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A new species of stilt-legged mite of the genus *Neophyllobius* Berlese (Acari: Camerobiidae) from Brazil

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Original research

ABSTRACT

A new species of Neotropical Camerobiidae from Brazil, *Neophyllobius* (*Neophyllobius*) *unespensis* **n. sp.**, is collected and described from the raceme-type inflorescences of a native South America forest tree, Cannonball tree, *Couroupita guianensis* Aubl. (Lecythidaceae), description based on females, a protonymph, and a larva. The new stilt-legged mite was found during two springs for two consecutive years, which coincides with the inflorescence period of this tree.

Keywords systematics; Prostigmata; Raphignathoidea; free-living predatory mites; forest tree
Zoobank http://zoobank.org/FBAA69ED-20E6-4532-B979-F081E0169CEE

Introduction

The family Camerobiidae Southcott (Acari: Trombidiformes: Prostigmata) is the second largest family in the superfamily Raphignathoidea; it consists of almost 171 species in seven genera; with the genus *Neophyllobius*, the largest of the family with 133 species reported (Beron 2020; Mirza *et al.* 2022; Escobar-Garcia *et al.* 2023). This stilt–legged mites, are widely distributed in both, temperate and tropical zones, and are free-living predators feeding on different phytophagous mites and crawlers of scale insects (Homoptera: Diaspididae, Margarodidae); however, in their habitats, they are usually in very low in numbers, as reported in the literature to date (Bolland 1986; Du Toit *et al.* 1998; Fan & Zhang 2005; Beron 2020; Mirza *et al.* 2022; Escobar-Garcia *et al.* 2023). Two stilt–legged mites' species have been recorded in South America, namely *Tycherobius edaphon* Flechtmann (Flechtmann 2001) described from Brazil, and *Neophyllobius* (*Neophyllobius*) *unpensis* Escobar-Garcia, Welbourn & Ueckermann (Escobar-Garcia *et al.* 2023) described from Peru.

Herein a new species of *Neophyllobius* is described and illustrated, on *Couroupita guianensis* Aubl. (Lecythidaceae), a native tree from the Amazon rainforest in South America recognized for its great economic, social, and environmental benefits, ethnomedicine, and its ability to control important pests and pathogens, such as larvicidal and ovicidal activities against the pest insects (Baskar *et al.* 2015; Esposito *et al.* 2023, Escobar-Garcia *et al.* 2024; CABI 2024). The purpose of this paper is to describe a new species of *Neophyllobius*.

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Material and methods

Stilt–legged mites were collected from raceme-type inflorescences of *Couroupita guianensis* on the campus of the São Paulo State University (UNESP), Jaboticabal, Brazil (21°14′50.28″ S, 48°17′51.85″ W), in the spring of 2022 and 2023. Sampling involved collecting two raceme-type inflorescences from each of the four trees, every two weeks. Samples were placed in paper bags, and transferred to the Acarology laboratory (AcaroLab), UNESP, Jaboticabal, Brazil. The red mites with a dorsocentral opisthosomal white spot and long legs were collected with a fine-tipped brush under the stereomicroscope (Olympus SZ61), and then mounted dorso-ventrally on microscope slides in 7 µl Hoyer's medium and put in an oven at 50 °C for 7 days (Walter & Krantz 2009), the slides were then sealed with nail polish. Mite morphology was studied using a phase-contrast compound microscope (Nikon Eclipse E200). Specimens were measured with an ocular micrometre coupled to the microscope and presented in micrometres (µm); the holotype highlighted in bold. Distances between setae were calculated as the distance between the centres of two setal bases; the apparent length of a seta was measured from the setal base to the tip of the seta. Body length was measured between the posterior border of the idiosoma and the tip of the infracapitulum. Notations of gnathosomal follows those of Grandjean (1946) and for the idiosomal setae and leg setation those of Kethley (1990). The photos were taken using a camera (AixoCam MRc5) mounted on a phase-contrast compound microscope (Zeiss Axioscope AX10 Lab.A1). The type material is deposited in ESALQ—Department of Entomology and Acarology, Luiz de Queiroz College of Agriculture, University of São Paulo (USP), Brazil.

Taxonomy

Family Camerobiidae Southcott, 1957

Genus *Neophyllobius* Berlese, 1886

Type species: *Neophyllobius elegans* Berlese, 1886:19 [1].

Neophyllobius (*Neophyllobius*) *unespensis* Escobar-Garcia & Ueckermann n. sp.

Zoobank: 5B0ABC3F-B771-4DD5-B7D8-D9228858EB59

(Figures 1–6)

Type materials

Holotype female, Brazil, collected on *Couroupita guianensis*, campus of the São Paulo State University (UNESP), Jaboticabal, Brazil (21°14′50.28″ S, 48°17′51.85″ W, 588 m a.s.l.), November 13, 2023; coll. H.A. Escobar-Garcia. Paratypes: a female (collected November 27, 2022), a protonymph (collected October 30, 2022), and a larva (collected December 11, 2022), same place of the holotype, coll. H.A. Escobar-Garcia, separate microscope slides and deposited in ESALQ.

General diagnosis. Female

Tarsi I–IV each with two mid–ventral setae; coxae II with one seta; femura I–IV with 4–3–3–2 setae; setae $f_1 \geq e_1$, and are the longest of dorsocentral setae; most distal seta on femura I–IV not reaching articulation facet between genu and femur; genual setae I–III reaching slightly beyond the base of basal tibial seta; genual setae I–IV lengths as follows: I (70–74), II (65–66), III (70–74), IV (108–118).

Description. Female (n = 2)

(Figures 1–3)

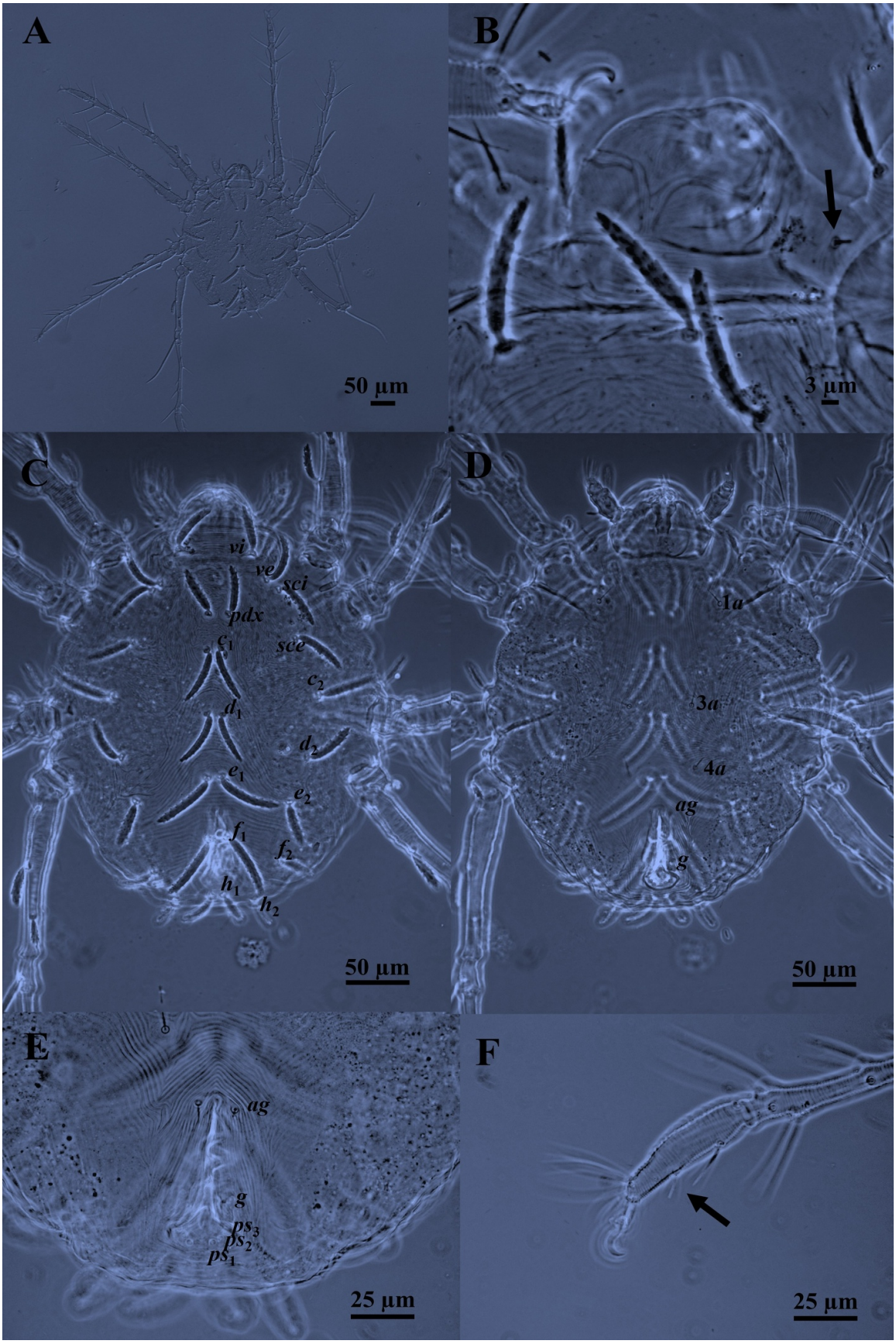


Figure 1 Body of female *Neophyllobius* (*N.*) *unespensis* **n. sp.** **A** – Idiosomal dorsum of female and legs; **B** – Gnathosoma of larva, dorsal infracapitulum with pair supracoxal setae *ep* (indicated by arrow); **C** – Idiosomal dorsal with 15 pairs of serrated setae, set on small tubercles; **D** – Idiosomal venter with striae form a diamond-shaped pattern between setae 3*a*–4*a*; **E** – Region aggenital and genito-anal; **F** – Tarsus IV with two mid–ventral setae (indicated by arrow).

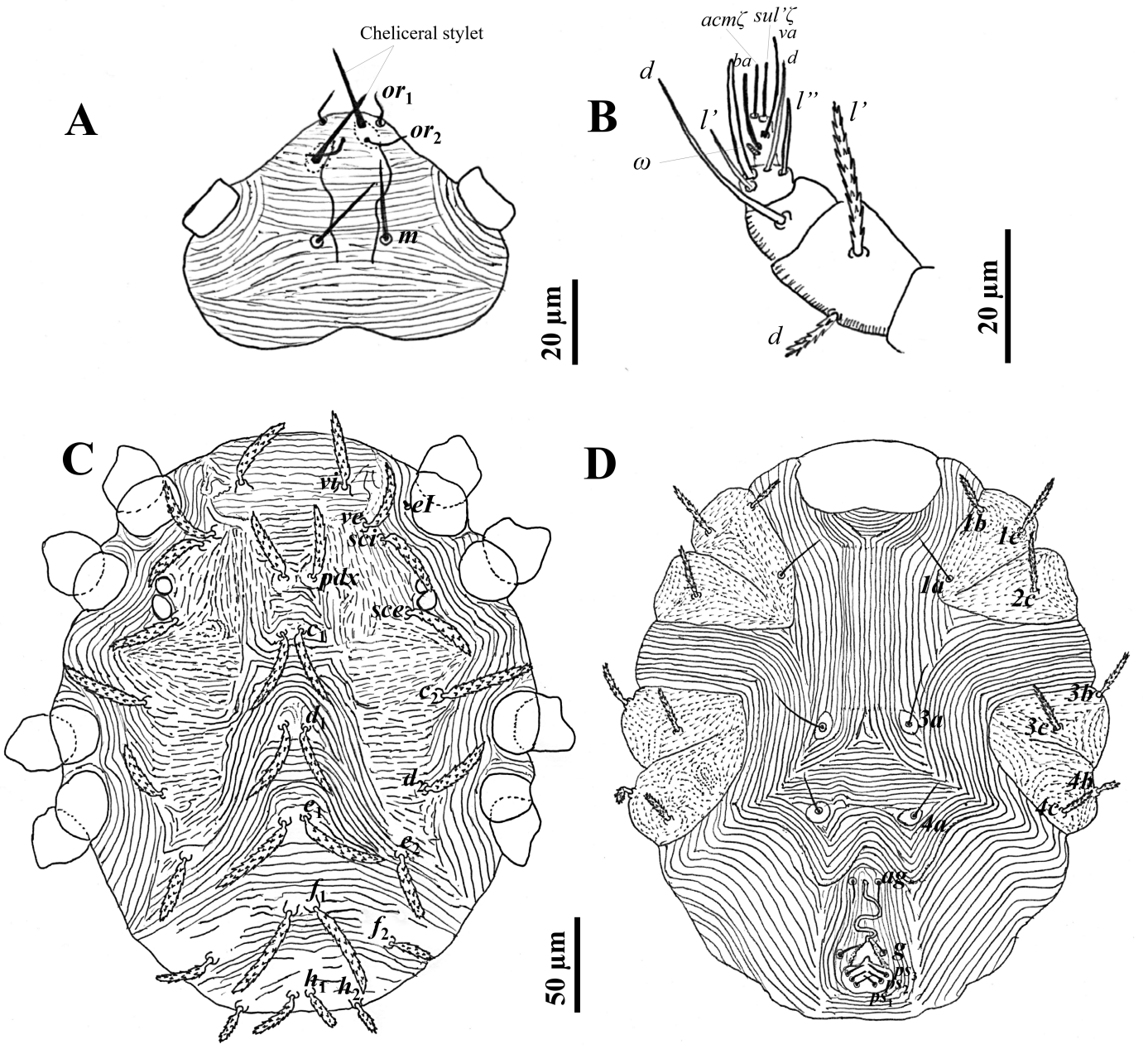


Figure 2 Body of female *Neophyllobius* (*N.*) *unespensis* **n. sp.** **A** – Gnathosoma, venter infracapitulum, and chelicerae; **B** – Palp; **C** – Idiosomal dorsum; **D** – Idiosomal venter.

Body —In life, the color is red with a white dorsocentral opisthosomal spot. Dorsoventrally compressed, ovoid to nearly circular body with two lateral eyes on either side of the prodorsum. Body length **325**–338. (Figs 1A and 2C).

Idiosomal dorsum — Idiosoma broadly oval; two pairs of eyes anterolateral to *sce*, anterior pair smaller than posterior pair; cuticular striae transverse, oblique, and arched; cuticular striae transverse between v_i–v_i, striae arching between c_1–d_1–e_2 (but diagonal behind e_2); transverse between e_1–f_1–h_1; longitudinal (and often oblique) thin striae laterally between c_1–c_2, d_1–d_2; shield-like areas carrying setae c_2, d_2 and e_2; with 15 pairs of distinctly serrated setae, slightly curved; five pairs of prodorsal setae (*vi*, *ve*, *sci*, *pdx*, *sce*) and 10 pairs of dorsal opisthosomal setae ($c_{1\text{-}2}$, $d_{1\text{-}2}$, $e_{1\text{-}2}$, $f_{1\text{-}2}$, $h_{1\text{-}2}$) all inserted on small tubercles (Figs 1C and 2C); some dorso–



Figure 3 *Neophyllobius* (*N.*) *unespensis* **n. sp.** Female, Legs I–IV with serrated setae, **A** – Leg I; **B** – Leg II; **C** – Leg III; **D** – Leg IV.

central setae shorter than interval to setae next behind; setae $f_1 \geq e_1$ are the longest and h_2 the shortest ($f_1 \geq e_1 \geq c_2 \geq d_1 \geq c_1 \geq sci = pdx \geq vi \geq sce \geq ve = d_2 \geq e_2 > f_2 \geq h_1 > h_2$, based on mean). Length of dorsal setae: *vi* 40–**42**, *ve* **38**–40, *sci* **40**–45, *pdx* **40**–45, *sce* 38–**43**, c_1 **44**–45, c_2 **50**, d_1 **42**–50, d_2 **38**–40, e_1 **51**–57, e_2 **36**–39, f_1 **54**–55, f_2 **30**, h_1 25–**30**, h_2 **23**–24. Distance between setae: *vi*–*vi* 50–**52**, *ve*–*ve* **75**–80, *sci*–*sci* **94**–100, *pdx*–*pdx* 10–**15**, *sce*–*sce* **118**–128, c_1–c_1 **10**–16, c_2–c_2 **150**–165, d_1–d_1 **12**–14, d_2–d_2 **134**–140, e_1–e_1 **10**–15, e_2–e_2 **112**–114, f_1–f_1 **13**–17, f_2–f_2 **92**–98, h_1–h_1 **10**, h_2–h_2 **60**–62.

Gnathosoma — Stylophore with one pair of peritremes forming a complete loop. Dorsal infracapitulum with pair of supracoxal setae *ep* (Figs 1B and 2A). The ventral infracapitulum with three pairs slender and simple setae: the *m* setae 20 long, two pairs of adoral setae or_1 6 and or_2 6. Distance between the *m* setae (*m*–*m*) **16**–17, or_1–or_1 15, or_2–or_2 **8**–10. Cheliceral stylet **20**–22 long (Fig. 2A). Palps, five-segmented (Fig. 2B): trochanter without setae; femur with two serrated setae (*d* **10**, *l′* **23**), genu with one tactile seta *d*, tibia with three tactile setae (*l′*, *l″* and *d*) and one sword-like seta, tarsus with two eupathidia (*acmζ*, *sulζ*), two tactile setae (*ba*, *va*), and a small solenidion (*ω*) **3**.

Idiosomal venter — Longitudinal striae between 1*a*–1*a* and 3*a*–3*a*; transverse between

4*a*–4*a*, striae arching between 4*a*–*ag*. The striations between 1*a*–3*a* setae are longitudinal. Setae 3*a* and 4*a* set on individual platelets. Striae form a diamond-shaped pattern between setae 3*a*–4*a* (Figs 1D and 2D). Striae on coxal fields I–II and III–IV stippled. One pair of aggenital setae (*ag*) present, genito-anal valves with a pair of genital setae (*g*) and three pairs of pseudanal setae $ps_{1\text{-}3}$ (Figs 1E and 2D). Length of ventral setae: 1*a* **25**–26, 3*a* **30**, 4*a* **18**–20, *ag* 13–**14**, *g* 10–**12**, $ps_{1\text{-}3}$ 9–10. Distance between setae: 1*a*–1*a* 72–**92**, 3*a*–3*a* 45–**47**, 4*a*–4*a* **49**–50, *ag*–*ag* **15**–17, *g*–*g* **18**–25.

Leg chaetotaxy — Coxae I–II and coxae III–IV well separated; legs I–IV slender and long; all tarsi with ambulacrum bearing a pair of claws and an empodium with two rows of rayed hairs. Tarsi I–IV with two midventral setae (Figs 1F and 3). Genua I–IV each with one serrated seta; genu IV with a whip–like seta (*d*), IV (108–**118**) > III (70–**74**) = I (70–**74**) > II (**65**–66). Genua I and II each with a seta *κ*. Genual setae I–III reaching slightly beyond the base of basal tibial seta. Genual setae IV reaching beyond half the length of the tibia. Number of setae on leg segments (Fig. 3), with solenidia (on tibiae and tarsus), supracoxal setae (on coxae), and specialized setae (on genua) given in parentheses and not included in setal counts: coxae 3(+1*eI*)–1–2–2, trochanters 1–1–1–1, femora 4–3–3–2, genua 1(+1*κ*)–1(+1*κ*)–1–1, tibiae 9(+1*φ*)–8(+1*φ*)–8(+1*φ*)–7(+1*φ*), tarsi 10(+1*ω*)–10(+1*ω*)–8–8. Length of solenidia on tibiae (*φ*): I*φ* (**10**–11); II*φ* (**7**–8); III*φ* (**7**–8); IV*φ* (6). Length of solenidia on tarsi (*ω*): I*ω* (5); II*ω* (4).

Description. Protonymph (n = 1)

(Figure 4)

Body — Protonymph is also red, with two lateral prodorsal eyes and a dorsocentral opisthosomal white patch. Protonymph is dorsoventrally compressed, ovoid, or almost circular, and smaller than females. Body length 260 (Fig. 4A).

Idiosomal dorsum — As in female (Fig. 4B). Lengths of prodorsal setae: *vi* 35, *ve* 33, *sci* 38, *pdx* 33, *sce* 35 (*sci* > *vi* = *sce* > *ve* = *pdx*); lengths of dorsal opisthosomal setae: c_1 40, c_2 44, d_1 40, d_2 35, e_1 45, e_2 34, f_1 45, f_2 21, h_1 22, h_2 16, ($e_1 = f_1 > c_2 > c_1 = d_1 > d_2 > e_2 > h_1 > f_2 > h_2$); distances between dorsal idiosomal setae: *vi*–*vi* 43, *ve*–*ve* 65, *sci*–*sci* 74, *pdx*–*pdx* 12, *sce*–*sce* 95, c_1–c_1 10, c_2–c_2 125, d_1–d_1 10, d_2–d_2 105, e_1–e_1 10, e_2–e_2 95, f_1–f_1 10, f_2–f_2 70, h_1–h_1 7, h_2–h_2 35.

Gnathosoma — As in female. Infracapitulum with three pairs simple and slender setae: one pair infracapitular setae *m* 17, and two pairs of adoral setae or_1 5 and or_2 5, *m*–*m* 17, or_1–or_1 10, or_2–or_2 8. Dorsal infracapitulum with pair of supracoxal setae (*ep*). Cheliceral stylet 16 long. Palps five-segmented: trochanter without setae; femur with two serrated setae (*d*, *l′*), genu with one long dorsal tactile seta (*d*), tibia with three tactile setae (*l′*, *l″* and *d*) and one sword-like seta, tarsus with two eupathidia (*acmζ*, *sulζ*), two tactile setae (*ba*, *va*), and a small solenidion (*ω*) 2.

Idiosomal Venter — Similar to the female in having three pairs of pseudanal setae $ps_{1\text{-}3}$, but without *ag* and *g* setae (Fig. 4C). Lengths of ventral setae: 1*a* 15, 3*a* 20, 4*a* 14, $ps_{1\text{-}3}$ 6. Distances between ventral idiosomal setae: 1*a*–1*a* 85, 3*a*–3*a* 37, 4*a*–4*a* 46.

Leg chaetotaxy — Legs like that of female. Tarsus I–IV each with one mid–ventral seta (Fig. 4D). Genua I–IV each with one serrated seta; genu IV with whip–like seta (*d*), IV 90 > III 85 > I 75 > II 70. Genua I and II each with a *κ* seta. Genual setae I–III reaching beyond half the length of the tibia. Genual setae IV reaching the base of the solenidion on tibia. Number of setae on leg segments, solenidia (on tibiae and tarsus), supracoxal setae (on coxae), and specialized setae (on genua) are given in parentheses and not included in setal counts: coxae 3(+1*eI*) –1–2–0, trochanters 1–1–1–0, femora 3–2–1–1, genua 1(+1*κ*) –1(+1*κ*) –1–1, tibiae 5(+1*φ*) –5(+1*φ*) –5(+1*φ*) –3(+1*φ*), and tarsi 9(+1*ω*) –9(+1*ω*) –7–5. Length of solenidia on tibiae (*φ*): I*φ* 8; II*φ* 5; III*φ* 5; IV*φ* 5. Length of solenidia on tarsi (*ω*): I*ω* 4; II*ω* 3.

Description. Larva (n = 1)

(Figure 5)

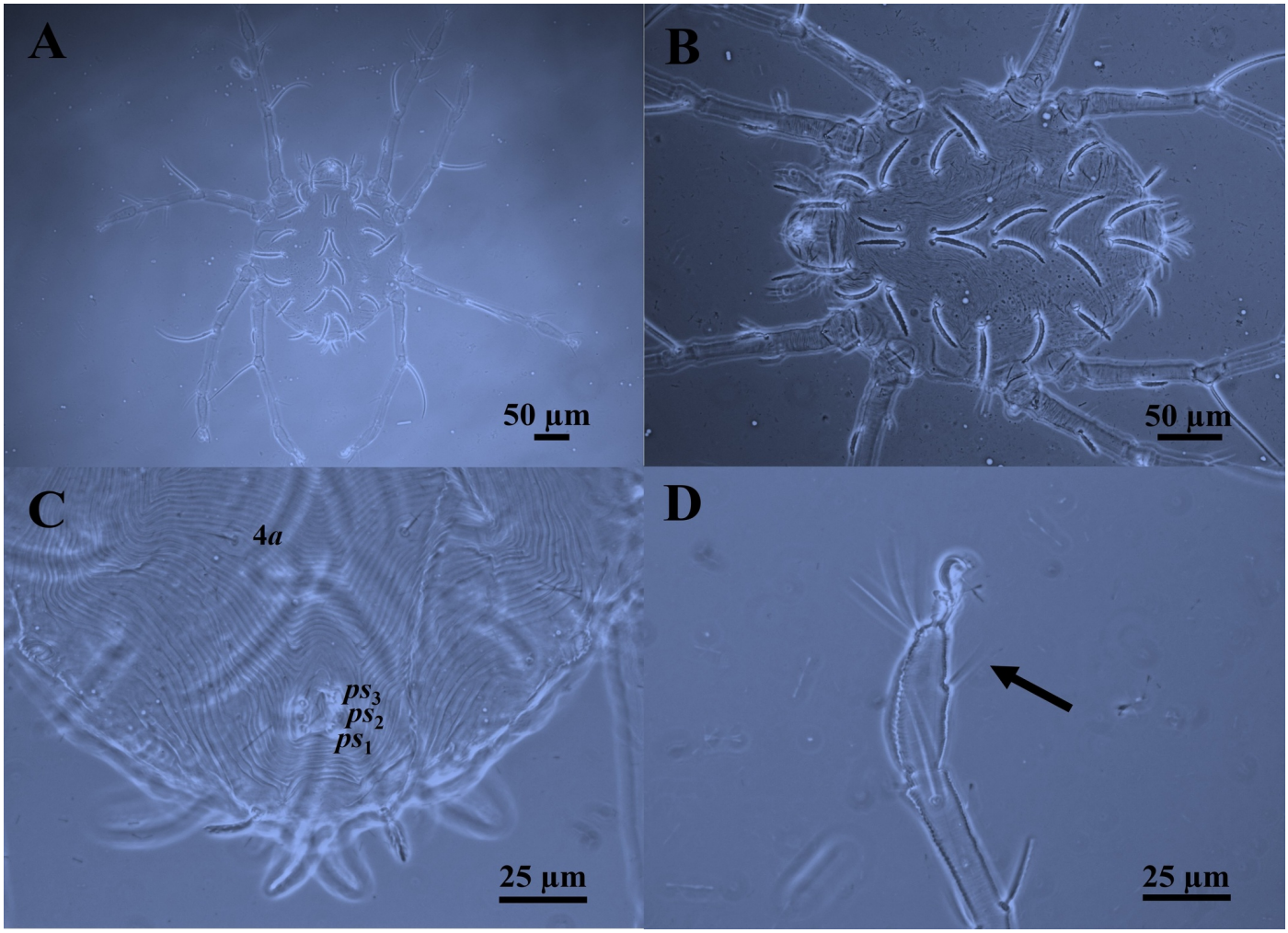


Figure 4 Body of protonymph *Neophyllobius* (*N.*) *unespensis* **n. sp. A** – Gnathosoma and idiosomal dorsum of protonymph; **B** – Idiosomal dorsum with cuticular striae; **C** – Genito-anal valves with three pairs of pseudanal setae $ps_{1\text{-}3}$; **D** – Tarsus IV with one mid–ventral setae (indicated by arrow).

Body — Larva is likewise reddish yellow, with two lateral prodorsal eyes and a dorsocentral opisthosomal white patch. Larva are dorsoventrally compressed, ovoid, or almost circular, and smaller than protonymph. Body length 190 (Fig. 5A).

Idiosomal dorsum — In general, like that of protonymph. Idiosoma dorsally with 14 pairs of setae (*pdx* absent) situated on small tubercles (Fig. 5B). Shape of setae similar. Lengths of prodorsal setae: *vi* 28, *ve* 30, *sci* 33, *sce* 34 (*sce* > *sci* > *ve* > *vi*); lengths of dorsal opisthosomal setae: c_1 36, c_2 38, d_1 35, d_2 28, e_1 34, e_2 25, f_1 34, f_2 24, h_1 16, h_2 10, ($c_2 > c_1 > d_1 > e_1 = f_1 = d_2 > e_2 > f_2 > h_1 > h_2$); distances between dorsal idiosomal setae: *vi*–*vi* 33, *ve*–*ve* 55, *sci*–*sci* 65, *sce*–*sce* 77, c_1–c_1 8, c_2–c_2 110, d_1–d_1 10, d_2–d_2 80, e_1–e_1 8, e_2–e_2 75, f_1–f_1 7, f_2–f_2 50, h_1–h_1 8, h_2–h_2 36.

Gnathosoma – As in protonymph. Infracapitulum with three pairs simple and slender setae: one pair infracapitular setae *m* 6, and two pairs of adoral setae or_1 6 and or_2 6, *m*--*m* 20, or_1–or_1 8, or_2–or_2 6. Dorsal infracapitulum with pair of supracoxal setae (*ep*). Cheliceral stylet 16 long. Palps five-segmented: trochanter without setae; femur with a serrated setae *d*, genu with one long dorsal tactile seta *d*, tibia with three tactile setae (*l′*, *l″* and *d*) and one sword-like seta, tarsus with two eupathidia (*acmζ*, *sulζ*), two tactile setae (*ba*, *va*), and a small solenidion (*ω*) 2.

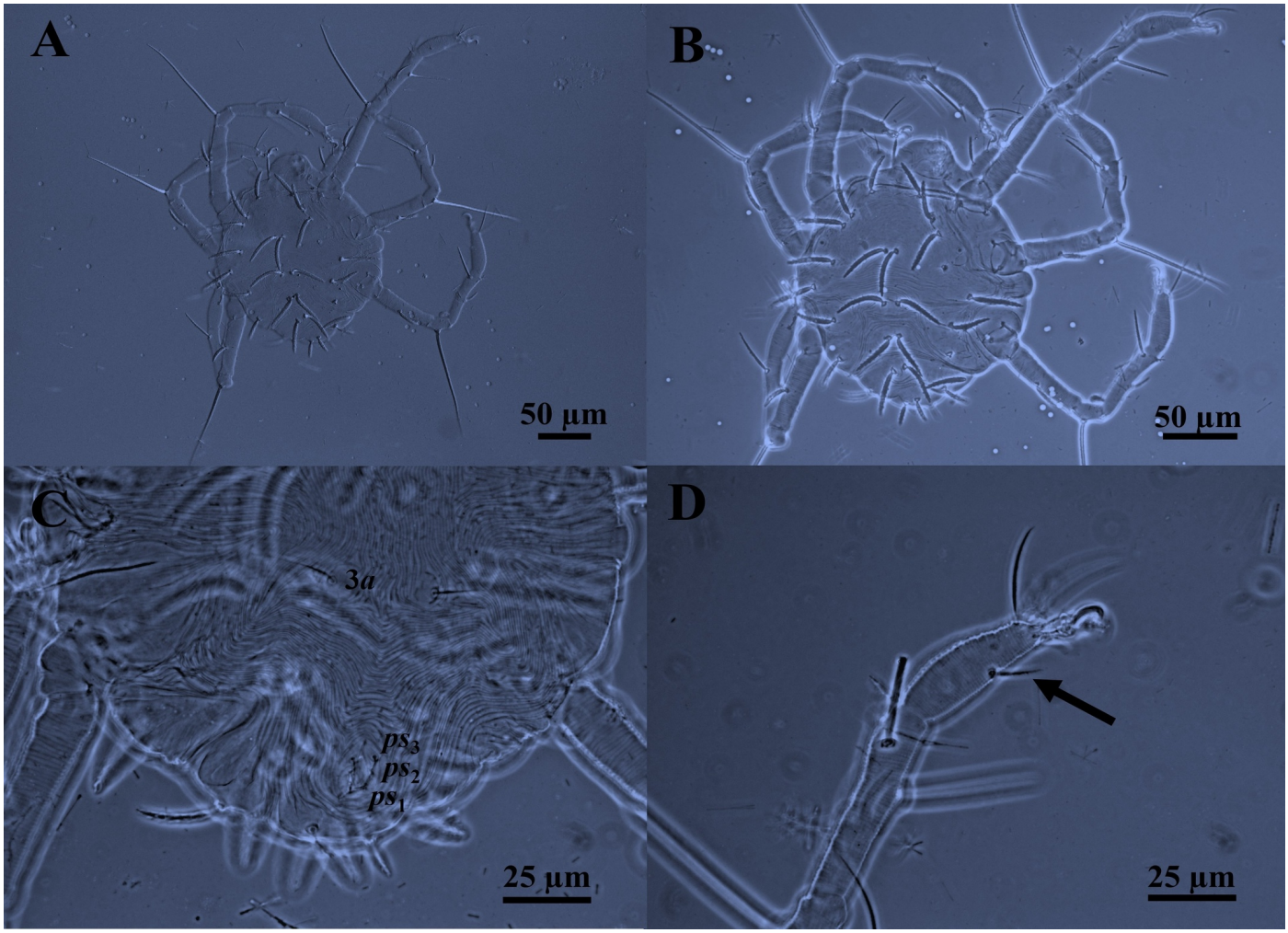


Figure 5 Body of larva *Neophyllobius* (*N.*) *unespensis* **n. sp. A** – Gnathosoma and idiosomal dorsum of larva; **B** – Idiosomal dorsum with cuticular striae; **C** – Genito-anal valves with three pairs of pseudanal setae $ps_{1\text{-}3}$; **D** – Tarsus I with one mid–ventral setae (indicated by arrow).

Idiosomal Venter — Like the protonymph in having three pairs of pseudanal setae $ps_{1\text{-}3}$, but without 4*a*, *ag*, and *g* setae (Fig 5C). Lengths of ventral setae: 1*a* 12, 3*a* 20, $ps_{1\text{-}3}$ 5. Distances between ventral idiosomal setae: 1*a*–1*a* 55, 3*a*–3*a* 28.

Leg chaetotaxy — Legs like that of protonymph, but without leg IV. Tarsus I–III each with one mid–ventral seta (Fig. 5D). Genua I–III each with one whip–like serrated setae, III 112 > I 100 > II 87. Genua I and II each with a κ seta. Genual setae I–III reaching beyond half the length of the tarsus. Number of setae on leg segments, solenidia (on tibiae and tarsus), supracoxal setae (on coxae), and specialized setae (on genua) are given in parentheses and not included in setal counts: coxae 2(+1*eI*)–0–0, trochanters 0–0–0, femora 2–2–1, genua 1(+1κ)–1(+1κ)–1, tibiae 3(+1φ) –3(+1φ)–3(+1φ), and tarsi 7(+1ω) –7(+1ω)–5. Length of solenidia on tibiae (φ): Iφ 5; IIφ 5; IIIφ 5. Length of solenidia on tarsi (ω): Iω 2; IIω 2.

Etymology

The specific epithet "*unespensis*" refers to the name of the São Paulo State University (UNESP), Jaboticabal, São Paulo, Brazil, where this species was collected.

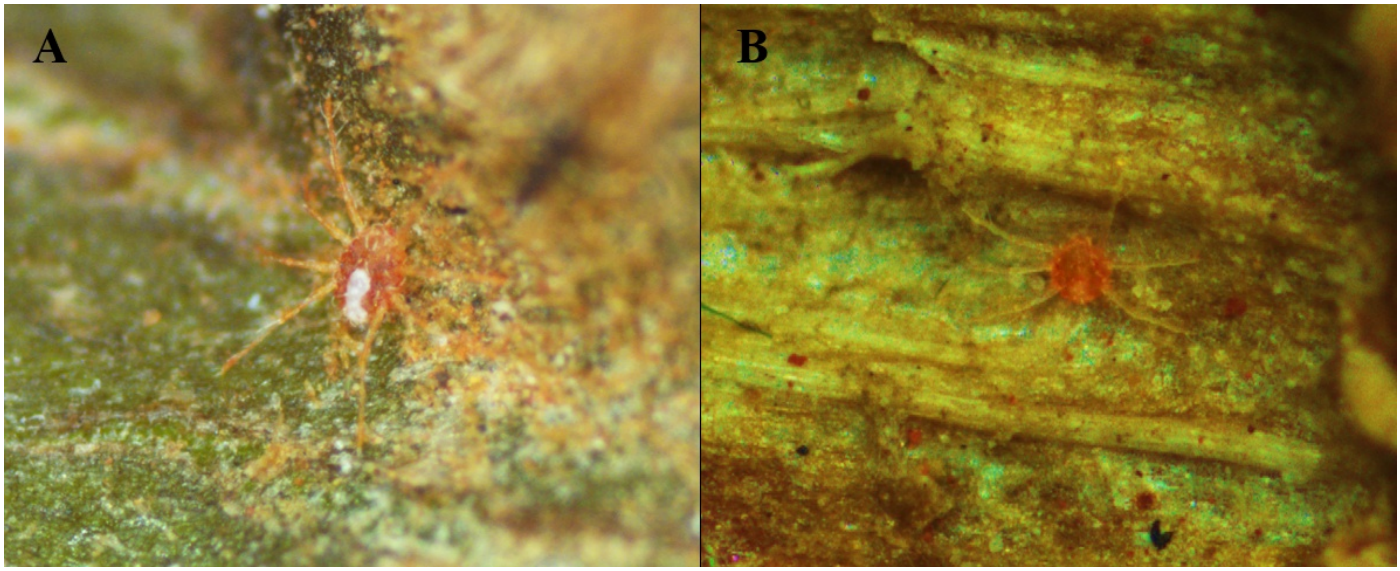


Figure 6 Color in life of *Neophyllobius* (*N.*) *unespensis* **n. sp. A** – Female; **B** – Larva.

Remarks

The new species resembles *Neophyllobius mkuzensis* du Toit, Theron & Ueckermann 1998; and *Neophyllobius gigantorum* Bolland 1991; nevertheless *Neophyllobius* (*N.*) *unespensis* **n. sp.** can be distinguished from *N. mkuzensis* by a) serrated setae, slightly curved inserted on small tubercles (*vs.* serrated setae, slightly curved inserted on strong tubercles); b) cuticular striae arching between c_1–d_1–e_2, (*vs.* transverse between c_1–d_1–e_2); c) lengths of prodorsal setae *vi* (40–42), *ve* (38–40), *sci* (40–45), *pdx* (40–45), and *sce* (38–43) are shorter, [*vs.* (60–61), (63–72), 54, (47–54), and 54, respectively]; d) lengths of hysterosomal setae c_2 50, d_1 (42–50), d_2 (38–40), e_1 (51–57), e_2 (36–39), f_1 (54–55), f_2 30, h_1 (25–30), and h_2 (23–24), are shorter, [*vs.* (88–95), (54–60), 57, (88–95), (50–54), 76, 44, (38–44), and (35–38) respectively]; e) seta on each of genua I and II exceeding the first row of tibial setae, (*vs.* seta on each of genua I and II not reaching base of basal tibial setae); f) setae $f_1 \geq e_1$ are the longest of idiosomal setae, (*vs.* setae $c_2 \geq e_1$ are the longest of idiosomal setae).

Neophyllobius (*N.*) *unespensis* **n. sp.** can be distinguished from *N. gigantorum* by a) all serrated setae, slightly curved inserted on small tubercles (*vs.* c_2–e_1–f_1 serrated setae, slightly curved inserted on strong tubercles); b) lengths of prodorsal setae *vi* (40–42), *ve* (38–40), *sci* (40–45), and *sce* (38–43) are shorter, [*vs.* (45–50), (60–70), (55–60), and (45–55), respectively]; c) lengths of hysterosomal setae d_1 (42–50), d_2 (38–40), e_1 (51–57), e_2 (36–39), f_2 30, h_1 (25–30), and h_2 (23–24), are shorter, [*vs.* (60–65), (70–75),(65–70), 55, (55–60), 35, and 30 respectively]; d) seta on each of genua I–III exceeding the first row of tibial setae, (vs. seta on each of genua I–III not reaching base of basal tibial setae); e) genual IV reaching beyond half the length of the tibia, (*vs.* genual IV reaching base of the first tibial seta); f) setae $f_1 \geq e_1$ are the longest of idiosomal setae, (*vs.* setae $d_2 \geq e_1$ are the longest of idiosomal setae).

Ecological observations

In this study *Neophyllobius* (*N.*) *unespensis* **n. sp.** was found in very low numbers on raceme-type inflorescences of *Couroupita guianensis* (Fig. 6). The orange eggs were observed to be placed individually and covered with webbing. Most mites were collected from October to December corresponding to the spring season in Jaboticabal, São Paulo, Brazil. Environmental conditions in the spring ranged from 11.8 to 21.7 °C to a maximum of 21.6 to 35.3 °C with a relative humidity ranging from 39.8 to 91.6%.

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Disclosure statement

No potential conflict of interest was reported by the authors.

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