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Article

A new species of *Eustigmaeus* (Acari: Prostigmata: Stigmaeidae) from Vietnam

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ABSTRACT
A new species of the genus *Eustigmaeus* (Acari: Stigmaeidae), *E. vietnamiensis* **sp. nov**. is described from the bark of fig tree (*Ficus* sp.) in Cat Tien National Park, Vietnam. The mite family Stigmaeidae is recorded from Vietnam for the first time.

KEY WORDS: Acarina; Cat Tien; predatory mites; Raphignathoidea; systematics.

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INTRODUCTION

The predatory mite family Stigmaeidae (Acari: Prostigmata) is the largest in the superfamily Raphignathoidea and includes about 597 species of 34 valid genera (Doğan *et al*. 2015, 2017; Fan and Ueckermann 2016; Fan *et al*. 2016; Khaustov 2016; Paktinat-Saeij *et al*. 2016; Stathakis *et al*. 2016; Bingül and Doğan 2017; Bingül *et al.* 2017; Khanjani *et al*. 2017; Khaustov *et al*. 2017; Nazari and Khanjani 2017; Akyol and Gül 2018; Da-Costa *et al*. 2018; Rehman *et al*. 2018). Among them, the genus *Eustigmaeus* Berlese, 1910 is the second largest genus with 125 species (Fan *et al*. 2016; Khaustov 2016; Stathakis *et al*. 2016).

Mites of the family Stigmaeidae are unevenly studied in Southeast Asia. Most records belong to China (for references see Fan and Chen 2010), the Philippines (Rimando and Corpuz-Raros 1996, 1997, 2001), Indonesia (Summers 1964; Ehara and Oomen-Kalsbeek 1983), Malaysia (Shiba 1976; Ehara 1993) and Thailand (Ehara and Wongsiri 1984). Stigmaeid mites have never been recorded from Vietnam previously.

During the study of mites in tropical rainforest in Cat Tien National Park, Vietnam, a new species of *Eustigmaeus* was revealed and described herein.

MATERIALS AND METHODS

Mites were collected from outer layer of living fig tree bark (*Ficus* sp.) using Berlese funnels and preserved in 96% ethanol. After that mites were cleared in lactic acid and mounted in Hoyer's medium. In the description below, the palpal, idiosomal and the leg setation follows Grandjean (1939, 1944, 1946). The nomenclature of prodorsal setae follows Kethley (1990). All measurements are given in micrometres (μm) for the holotype because all available paratypes are visible only in

lateral view and correct length of many setae is not discernible. In descriptions of leg setation the number of solenidia is given in parenthesis. Photographs were taken with a digital camera AxioCam 506 color via compound microscope Carl Zeiss AxioImager A2 with phase-contrast and DIC illumination.

SYSTEMATICS

Family Stigmaeidae Oudemans, 1931
Genus *Eustigmaeus* Berlese, 1910

Type species: *Stigmaeus kermesinus* Koch, 1841, by original designation.

Eustigmaeus vietnamiensis sp. nov. (Figs. 1–5)

Description

FEMALE. Idiosoma oval in outline. Length of idiosoma 260, width 190.

Idiosomal dorsum (Figs. 1A, 4, 5A–D) – Idiosoma completely covered by two large plates (Fig. 4). Plates with large round dimples of similar size without punctations. Diameter of eyes 12. Dorsal setae brush-like (Figs. 5A–D). A very weak subcuticular reticulate pattern visible in central parts of dorsal plates. Setae h_1 and h_2 situated ventrally. Setae h_2 only slightly thickened, not brush-like distally. Length of dorsal setae: *vi* 27, *ve* 32, *sci* 28, *sce* 25, c_1 28, c_2 20, d_1 30, d_2 26, e_1 29, e_2 28, f_1 28, h_1 23, h_2 14.

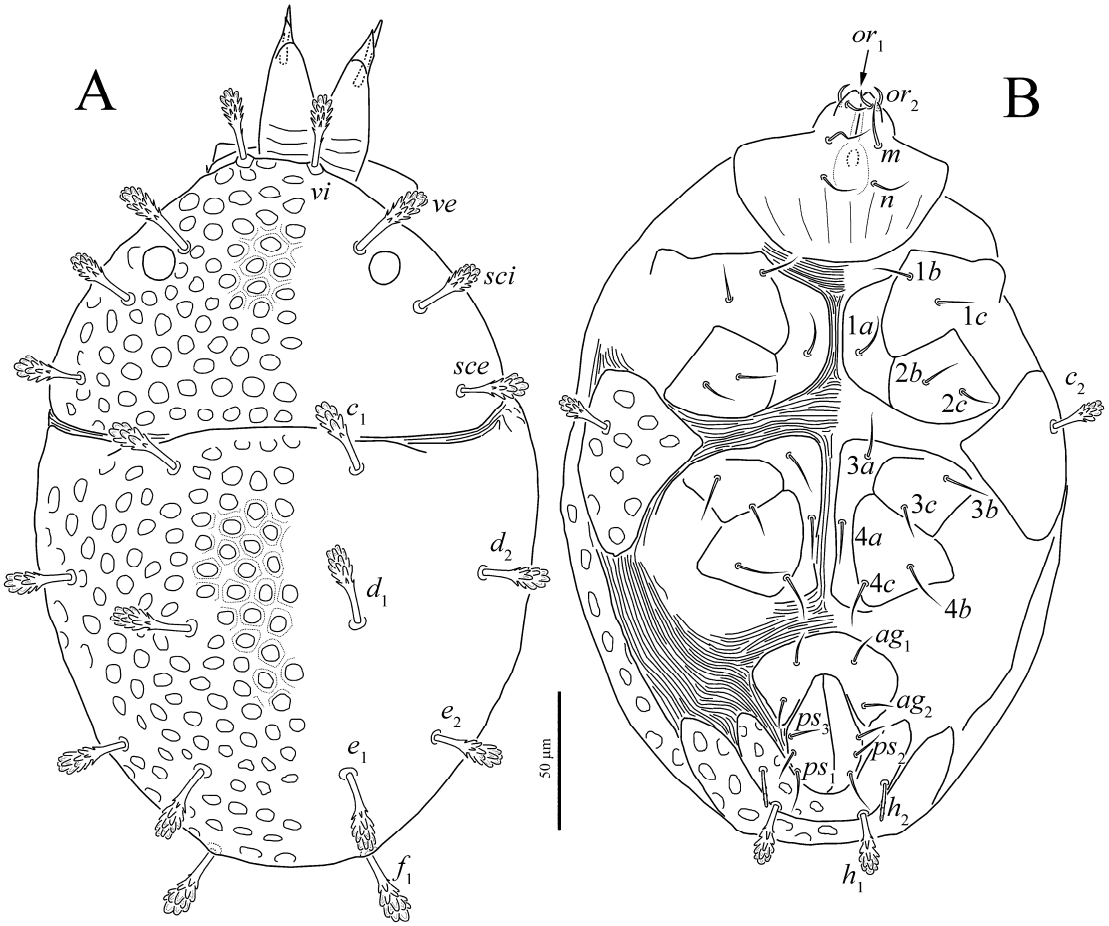

Figure 1. *Eustigmaeus vietnamiensis* **sp. nov. (**female) – A. Dorsum of the body; B. Venter of the body. Legs omitted.

Idiosomal venter (Figs 1B, 5E, F) – Callosities absent. Endopodal plates separated medially, smooth. Humeral plates triangular, with round dimples as on dorsal plates. With two pairs of simple aggenital, and three pairs of simple pseudanal setae. All ventral setae smooth and pointed. Length of ventral setae: 1*a* 17, 1*b* 17, 1*c* 14, 2*b* 15, 2*c* 13, 3*a* 18, 3*b* 16, 3*c* 13, 4*a* 17, 4*b* 18, 4*c* 17, ag_1 13, ag_2 11, ps_1 16, ps_2 14, ps_3 11.

Gnathosoma (Figs 2A, 5E) – Chelicerae mostly smooth dorsally, with several transverse lines in posterior half. Palpal segments not reticulated. Tibial claw well-developed. Setae *l'* on palpal tibia spine–like. Setae on palpal femur and genu weakly barbed, other palpal setae smooth. Palpal supracoxal setae (*ep*) spine-like. Number of setae on palpal segments: Tr 0, Fe 3 (*d*, *l'*, *v"*), Ge 2 (*d*, *l"*), Ti 3 (*d*, *l'*, *l"*), Ta 8(1) (fused eupathidia *ul'ξ*, *ul" ξ*, *sul ξ*, eupathidion *acm ξ*, *ba*, *bp*, *lp*, 1 solenidion *ω*). Rostrum of subcapitulum (Fig. 5E) relatively short and wide. All subcapitular setae smooth, setae or_1 and or_2 slightly thickened, curved and blunt-ended; other subcapitular setae simple, pointed. Basal part of subcapitulum without distinct reticulation, with several weak longitudinal lines in posterior half (Fig. 5E). Length of subcapitular setae: *m* 17, *n* 16, or_1 8, or_2 9.

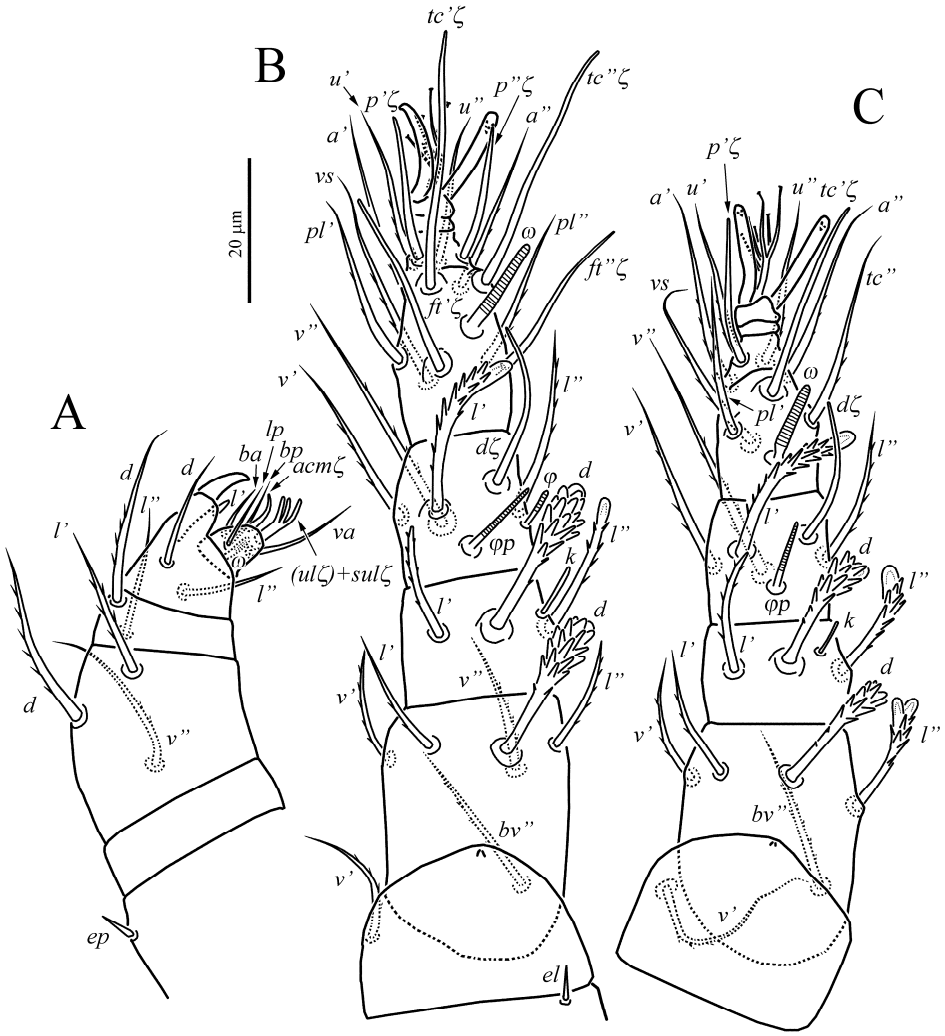

Figure 2. *Eustigmaeus vietnamiensis* **sp. nov. (**female) – A. Left palp in dorsal view; B. Right leg I in dorsal view; C. right leg II in dorsal view.

Legs (Figs 2B, C, 3) – Empodial raylets weakly capitate. Length of legs: I 115, II 105, III 110, IV 115. Leg I (Fig. 2B). Coxae I posterodorsally with spine-like leg supracoxal setae (*el*). Leg

chaetotaxy: Tr 1 (*v'*), Fe 6 (*d*, *l'*, *l"*, *v'*, *v"*, *bv"*), Ge 4 (*d*, *l'*, 1*"*, *k*), Ti 5(2) (*dξ*, *l'*, *l"*, *v'*, *v"*, *φ*, *φp*), T*a* 13(1) (*p'ξ*, *p"ξ*, *tc'ξ*, *tc"*, *ft'ξ*, *ft"ξ*, *u'*, *u"*, *a'*, *a"*, *pl'*, *pl"*, *vs*, *ω*). Setae *d* on tibia and (*p*), (*tc*), (*ft*) on tarsus are eupathidia. All setae (except eupathidia) barbed. Setae *d* on femur and genu brush-like with hyaline sheaths; setae *l"* of genu and *l'* of tibia thickened, with hyaline sheaths distally; setae *l"* of femur and *l'* of genu blunt-tipped, other setae (except eupathidia) pointed. Seta *k* 8. Solenidion *ω* 13, finger-shaped; solenidia *φ* 5 and *φp* 12 baculiform. Leg II (Fig. 2C). Leg chaetotaxy: Tr 1 (*v'*), Fe 5 (*d*, *l'*, *l"*, *v'*, *bv"*), Ge 4 (*d*, *l'*, *l"*, *k*), Ti 5(1) (*dξ*, *l'*, *l"*, *v'*, *v"*, *φ*), Ta 9(1) (*p'ξ*, *tc'ξ*, *tc"*, *u'*, *u"*, *a'*, *a"*, *pl'*, *vs*, *ω*). Setae *d* on tibia, *p'* and *tc'* on tarsus represented by eupathidia. All setae (except eupathidia) barbed. Setae *d*, *l"* on femur and genu brush-like with hyaline sheaths; seta *l'* of tibia thickened, with hyaline sheath distally; seta *l'* of genu blunt-tipped, other setae (except eupathidia) pointed. Solenidion *ω* 12 finger-shaped; solenidion *φp* 9 baculiform. Seta *κ* 5. Leg III (Fig. 3A). Leg setation: Tr 1 (*v'*), Fe 3 (*d*, *l'*, *ev'*), Ge 1 (*d*), Ti 5(1) (*d*, *l'*, *l"*, *v'*, *v"*, *φ*), Ta 7 (1) (*tc'*, *tc"*, *u'*, *u"*, *a'*, *a"*, *vs*, *ω*). Solenidioa *ω* 6 and *φp* 9 baculiform. All setae barbed. Setae *l'* of trochanter, *d*, *l'* of femur, *d* of genu, *d* and *l'* of tibia distinctly thickened, brush-like with hyaline sheaths, other setae pointed. Leg IV (Fig. 3B). Leg setation: Tr 1 (*v'*), Fe 2 (*d*, *ev'*), Ge 1 (*d*), Ti 5(1) (*d*, *l'*, *l"*, *v'*, *v"*, *φ*), Ta 7(1) (*tc'*, *tc"*, *u'*, *u"*, *a'*, *a"*, *vs*, *ω*). Solenidia *ω* 4 and *φ* 8 baculiform. Setae *d* of femur, *d* of genu, *d* and *l'* of tibia distinctly thickened, brush-like with hyaline sheaths, other leg setae pointed. Setae (*tc*), (*u*) and *a"* of tarsus smooth, other setae barbed.

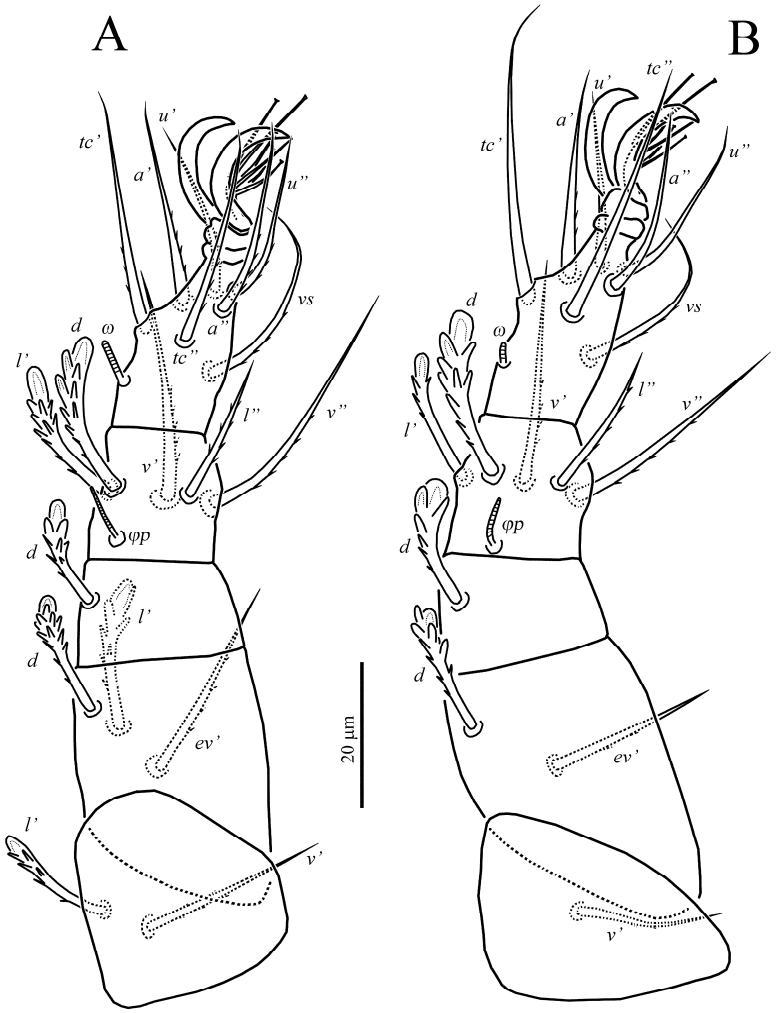

Figure 3. *Eustigmaeus vietnamiensis* **sp. nov**. (female) – A. Right leg III in dorsal view; B. Right leg IV in dorsal view.

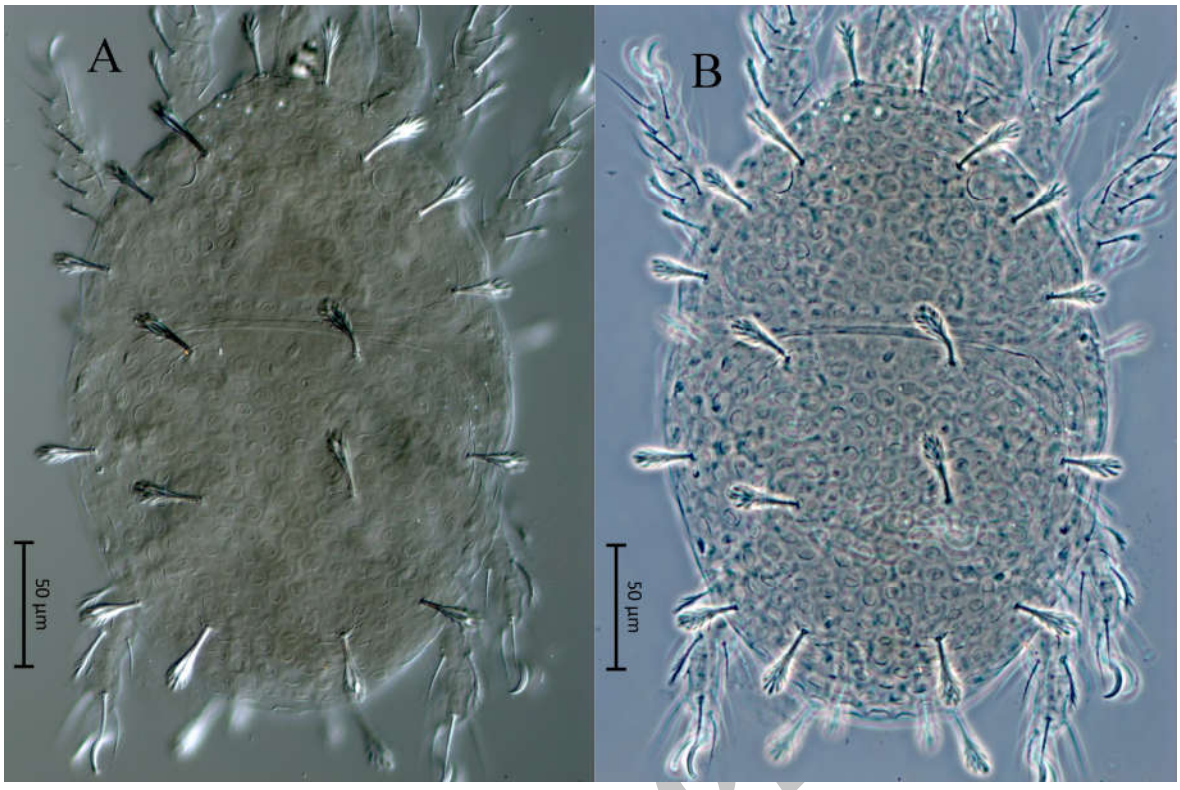

Figure 4. DIC (A) and phase-contrast (B) micrographs of *Eustigmaeus vietnamiensis* **sp. nov**. (female) – General view dorsally.

Type material

Female holotype, slide No. ZISP T-St-001, VIETNAM, Cat Tien National Park, on the bark of fig tree (*Ficus* sp.), 16 January 2015, coll. S. Tsurikov. Paratypes: three females, same data, slides ZISP T-St-oo2, ST160115, ST160115/1.

Type deposition

The holotype and one paratype are deposited in the in the mite collection of the Zoological Institute of Russian Academy of Sciences, Saint Petersburg, Russia, two paratypes are deposited in the mite collection of the Tyumen State University Museum of Zoology, Tyumen, Russia.

Etymology

The name of the new species is refers to distribution in Vietnam.

Differential diagnosis

The new species is most similar to *E. clavigerus* (Wood, 1966), described from the New Zealand (Wood 1966; Fan and Zhang 2005), and *E. barrioni* Rimando & Corpuz-Raros, 1997, described from the Philippines (Rimando and Corpuz-Raros 1997), by the presence of eyes, absence of callosities, not fused endopodal plates medially, presence of two pairs of aggenital setae and brush-like dorsal idiosomal setae. The new species can be distinguished from both species by very weak subcuticular reticulation pattern visible only in central parts of dorsal plates (vs. dorsal plates strongly reticulated in *E. clavigerus* and *E. barrioni*), and dorsal setae densely barbed, strongly clavate, with rounded tips, distal barbs rounded and with hyaline sheaths (vs. dorsal setae not so densely barbed, weakly clavate, with attenuated tips, distal barbs attenuated in *E. clavigerus* and *E. barrioni*). From *E. clavigerus* it differs by the endopodal plates smooth (vs. endopodal plates

reticulated in *E. clavigerus*), distinctly shorter solenidion on tarsus I (13) (vs. 17-20 in *E. clavigerus*), and seta *d* on palpfemur pointed, weakly barbed (vs. seta *d* of palpfemur blunt-ended, with several strong subapical barbs in *E. clavigerus*). From E. *barrioni* it also can be distinguished by smooth dimples on dorsal idiosomal plates (vs. with punctations in *E. barrioni*), and by distinctly widened distally, strongly clavate setae c_2 (vs. setae c_2 baculiform, not clavate in *E. barrioni*).

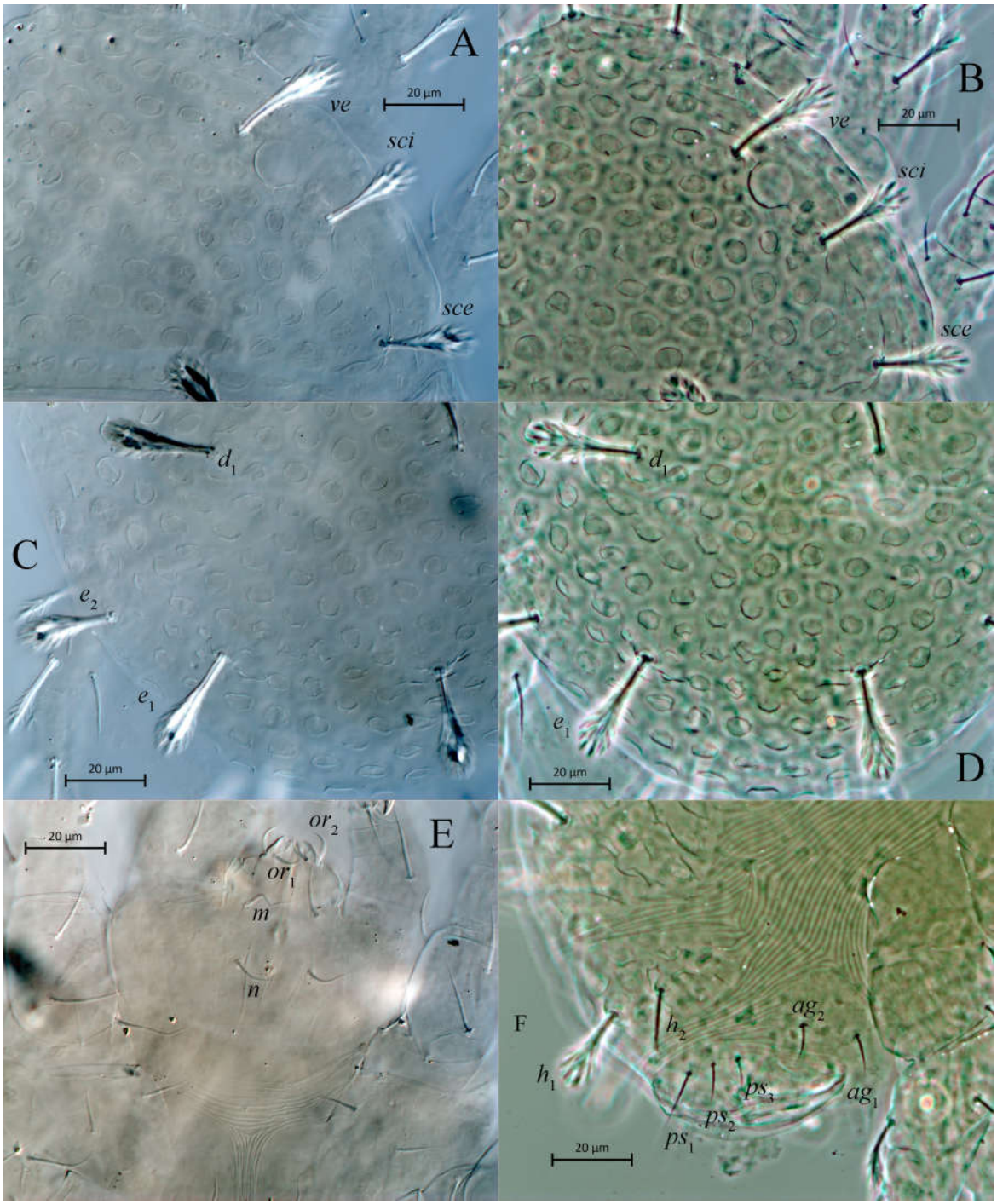

Figure 5. DIC (A, C, E) and phase-contrast (B, D, F) micrographs of *Eustigmaeus vietnamiensis* **sp. nov**. (female) – A & B. Right part of prodorsal shield; C & D. Central part of hysterosomal shield; E. Subcapitulum and anterior part of propodosomal ventrally; F. Suranal, aggenital and anogenital plates in lateral view.

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گونهٔ جدیدی از جنس *Eustigmaeus* (Acari: Prostigmata: Stigmaeidae) از ویتنام

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چکیده

گونهٔ جدیدی از جنس *Eustigmaeus* (Acari: Stigmaeidae) با نام ***E. vietnamiensis* sp. nov.** جمع‌آوری شده از روی پوست درخت انجیر (*Ficus* sp.) در پارک ملی کت تین ویتنام توصیف می‌شود. خانوادهٔ Stigmaeidae برای نخستین بار از ویتنام گزارش می‌شود.

واژگان کلیدی: Acarina ؛ کت تین؛ کنه‌های شکارگر؛ Raphignathoidea ؛ سیستماتیک.

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