

## Acari of lizards from Atlantic Forest in northeastern Brazil

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### Abstract

Although mites are often associated with reptiles, there is little information available about parasites of lizards in Brazil. The aim of this study was to identify the ectoparasites of the lizards *Kentropyx calcarata* (Squamata: Teiidae), *Hemidactylus mabouia* (Squamata: Gekkonidae) and *Tropidurus hispidus* (Squamata: Tropiduridae) from northeastern Brazil. The lizards were captured during the dry season at Mata de Tejipió, a fragment of Atlantic Forest, located in the municipality of Recife, state of Pernambuco, northeastern Brazil. *Eutrombicula* sp. (Acari: Trombiculidae), *Geckobia hemidactyli* and *Geckobiella harrisi* (Acari: Pterygosomatidae) were found associated with adult lizards of *K. calcarata*, *H. mabouia*, and *T. hispidus*, respectively. Mites were found in skin folds of the throat and post femoral regions (*Eutrombicula* sp.), “mite-pockets” (*G. harrisi*); and in axillary, dorsal, ventral and pelvic regions (*G. hemidactyli*). In Brazil, this study widens the known geographical distribution of *Geckobiella harrisi* on *T. hispidus* and *G. hemidactyli* on *H. mabouia*. In addition, *K. calcarata* is recorded as a new host of *Eutrombicula* sp. These findings show the importance of ectoparasites as a tool for ecological and biogeographic studies.

### Keywords

*Eutrombicula*, *Geckobia hemidactyli*, *Geckobiella harrisi*, mites, Squamata

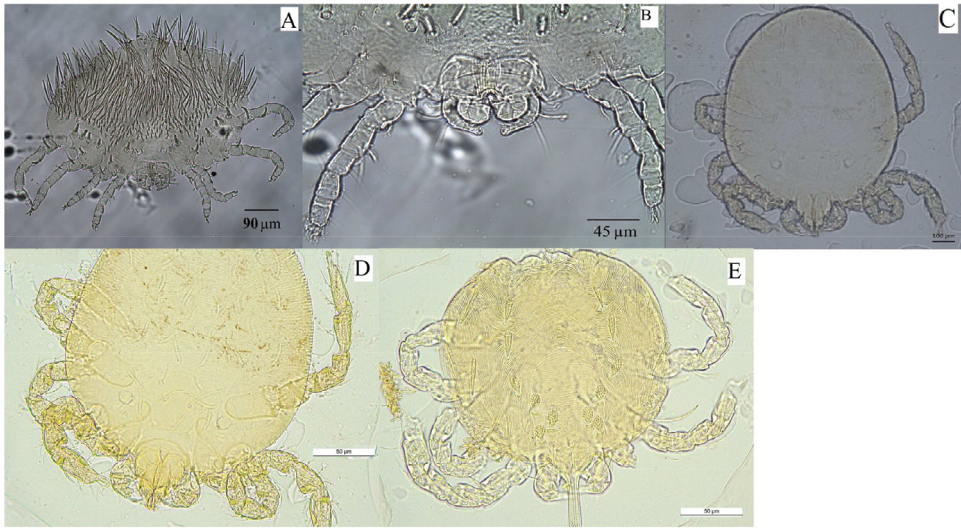
## Introduction

Studies about host-parasite interactions are important to comprehend ecological relationships, providing information about the biology and conservation of the species (Bush *et al.* 2001). Despite this, host-parasite relationships between Acari and reptiles have received limited attention (Fajfer, 2012). Several families of mites are described as reptile ectoparasites (Fajfer, 2012), but only the families Harpirhynchidae (Fain, 1964), Heterozetidae (Flechtmann and Johnston, 1990), Trombiculidae (Carvalho *et al.* 2006; Rocha *et al.* 2008; Delfino *et al.* 2011; Menezes *et al.* 2011), Pterygosomatidae (Delfino *et al.* 2011) and Macronyssidae (Barbosa *et al.* 2006) have been recorded from Brazilian Squamata. In lizards, morphological characteristics that facilitate the attachment of ectoparasites are the “mite-pockets” (Bertrand and Modrý, 2004), imbricate scales (Menezes *et al.* 2011), skin folds (Bauer *et al.* 1990; Carvalho *et al.* 2006), axillary and post-femoral regions (Delfino *et al.* 2011). “Mite-pockets” are structures formed by skin folds popliteal position, which is open when extended and closed when it is flexed, housing damaging mites (Bertrand and Modrý, 2004).

The lizard *Kentropyx calcarata* Spix 1825 (Squamata, Teiidae) has a wide distribution in forested habitats in the Amazon and the Atlantic Forest (Avila-Pires, 1995), but it can also be associated with forest edge (Morato *et al.* 2011) and disturbed areas (Prudente *et al.* 2013). *Hemidactylus mabouia* (Moreau de Jonnés 1818) (Squamata, Gekkonidae) is an exotic species of lizard from Africa, without micro-environmental specificity that shows a close relationship with anthropic and perianthropic environments and occupies microhabitats, such buildings (Vrcibradic *et al.* 2011). *Tropidurus hispidus* (Spix 1825) (Squamata, Tropiduridae) is found in open areas but it can also be associated with forest edge (Morato *et al.* 2011) or be a generalist regarding to its habitat (Van Sluys *et al.* 2004; Miranda *et al.* 2012). This species is in constant contact with human inhabited areas (Vitt *et al.* 2008).

In the current study, we documented mites infesting free-living lizards *K. calcarata*, *T. hispidus* and *H. mabouia* in a fragment of the Brazilian Atlantic Forest. This study was developed at Mata de Tejipió (08°05'45.59"S; 34°57'04.91"W), a fragment of Atlantic Forest located in the municipality of Recife, state of Pernambuco, northeastern Brazil. The area has 172 ha of tropical rain forest in secondary stages of regeneration (Feitosa, 2004), including areas of buildings reserved for military activities. The capture of the lizards occurred during the dry season, with the use of pitfall traps, drift fences and by active search, authorized by Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio N° 31795-1) and approved by Comitê de Ética e Experimentação Animal da Universidade Federal Rural de Pernambuco (CEUA-UFRPE N° 064/2013).

Captured lizards were restrained manually, examined visually, and all detected ectoparasites were collected and preserved in 70% ethanol. The anatomical sites occupied by ectoparasites were recorded. Lizards were released at the same locations of the captures.



**Figure 1.** Light microscopy photographs of the mite specimens found infesting lizards in the Atlantic Forest, northeastern Brazil. *Geckobia hemidactyli* (A and B); *Eutrombicula* sp. (C and D) and *Geckobiella harrisi* (E).

Mites were mounted on permanent slides in Hoyer's medium for subsequent identification based in Lawrence, 1936; Bochkov and Mironov, 2000 (*Geckobia hemidactyli*); Jack, 1964 (*Geckobia hemidactyli* and *Geckobiella harrisi*); Paredes-León *et al.* 2012 (*Geckobiella harrisi*); Brennan and Goff, 1977; Loomis and Wrenn, 1984; Daniel and Stekol'nikov, 2004 (*Eutrombicula* sp.). Mites were deposited in the Coleção Parasitológica do Laboratório de Parasitologia da Universidade Federal Rural de Pernambuco (LAPAR-UFRPE), *Eutrombicula* sp. (CP-LAPAR 79), *Geckobia hemidactyli* (CP-LAPAR 80) and *Geckobiella harrisi* (CP-LAPAR 81).

Twenty-nine lizard specimens were captured including *Tropidurus hispidus* (Squamata: Tropiduridae) (n=13), *Hemidactylus mabouia* (Squamata: Gekkonidae) (n=11) and *Kentropyx calcarata* (Squamata: Teiidae) (n=5). Specimens of *K. calcarata* were captured inside the forest, and the other lizards were captured at the edge of the forest in proximity to buildings.

Three adult lizards (10.3%) were infested with mites (larvae and adults). *Eutrombicula* sp. (Acari: Trombiculidae) (n=28), *Geckobia hemidactyli* Lawrence 1936 (n=18) and *Geckobiella harrisi* Davidson 1958 (Acari: Pterygosomatidae) (n=2) (Figure 1) were found on *K. calcarata*, *H. mabouia* and *T. hispidus*, respectively. Mites were found on skin folds of the throat and post femoral regions (*Eutrombicula* sp.), and in axillar, dorsal, ventral and pelvic regions (*G. hemidactyli*). *Geckobiella harrisi* was found in the mite-pockets.

Little information is available about the parasites of lizards in Brazil, particularly in the northeast region. The infestation prevalence recorded in this study is lower than reported in other studies with lizards of different habitats from Brazil (Cunha-Barros and

Rocha, 2000; Rocha *et al.* 2008; Delfino *et al.* 2011) where the infestation prevalence of *E. alfreddugesi* ranges from 5% to 100% (Delfino *et al.* 2011). According to Fajfer (2012), the highest and most varied ectoparasite prevalence is noted for temporary ectoparasites of reptiles. In this study, both permanent (*G. hemidactyli* and *G. harrisi*) and temporary ectoparasites (*Eutrombicula*) were identified, which was also recorded by Delfino *et al.* (2011) on *T. hispidus* from the state of Ceará, northeastern Brazil.

*Kentropyx calcarata* represents a new record for *Eutrombicula* sp. The genus *Eutrombicula* comprises nearly 80 species into six groups involving 30 unnamed species (Loomis and Wrenn, 1984; Daniel and Stekol'nikov, 2004). According to Daniel and Stekol'nikov (2004), further taxonomic investigations and descriptions of new *Eutrombicula* species are needed, especially in South America. The parasitism by larvae (chiggers) of *Eutrombicula* has been reported in Brazil on *Mabuya agilis* Raddi 1823, *M. macrorhyncha* Hoge 1947, *Cnemidophorus littoralis* Rocha, Araújo, Vrcibradic & Costa 2000, *Ameiva ameiva* Linnaeus 1758 (Cunha-Barros and Rocha 2000, Cunha-Barros *et al.* 2003), *T. hispidus*, *T. semitaeniatus* Spix 1825, *T. erythrocephalus* Rodrigues 1987, *T. cocorobensis* Rodrigues 1987, *T. itambere* Rodrigues 1987, *T. oreadicus* Rodrigues 1987, *T. torquatus* Wied 1820 (Carvalho *et al.* 2006, Rocha *et al.* 2008, Delfino *et al.* 2011, Menezes *et al.* 2011), *Plica plica* (Linnaeus 1758) and *P. umbra* (Linnaeus 1758) (Gomides *et al.* 2015). This diversity of parasitized hosts, including humans, indicates that parasitism by *Eutrombicula* is not host specific (Clopton and Gold 1993, Fajfer 2012).

*Geckobia hemidactyli* is a parasite of Gekkonidae, including *H. mabouia*, *H. tasmani* Hewitt, 1932, *H. frenatus* Schlegel, 1836 and *H. mercatorius* Gray, 1842 in Africa, Asia, Mediterranean and America (Fajfer, 2012). In the American continent the parasitic association between *G. hemidactyli* and *H. mabouia* was recorded in Puerto Rico, the Caribbean, Colombia (Martínez-Rivera *et al.* 2003), the United States (Corn *et al.* 2011) and northern Brazil (Martínez-Rivera *et al.* 2003). *G. hemidactyli* is a common parasite of *H. mabouia*, and therefore Martínez-Rivera *et al.* (2003) suggested that the distribution of the mite followed *H. mabouia* in its geographical expansion throughout the Americas.

Introduction and establishment of exotic vertebrate parasites into any new environment usually leads to increased abundance and diversity of the local parasite fauna, resulting in the introduction of pathogens that could impact the health of local wildlife, domestic animals, and humans (Corn *et al.* 2011). This is the first record of natural infestation by *G. hemidactyli* on *H. mabouia* in northeastern Brazil. According to Martínez-Rivera *et al.* (2003) these findings serve as evidence for the importance of ectoparasites as a tool for biogeographic and ecological studies.

In the American continent, the genus *Geckobiella* includes eleven species identified as lizard parasites with main hosts being the families Iguanidae, Phrynosomatidae and Tropicuridae (Paredes-León *et al.* 2012). In Brazil, the first record of *Geckobiella harrisi* was made by Davidson (1958) in a tropidurid lizard of the species *Plica plica* (Linnaeus, 1758) from the state of Pará. Delfino *et al.* (2011) reported

the occurrence of *Geckobiella* sp. on *T. hispidus* from Ceará state. Geographic distribution of *G. harrisi* in Brazil is now extended to Pernambuco state.

In other studies, chiggers were found in axillary, ventral and dorsal regions, tail, and cloaca (Cunha-Barros and Rocha, 2000; Delfino *et al.* 2011) and the main infestation sites were the mite-pockets and post femoral region in different species of lizards (Carvalho *et al.* 2006; Rocha *et al.* 2008; Delfino *et al.* 2011). Apparently mite-pockets restrict the distribution of chiggers on the lizard's body, reducing damage (Bauer *et al.* 1990). In the present study, *G. harrisi* was found in the mite-pockets, although pterygosomatids are not usually found in this site (Delfino *et al.* 2011). According to Fajfer (2012), despite living under the lizard scales, pterygosomatids may also occur in "pocket-like structures" and in completely unprotected sites on the host's body. Imbricate scales and the presence and morphology of mite-pockets influence ectoparasitism in lizards (Cunha-Barros and Rocha, 2000; Bertrand and Modrý, 2004; Carvalho *et al.* 2006; Menezes *et al.* 2011). The pattern of scales is very characteristic in *K. calcarata* and mite-pockets are absent. Mites of lizards can occupy a wide range of parasitic niches and most species are very specific of the location in their host (Fajfer, 2012). In the study made by Delfino *et al.* (2011), *Geckobiella* sp. occurred uniformly under the scales throughout the body of *T. hispidus*, and mite species was found on same host specimen as *E. alfreddugesi* although they did not occupy the same infestation site. *Geckobia hemidactyli* was found in specimens of *H. mabouia* on the ventral surface, axilla, groin and tail (Martínez-Rivera *et al.* 2003). In adult lizards, mites are particularly abundant on body parts that come in contact during mating (ventral and dorsal surface, axilla, groin and tail) facilitating the transmission (Martínez-Rivera *et al.* 2003).

According to Martínez-Rivera *et al.* (2003), sexual contact or other prolonged and direct physical interaction is the most likely way for a host to acquire *Geckobia* mites. Mites and ticks are vectors of several infectious diseases and may cause direct impact (dermatitis and anemia) on the health of the lizards (Fajfer, 2012). Despite this, parasitized lizards studied here did not present any evidence of skin damage due to external parasites. *E. alfreddugesi* has previously been found on humans (Clopton and Gold, 1993) and infested lizards may be part of its natural life cycle. Further research of mite infestations in lizards in Brazil is needed to understand the life cycle of these mites and the potential role of lizards as reservoirs of mites infesting humans. The results obtained show the importance of considering the host and parasite relationship as a relevant study tool, since it is possible to evidence patterns of historical biogeography, as well as morphological, physiological and ecological factors determining species distribution.

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## Resumo

### Acari de lagartos da Floresta Atlântica no Nordeste do Brasil

Embora os ácaros estejam frequentemente associados com os répteis, existe pouca informação disponível sobre os parasitas de lagartos no Brasil. O objetivo deste estudo foi identificar os ectoparasitos dos lagartos *Kentropyx calcarata* (Squamata: Teiidae), *Hemidactylus mabouia* (Squamata: Gekkonidae) e *Tropidurus hispidus* (Squamata: Tropiduridae) na região nordeste do Brasil. Os lagartos foram capturados durante a estação seca na Mata de Tejiupió, um fragmento de Floresta Atlântica, localizada no município de Recife, estado de Pernambuco, Brasil. Os ácaros *Eutrombicula* sp. (Acari: trombiculidae), *Geckobia hemidactyli* e *Geckobiella harrisi* (Acari: Pterygosomatidae) foram encontrados associados com lagartos adultos de *K. calcarata*, *H. mabouia* e *T. hispidus*, respectivamente. Os ácaros foram encontrados em dobras da pele na região gular e regiões pós-femural (*Eutrombicula* sp.), “bolsas-de-ácaros” (*G. harrisi*) e nas regiões axilar, dorsal, ventral e pélvica (*G. hemidactyli*). No Brasil, este estudo estende a distribuição geográfica conhecida de *Geckobiella harrisi* em *T. hispidus* e *G. hemidactyli* em *H. Mabouia*. Adicionalmente, *Kentropyx calcarata* é assinalado como novo hospedeiro de *Eutrombicula* sp. Esses resultados mostram a importância dos ectoparasitos como uma ferramenta para estudos ecológicos e biogeográficos.

## Palavras-chave

*Eutrombicula*, *Geckobia hemidactyli*, *Geckobiella harrisi*, ácaros, Squamata