





Scientific Note

New records of the mites *Geckobia bataviensis* Vitzthum, 1926 and *Pterygosoma dracoensis* Jack, 1962 (Trombidiformes: Pterygosomatidae) from Timor-Leste

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Abstract. We report on the presence of scale mites (Trombidiformes: Pterygosomatidae) parasitizing three species of lizards in Timor-Leste. *Geckobia bataviensis* Vitzthum, 1926 was found associated with the Common House Gecko, *Hemidactylus frenatus* Duméril & Bibron, 1836, and the Indopacific Tree Gecko, *Hemiphyllodactylus typus* Bleeker, 1860, whereas *Pterygosoma dracoensis* Jack, 1962 was found on the patagia of a Timor Flying Dragon, *Draco timoriensis* Kuhl, 1820. The association of *G. bataviensis* with *H. frenatus* was well documented previously, but this is the first properly documented record of this mite for Timor-Leste. Our report of *G. bataviensis* on *H. typus* is the first association of this mite with this gecko. This is the second report of *P. dracoensis* on *D. timoriensis* and the first for Timor-Leste.

Keywords: Scale mites, ectoparasites, *Hemidactylus frenatus*, *Hemiphyllodactylus typus*, *Draco timoriensis*.

Mites of the family Pterygosomatidae Oudemans, 1910 (Acari: Trombidiformes) are permanent ectoparasites primarily associated with several groups of lizards (Fajfer 2015; 2018; 2020). These pterygosomatids or scale mites are organized into 13 genera that comprise over 180 species (Fajfer 2019). Among them, *Geckobia* Mégnin, 1878 is a diverse group (> 65 species) specialized to parasitize geckos (Gekkonidae Gray, 1825; Phyllodactylidae Gamble, Bauer, Greenbaum & Jackman, 2008; Carphodactylidae Kluge, 1967; Diplodactylidae Underwood, 1954; and Eublepharidae Boulenger, 1883) and tree iguanas (Liolaemidae Frost & Etheridge, 1989) (Fajfer 2012; 2015). In contrast, *Pterygosoma* Peters, 1849 includes at least 50 species associated with African and Asian agamid lizards (Fajfer 2020).

During the first comprehensive amphibian and reptile survey of Timor-Leste (Kaiser et al. 2011; 2013; O'Shea et al. 2012; 2015; Sanchez et al. 2012), ectoparasite samples from various reptiles were included in the ancillary collections. Among these were mites from the geckos *Hemidactylus frenatus* Duméril & Bibron, 1836 (Gekkonidae) and *Hemiphyllodactylus typus* Bleeker, 1860 (Gekkonidae), and from the flying dragon *Draco timoriensis* Kuhl, 1820 (Agamidae). We here report on new records for *Geckobia bataviensis* Vitzthum, 1926 parasitizing the two gecko species and *Pterygosoma dracoensis* Jack, 1962 parasitizing the flying dragon in Timor-Leste.

Lizard specimens included in this report were collected in Timor-Leste during two research surveys (January-February 2010, June-July 2012). They were euthanized using pericardial injections with 1% procaine, fixed in 10% formalin, and preserved in 70% ethanol. Mites were removed by gentle tugging with fine-point forceps during the post-mortem, pre-fixation examination and preserved in 95% ethanol.

Scale mites were removed from preservative and slide-mounted in Hoyer's medium, following the procedure described by Barros-Battesti et al. (2021). Mite specimens were deposited in the Acarological Collection of the Instituto Butantan, São Paulo, Brazil (IBSP) under

accession numbers IBSP 16506-16511. They were identified to genus using the key to pterygosomatid genera of Bertrand (2013), and to species using keys for *Geckobia* (Bertrand 2013) and *Pterygosoma* (Fajfer 2020). Microscope images were taken using a Leica DM4000B compound microscope with phase contrast. Extended focal range images were compiled using the Leica Application Suite v. 2.5.0, and images were further improved using Adobe Photoshop v. 13.0.

Geckobia bataviensis Vitzthum, 1926

Specimens. We recovered a total of 52 female specimens of *G. bataviensis* (Fig. 1A-C) from the following five geckos: *H. frenatus* (USNM 579085), collected at 3.2 km south of Tua Koin Lodge, Ataúro Island, Dili Municipality, Timor-Leste (8°16'13"S; 125°36'8"E, elevation 105 m) on 30 January 2010, two females (IBSP 16506); *H. frenatus* (USNM 579735) collected at Barry's Place, Ataúro Island, Dili Municipality, Timor-Leste (8°13'6"S; 125°36'41"E, sea level) on 28 January 2012, five females (IBSP 16509); *H. frenatus* (USNM 580492) collected near Baguia, Baucau Municipality, Timor-Leste (8°37'12"S; 126°39'29"E, elevation 439 m) on 30 June 2012, 25 females (IBSP 16508); *H. frenatus* (USNM 579079) collected on a tree in the dry bed of the Maraé River, west of Maubara, Liquiça Municipality, Timor-Leste (8°37'22"S; 125°10'14"E, elevation 30 m) on 6 February 2010, 14 females (IBSP 16511); *H. typus* (USNM 580503) collected at Ossohuna, Baucau Municipality, Timor-Leste (8°40'41"S; 126°37'01"E, elevation 938 m) on 1 July 2012, six females (IBSP 16507).

Records. *Geckobia bataviensis* is a widely distributed scale mite that has been recorded parasitizing several species of the lizard genera *Hemidactylus* Goldfuss, 1820, *Gehyra* Gray, 1834, and *Gekko* Laurenti, 1768. It is the most common scale mite associated with *H. frenatus* (Fig. 2A), a human commensal gecko that has been introduced to many tropical and subtropical areas all over the world from its presumed Indo-Malayan origin (Vitzthum 1926; Domrow 1983; Haitlinger 1988;

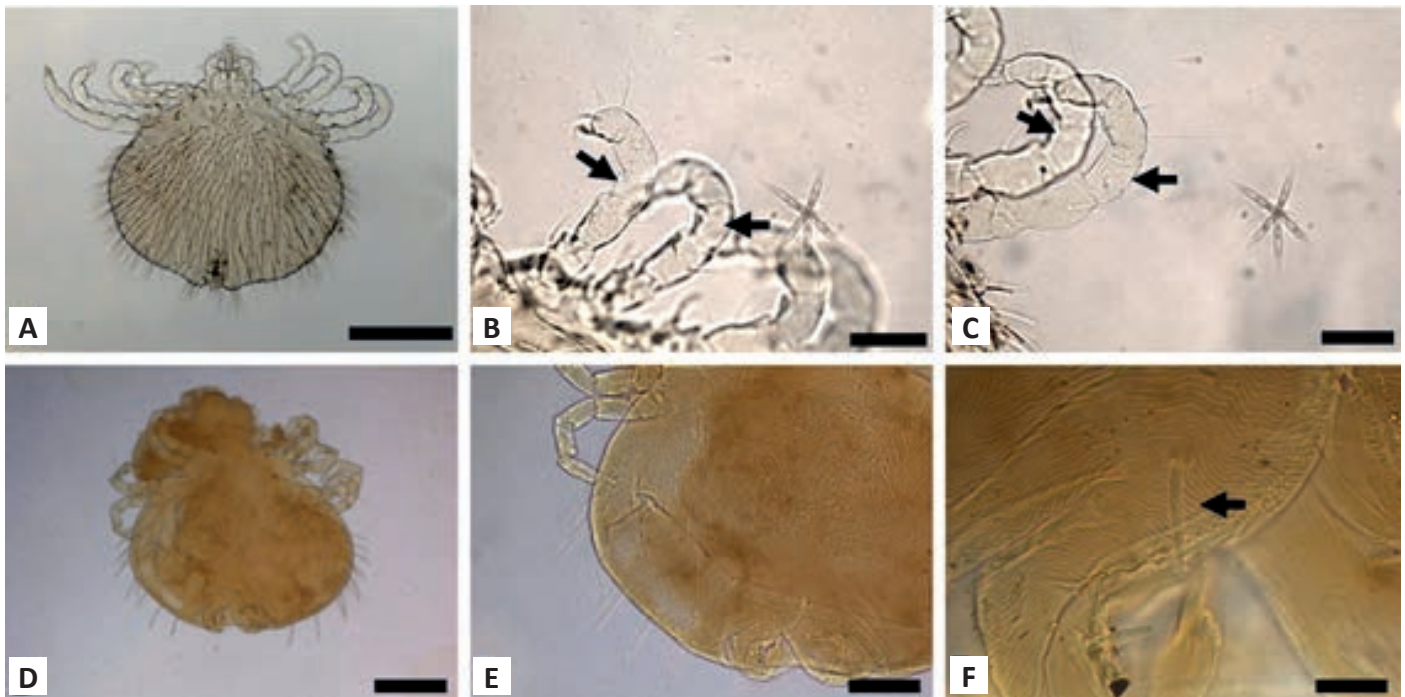


Figure 1. Microscopic images of scale mites (Pterygosomatidae) from Timor-Leste. (A) General view of *Geckobia bataviensis* Vitzthum, 1926. Scale bar = 200 μ m. (B) The arrows identify Genua I (left) and II (right) of *G. bataviensis*. The absence of setae on these segments is one identifying characteristic of the species. Scale bar = 50 μ m. (C) The arrows identify Genua III (left) and IV (right) of *G. bataviensis*. The absence of setae on these segments is a second identifying characteristic of the species. Scale bar = 50 μ m. (D) General view of *Pterygosoma dracoensis* Jack, 1962. Scale bar = 200 μ m. (E) Details of the dorsal median surface of *P. dracoensis* showing the dorsal median setae. Scale bar = 100 μ m. (F) The presence of tapered and serrate *ps* setae (arrow) is a diagnostic feature of *P. dracoensis*. Scale bar = 20 μ m.

Domrow 1991; Lever 2003; Paredes-León et al. 2008; Hoskin 2011; Prawasti et al. 2013; Heath & Whitaker 2015; Díaz et al. 2020). Other than *H. frenatus*, *G. bataviensis* is known to parasitize several other members of the genus *Hemidactylus*, including *H. "brookii"* in Asia (Bochkov & Mironov 2000), *H. turcicus* (Linnaeus, 1758) in Mexico (Paredes-León et al. 2008), *H. platyurus* (Schneider, 1797) (reported as *Cosymbotus platyurus* by Prawasti et al. 2013), and *H. garnotii* Duméril & Bibron, 1836 in Hawaii (Tenório 1985). Heath & Whitaker (2015) identified scale mites collected on lizards by New Zealand MPI quarantine authorities and reported the presence of *G. bataviensis* on transported geckos *Gehyra mutilata* (Wiegmann, 1834), *G. oceanica* (Lesson, 1830), *Gekko gecko* (Linnaeus, 1758), *H. cf. brookii*, *Hemidactylus flaviviridis* Rüppell, 1835, *H. frenatus*, *H. garnotii*, and *H. platyurus*, arriving from American Samoa, Australia, Cambodia, China, Cook Islands, Ecuador, Fiji, French Polynesia, Hong Kong, Japan, Malaysia, New Caledonia, Niue, Pakistan, Philippines, Papua New Guinea, Réunion, Samoa, Singapore, Solomon Islands, Taiwan, Thailand, Timor-Leste, Tonga, Tuvalu, Vanuatu, Vietnam, and Wallis Island. However, these authors did not specifically connect localities and hosts, making a specific host-parasite association impossible.

Taxonomy. *Geckobia bataviensis* displays significant morphological variability and was once considered distinct from its current junior synonyms *G. gleadoviana* Hirst, 1926, *G. nepalii* Hiregaudar, Joshee & Soman, 1959, and *G. cosymboti* Cuy, 1973 (Domrow 1983; Haitlinger 1988). However, studies using integrative tools and species delimitation might be able to confirm if these morphological variations are indeed intraspecific or should be considered species specific. According to Bertrand (2013), *G. bataviensis* can be reliably identified by the absence of setae in Genua I and IV (Fig. 1 A-C).

Association. Our report of *G. bataviensis* on *H. typus* is the first association of this mite with this gecko. Our specimens confirm the association of *G. bataviensis* with *H. frenatus*, and this is the first locality-specific record for this scale mite in Timor-Leste. Among the parasitized individuals, mites were invariably present on the toes, in the spaces between the claw and the lamellae (Fig. 2A). There did not appear to be any difference in mite numbers or position between front and hind toe infections. Additional areas of mite attachment were primarily the ventral parts of the hind legs, with very few mites found on the venter itself. We never located these mites on dorsal surfaces.

Pterygosoma dracoensis Jack, 1962

Specimens. Even though multiple specimens were present on the body of the lizard (Fig. 2B), we were only able to recover a single complete female specimen of *P. dracoensis* (IBSP 16510; Fig. 1D-F) from a female *D. timoriensis* (USNM 579711) collected from a tree opposite the Dare Memorial Museum, Dili Municipality, Timor-Leste (8°35'49"S; 125°34'35"E, elevation 545 m) on 26 January 2012.

Records. *Pterygosoma dracoensis* was originally described by Jack (1962) from type material collected from different specimens on different islands in the Indonesian archipelago. Jack (1962) based the description on female and male type specimens obtained from *Draco lineatus amboinensis* (Lesson, 1834) in the Moluccas (Ambon, Seram), and a nymph and larvae from *D. boschmai* Hennig, 1936 (reported as *D. reticulatus* Günther, 1864) in the Lesser Sundas (Flores). Additional listed material of this species was collected from specimens of *D. beccarii* W. Peters & Doria, 1878 from Indonesia (South Sulawesi), *D. blandfordi* Boulenger, 1885 from southern Thailand (Malay Peninsula), *D. lineatus lineatus* Daudin, 1802 from Indonesia (Java), *D. ornatus* (Gray, 1845) from the central Philippines (Dinagat), *D. volans* Linnaeus, 1785 from the "East Indies," *D. cornutus* Günther, 1864 from Borneo, *D. spiloferus* (Wiegmann, 1834) from the northern Philippines (Luzon), *D. timoriensis* from Indonesia (Alor), and on *D. maculatus* (Gray, 1845) from India (Arunachal Pradesh) (Jack 1962; Fajfer 2020).

Taxonomy. *Pterygosoma dracoensis* can be identified by the type of *ps* setae (tapered and serrate) and the numerous dorsal-median setae (Fig. 1D-F).

Association. Here, we report the second association of *P. dracoensis* with *D. timoriensis*, from a new locality, Timor-Leste. The female *Draco* with these mites was the only individual among the entire collection, on which we were able to locate parasites. Mites were attached on the ventral surface of the left patagium (Fig. 2B), including one additional adult and several nymphs. The collection was complex based on the size and vulnerability of these organisms, and only a single adult was ultimately available for study.

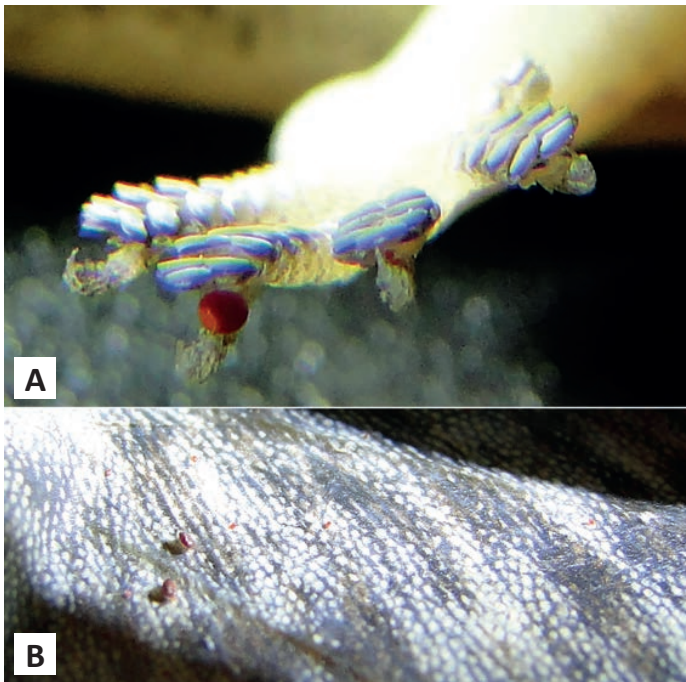


Figure 2. (A) Toes of *Hemidactylus frenatus* Schlegel, 1836 (Gekkonidae) (USNM 580492) with an engorged scale mite, *Geckobia bataviensis* Vitzthum, 1926 (Pterygosomatidae), on its toe. The exposed mite shows the position mites generally take between the claw and the lamellae. One toe to the right, the red body of another mite can barely be seen, showing how the attachment position of the mites provides some protection during the gecko's movement. (B) Ventral surface of the left patagium of a female *Draco timoriensis* Kuhl, 1820 (Agamidae) (USNM 579711), showing two adults *Pterygosoma dracoensis* Jack, 1962 (Pterygosomatidae). The several small red spots on the patagial surface are nymphs of the same species, which could not be extracted intact due to equipment limitations in our field laboratory.

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Authors' Contributions

FCJ and RB-S examined, confirmed the identification of the mites and deposited the slides at the IBSP Collection. FCJ, RB-S, and FHO performed the study. HK confirmed the identification of the hosts and collected the samples. FCJ, RB-S, FHO, and HK co-wrote the manuscript.

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