

Association of *Hemidactylus palaichthus* Kluge, 1969 (Squamata, Gekkonidae) with the bromeliad *Aechmea huebneri*

The Antilles leaf-toed gecko *Hemidactylus palaichthus* Kluge, 1969 is a South American member of the African-Atlantic clade of the *Hemidactylus* geckos (Carranza & Arnold 2006). It is distributed throughout islands of St. Lucia and Monos, Trinidad and Tobago, Colombia, Venezuela, Guyana, Surinam and northern Brazil (Hoogmoed 1973, Staton & Dixon 1977, Vanzolini 1978, Rivero-Blanco & Dixon 1979, Powell 1990). Records for this species indicate that it reaches its southernmost distribution in the central Brazilian Amazonia (lower parts of the rivers Rio Negro, Purus and Madeira; Avila-Pires 1995, Ribeiro-Júnior 2015). According to Kluge (1969), *H. palaichthus* has been reported in apparently anthropically undisturbed environments such as fences of farms, walls and posts inside villages, scrubby second growth and isolated vegetation (palms, logs) in areas of pasture (Cunha 1981, Vanzoline 1978). O'Shea (1989) and Vitt & Zani (1998) recorded the species in transitional forests between lowland forests and open savannas. Ecological data summarized by Rivero-Blanco & Dixon (1979), Avila-Pires (1995) and Ribeiro-Júnior (2015) report that the species commonly inhabits semi-open to open habitats (dry zones), including disturbed and perianthropic areas. It was also found on dwellings and other buildings (Staton & Dixon 1977). In addition, Kluge (1969) and Avila-Pires (1995) reported that *H. palaichthus* is partially sympatric with the Tropical house gecko *H. mabouia* (Moreau de Jonnés, 1818), which is introduced in Brazil and widely distributed throughout anthropogenic habitats (Carranza & Arnold 2006, Rödder et al. 2008, Ribeiro-Júnior 2015), but also found in natural areas away from dwellings (Vanzoline 1978, Sousa & Freire 2010). Still, information about the habitat and natural history of *H. palaichthus* remains limited.

During short-term herpetological surveys at the Rio Negro Sustainable Development Reserve (Reserva de Desenvolvimento Sustentável do Rio Negro; Fig. 1) carried out in 2017–2018, a population of *H. palaichthus* (Fig. 2A) associated with the bromeliad *Aechmea huebneri* (Fig. 3A) was detected in a relatively undisturbed white-sand forest habitats (Fig. 3B). This population occurs at the southern

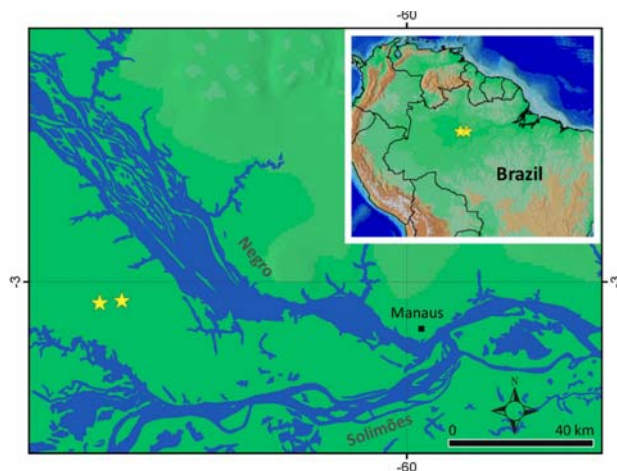


Figure 1. Capture locations (stars) of *Hemidactylus palaichthus* in Rio Negro Sustainable Development Reserve, northern Brazil.

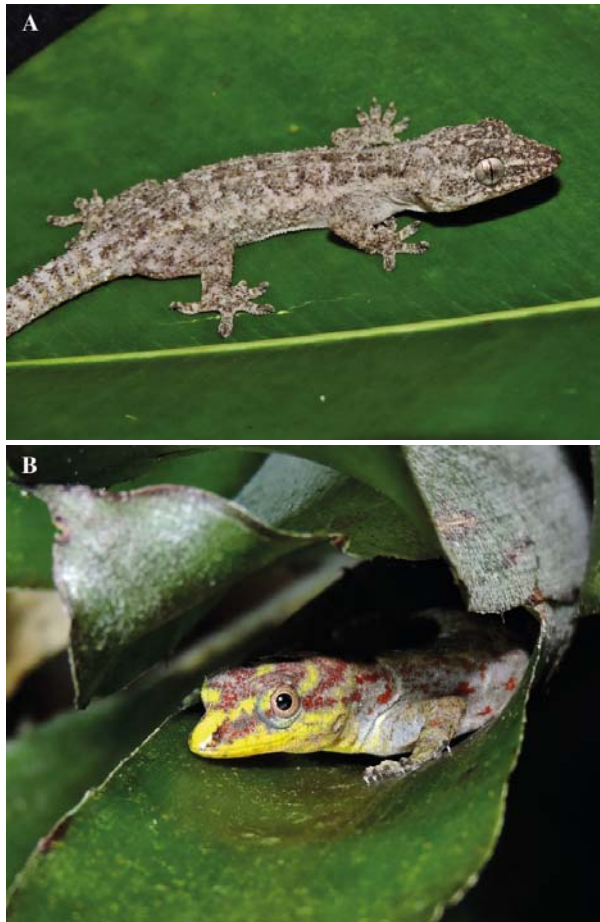


Figure 2. Species of geckos registered in bromeliad rosettes in the study area. A - Adult female *Hemidactylus palaichthus* specimen collected from the rosette of *Aechmea huebneri*. B - Adult male *Gonatodes humeralis* in a rosette of an epiphytic bromeliad at a tall *terra firme* forest.

margin of the species' known range, where practically no data are available. These findings are reported herein, in order to contribute to knowledge on the biology of this poorly studied gecko species.

The Rio Negro Sustainable Development Reserve (RNSDR) is part of the Lower Rio Negro Mosaic, a mixture of protected areas of high bio- and socio-cultural diversity. The RNSDR was created in 2008 by law 3.355 and has a total area of 103.086 ha. It lies west of the confluence of the Rio Negro with the Solimões River, in the municipalities of Manacapuru, Iranduba and Novo Airão, in the state of Amazonas, Brazil. The RNSDR protects the following ecoregions: *igapós* (flooded blackwater forests), tall dense *terra firme* forests (unflooded forests), *campinarana* (open low forests) and *campina* (open low forests with the predominance of shrubs and grasslands). The latter two ecoregions are also known as the Amazonian Caatinga and represent open low forests on infertile sandy soil (white sands) where sunlight can reach the ground. They form patches scattered across the landscape and isolated by a dense forest matrix (e.g. Adeney et al. 2016, Ferreira et al. 2018).

A total of seven *H. palaichthus* individuals in two isolated *campina* "islands" were observed in the RNSDR in September 2018. Six voucher specimens were deposited at the herpetological collection of the Laboratório de Ecologia de Populações, Instituto Nacional de Pesquisas da Amazônia (Amazonas, Brazil), with an abbreviation of APL. Specimen data are as follows: (i) an adult male (snout-vent length, SVL = 45.6 mm), APL 22258, and two adult females, APL 22257,

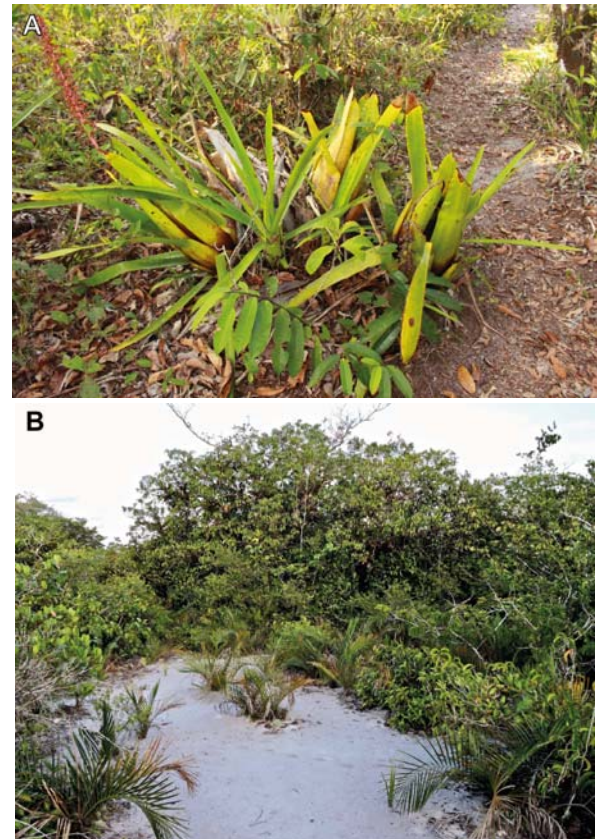


Figure 3. Habitat of *Hemidactylus palaichthus* at the study area. A - *Aechmea huebneri* growth. B - General aspect of the *campina* ecoregion.

APL 22259, (SVL = 48.7 and 48.2 mm, respectively), ca. 84 km W of Manaus (3.05392 S, 60.75458 W, 60 m a.s.l.), 15 September 2018; (ii) three adult females, APL 22268-22270, (SVL = 60.7, 61.2, 51.4 mm, respectively). An additional uncollected adult was observed ca. 81 km W of Manaus (3.04791 S, 60.72994 W, 54 m a.s.l.), on 16 September 2018. All geckos were found during the night between 20:00 and 22:30 h. The five females were active inside the rosettes of the large individual terrestrial or epiphytic bromeliad *Aechmea huebneri* (each bromeliad contained a single female). The two remaining individuals were observed on the sandy ground near the same bromeliad species. Bromeliad inspection (approximately 50 bromeliads) revealed that most bromeliads contained apparently viable *H. palaichthus* eggs, as well as shell fragments of previously hatched eggs. Eggs were deposited in pairs or individually between the leaves in the basal part of the bromeliad rosettes.

The field investigations carried out indicate that *A. huebneri* in the *campina* ecoregion represents an important habitat for *H. palaichthus* in the RNSDR. This gecko was not found either in *campinaranas* or in the tall dense *terra firme* forests during multiple visits to the area. A thorough inspection of terrestrial and epiphytic bromeliads (genera *Aechmea*, *Guzmania*, *Tilandsia*) revealed that *Gonatodes humeralis* (Guichenot, 1855) (Fig. 2B) is the only gecko that occasionally occupies bromeliad rosettes in the latter ecoregions. It appears that open drier *campina* habitats are more suitable for the ecological requirements of *H. palaichthus* than a moist closed forest. Therefore, *campina* "islands" can serve as natu-

ral habitats, enabling this gecko to occur in the central Brazilian Amazonia area.

Hemidactylus palaichthus probably profits from the association with *A. huebneri* in several ways: (i) the large rosettes with firm thorny leaves provide shady shelters and protection from larger predators, (ii) the deep leaf axils provide appropriate places for oviposition and egg incubation, (iii) the phytotelmata between the leaves maintain freshwater and adequate humidity in an otherwise open sunny landscape, (iv) the presence of diverse groups of arthropods and others invertebrates associated with the bromeliad rosettes ensure sufficient trophic resources; for examples of organisms associated with bromeliads, see Araújo et al. (2007), Frank & Lounibos (2009), Montero et al. (2010), Céréghino et al. (2011), Dézerald et al. (2014) and Buosi et al. (2015).

Different examples of gecko-bromeliad associations have been reported for New World gecko species, including seven Brazilian taxa: *Coleodactylus elizae* Gonçalves et al., 2012; *Gymnodactylus darwini* (Gray, 1845); *G. geckoides* Spix, 1825; *H. agrius* Vanzolini, 1978; *H. brasiliensis* (Amaral, 1935), *H. mabouia* and *Phyllopezus lutzae* (Loveridge, 1941); for examples, see Santos et al. (2003) and Silva-Jorge et al. (2014). A close association between *H. agrius*, the closest relative of *H. palaichthus* (see Carranza & Arnold 2006), and the rupicolous bromeliad *Encholirium spectabile* in the semiarid northeastern area of Brazil appears to be the most interesting case, where the gecko profits from the association in similar ways as we describe here.

Santos et al. (2003) and Silva-Jorge et al. (2014) pointed out the important role of the bromeliads in the conservation of *H. brasiliensis* and *H. agrius* in semiarid habitats. Thus, it is similarly concluded herein that natural *campina* habitats containing the large bromeliad growths substantially contribute to the high biodiversity of the central Brazilian Amazonia (Prance & Schubart 1978, Capurucho et al. 2013, Cohn-Haft et al. 2013, Borges et al. 2016a, 2016b, Ferreira et al. 2018). Therefore, the importance of the RNSDR for the conservation of the local biodiversity is indisputable (detailed descriptions of Rapid Assessment for Long Duration Ecological Projects - RAPELD sampling unit in the RNSDR and its ecological importance are available at https://ppbio.inpa.gov.br/en/sites/RDS_Rio_Negro). This note presents new information on *H. palaichthus* habitat use in Amazonian environments located at the southern border of its range, in order to aid future ecological studies on *Hemidactylus*. In addition, it should provide support for conservation and management efforts through the reported species-habitat association of this poorly known gecko species.

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