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THE IMMATURE STAGES AND ADULTS OF GECKOBIA KEEGANI (ACARI: PTERYGOSOMATIDAE), PARASITE OF HEMIDACTYLUS FRENATUS (GEKKONIDAE) IN COSTA RICA

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Summary: A description of the egg, prelarva, larva, protonymph, deutonymph, and tritonymph is given for Geckobia keegani. The measurement of palps, scutum, the distance between the ocular dots, and the idiosoma are given for the movable stages. Leg chaetotaxy is also described. Based on more detailed characters, a redescription of the male and female is given.

Résumé: Description de l’œuf, prêlarve, larve, protonymphpe, deutonymphpe et tritonymphpe de G. keegani. Les mesures des palpes, du scutum, de la distance entre les formations oculaires et de l’idiosoma sont données pour tous les stades mobiles. La chétotaxie des pattes est aussi décrite. Une redescription du mâle et de la femelle est fournie.

Introduction

Mites of the genus Geckobia Mégnin, 1878 (Pterygosomatidae) are parasites of lizards from the family Gekkonidae (Bertrand & Pedrón 1999), with a geographical distribution in Africa, Asia, Australia, and America (Cruz 1984, Floch & Abbonnenc 1944, Floch & Fauran 1955). Few studies analyze the relationship of these parasites of geckos, one is the study performed by Girot (1969).


Geckobia keegani was described from the Philippine Islands. It was also reported from New Guinea and Hawaii (Lawrence 1953, Domrow 1983, Tenorio 1985) and first description of the male was made by Domrow (1983). The immature stages were still...
undescribed. Jack (1964) gave some details of the leg chaetotaxy with emphasis in the tarsus.

This paper is the first report of *G. keegani* parasitic on the introduced gecko *H. frenatus* in Costa Rica, and the different stages are described and new data are given on male and female.

**Material and Methods**

The specimens of *Hemidactylus frenatus* Schlegel 1836 were collected at the Marine Station of the National University, Punta Morales, Puntarenas, Costa Rica in 2000.

All mites were collected from 10 males, 10 females and 10 juveniles of *H. frenatus* and were preserved in alcohol 80%, clarified in Nesbitt solution for 24 hours and then mounted on microscope slides using HOYER’s solution. The slides were oven-dried at 40 °C for eight days. Microscopic observations were done using phase contrast microscopy, and photographs were taken with a Wild PM S11 camera adapted to the microscope. The mites were deposited in the collection of the Arthropod Museum of the University of Costa Rica.

A total of 15 eggs, 1 prelarva, 15 larvae, 1 protonymph, 15 deutonymph and 15 tritonymph were used for describing the immature stages. A total of 6 females and 7 males were used for the redescription of the adult stages.

*Geckobia keegani* Lawrence 1953

Distribution on the host: Larvae and deutonymphs were abundant at the head, neck, axilla, dorsum, groin, base of the tail, and the thighs of the hosts, meanwhile males were located only at the groin, the base of the tail, and the thighs. Gravid females were always located on the toes of the fore and hind legs of the geckos. Non-gravid females were found at various body locations.

**Female (Fig. 1):** The measurements of palps, scutum, distance between ocular spots, and idiosoma are presented in Table 1. Leg chaetotaxy is presented in Table 2. Gnathosoma: base with abundant striations between coxae I-II. Palps: femur with one seta finely barbed. Genu with a smooth seta, longer than of

the femur. Tarsus ventrally displaced at the base of the tibial claw, with smooth setae and one small digitiform structure that ends into two short filaments. Scutum: anterior margin slightly excavated. Lateral margins irregular. Posterior margin with a profound indentation. Surface of scutum with ovoid sculptures and slightly sclerotized. With 7-8 pairs of setae, placed at the anterior margin, external margin and towards the median line. Setae of anterior half of scutum stout and pectinated. Idiosoma: with two terminal striated and digitiform projections. With stout and pectinated setae. Ventral setae: 50 pairs short with apices brush-like, towards the posterior end of idiosoma. Those setae become pectinated. Dorsal setae about 50 pairs, the posterior ones larger. Dorso-ventral posterior region of idiosoma without setae. Length and width included in Table 1. Anogenital field: dorsal end with an opening surrounded by three pairs of setae at the anterior part and two pairs of lateral setae. Posterior area ending in a pointed projection, strongly striated. With three long pregenital setae and three pairs at the anterior region, one of those cornicle-shaped. Coxae: I and II with three setae, one filiform, two brush-like. Coxae III and IV with four setae, all brush-like.

**Male (Fig. 2):** Measurements of palps, scutum, distance between ocular spots and idiosoma are presented in Table 1. Leg chaetotaxy is included in Table 2. Palps: segment one with a short brush-like seta. Segment two with a long and slender seta. Segment three with a long seta. Scutum: square-shaped scutum, more tenuous than that of females. Posterior margin not incised. Surface without weak areas. Aedeagus: conspicuous. Spear-shaped. With a pointed distal end and a second sub apical point. Length: 112 μm. Coxae: I-II with a filiform seta and another brush—like. III-IV with short and tipped setae.

**Egg (Fig. 3):** Pyriform, smooth chorion without sculptures. A peduncle is present to attach the egg to the substratum. Length (excluding peduncle): mean 209 μm (137-251 μm). Width: mean 163 μm (114-205 μm).

**Prelarva (calyptostasic) (Fig. 4):** Ovoid body. Length: 217 μm. Width: 188 μm. The anterior region
FIG. 1-8: Geckobia keegani: 1. — Female. 2. — Male. 3. — egg. 4. — Prelarva. 5. — Larva. 6. — Protonymph. 7. — Deutonymph. 8. — Tritonymph.
Palps
Distance of eye spots
Idiosoma

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<th>Leg/Segment</th>
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<th>Deutonymph</th>
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TABLE 1: Body measurements (mm), §(min-max), and pairs of setae on the scutum and idiosoma of larvae (n=15), deutonymphs (n=15), females (n=6) and males (n=7) of *Geckobia keegani*.

Larvae (Fig. 5): With three pairs of free legs. The measurements of palps, scutum distance between ocular spots, idiosoma and chaetotaxy are included in Table 2. Chelicerae: with movable digit spear shaped. Fixed digit tubuliform, ending as a blunt claw. Palps: with smooth basal segments, second and third segments with one seta each, fourth segment ending in a blunt claw, with four filiform setae. Scutum: slightly quadrangular and with a straight anterior margin. Posterior margin with a medial indentation. With eight long barbulated setae distributed in rows: one anterolateral pair, one antero submedial pair, and two posterolateral pairs.

Idiosoma: dorsal region with long and barbulose setae. Ventral region with a pair of filiform setae, between coxae III-III and a pair at the posterior region.

**Protonymph** (calyptostacic) (Fig. 6): With three pairs of legs (which belong to the larval skin). Pharate form and globose body. Width: 211 µm. At the anterior region there are four pairs of sac-like structures (palps, chelicerae, leg I and II). A pair of sacs (leg III and IV) are present at the gnathosomal region.

**Deutonymph** (Fig. 7): With four pairs of legs. Measurements of palps, scutum, distance between ocular spots and idiosoma are presented in Table 1. Leg chaetotaxy is presented in Table 2.

Palps: Femur with one setose seta. Genu with one long smooth seta. Tibia with two filiform setae. Tarsus with strong claw and three filiform setae.

Scutum: slightly sclerotized with two pairs of anterolateral barbulose setae. Median line with four equally distributed barbulose setae. Posterior margin deeply emarginated.

Ocular spots: on small sclerites and at the sides of a large pectinated seta.

Idiosoma: with serrated setae. The dorsals larger than the ventrals.
Anal field: opening slit of longitudinal type. Simple, surrounded by a ring and two pairs of pectinated setae at its sides.

Legs: genu of all four legs usually glabrous

TRITONYMPH (calyptostasic) (FIG. 8): With four pair of legs that belong to the deutonymph. Body globose. Length: 314 µm. With a pair of sacs on bosses at each side of the anterolateral region (legs I and II). One pair corresponding to the gnathosoma and two pairs for legs III and IV.

DISCUSSION

According to LAWRENCE (1953) G. keegani differs from G. simplex in two main features: i) the former species has half the number of scutal setae than the later and ii) the tarsus in G. keegani females had four setae, two of them ciliated. We found that all of such setae in our specimens were smooth. DOMROW (1983) presents the first general description of the male of G. keegani. Here, we add to this description by giving details of additional characters as the palps, coxae and aedeagus.

Some authors report the presence of several stages of this mite on the same host. CRUZ (1979) found females, nymphs, and one larva on H. frenatus, but he did not describe such stages. JACK (1964) studied the leg chaetotaxy of G. keegani ((5-5-5-5), (0-0-0-0) (2-1-1-1), (1-1-0)). This author did not mention the leg chaetotaxy of the different stages but emphasizes that the setation pattern of tibia and trochanter in Geckobia is more or less constant, except in G. keegani. The anterolateral seta of trochanter IV is absent. On few male specimens one seta on the trochanter of leg IV was observed.

DOMROW (1983) was the first in describing in general terms the male of G. keegani. LAWRENCE (1953) indicated that the posterior coxae (III-IV) differed from most species of Geckobia in having two spur like hairs on its anterior margin and only two, one none on its posterior margin. Additionally, in G. keegani three or four hairs (instead of five) were found on this coxal plate, which are comparatively small and weak. According to DOMROW (1983) the coxal formula for males of G. keegani is 2-2-2-1, with glabrous setae on coxa I and short and stiff setae on coxae II-IV. It is not difficult to interpret the use of “spur like hairs” by LAWRENCE (1953) because, according to the definition of the term “spur”, our male and female specimens show no apparent differences of coxal hairs as described by LAWRENCE (1953) and DOMROW (1983).

LAWRENCE (1953) described the scutum of the female with 20 similar hairs similar in appearance and size from the other dorsal hairs. He draw a rectangular scutum with 16 hairs and an anterior and lateral margins almost straight. The posterior margin with a profound incision, straight at midline and arched laterally to conform two big projections or lobes, measures (length and width) were not given. Drawings of male by DOMROW (1983) show a rectangular scutum without the incision at the posterior margin, with a similar shape of the scutum observed on the female, with 4 + 6 setae on two specimens. Length and width were 60-65 µm, and 130-135 µm respectively.

The measurements (length and width) of the male scutum given by DOMROW (1983) and our measures overlapped and the number of scutal setae corresponded to that reported in previous descriptions. The comparison is limited by the lack of details in the LAWRENCE’S (1953) and DOMROW’S (1983) descriptions.

DIFFERENTIAL DIAGNOSIS: The specimens collected in Costa Rica were identified as G. keegani with the following characteristics: Body almost circular. Dorso-posterior setae larger than the anterior ones. Scutum well defined and with an indentation at the posterior margin, 20 setae with weak differences in appearance and size in comparison with the dorsal setae in the trochanter of leg IV.

This species differs from the species described on this host by the following characters: G. philippinensis exhibits a wider than long body, crab-shaped and legs IV larger than the others (Cuy 1979). The ventral setae are scaled-shaped and there is no scutum (Barth et al. 1999). The dorsal surface shows 9 or 10 large and wide hairs placed at the site where the scutum is supposed to be. The median dorsal setae are smaller, meanwhile the posterior and peripheral setae are longer and pointed (Cuy 1979, Lawrence 1953). Legs IV are larger than the others according to Cuy (1979) and Lawrence (1953).
G. dubium is close to G. bataviensis. Size 500 μm by 800 μm. The scutum is longer and with only three dorsal setae. Palps are stout, with one long tibial and one long tarsal setae. Eyes are in antero-lateral position in regard to scutum. Palpal femoral seta is smooth, long and inserted in a well defined fosset (Bertrand et al 1999).

According to body size, the following species could be grouped as small or large size species:

A] Large body size: Domrow (1983), based on morphological criteria, considers G. cosymboti, G. gleadowiana and G. nepalii as synonyms of G. bataviensis. Such species show well developed eyes (Bertrand et al 1999), oval idiosoma, slightly wider than long, squared scutum with dense setae and the posterior margin slightly indented and with approximately 40 setae (Cuy 1978). Haitlinger (1988) mentions that the female size is 608 μm by 560 μm, that it has more than 300 setae on the idiosoma, and that the scutum has a larger width than length measuring 240 μm by 160 μm with a concave posterior margin.

G. andoharonaimaitsoensis. Living female is red. Body width is larger that its length measuring 576 μm by 448 μm. Triangular scutum measuring 186 μm by 134 μm, with 37 barbulated setae. Approximately 100 dorsal setae. Palpal femur with ciliated setae (Haitlinger 1988).

G. ifanadianaensis. Female is red when alive. Body width is larger that its length measuring 624 μm by 584 μm. Scutum width is larger than its length, measuring 270 μm by 130 μm, with 28 short and stout setae. Approximately 360 dorsal setae (Haitlinger 1988).

B] Small body size: G. samanbavijinensis width is larger than its length, measuring 324 μm by 308 μm. Scutum is also wider than long with a concave posterior margin and with 28 setae. Approximately 100 dorsal setae. The palpal femur shows ciliated setae (Haitlinger 1988).

G. mananjaryensis is red when alive, body wider than long measuring 360 μm by 336 μm. Scutum also wider than long measuring 190 μm by 80 μm with 30 setae. Approximately 120 dorsal setae. The palpal femur shows ciliated setae (Haitlinger 1988).

This comparative morphological analysis of the different species of Geckobia confirms that the species presented in our study is G. keegani. This represents the first report for this parasite hosted by H. frenatus in Costa Rica. One important problem is the scarcity of descriptions of the males for the different species, necessary for comparative studies. Perhaps future studies could give attention to the use of the aedeagus for species recognition.

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