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Sergey G Ermilo. Two new species of *Amboroppia* (*Quintanoppia*) (Acari, Oribatida, Oppiidae) from Guatemala. *Acarologia*, 2024, 64 (2), pp.315-322. 10.24349/rba2-mlms . hal-04495694

HAL Id: hal-04495694

<https://hal.science/hal-04495694>

Submitted on 8 Mar 2024

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Two new species of *Amboroppia* (*Quintanoppia*) (Acari, Oribatida, Oppiidae) from Guatemala

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Original research

ABSTRACT

Two new species of oppiid mites of the subgenus *Amboroppia* (*Quintanoppia*) (Oribatida, Oppiidae) — *A. (Q.) guatemalaensis* n. sp. and *A. (Q.) zacapaensis* n. sp. — are described, based on materials collected from damp litter in cloud forest in Guatemala. An identification key to the known species of *Amboroppia* (*Quintanoppia*) is provided.

Keywords oribatid mites; taxonomy; morphology; identification key; Neotropical region

Zoobank <http://zoobank.org/C03727A0-BD42-4125-8B6A-C88175EEA82>

Introduction

The oribatid mite genus *Amboroppia* (Acari, Oribatida, Oppiidae) was proposed by Ermilov and Starý (2022), with *Amboroppia bayartogtokhi* Ermilov and Starý, 2022 as type species, based on specimens collected from Bolivia. Ermilov *et al.* (2022) described the second species of the genus, *A. andensis* Ermilov, Subías, Shtanchaeva and Friedrich, 2022 from Peru. Ermilov and Kontschán (2023) proposed the new subgenus of *Amboroppia*, *A. (Quintanoppia)* Ermilov and Kontschán, 2023, with *A. (Q.) defectofossulata* Ermilov and Kontschán (2023) as type species from Mexico. Thus, the genus comprises two subgenera and three species distributed in the Neotropical region having a highly circumscribed geographic distribution, i.e., are endemic to a single country. Representatives of the genus are typical inhabitants of soil-litter in primary and secondary mountain forests (Ermilov and Kontschán 2023). The generic and subgeneric traits have been presented by Ermilov and Kontschán (2023).

The main goals of this paper are to describe two new species of *A. (Quintanoppia)* collected from Guatemala and to present an identification key to the known species of the subgenus.

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.


Terminology — Morphological terminology used in this paper follows that of Ermilov and Starý (2022) and Ermilov *et al.* (2022); see also Norton (1977) for leg setal nomenclature and Norton and Behan-Pelletier (2009) for overview.

Received 13 January 2024

Accepted 26 February 2024

Published 04 March 2024

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Academic editor

Pfingstl, Tobias

<https://doi.org/10.24349/rba2-mlms>

ISSN 0044-586X (print)

ISSN 2107-7207 (electronic)



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How to cite this article Ermilov S. G. (2024), Two new species of *Amboroppia* (*Quintanoppia*) (Acari, Oribatida, Oppiidae) from Guatemala. *Acarologia* 64(2): 315-322. <https://doi.org/10.24349/rba2-mlms>

Abbreviations — *Prodorsum*: *ro*, *le*, *in*, *bs*, *ex* = rostral, lamellar, interlamellar, bothridial, and exobothridial setae, respectively; *lpc* = lateral prodorsal carina. *Notogaster*: *c*, *la*, *lm*, *lp*, *h*, *p* = setae; *ia*, *im*, *ip* = lyrifissures; *gla* = opisthonotal gland opening. *Gnathosoma*: *a*, *m*, *h* = subcapitular setae; *or* = adoral seta; *d*, *l*, *sup*, *inf*, *cm*, *acm*, *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; *Pdl* = 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, and tarsus, respectively; *pa* = porose area; ω , ϕ , σ = solenidia; ε = famulus; *d*, *l*, *v*, *bv*, *ev*, *ft*, *tc*, *it*, *p*, *u*, *a*, *s*, *pv*, *pl* = setae.

Descriptions

Amboroppia (Quintanoppia) guatemalaensis n. sp.

Zoobank: AD2F17D5-1001-4B23-9E9E-D1F022EA18BB

(Figures 1, 2)

Type material — Holotype (male) and six paratypes (six males): eastern Guatemala, Zacapa Department, Sierra de Las Minas, 9 km N. San Lorenzo, 2100 m a.s.l., damp litter in cloud forest, 17.XI.1986 (E. Lindquist).

The holotype is deposited in the Canadian National Collection, Ottawa, Canada; six 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: 870–945. Interbothridial region of prodorsum tuberculate. Median tooth of rostrum pointed. Six to seven teeth on lateral side of prodorsum. Costular-transcostular complex absent. Relative length of prodorsal setae: *in* > *ro* > *le* > *ex*; all setae setiform, barbed; bothridial seta long, spindle-form, with narrowly elongate dilated mediiodistal part, barbed. Notogastral seta *c* short; *p*₁, *p*₂, *p*₃ medium-sized; others long; all barbed.

Description — *Measurements* – Body length: 945 (holotype), 870–945 (paratypes); notogaster width: 600 (holotype), 540–600 (paratypes).

Integument – Body color light brown to brown. Body surface microporose (visible only under high magnification in dissected specimen, \times 1000); interbothridial region and lateral part of prodorsum (between bothridium and acetabula I–IV) densely tuberculate.

Prodorsum – Rostrum of typical form, tripartite; median tooth pointed. Lateral side of prodorsum with six to seven strong teeth. Costular-transcostular complex absent. Rostral (101–123), lamellar (94–120) and interlamellar (187–195) setae setiform, barbed; exobothridial seta (45–49) setiform, slightly barbed; *ex* thinner than others; bothridial seta (315–345) of typical morphology: spindle-form, with narrowly elongate dilated mediiodistal part, barbed. Three pairs of interbothridial muscle sigillae. Basal part of prodorsum with one pair of distinct tubercles and several tuberculate thickenings.

Notogaster – Seta *c* (56–60) setiform, slightly barbed; others (*p*₁, *p*₂: 142–154; *p*₃: 116–120; *h*₁: 202–225; *la*, *lm*, *lp*, *h*₂, *h*₃: 255–300) setiform, barbed. Opisthonotal gland opening and lyrifissures *ia*, *im*, *ip* distinct; *ih* and *ips* not observed.

Gnathosoma – Subcapitulum size: 210–229 \times 135–150; subcapitular setae (*a*: 45–52; *m*: 60–71; *h*: 71–75) setiform, slightly barbed; both adoral setae (19) setiform, barbed. Chelicera length: 202–206; setae (*cha*: 56–64; *chb*: 37–41) setiform, barbed. Palp length: 112–120; postpalpal seta (9) spiniform, roughened.

Epimeral and lateral podosomal regions – Epimeral border IV well visible, oblique. All epimeral setae (*1a*, *2a*, *3a*, *4b*: 67–75; *3c*: 131–142; others: 94–101) setiform, barbed. Discidium triangular.

Anogenital region – All genital setae (37–41) setiform, slightly barbed; aggenital (101–105), anal (45–49) and adanal (101–105) setae setiform, barbed. Adanal lyrifissure distinct.



Figure 1 *Amboroppia (Quintanoppia) guatemalaensis* n. sp., adult: A – dorsal view (legs omitted); B – ventral view (gnathosoma and legs omitted); C – lateral view (gnathosoma and legs omitted). Scale bar 200 μ m.

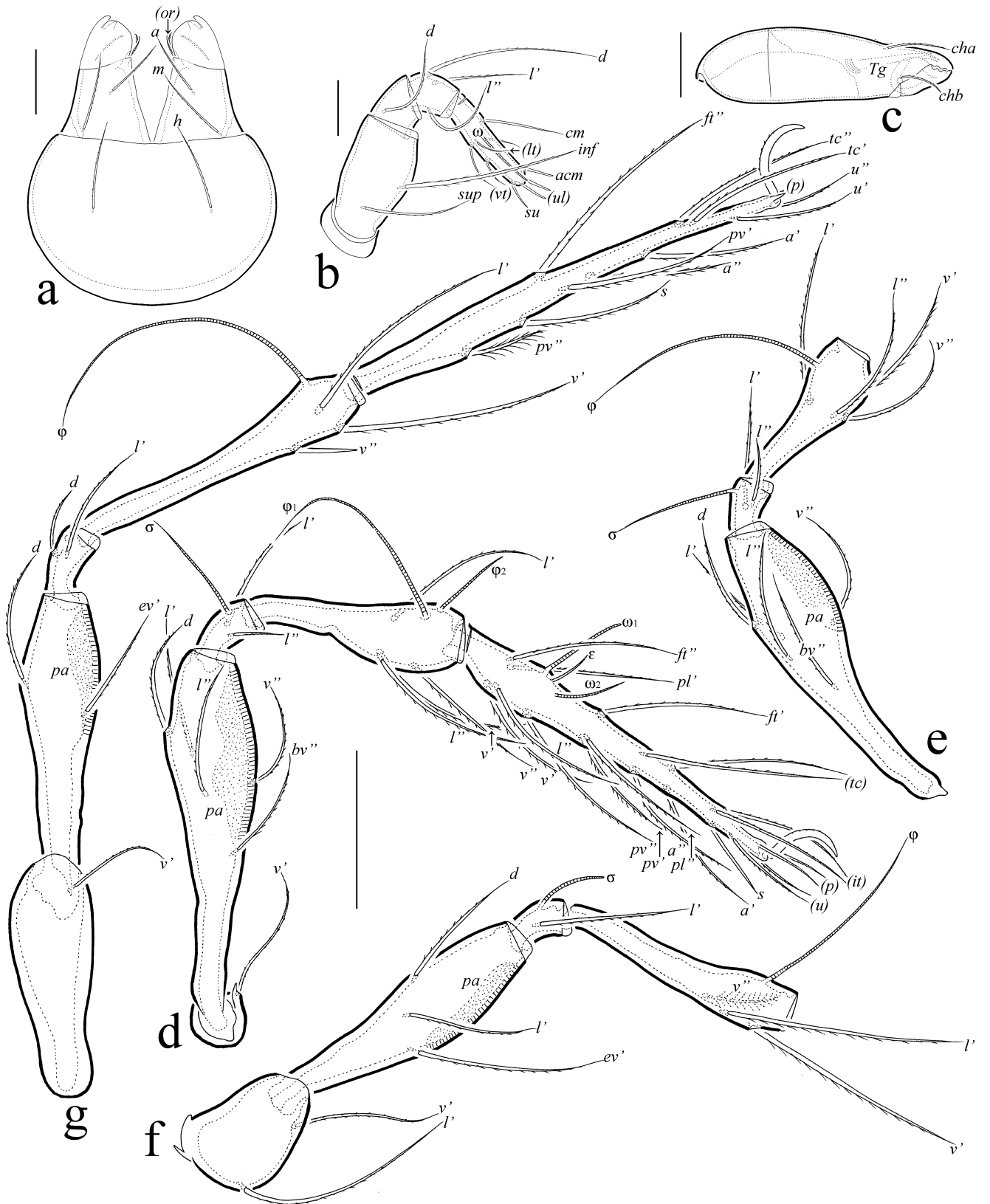


Figure 2 *Amboroppia (Quintanoppia) guatemalaensis* n. sp., adult: A – subcapitulum, ventral view; B – palp, right, antiaxial view; C – chelicera, right, antiaxial view; D – leg I, right, antiaxial view; E – leg II (tarsus and trochanter omitted), right, antiaxial view; F – leg III (trochanter omitted), left, antiaxial view; G – leg IV, left, antiaxial view. Scale bar 50 μ m (A, C), 20 μ m (B), 100 μ m (D–G).

Legs – Claw of all legs slightly barbed on dorsal side. Trochanter III with two posterior teeth. Femora I–IV with large ventral porose area. 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.

Remarks — *Amboroppia (Quintanoppia) guatemalaensis* n. sp. is similar to *A. (Q.) defectofossulata* Ermilov and Kontschán, 2023 in having long dorsal notogastral setae (*la* clearly beyond the insertion of h_3), but differs from the latter by the larger body length (870–945 versus 600–660 in *A. (Q.) defectofossulata*), the morphology of the median tooth of the rostrum (pointed versus rounded in *A. (Q.) defectofossulata*), and the absence (versus presence in *A. (Q.) defectofossulata*) of the costular-transcostular complex and granules in the region between lamellar and interlamellar setae.

Etymology — The species name *guatemalaensis* refers to the country of origin, Guatemala.

***Amboroppia (Quintanoppia) zacapaensis* n. sp.**

Zoobank: C08A48CB-47BB-4C0C-BB08-674524F25E33

(Figure 3)

Type material — Holotype (male) and three paratypes (three males): eastern Guatemala, Zacapa Department, Sierra de Las Minas, 9 km N. San Lorenzo, 2100 m a.s.l., damp litter in cloud forest, 17.XI.1986 (E. Lindquist).

The holotype is deposited in the Canadian National Collection, Ottawa, Canada; three 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: 810–900. Interbothridial region of prodorsum tuberculate. Median tooth of rostrum rounded. Five to seven teeth on lateral side of prodorsum. Costular-transcostular complex absent. Relative length of prodorsal setae: $in > ro > le > ex$; all setae setiform, barbed; bothridial seta long, spindle-form, with narrowly elongate dilated mediobasal part, barbed. Notogastral seta *c*, h_1 , p_1 , p_2 , p_3 short, others medium-sized; all barbed.

Description — *Measurements* – Body length: 870 (holotype), 810–900 (paratypes); notogaster width: 570 (holotype), 525–585 (paratypes).

Integument – Body color light brown to brown. Body surface microporose (visible only under high magnification in dissected specimen, $\times 1000$); interbothridial region and lateral part of prodorsum (between bothridium and acetabula I–IV) densely tuberculate.

Prodorsum – Rostrum of typical form, tripartite; median tooth rounded. Lateral side of prodorsum with five to seven strong teeth. Costular-transcostular complex absent. Rostral (82–86), lamellar (71–79) and interlamellar (139–150) setae setiform, barbed; exobothridial seta (41–49) setiform, slightly barbed; *ex* thinner than others; bothridial seta (202–221) of typical morphology: spindle-form, with narrowly elongate dilated mediobasal part, barbed. Three or four pairs of interbothridial muscle sigillae. Basal part of prodorsum with one pair of distinct tubercles and several tuberculate thickenings.

Notogaster – Seta *c* (36–45) setiform, slightly barbed; others (h_1 , p_1 , p_2 , p_3 : 56–64; *la*, *lm*, *lp*, h_2 , h_3 : 135–172) setiform, barbed. Opisthonotal gland opening and lyrifissures *ia*, *im*, *ip*

Table 1 Leg setation and solenidia of adult *Amboroppia (Quintanoppia) guatemalaensis* n. sp. and *A. (Q.) zacapaensis* n. sp.

Leg	Tr	Fe	Ge	Ti	Ta
I	<i>v'</i>	<i>d</i> , (<i>l</i>), <i>bv''</i> , <i>v''</i>	(<i>l</i>), σ	(<i>l</i>), (<i>v</i>), ϕ_1 , ϕ_2	(<i>ft</i>), (<i>tc</i>), (<i>it</i>), (<i>p</i>), (<i>u</i>), (<i>a</i>), <i>s</i> , (<i>pv</i>), <i>v'</i> , (<i>pl</i>), <i>l''</i> , ϵ , ω_1 , ω_2
II	<i>v'</i>	<i>d</i> , (<i>l</i>), <i>bv''</i> , <i>v''</i>	(<i>l</i>), σ	(<i>l</i>), (<i>v</i>), ϕ	(<i>ft</i>), (<i>tc</i>), (<i>it</i>), (<i>p</i>), (<i>u</i>), (<i>a</i>), <i>s</i> , (<i>pv</i>), <i>l''</i> , ω_1 , ω_2
III	<i>l'</i> , <i>v'</i>	<i>d</i> , <i>l'</i> , <i>ev'</i>	<i>l'</i> , σ	<i>l'</i> , (<i>v</i>), ϕ	(<i>ft</i>), (<i>tc</i>), (<i>it</i>), (<i>p</i>), (<i>u</i>), (<i>a</i>), <i>s</i> , (<i>pv</i>)
IV	<i>v'</i>	<i>d</i> , <i>ev'</i>	<i>d</i> , <i>l'</i>	<i>l'</i> , (<i>v</i>), ϕ	<i>ft''</i> , (<i>tc</i>), (<i>p</i>), (<i>u</i>), (<i>a</i>), <i>s</i> , (<i>pv</i>)

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.

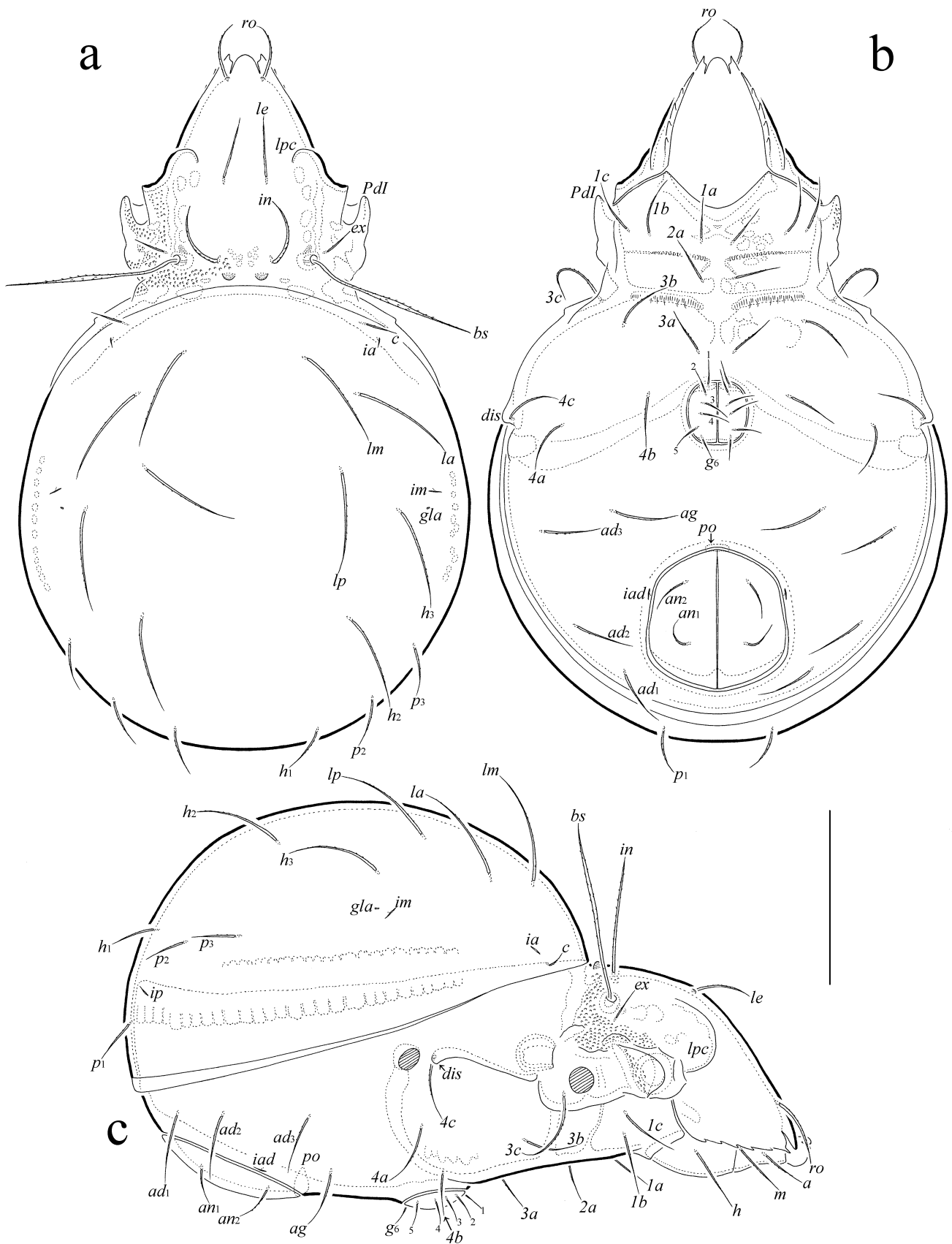


Figure 3 *Amboroppia (Quintanoppia) zacapaensis* sp., adult: A – dorsal view (legs omitted); B – ventral view (gnathosoma and legs omitted); C – lateral view (legs omitted). Scale bar 200 µm.

distinct; *ih* and *ips* not observed.

Gnathosoma – Similar to *Amboroppia (Quintanoppia) guatemalaensis* **n. sp.** except sizes: subcapitulum size: 195–210 × 123–135; *a*: 45–52; *m*: 56–60; *h*: 64–71; adoral setae: 19; chelicera length: 187–195; *cha*: 49–52; *chb*: 30–34; palp length: 94–105; postpalpal seta: 9.

Epimeral and lateral podosomal regions – Epimeral border IV well visible, oblique. All epimeral setae (*1a*, *2a*, *3a*, *4b*: 49–64; *3c*: 101–109; others: 75–86) setiform, barbed. Discidium triangular.

Anogenital region – All genital setae (34–37) setiform, slightly barbed; aggenital (82–86), anal (37–41) and adanal (82–86) setae setiform, barbed. Adanal lyrifissure distinct.

Legs – Similar to *Amboroppia (Quintanoppia) guatemalaensis* **n. sp.**

Remarks — *Amboroppia (Quintanoppia) zacapaensis* **n. sp.** differs from *A. (Q.) defectofossulata* Ermilov and Kontschán, 2023 and *A. (Q.) guatemalaensis* **n. sp.** by the length of dorsal notogastral setae (medium sized versus long in *A. (Q.) defectofossulata* and *A. (Q.) guatemalaensis*).

Etymology — The species name *zacapaensis* refers to the department of origin, Zacapa.

General remarks

Two of the generic morphological traits of *Amboroppia* are: the presence of prodorsal costulae and transcostula (Ermilov and Kontschán 2023), and body length 400–700. However, the costular-transcostular complex absent in *A. (Q.) guatemalaensis* **n. sp.** and *A. (Q.) zacapaensis* **n. sp.**, and their body length 810–945. Hence, we propose to correct these characteristics in the generic diagnosis of *Amboroppia*: costular-transcostular complex present or absent, and body length in the interval 400–1000.

Key to known species of *Amboroppia (Quintanoppia)*

1. Costular-transcostular complex well developed; body length: 600–660
 *Amboroppia (Quintanoppia) defectofossulata* Ermilov and Kontschán, 2023
 — Costular-transcostular complex not developed 2
2. Dorsal notogastral setae long (*la* clearly beyond the insertion of *h*₃); median tooth of rostrum pointed distally; body length: 870–945
 *Amboroppia (Quintanoppia) guatemalaensis* **n. sp.**
 — Dorsal notogastral setae medium-sized (*la* not reaching the insertion of *h*₃); median tooth of rostrum rounded; body length: 810–900
 *Amboroppia (Quintanoppia) zacapaensis* **n. sp.**

Acknowledgements

I thank Dr. Wayne Knee for facilitating the loan of Acari material from the Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa, Canada and two anonymous reviewers for valuable comments.

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