

New species of *Pulchroppia* (Acari, Oribatida, Oppiidae) from Indonesia

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Original research

ABSTRACT

Two new species of the genus *Pulchroppia* (Oribatida, Oppiidae), *P. richterae* n. sp. and *P. marianae* n. sp., are described, based on materials collected from litter of secondary rainforest in Sumatra, Indonesia. Generic diagnosis and an identification key to the known species of *Pulchroppia* are presented.

Keywords oppiid mites; taxonomy; morphology; generic diagnosis; identification key; Sumatra; Oriental region

Zoobank <http://zoobank.org/73D98ED6-6D2B-4379-BFA0-733D48C4B8B3>

Introduction

The oribatid mite genus *Pulchroppia* (Acari, Oribatida, Oppiidae) was proposed by Hammer (1979), with *Pulchroppia elegans* Hammer, 1979 as type species. At present, the genus comprises eight species from the Oriental region (Subías 2022), which are collectively distributed in different biotopes including e.g., soil, litter, ferns, and mosses in forests, swamps, agroecosystems, and caves on the plains and highlands (Hammer 1979; Corpuz-Raros and Ermilov 2019, 2020). The main goals of this paper are: to describe two new species of *Pulchroppia* from Indonesia collected in the framework of the EFForTS Project (Drescher *et al.* 2016) on the island of Sumatra, to summarize generic morphological traits and to provide an identification key to the known species of the genus.

Presently, one species of *Pulchroppia* has been registered in the Indonesian fauna (Hammer 1979; Corpuz-Raros and Ermilov 2019), *P. elegans* Hammer, 1979.

Methods

Observation and documentation

For measurement and illustration, specimens were mounted in lactic acid on temporary cavity slides. All measurements are in micrometers. Body length was measured in lateral view, from the tip of the rostrum to the posterior edge of the notogaster; other structures were oriented to avoid parallax errors. Notogastral width refers to the maximum in dorsal aspect. Setal lengths were measured perpendicular to their long axis, accounting for curvature. Formulas for leg solenidia are given in square brackets according to the sequence genu-tibia-tarsus. Drawings were made with a camera lucida using a Leica DM 2500 light microscope.

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Terminology

Morphological terminology used in this paper follows that of Grandjean (see Travé and Vachon 1975 for references), Ermilov *et al.* (2021), Ermilov and Rybalov (2022); Norton (1977) for leg setal nomenclature; Norton and Behan-Pelletier (2009) for overview.

Abbreviations

Prodorsum: *cos* = costula; *tcos* = transcostula; *ro*, *le*, *in*, *bs*, *ex* = rostral, lamellar, interlamellar, bothridial, and exobothridial setae, respectively; *exv* = vestige of the second exobothridial seta. *Notogaster*: *c*, *la*, *lm*, *lp*, *h*, *p* = setae; *ia*, *im*, *ip*, *ih*, *ips* = lyrifissures; *gla* = opisthonotal gland opening. *Gnathosoma*: *a*, *m*, *h* = subcapitular setae; *or* = adoral seta; *d*, *l*, *v*, *cm*, *ul*, *su*, *vt*, *lt* = palp setae; ω = palp solenidion; *cha*, *chb* = cheliceral setae; *Tg* = Trägårdh's organ. *Epimeral and lateral podosomal regions*: *1a–1c*, *2a*, *3a–3c*, *4a–4c* = epimeral setae; *PdI* = pedotectum I; *dis* = discidium. *Anogenital region*: *g*, *ag*, *an*, *ad* = genital, aggenital, anal, and adanal setae, respectively; *iad* = adanal lyrifissure; *po* = preanal organ. *Legs*: *Tr*, *Fe*, *Ge*, *Ti*, *Ta* = trochanter, femur, genu, tibia, tarsus, respectively; ω , ϕ , σ = solenidia; ϵ = famulus; *d*, *l*, *v*, *bv*, *ev*, *ft*, *tc*, *it*, *p*, *u*, *a*, *s*, *pv*, *pl* = setae; *tt* = trochanter tooth; *pa* = porose area.

Systematics

Main generic traits of *Pulchroppia*

Adult — *Size*. Length about 300–700. *Integument*. Interbothridial region smooth or tuberculate. Notogaster and anogenital region usually smooth, sometimes foveolate, or notogaster partially with tubercles and rugae. *Prodorsum*. Rostrum rounded, sometimes with two incisions. Costulae and transcostula absent or present (often poorly visible). Lateral carina absent. Paired interbothridial and postbothridial tubercles present or absent. Interbothridial muscle sigillae absent or present (three or four pairs). Rostral, lamellar and interlamellar setae well developed, setiform (exception: *in* slightly dilated distally); *le* inserted closer to *in* than to *ro*. Bothridial seta with some setiform branches unilaterally; branches simple or bifurcate. *Notogaster*. Without humeral tooth and crista. Ten pairs of setae, *c* minute, others short or medium-sized, or long, setiform (exception: slightly dilated distally). *Gnathosoma*. Subcapitulum diarthric. Both adoral seta present. Palp setation: 0–2–1–3–8(+ ω); solenidion very long, in anterior part attached to distal seta. Chelicera chelate-dentate. *Epimeral and lateral podosomal regions*. Epimeral border IV completely absent. Epimeral setal formula: 3–1–3–3; all setae setiform; seta *4a* displaced in aggenital region. Pedotectum I represented by small lamina. Discidium usually present. *Anogenital region*. Five pairs of genital, one pair of aggenital, two pairs of anal, and three pairs of adanal setae, all setae setiform. Adanal seta *ad*₁ posterolateral, *ad*₂ lateral, *ad*₃ anterolateral to anal plate, distance *ad*₃–*ad*₃ longer than *ag*–*ag* and *ad*₂–*ad*₂. Adanal lyrifissure slightly inverse oblique or parallel, close and lateral to anal aperture. *Legs*. Tarsus I with 20 setae (*l*'' and *v*' present), tarsus II with 16 setae (*l*'' present). Tarsus II with two solenidia.

Juveniles — Unknown.

Descriptions

Pulchroppia richterae n. sp.

Zoobank: 963F9CBF-5474-4F0E-B297-2A85A3FB7656

(Figures 1, 2)

Additional pictures are available in the online repository <http://www.ecotaxonomy.org>: ECOTAX_ID: 405475

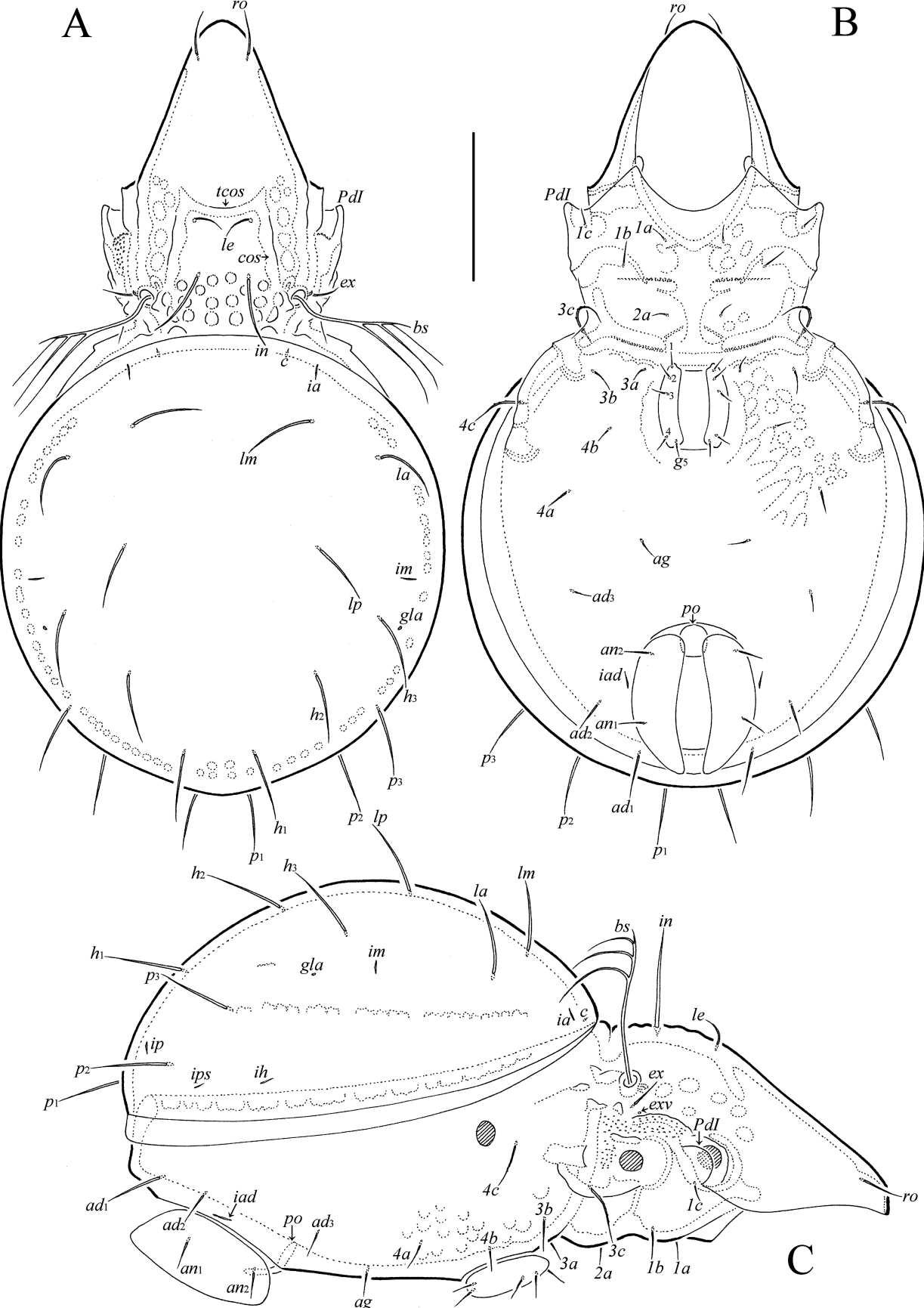


Figure 1 *Pulchroppia richterae* n. sp., adult: A – dorsal view (legs omitted); B – ventral view (gnathosoma and legs omitted); C – lateral view (gnathosoma and legs omitted). Scale bar 100 μ m.

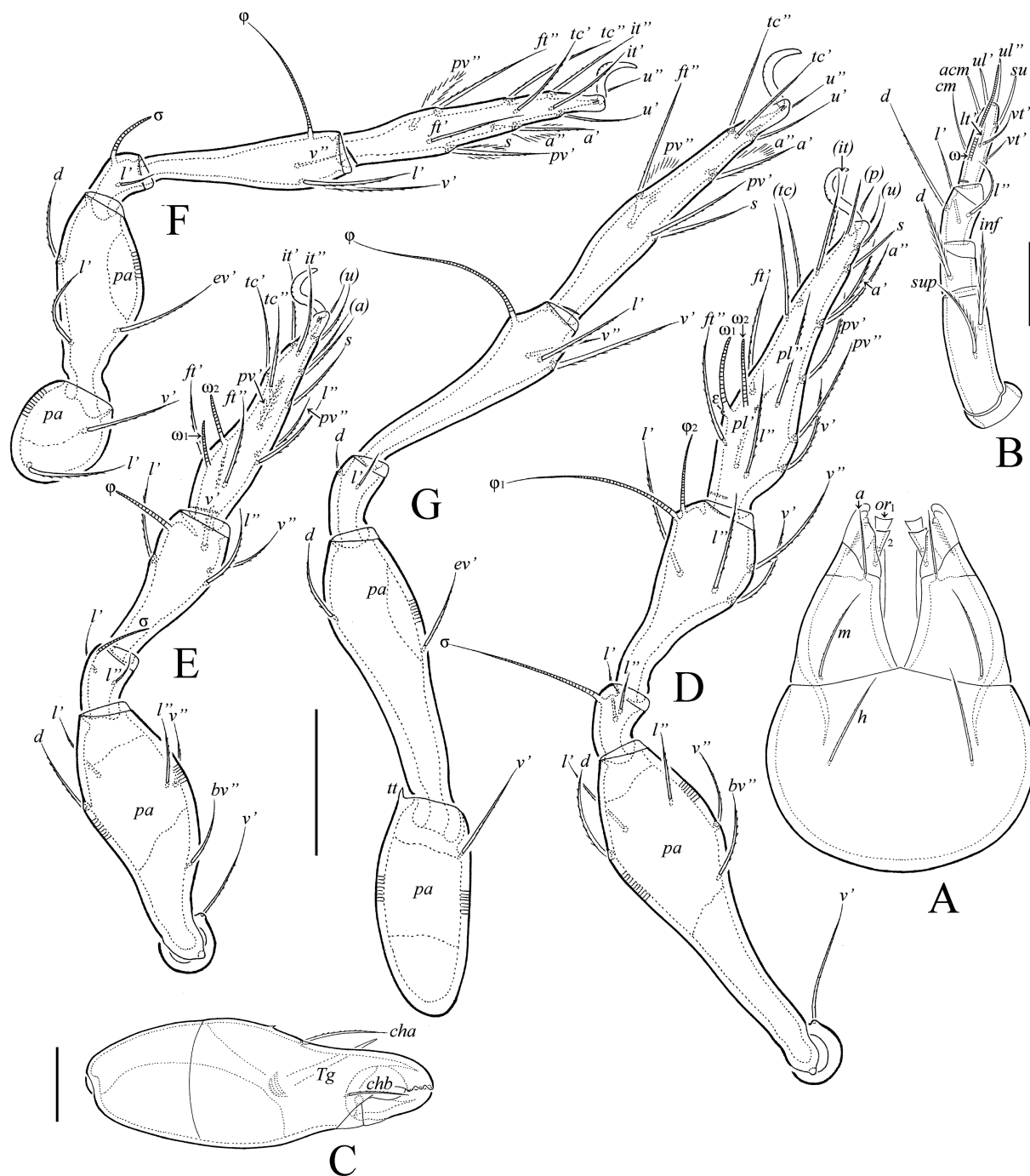


Figure 2 *Pulchroppia richterae* n. sp., adult: A – subcapitulum, ventral view; B – palp, right, antiaxial view; C – chelicera, right, antiaxial view; D – leg I, right, antiaxial view; E – leg II right, antiaxial view; F – leg III, left, antiaxial view; G – leg IV, left, antiaxial view. Scale bar 25 μ m (A, C), 20 μ m (B), 50 μ m (D–G).

Type material — Holotype (female) and four paratypes (three males and one female): Indonesia, Sumatra, Harapan landscape, secondary rainforest, 02°11'15.2"S, 103°20'33.4"E, litter. Specimens were collected by Bernhard Klärner (November 2013) and identified to morphospecies level by Dorothee Sandmann.

The holotype is deposited in the collection of the BRIN (National Research and Innovation

Agency), Cibinong, Indonesia; four paratypes are in the collection of the Tyumen State University Museum of Zoology, Tyumen, Russia. All specimens are preserved in 70% solution of ethanol with a drop of glycerol.

Diagnosis — Body length: 540–555. Interbothridial region tuberculate; notogaster and anogenital region smooth. Rostrum rounded. Rostral and lamellar setae medium-sized, setiform, slightly barbed; interlamellar seta comparatively long, setiform, erect, nearly smooth; exobothridial seta similar to lamellar seta in length; bothridial seta with three branches. Notogastral seta *c* represented by microseta, other setae medium-sized, setiform, erect, nearly smooth. Ventrosejugal tubercles absent. Discidium not defined. Adanal setae setiform, slightly roughened. Adanal lyrifissure slightly inverse oblique. Leg trochanter IV with anterodorsal tooth.

Description — *Measurements* – Body length: 555 (holotype: female), 540–555 (three male paratypes); 540 (one female paratype); body width: 315 (holotype), 315 (three male paratypes); 330 (one female paratype). No distinct difference between males and females in body size.

Integument – Body color light brown to brown. Body surface mostly smooth but interbothridial region with some large tubercles (diameter up to 13) and lateral part of body between bothridium and acetabula I–III densely microtuberculate (diameter of tubercle up to 4).

Prodorsum – Rostrum rounded. Costulae and transcostula present but poorly visible. Rostral (26–34) and lamellar (26–34) setae setiform, slightly barbed; interlamellar seta (82–90) setiform, erect, nearly smooth; exobothridial seta (26–34) setiform, erect, slightly barbed, located on tubercle; bothridial seta (112–127) with three branches; of them, distal branch the shortest, proximal branch the longest. Interbothridial region without muscle sigillae. Postbothridial tubercle absent.

Notogaster – Anterior border convex medially. Notogastral seta *c* (1–2) represented by microseta, others (p_1 : 41–45; *la*, *lm*, *lp*, h_1 – h_3 , p_2 , p_3 : 56–71) setiform, erect, nearly smooth; *lm* and *lp* distinctly not reaching the insertions of *lp* and h_2 , respectively. All notogastral lyrifissures and opisthonotal gland opening distinct.

Gnathosoma – Subcapitulum size: 131–135 × 82–90; subcapitular setae (*a*: 20–22; *m*, *h*: 34–37) setiform, slightly barbed; both adoral setae (13–15) dilated and truncate distally, smooth. Palp length: 82–86; postpalpal seta (4) spiniform, smooth. Chelicera length: 120–124; setae (*cha*: 28–30; *chb*: 20–22) setiform, barbed.

Epimeral and lateral podosomal regions – Epimeral setae *3c* (41–52), *4c* (34–37) setiform, slightly barbed, others (*1b*, *3b*, *4a*: 22–26; *1a*, *1c*, *2a*, *3a*, *4b*: 15–19) setiform, nearly smooth. Ventrosejugal tubercles absent. Discidium not defined.

Anogenital region – Genital (15–19), aggenital (15–19), adanal (ad_1 : 41–45; ad_2 : 22–26; ad_3 : 15–19), and anal (22–26) setae setiform slightly roughened. Adanal lyrifissure slightly inverse oblique, close to anal aperture.

Legs – Claw of each leg slightly barbed on dorsal side. Trochanter IV with anterodorsal tooth. Porose area on femora I–IV and on trochanters III, IV slightly visible. Formulas of leg setation and solenidia: I (1–5–2–4–20) [1–2–2], II (1–5–2–4–16) [1–1–2], III (2–3–1–3–15) [1–1–0], IV (1–2–2–3–12) [0–1–0]; homology of setae and solenidia indicated in Table 1. Setae *p'* and *p''* setiform on tarsus I versus very short, conical on tarsi II–IV; seta *s* eupathidial on tarsus I; famulus short, erect, slightly swollen distally, located close and behind solenidion ω_1 . Solenidia ω_1 , ω_2 on tarsi I, II, ϕ on tibia II, σ on genua II, III medium-sized, slightly bacilliform or rod-like versus other solenidia long, setiform.

Remarks — *Pulchroppia richterae* n. sp. is morphologically similar to *P. elegans* Hammer, 1979 in having setiform, nearly smooth notogastral setae and simple branches on the bothridial seta, but differs from the latter by the larger body length (540–555 versus 460), the number of branches on the bothridial seta (three versus seven or eight), the length of dorsal notogastral setae (medium-sized versus long), by tuberculate (versus not tuberculate) interbothridial region, and the relative length of lamellar and exobothridial setae (*ex* not shorter than *le* versus shorter).

Etymology — The species name is dedicated to MSc Kristina Richter for her contributions to studies on the diversity and ecology of oribatid mites of Ecuador and Indonesia. She

contributed to the morphospecies collection of oribatid mites of Jambi province, Sumatra Indonesia and in digitally recording this collection.

***Pulchroppia marianae* n. sp.**

Zoobank: AF6911A0-4AFF-43BB-84F7-1E5CA7E30A02

(Figure 3)

Additional pictures are available in the online repository https://www.ecotaxonomy.org:ECOTAX_ID:405881

Type material — Holotype (male) and four paratypes (two males and two females): Indonesia, Sumatra, Bukit Duabelas, secondary rainforest, 01°58'55.1"S, 102°45'02.7"E, litter. Specimens were collected by Bernhard Klärner (November 2013) and identified to morphospecies level by Dorothee Sandmann.

The holotype is deposited in the collection of the BRIN (National Research and Innovation Agency), Cibinong, Indonesia; four paratypes are in the collection of the Tyumen State University Museum of Zoology, Tyumen, Russia. All specimens are preserved in 70% solution of ethanol with a drop of glycerol.

Diagnosis — Body length: 450–555. Interbothridial region tuberculate; notogaster and anogenital region foveolate. Rostrum narrowly rounded, with two small lateral incisions. Rostral and lamellar setae medium-sized, setiform, slightly barbed; interlamellar seta setiform, erect, slightly barbed; exobothridial seta longer than lamellar seta; bothridial seta with four branches. Notogastral seta *c* represented by microseta, others long, setiform, with flagellate tip, shortly ciliate. Ventrosejugal tubercles present. Discidium developed. Adanal setae setiform, with flagellate tip, shortly ciliate. Adanal lyrifissure slightly inverse oblique. Leg trochanter IV with anterodorsal tooth.

Description — *Measurements* – Body length: 510 (holotype: male), 450, 495 (two male paratypes); 540, 555 (two female paratypes); body width: 270 (holotype), 263, 270 (two male paratypes); 300, 330 (two female paratypes). Males smaller than females in body size.

Integument – Body color light brown to brown. Notogaster and anogenital region foveolate (diameter of foveola up to 7); interbothridial region with some large tubercles (diameter up to 13); lateral part of body between bothridium and acetabula I–III densely microtuberculate (diameter of tubercle up to 4).

Prodorsum – Rostrum protruding, narrowly rounded, with two small lateral incisions. Costulae present but poorly visible; transcostula not observed. Rostral (30–37) and lamellar (22–24) setae setiform, slightly barbed; interlamellar (56–64) and exobothridial (34–41) setae setiform, erect, slightly barbed; *ex* located on tubercle; bothridial seta (105–116) with four branches; of them, distal branch the shortest, proximal branch the longest. Interbothridial region without muscle sigillae. Postbothridial tubercle present.

Notogaster – Anterior border convex medially. Notogastral seta *c* (1–2) represented by microseta, others (p_1 : 41–45; *la*, *lm*, *lp*, h_1 – h_3 , p_2 , p_3 : 82–86) setiform, with flagellate tip,

Table 1 Leg setation and solenidia of adult *Pulchroppia richterae* n. sp. and *P. marianae* n. sp.

Leg	Tr	Fe	Ge	Ti	Ta
I	v'	$d, (l), bv'', v''$	$(l), \sigma$	$(l), (v), \varphi_1, \varphi_2$	$(ft), (tc), (it), (p), (u), (a), s, (pv), (pl), l'', v', \varepsilon, \omega_1, \omega_2$
II	v'	$d, (l), bv'', v''$	$(l), \sigma$	$(l), (v), \varphi$	$(ft), (tc), (it), (p), (u), (a), s, (pv), l'', \omega_1, \omega_2$
III	l', v'	d, l', ev'	l', σ	$l', (v), \varphi$	$(ft), (tc), (it), (p), (u), (a), s, (pv)$
IV	v'	d, ev'	d, l'	$l', (v), \varphi$	$ft'', (tc), (p), (u), (a), s, (pv)$

Note: Roman letters refer to normal setae, Greek letters to solenidia (except ε = famulus); single quotation mark (') designates setae on the anterior and double quotation mark (") setae on the posterior side of a given leg segment; parentheses refer to a pair of setae.

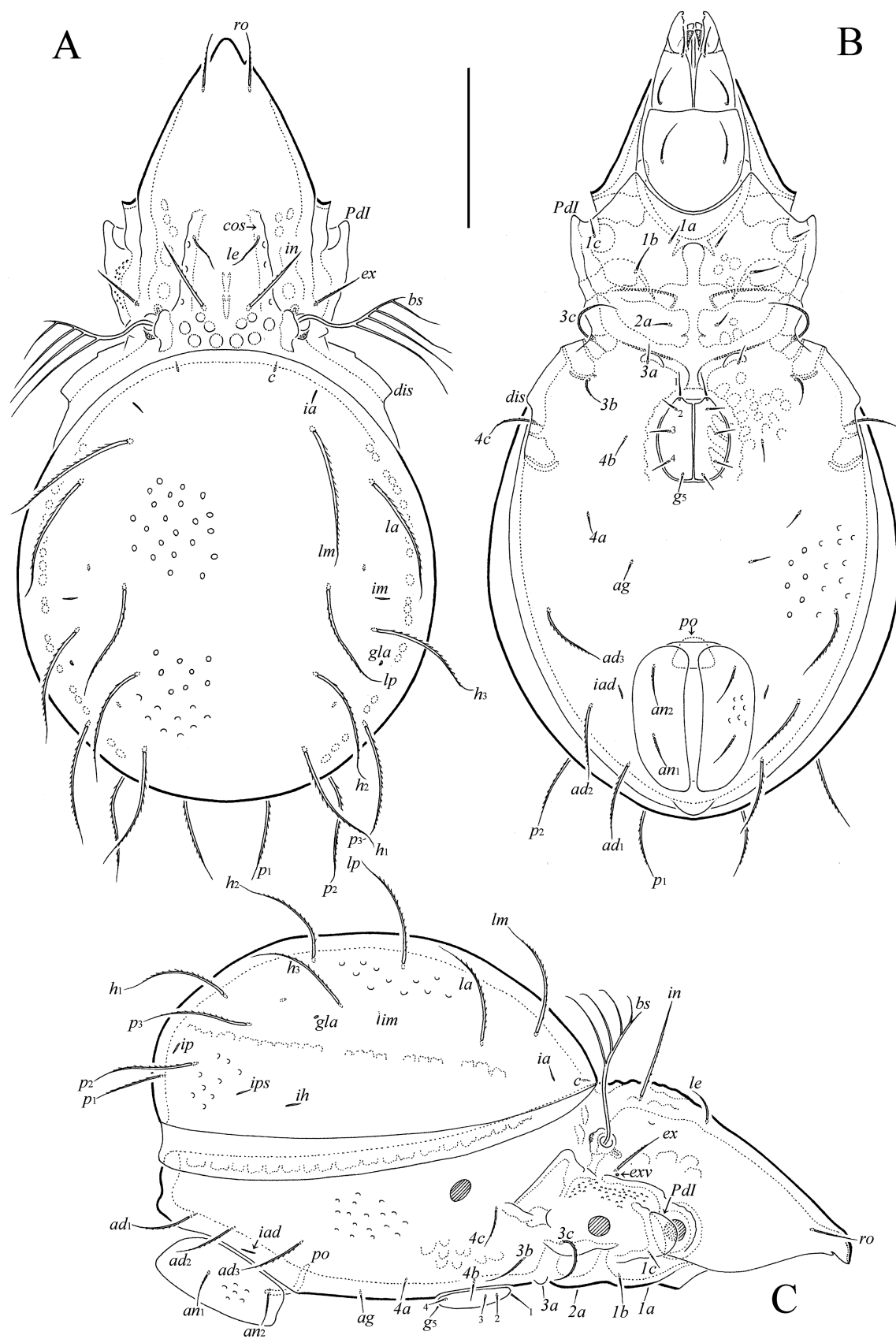


Figure 3 *Pulchroppia marianae* n. sp., adult: A – dorsal view (legs omitted); B – ventral view (legs omitted); C – lateral view (gnathosoma and legs omitted). Scale bar 100 μ m.

shortly ciliate; *lm* and *lp* reaching or almost reaching the insertions of *lp* and *h*₂, respectively. All notogastral lyrifissures and opisthonotal gland opening distinct.

Gnathosoma – Mostly similar to *P. richterae* **n. sp.** except sizes. Subcapitulum size: 124–131 × 82–86; subcapitular setae (*a*: 20–22; *m*, *h*: 34–37) setiform, slightly barbed; both adoral setae (13–15) dilated and truncate distally, smooth. Palp length: 82–86; postpalpal seta (4) spiniform, smooth. Chelicera length: 124–131; setae (*cha*: 28–30; *chb*: 20–22) setiform, barbed.

Epimeral and lateral podosomal regions – Epimeral setae *3c* (49–52), *3b*, *4c* (41–45) setiform, slightly barbed, others (*1b*: 15–19; *4a*, *4b*: 13–15; *1a*, *1c*, *2a*, *3a*: 11–15) setiform, roughened or slightly roughened; *3a* located at the base of well-developed ventrosetigular tubercle. Discidium elongate triangular.

Anogenital region – Genital (*g*₁: 15; others: 11) and aggenital (13–15) setae setiform, slightly roughened; adanal setae (45–52) setiform, with flagellate tip, shortly ciliate; anal seta (22–30) setiform, slightly barbed. Adanal lyrifissure slightly inverse oblique, close to anal aperture.

Legs – Similar to *P. richterae* **n. sp.**; homology of setae and solenidia indicated in Table 1.

Remarks — *Pulchroppia marianae* **n. sp.** differs from all representatives of the genus by the presence (versus absence) of foveolate notogaster and anogenital region.

Etymology — The species name is dedicated to Dr. Franca Marian for her contributions to the ecological and taxonomic knowledge of the oribatid mites of Ecuador. She was instrumental in establishing the morphospecies collection of oribatid mites of Podocarpus National Park and surrounding areas in southern Ecuador and in digitally recording this collection.

Key to known species of *Pulchroppia*

1. All or some branches of bothridial seta bifurcate 2
— All branches of bothridial seta simple 3
2. All branches of bothridial seta bifurcate; rostrum protruding, with two incisions; interbothridial region with one pair of tubercles, without muscle sigillae; body length: 315–365
..... *Pulchroppia roynortoni* Ermilov and Anichkin, 2011. Distribution: Vietnam.
— Some branches of bothridial seta bifurcate, others simple; rostrum rounded; interbothridial region without tubercles, with three pairs of muscle sigillae; body length: 549–564
..... *Pulchroppia ramifera* Wang and Li, 1997 (in Wang *et al.* 1997). Distribution: China.
3. Notogaster entirely or partially with strong ornamentation or sculpturing 4
— Notogaster nearly smooth 5
4. Notogaster and anogenital region foveolate; notogaster without tubercles and rugae; anal plate not striate; rostrum protruding, with two small incisions; bothridial seta with four branches; interbothridial region tuberculate, without muscle sigillae; exobothridial seta not shorter than lamellar seta; body length: 450–555 *Pulchroppia marianae* **n. sp.** Distribution: Sumatra.
— Notogaster and anogenital region not foveolate; posterior part of notogaster with tubercles and rugae; anal plate striate; rostrum rounded; bothridial seta with seven branches; interbothridial region not tuberculate, with four pairs of muscle sigillae; exobothridial seta shorter than lamellar seta; body length: 427–452
..... *Pulchroppia sculpturata* Mahunka, 2008. Distribution: Thailand.
5. Interlamellar and notogastral setae dilated distally; body length: 295–475
..... *Pulchroppia burckhardtii* Mahunka, 1987. Distribution: Borneo.
— Interlamellar and notogastral setae setiform 6

6. All notogastral setae nearly smooth 7
 — All notogastral setae distinctly barbed 8
7. Bothridial seta with three branches; dorsal notogastral setae medium-sized; interbothridial region tuberculate; exobothridial seta not shorter than lamellar seta; body length: 540–555 ...
 *Pulchroppia richterae* **n. sp.** Distribution: Sumatra.
 — Bothridial seta with seven or eight branches; dorsal notogastral setae long; interbothridial region not tuberculate; exobothridial seta shorter than lamellar seta; body length: 460
 *Pulchroppia elegans* Hammer, 1979. Distribution: Oriental.
8. All notogastral setae barbed only in distal part; body length: 500–510
 *Pulchroppia pendula* (Balogh, 1970). Distribution: Sri Lanka.
 — All notogastral setae barbed entirely 9
9. Bothridial seta with four or five branches; interlamellar seta longer than rostral seta; exobothridial seta not shorter than lamellar seta; body length: 639–672
 *Pulchroppia granulata* Mahunka, 1988. Distribution: Oriental.
 — Bothridial seta with seven or eight branches; interlamellar seta shorter than rostral seta; exobothridial seta shorter than lamellar seta; body length: 373
 *Pulchroppia malapectinata* (Corpuz-Raros, 1979). Distribution: Philippines.

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