult

Diagnosis. Body size: 614–630 × 348–365 μm. Surface of prodorsum, notogaster and anogenital region foveolate. All body setae without cerotegument. Surface of prodorsum, notogaster and anogenital region with round foveolae (diameter up to 6 μm), clearly distanced from one another.

Prodorsum (Figs 1, 3). Rostrum rounded. Rostral (ro) and lamellar (le) setae of medium size, similar in length (61–69 μm), setiform, smooth, directed antero-medial. Interlamellar setae (in) short (8 μm), spiniform, directed upwards. Sensilli (ss, 82–90 μm) clavate, directed posterio-lateral; sensillar head elongated, densely covered by small scales. Bothridia distanced from anterior margin of notogaster. Exobothridial setae and their alveoli absent. Two pedotectal tooth (pdt) well developed, triangular, weakly blunted.

Notogaster (Figs 1–4) oval in dorsal view, flattened in lateral view. Anterior margin convex, weakly extending anteromedially and reaching level of bothridia. Posterior margin concave medially. Dorso-lateral part with central longitudinal ridge (r) large and wide, distinctly visible, about 1/5 length of notogaster. Circum-marginal furrow (cmf) U-shaped, represented by deep depression, bordering central longitudinal ridge. Five pairs of notogastral setae (h₁, h₂, p₁–p₃) similar in length (22–24 μm), thin, smooth, inserted (except p₂) dorso-laterally in one row. Lyrifissures ia, im, ip, ih, 1ps short, thin. Opisthontal gland openings not visible.

Gnathosoma (Fig. 2). Morphology of subcapitulum, palps and chelicerae typical for Pedrocortesella (Fernandez 1990, Hunt 1996, Bayartogtokh 2001).

Epimeral region (Figs 2, 3). Epimeral setal formula: 3–1–3–3. Epimeral setae (18–20 μm) thin, smooth.

Anogenital region (Figs 2, 3). Seven pairs of genital (g₁, 18–20 μm; g₂–g₅, 12–14 μm), one pair of aggenital (ag, 16–18 μm), two pairs of anal (an₁, an₆, 12–14 μm) and three pairs of anal (ad₁–ad₃, 16–18 μm) setae setiform, thin, smooth. Left anal plate of holotype with three anal setae. Adanal setae ad₁ located in postanal position, ad₂ in latero-postanal position, ad₃ in paraanal position. Lyrifissures iad not visible.


Table 1. Setal and solenidal counts on legs of Pedrocortesella dongnaiensis spec. nov. during ontogeny (same data for adult P. vietnamica spec. nov.).

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Setal and solenidal counts on legs of Pedrocortesella dongnaiensis spec. nov. during ontogeny (same data for adult P. vietnamica spec. nov.).</th>
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<th>Formula of solenidia</th>
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micular cerotegument. All body setae without cerotegument. Surface of prodorsum, notogaster and anogenital region with round foveolae (diameter up to 6 μm), clearly distanced from one another.

Pedrocortesella dongnaiensis spec. nov., adult. ▶
Juvenile instars

Description


Integument (Figs 5–14). Body cuticle colourless to yellowish. Microgranular (diameter less than 1 µm) cerotegument covers body and legs in all juvenile instars. Interlamellar, exobothridial, subcapitular, epimeral, genital and aggenital setae usually without cerotegument, other setae consistently covered with cerotegument, described together as a unit. Cuticle of prodorsum and gastronomic regions, and segments of legs with reticular ornamentation.

Cuticle of epimeral and anogenital regions folded.


Gastronomic region (Figs 5, 6, 11–14) weakly flat

Figs 7–14. Pedrocortesella dongnaiensis spec. nov., juvenile instars. 7–10. Epimeral region (legs except trochanters not shown) of larva, proto-, deut- and tritonymph, respectively. 11–14. Anogenital region of larva, proto-, deut- and tritonymph, respectively. Scale bars 7,8,11, 12 = 50 µm; 9,10,13,14 = 100 µm.
in lateral view. Rounded posteriorly. Centrodorsal region convex. Larva with eight pairs of gastronotic setae \((c_1, c_2, d, d, dp, lp, l_h, l_h)\). Setae \(c_3\) and their alveoli absent. Setae \(l_h\) longest, leaf-shaped; other setae short, simple. Nymphs also with eight pairs of gastronotic setae \((c_1, c_2, lp, l_h, h_2, p_1-p_3)\). All setae leaf-shaped, \(l_h\) longest. Larval exuvial scalp with seven pairs of setae \((c_1, c_2, da, dm, dp, lp, h_2)\); nymphal exuvial calps with six pairs of setae \((c_1, c_2, lp, l_h, h_2, p_3)\). Cupules \(ia, im, ip\) and opisthontanal gland openings poorly visible.

Gnathosoma. Morphology of subcapitulum, palp and chelicerae typical for juveniles of *Pedrocortesella* (Ermilov et al. 2010).

Epimeral region (Figs 7–10). Setal formulae for epimera: larva 3–1–2 (1c forms protective scale over Claparède’s organ), protonymph 3–1–2–1, deutonymph 3–1–2–2, tritonymph 3–1–3–3. Epimeral setae simple, thin, smooth.

Anogenital region (Figs 11–14). Ontogeny of genital, aggenital, anal, adanal setae, larvae to tritonymph, 0–1–4–6, 0–0–1–1, 0–0–3–3, 0–0–0–2, respectively. Deutonymphal instar with two pairs of vestigial alveoli of anal setae. Genital and aggenital setae simple, smooth; anal and adanal setae leaf-shaped. Cupules \(ih, ips, iad\) and opisthontanal gland opening appearing in normal ontogenetic pattern.

Legs. One claw of each leg barbed on dorsal side. Morphology of leg segments, setae and solenidia typical for juveniles of *Pedrocortesella* (Ermilov et al. 2010). Formulae and homology of leg setae and solenidia indicated in Tables 1 and 2.

**Material examined.** Collection data: V-RS-a (holotype and juvenile instars), V-RS-f (paratype).

**Type deposition.** The holotype is deposited in the collection of the Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia; one paratype and juvenile instars are deposited in the collection of the Tyumen State University Museum of Zoology, Tyumen, Russia.

**Etymology.** The specific name “dongnaiensis” refers to the Dong Nai river, near to which a new species has been found.

**Remarks.** Adult. In having the combination of main morphological characters (body surface foveolate; Table 2. Leg setation and solenidia of *Pedrocortesella dongnaiensis* spec. nov. during ontogeny (same data for adult *P. vietnamica* spec. nov.). Roman letters refer to normal setae, Greek letters refer to solenidia; \(e\), famulus; \(\phi\), solenidion and seta coupled. One apostrophe (’) marks setae on anterior and double apostrophe (") setae on posterior side of the given leg segment. Parentheses refer to a pair of setae. Setae are listed only for the stage in which they first appear.

<table>
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<tr>
<th>Leg I</th>
<th>Trochanter</th>
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<th>Genu</th>
<th>Tibia</th>
<th>Tarsus</th>
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<td>(d, l), (\sigma)</td>
<td>(l), (v), (\phi)</td>
<td>(ft, (tc), (p), (u), (a), (s, pv), (pl))</td>
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<td>(l)</td>
<td>(\sigma)</td>
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<td>Deutonymph</td>
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<td>Tritonymph</td>
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<td>Adult</td>
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</table>
Pedrocortesella dongnaiensis spec. nov. is most similar to P. monicai (data from Fernandez 1990).
The nymphal instars of P. monicai are characterized by: interlamellar and exobothridial setae not evident; six pairs of gastronomic setae present (c₁, c₂ absent); adanal setae simple; deutonymphal instar without anal vestigial alveoli.

3) Distinctions between Pedrocortesella dongnaiensis spec. nov. and P. montis (data from Eguaras et al. 1990).
The larval instar of P. dongnaiensis spec. nov. is characterized by: rostral setae setiform; gastronomic setae (except h₁) simple; setae c₁, c₂ absent; setae c₁ and c₂ distant; setae h₁ longest in gastronomic region; central dorsal gastronomic region reticulate. The larva of P. montis is characterized by: rostral and gastronomic setae leaf-shaped; setae c₁ present; c₁ and c₂ close together; setae h₁ not longer than other gastronomic setae; central dorsal gastronomic region folded.

The nymphal instars of Pedrocortesella dongnaiensis spec. nov. are characterized by: rostral setae setiform; gastronomic setae (except h₁) simple; setae c₁, c₂, and c₃ absent; setae h₁ longest in gastronomic region; epimeral formula for deutonymphal instar: 3–1–2–2; deutonymphal instar with two pairs of anal vestigial alveoli. The nymphal instars of P. montis are characterized by: rostral setae leaf-shaped; setae c₂ present; setae c₁ and c₂ close together; setae h₁ not longer than other gastronomic setae; epimeral formula for deutonymphal instar: 3–1–3–2; deutonymphal instar without anal vestigial alveoli.

Pedrocortesella vietnamica spec. nov.
Figs 15–19

Adult


Description

Measurements. Body length: 381 µm (holotype, male), 365 µm (paratype, male); body width: 182 µm (holotype), 166 µm (paratype).

Integument (Figs 15–18). Body colour yellow-brownish. Body surface and legs covered with round cerotegumental granules (diameter up to 1 µm) and reticulate ornamentation. Subcapitular, epimeral,
genital, aggenital and anal without cerotegument; other setae with cloud-like or vermicular cerotegument.


Notogaster (Figs 15–18) oval in dorsal view, flattened in lateral view. Anterior margin convex. Posterior margin rounded. Dorsal part with central longitudinal ridge large and wide, distinctly visible, reaching posterior part of notogaster. Circummargin furrow represented by two deep, elongate longitudinally depressions, bordering central longitudinal ridge. Five pairs of notogastral setae similar in length (28–32 µm), leaf-shaped, inserted (except p1) dorso-laterally in one row. Lyrifissures and opisthognatal gland openings not visible.

Gnathosoma (Fig. 16). Morphology of subcapitulum, palps and chelicerae typical for Pedrocortesella (Fernandez 1990, Hunt 1996, Bayartogtokh 2001).


Anogenital region (Figs 16, 17). Posterior part of ventral plate weakly concave medially. Seven pairs of genital (g1, 18–20 µm; g2–g5, 10–12 µm), one pair of aggenital (10–12 µm) and two pairs of anal (10–12 µm) setae setiform, thin, smooth. Three pairs of analan setae (16–18 µm) leaf-shaped. Adanal setae ad1, located in postanal position, ad2 in latero-postanal position, ad3 in paraanal position. Lyrifissures iad not visible.

Legs (Fig. 19). Three claws of each leg smooth. Medial claw thicker than lateral ones. Morphology of leg segments, setae and solenidia typical for Pedrocortesella (Fernandez 1990, Eguarás et al. 1990, Hunt 1996, Bayartogtokh 2001, Bayartogtokh & Smelyansky 2004). Formulae and homology of leg setae and solenidia indicated in Tables 1 and 2.

Material examined. Collection data: V-RS-a (holotype), V-RS-2 (paratype).

Type deposition. The holotype is deposited in the collection of the Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia; paratype is deposited in the collection of the Tyumen State University Museum of Zoology, Tyumen, Russia.

Etymology. The specific name “vietnamica” refers to the country origin, Vietnam.

Remarks. Adult. In having the combination of main morphological characters (body surface reticulate; notogaster with central longitudinal ridge and two circummargin furrows of elongate form; five pairs of notogastral setae of medium size, leaf-shaped, Pedrocortesella vietnamica spec. nov. is most similar to P. anica Hunt, 1996 and P. bithongabela Hunt, 1996 from Australia (Hunt 1996). However, the new species differs from both by the smaller body size (365–381 × 166–182 µm versus 450–530 × 250–350 µm in P. anica, 465 × 250–330 µm), lamellar setae leaf-shaped (versus setiform in P. anica and P. bithongabela), bothridia distanced from anterior margin of notogaster (versus close in P. anica and P. bithongabela), notogastral longitudinal ridge strongly developed (versus weakly developed); notogastral setae of medium size, leaf-shaped (versus shorter, setiform).

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References


