A description of the male of Geckobiella donnae Paredes-León, Klompen et Pérez, 2012 (Acari: Pterygosomatidae) from captive iguanas in Honduras

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Abstract: Mites of the family Pterygosomatidae are usually infesting lizards, geckos and iguanas. In this family, the genus Geckobiella Hirst, 1917 comprises 12 species including Geckobiella donnae Paredes-León, Klompen et Pérez, 2012. We collected 48 mites of G. donnae from 10 captive iguanas Ctenosaura bakeri Stejneger (Reptilia: Iguanidae) out of 23 examined individuals (prevalence 43%) in Iguana Research and Breeding Station on Isla de Utila, Islas de la Bahía, Honduras on 1 September 2014. Males of G. donnae occurred together with females. The male of G. donnae is described here for the first time. We speculated that G. donnae is autochthonous on Isla de Utila with C. bakeri as a natural host or that it was transmitted to C. bakeri from Iguana iguana (Linnaeus) native to Utila or introduced to Utila from the North American/Central American mainland by a host kept as a pet.

Keywords: parasite, taxonomy, male, Prostigmata

The mite family Pterygosomatidae comprises about 180 species (Bochkov and O’Connor 2006, Fajfer 2012). Most of representatives of this family are permanent and highly specified ectoparasites of lizards, geckos and iguanas (Reptilia, Squamata) except for the genus Pimeliophilus Trägardh including the species that are parasites of arthropods (Davidson 1958, Goldberg and Bursey 1994, Hopmann and Barron 2007, Hunter and Barron 2007, Gomides et al. 2012, Fajfer and Gonzáles-Acuña 2013, Gomides et al. 2015). Pterygosomatids are widely distributed in the world, but the most of papers dealing with mites of the family Pterygosomatidae came from the New World (Walter and Shaw 2002, Paredes-León et al. 2008, Paredes-León and Pérez 2008, Paredes-León and Morales-Malacara 2009, Murgas et al. 2013, Quirroz-Gutiérrez et al. 2015). Paredes-León et al. (2012, 2013) and Paredes-León and Guzmán-Cornejo (2015) published the papers dealing with the family Pterygosomatidae and presented the complexity of the knowledge of the taxonomy, morphology, types of the hosts and of positions of different species within the genus Geckobiella Hirst, 1917. The genus Geckobiella comprises 12 species (Paredes-León and Guzmán-Cornejo 2015). This paper brings the first description of the male of Geckobiella donnae Paredes-León, Klompen et Pérez, 2012 (see Paredes-León et al. 2012).

MATERIALS AND METHODS

The field collection of pterygosomatid mites was run simultaneously with the investigation of ticks in Honduras during 2014 (Novakova et al. 2015). Collections were undertaken on Utila Island, a small Caribbean island 33 km from the mainland of Honduras (16°06′N; 86°54′W, 25 m a.s.l.) and characterised by mangrove forest, wetlands, remnants of broadleaf forest, and pastures.

Pterygosomatid mites were collected from captive iguanas Ctenosaura bakeri Stejneger (n = 23) and Iguana iguana (Linnaeus) (n = 1) at the Iguana Research and Breeding Station at Utila on 1 September 2014. Mites were attached mostly on head (including tympanaeum – see Fig. 1), neck and legs and were collected by Ivan Literák and Luis Chevez.

The mites attached to iguanas were collected during naked-eye examination using tweezers and then preserved in 96% ethanol. All mites collected were mounted into permanent slides using Liquide de-Swan medium (distilled water, 20 ml; arabic gum, 15 g; chloral hydrate 50 g and glucose 3 g, glacial acetic acid 5 ml; Kramár 1953) and observed under a light microscope. Pterygosomatid mites were identified according to Paredes-León et al. (2012). The drawings of the male of Geckobiella donnae were made using a drawing tube on a Zeiss Ergaval microscope (Carl Zeiss Jena, Jena, Germany), then edited by computer using GIMP2 software. For each leg the length was measured from the base of the coxal plate to the tip of the tarsus (excluding ambulacrum). Papers by Baker (1998), Cruz (1984), Cunliffe (1949,
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1952), Jack (1961), Newell and Ryckman (1964), Paredes-León et al. (2012), Paredes-León and Guzmán-Cornejo (2015) were used for the taxonomic study to compare the differences in features of known males of species of *Geckobiella*. Terminology follows Jack (1964), Norton (1977), later adapted by Bochkov and O’Connor (2006), Krantz and Walter (2009), and Paredes-León et al. (2012). All measurements are in micrometres.

Voucher specimens of males of *G. donnae* are deposited in the Slovak National Museum, Bratislava, Slovakia (10 individuals), Natural History Museum, London, UK (5 individuals), Royal Belgian Institute of Natural Sciences, Brussels, Belgium (5 individuals). Other examined mites are deposited in the personal collection of the first author.

**RESULTS**

*Geckobiella donnae* Paredes-León, Klompen et Pérez, 2012

Material examined: 48 mite individuals (35 males, 13 females) of *G. donnae* were collected from 10 captive iguanas *Ctenosaura bakeri* Stejneger, Honduras (photographed by Alberto Velasques).

**Description of male** (format follows Paredes-León et al. 2012)

**Gnathosoma** (Fig. 2). Subcapitulum with simple hypospote, not expanded at apex, 1 pair of slender and smooth setae (*n*) inserted ventrally behind palps; palps slender. Palpal femur three times longer than tibia. Setal formula (from femur to tarsus) 1–1–3–6+ω. Femoral and genual setae *d* simple and of approximately same length, genual seta thinner; tibial setae *l*′ smooth and simple, ventral tibial seta *v* sparsely barbed; tibial claw simple and short (half of length of palpal tarsus); elongate tarsus narrow-ly attached to tibia, bears long basal solenidion ω and six setae: basal seta sparsely barbed proximally, three more distal setae smooth and simple, paraxial one much shorter than other setae, 1 apical seta smooth, simple and 1 apical seta sparsely barbed. Chelicerae long (anterior end reaches proximal part of palpal tibia), proximal part of chelicerac base globose and wide (six times wider than width of distal part); fixed digit membranous, spiniform and movable digit robust and curved paraxially. Peritreme reaching half way along palpal femur.

**Idiosoma** (Figs. 3A,B). Clearly longer than wide; maximum width at level of setae *c2*; dorsal cuticle surrounding setal platelets, coxae and sternal area striated.

**Dorsum** (Fig. 3A). Prodorsum without shield, with five pairs of plumose setae on platelets (*vi, ve, sci, and two similar setae designated as c3 and sce*, respectively – *sensu* Paredes-León et al. 2012 – Fig. 3c) that do not extend to next posterior row of setae, setae *ve* and *c2* the longest. Dorsal setae (each on platelet) plumose, prodorsal marginal lensed eye present on platelet anterior to lateral seta. Hysterosomal setae *c1*, *e2*, *d1*, *d2*, *e1*, *e2*, *f1*, *f2* and *h1*, present; setae composition like in female. Most dorsal setae plumose (except for barbed *ps1* and *ps2* figured on dorsal side). Lyrifissure *ip* located between seta *f1* and margin of hysterosoma. Anal area located on posterior tip, with sparsely barbed setae *ps1* and *ps2*, and with *ps3* seta (figured on ventral side) acuminate, nude.

**Venter** (Fig. 3B). Setae: coxal formula 2–2–4–1, setae located on coxae I–IV except for *3a* located on intercoxal
area, and undesignated seta close posteriad to coxae IV; ventral setae 1a, 1b, 2a, 2b, 3a, 3b smooth and slender, 3c and 3d sparsely barbed. Two pairs of remaining ventral setae (except ps3) slender and smooth, located laterad and posteriad from base of aedeagus, respectively. Aedeagus long and slender. Lyrifissure situated on lateral margin of hysterosoma (visible mainly ventrally) close to seta ps2.

Legs (Figs 4A,B). Setal formulae (I–IV, microsetae (κ) and solenidia in brackets): trochanter 1–1–1–0, femur 5–5–3–2, genu 5(κ)–4–3–3, tibia 5–5–5–5, tarsus 14(2)–9(1)–9(1)–9.

Ventral setae v on trochanters I and II acuminate, nude, v seta on trochanter III plumose. All dorsal setae d on femora–tibiae I–IV plumose and thicker than most of lateral and ventral setae. Leg I bears all ventral setae v thin, acuminate and smooth. Smooth ventral setae occur also on tibia II, other leg segments bear these setae sparsely plumose or sparsely barbed. Most of lateral setae l’ and l” on all legs thinner and plumose except tibia I with setae l’ and l” long and smooth. Ventral seta v’ on genu IV with thick stem, multibranched. Tarsus I with one pair of smooth setae it’ and it” at base of ambulacrum; also with sparsely barbed setae u’ and u”. Solenidia of tarsus I long, o2’ longer than o1 but shorter than companion seta it. Tarsus I also with a pair of long smooth setae tc’ and tc” subequal in length; setae tc’ II–IV slightly barbed, shorter than tc’ I, tc” II–IV longer than tc’” II–IV. Setae p’ and p” on tarsi II–IV thin and slightly barbed or thin plumose; setae p’ and p” on tarsus I seem smooth; setae a’ and a” on all tarsi thicker, plumose.

Solenidia on tarsi II–III much shorter than solenidia on tarsus I, seta vs” on tarsus I present, but II–IV absent on tarsi.

Measurements. Altogether ten male individuals measured (mean followed in parentheses by range). Length of idiosoma (gnathosoma excluded) 426 (370–513), idiosoma maximum width 261 (226–294), aedeagus length 125 (108–158), width between setal pair vi 46 (40–57), width between setal pair ve 114 (96–124), width between setal pair vs 68 (59–75); setal lengths: vi 23 (20–27), ve 31 (27–36), sci 23 (20–25), leg lengths (excluding ambulacrum): leg I 601 (479–691), leg II 333 (274–357), leg III 349 (274–389), leg IV 399 (327–423); solenidion o1 of tarsus I length 85 (75–92), solenidion o2 of tarsus I length 55 (39–62), ft (companion seta of solenidion o2 of tarsus I) length 88 (82–103), solenidion o of tarsus II length 21 (18–24), solenidion o of tarsus III length 3 (3–4); subcapitulum length (from mid-point of posterior margin to tip of hypostome) 134 (121–151), base of subcapitulum width 93 (81–107), subcapitular setae n length 40 (30–50), length of chelicerae 125 (109–138), length of chelicerae (at base) 27 (24–32), palp length 94 (80–103), palp width 27 (24–29), palp–claw length 10 (8–11), and peritreme length (both members of pair) 203 (194–220).

Measurement of female Ten females (mean followed in parentheses by range). Length of idiosoma (gnathosoma excluded) 678 (600–796), idiosoma maximum width 425 (382–480), length of prodorsal shield 227 (205–260), width of prodorsal shield 119 (108–135), width between setal pair vi 85 (75–92), width between setal pair ve 211.

Fig. 3. Geckobiella donnae Paredes-León, Klompen et Pérez, 2012 from Ctenosaura bakeri Stejneger, Honduras. A – dorsal idiosoma of male; B – ventral idiosoma of male.
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...width between setal pair sci 150 (145–156); setal lengths: vi 38 (35–42), ve 56 (48–65), sci 45 (37–50); leg lengths (excluding ambulacrum): leg I 657 (575–715), leg II 481 (430–523), leg III 500 (425–561), leg IV 525 (483–575); solenidion o1 of tarsus I length 67 (60–76), solenidion o2 of tarsus I length 77 (65–84), ft (companion seta of solenidion o2 of tarsus I) length 113 (96–123), solenidion o of tarsus II length 40 (34–50), solenidion o of tarsus III length 15 (12–20); subcapitulum length 299 (281–325), base of subcapitulum width 130 (125–135), subcapitular setae n length 75 (60–83), length of chelicerae 256 (240–274), width of chelicerae (at base) 40 (30–43), palp length 235 (210–255), palp width 37 (34–40), palp-claw length 15 (15–18), and peritreme length (both members of the pair) 402 (340–447).

**Remarks.** The male of *G. donnae* is close to the male of *Geckobiella stamii* (Jack, 1961), sharing the dorsal area striated over its entire surface and also the absence of prodorsal shield. In *G. stamii* setae vi are the most anterior dorsal setae, followed by ve that are closer to sci. Setae e2 and e2 differ from dorsal setae, they are shorter, thinner and more spiked. Palpal femoral seta d forms a stout, short and five–pronged fork. Femur I is lacking setae l', l'' (Paredes-León et al. 2012). The male of *G. donnae* has prodorsal setae ve placed at a more anterior position than vi that are in the same row, and sci are situated in the second (more posterior) row. Setae d2 and e2 are of the same shape like the most of other dorsal setae. Palpal femoral seta d is longer, slender and plumose. Setae l', l'' are present.

The male of another similar species *Geckobiella pyriformis* (Newell et Ryckman, 1964) differs from *G. donnae* having tibia I with solid spine-like seta v", covered with short, spine ornamentation, setae four to five times shorter than v'. *Geckobiella pyriformis* bears 12 pairs of plumose apically pointed dorsal setae (f2 and h1 absent). In male of *G. donnae*, tibia bears both setae v' and v" attenuate and much longer. *Geckobiella donnae* bears 14 pairs of much broader plumose dorsal setae (f2 and h1 present), not apically pointed.

The male of *G. donnae* differs from *Geckobiella diolii* (Baker, 1998) by seta d on palpal femur longer plumose, by 14 pairs of plumose dorsal setae (f2 and h1 present) – setae (one third to one half) thicker than in male of *G. diolii* and by all dorsal setae located on area with striation. The male of *G. diolii* bears seta d on palpal femur short, almost conical; it also differs from *G. donnae* by 12 pairs of dorsal setae (f2 and h1 absent), and by hysterodorsal setae d1, e1 and f1 located on area lacking striation.

The male of *G. donnae* differs from that of *Geckobiella javieri* (Cruz, 1984) by longer plumose seta d on palpal femur, by 14 pairs of plumose dorsal setae (f2 and h1 present) and by all dorsal setae located on area with striation.

**Fig. 4.** Legs (I–IV) of male of *Geckobiella donnae* Paredes-León, Klompen et Pérez, 2012 from *Ctenosaura bakeri* Stejneger, Honduras. A – leg I, dorsolateral view; B – legs II – IV, dorsolateral view.
The male of *G. javieri* has palpal femur with short, almost conical seta *d*, 12 pairs of dorsal setae (*f2* and *h1* absent), and hysterodorsal setae *d1*, *e1*, *e2* and *f1* located on area without striation.

The male of *G. donnae* differs from a similar male of *Geckobiella bakeri* (Cunliffe, 1952) having femur and tibia of palpus with dorsal setae *d* about same length, venter of tibia IV with setae *v* long sparsely barbed. *Geckobiella bakeri* has dorsum of palpal femur with short, club-like spined seta *d*, palpal tibia with normal pilose seta *d* about twice as long as that on femur, and venter of tibia IV with seta *v* small, short triangular spine-like.

The male of *G. donnae* differs from the male of *Geckobiella boneti* (Cunliffe, 1952) having 14 pairs of plumose dorsal setae, genua by seta *d* on palpal femur longer plumose. Seta *v* on tibia IV is thin, sparsely barbed. *Geckobiella boneti* has 12 pairs of thinner plumose dorsal setae, and genua with seta *d* on palpal femur strong, short, almost conical. Seta *v* on tibia IV is solid and spine-like (Paredes-León et al. 2012).

Three other similar species, *Geckobiella harrisi* Davidson, 1958, *Geckobiella texana* (Banks, 1904) and *Geckobiella variabilis* Paredes-León et Guzmán-Cornejo, 2015 (see Banks 1904), differ from the male of *G. donnae* by hypertrichous dorsal setation and by trochanter setal formula 1–1–1–1, while the dorsum of *G. donnae* is hypotrichous and trochanter setal formula is 1–1–1–0 (Paredes-León and Guzmán-Cornejo 2015). In two remaining species, *Geckobiella pelaezi* (Cunliffe, 1949) and *Geckobiella trombidiiformes* Berleese, 1920, the males are unknown (Hoffmann and López-Campos 2000).

**DISCUSSION**

Most morphological features in both sexes of *Geckobiella donnae* from Honduras are identical—shape and position of setae on body and legs, setal formulae on legs and palps, including much shorter palpal tarsal paraxial seta both in male and female. The differences are: absence of prodorsal shield in smaller male, absence of *n* seta on trochanter IV and smooth ventral setae *v* on leg I, whereas female has prodorsal shield, bears ventral seta *n* on trochanter IV, and *v* setae on leg I are barbed, not smooth. In females analysed femur II bears four setae, whereas in males some individuals have five setae (as in Fig. 4B).

The females of *Geckobiella donnae* from Honduras were compared with those from the original description of female (Paredes-León et al. 2012) collected from captive iguanas in a pet store in USA. Our comparison show of female (Paredes-León et al. 2012) collected from cap were compared with those from the original description of males some individuals have five setae (as in Fig. 4B). In females analysed femur II bears four setae, whereas in males some individuals have five setae (as in Fig. 4B). In females analysed femur II bears four setae, whereas in males some individuals have five setae (as in Fig. 4B).

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