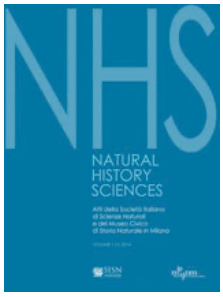

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Documenting mating behavior in a rare dwarf gecko: first field data on *Lygodactylus wetzeli* (Smith, Martin & Swain 1977) (Squamata: Gekkonidae)

Pier Cacciali[1,2*], Lorena Sforza[2], Pamela Reyes[1,3], Pamela Marchi[4]

[1]Biological Research Institute of Paraguay, Asuncion, Paraguay.
[2]Guyra Paraguay, Green Capital Ecological Park - Viñas Cue, Asuncion, Paraguay.
[3]Institute of Biosciences, Federal University of Mato Grosso, Brazil.
[4]Biology Department, Faculty of Exact and Natural Sciences, National University of Asuncion, Universitary Campus, San Lorenzo, Paraguay.

*Corresponding author: pier_cacciali@yahoo.com

Abstract - Reproductive behavior studies are essential for understanding the biology and ecology of species, particularly for poorly known and endemic taxa, as they provide insights into population dynamics, adaptations, and conservation strategies. Here, we present the first documented observations of the mating behavior of *Lygodactylus wetzeli*, a little-known dwarf gecko endemic to the Dry Chaco region of South America. On 9 January 2025, in Boquerón Department, Paraguay, at 12:37, an interaction involving two females and two males was observed on a *Libidibia paraguariensis* tree. The larger female displaced the other female, after which a male approached and initiated courtship. Following a brief interaction, mating occurred, with the male clasping the female and maintaining contact as the pair ascended the tree. The observation highlights unique reproductive behavior in *L. wetzeli* under extreme environmental conditions, characterized by high temperatures (39°C) and low humidity (40%). These findings provide critical insights into the natural history of *L. wetzeli*, laying the groundwork for future studies on its reproductive strategies and ecological adaptations. Comparative analyses with other *Lygodactylus* species, such as *L. klugei*, could reveal how environmental pressures shape reproductive behavior and contribute to diversification within the genus. This observation represents a significant contribution to the understanding of gecko ecology in the Dry Chaco and underscores the need for further research on this enigmatic species.
Key words: Dry Chaco, herpetology, lizards, Paraguay, sexual display.

Riassunto - Documentazione del comportamento riproduttivo di un raro geco nano: primi dati sul campo relativi a *Lygodactylus wetzeli* (Smith, Martin & Swain 1977) (Squamata: Gekkonidae).
Gli studi sul comportamento riproduttivo sono essenziali per comprendere la biologia e l'ecologia delle specie, in particolare per i taxa poco conosciuti ed endemici, poiché forniscono informazioni sulla dinamica delle popolazioni, sulle adattamenti e sulle strategie di conservazione. Qui presentiamo le prime osservazioni documentate sul comportamento riproduttivo di *Lygodactylus wetzeli*, un piccolo geco endemico del Chaco Secco in Sud America. Il 9 gennaio 2025, nel Dipartimento di Boquerón, in Paraguay, alle 12:37, è stata osservata un'interazione che coinvolgeva due femmine e due maschi su un albero di *Libidibia paraguariensis*. La femmina più grande ha

allontanato l'altra femmina, dopodiché un maschio si è avvicinato e ha iniziato il corteggiamento. Dopo una breve interazione, si è verificato l'accoppiamento, con il maschio che ha afferrato la femmina mantenendo il contatto mentre la coppia saliva sull'albero. L'osservazione evidenzia un comportamento riproduttivo unico in *L. wetzeli* in condizioni ambientali estreme, caratterizzate da temperature elevate (39 °C) e bassa umidità (40%). Questi risultati offrono preziose informazioni sulla storia naturale di *L. wetzeli*, gettando le basi per futuri studi sulle strategie riproduttive e sugli adattamenti ecologici. Analisi comparative con altre specie di *Lygodactylus*, come *L. klugei*, potrebbero rivelare come le pressioni ambientali influenzino il comportamento riproduttivo e contribuiscano alla diversificazione all'interno del genere. Questa osservazione rappresenta un contributo significativo alla comprensione dell'ecologia dei gechi nel Chaco Secco e sottolinea la necessità di ulteriori ricerche su questa enigmatica specie.
Parole chiave: Chaco Secco, erpetologia, lucertole, Paraguay, parata sessuale.

Understanding the reproductive behavior and biology of wildlife is critical for conservation efforts, particularly for endangered and endemic species, by providing insights into mating systems, breeding seasons, and reproductive success, which help address threats such as habitat loss and climate change (Gavin, 1991). Additionally, knowledge of reproductive strategies is essential for understanding population dynamics, including growth rates, carrying capacity, and the ecological factors that influence reproduction (Stearns, 1992). For species endemic to a particular ecoregion, reproductive studies also illuminate how species adapt and evolve under environmental pressures, revealing the selective forces shaping traits such as mating strategies, parental care, and sources availability (Clutton-Brock, 1991; Bronstein, 1994; Danchin *et al*., 2008). This is especially important for poorly known species and little conspicuous species such as dwarf geckos.

Lygodactylus wetzeli (Smith, Martin & Swain 1977) is a small, diurnal, arboreal, and neotropical gecko species, first described by Smith *et al*. (1977) based on specimens from the Pantanal region in Urucum (Mato Grosso do Sul, Brazil) where the species holds a few records (Lanna *et al*., 2018), although it is primarily distributed in the Dry Chaco region of South America in Paraguay and Bolivia (González, 1998; González *et al*., 2006; Cacciali *et al*., 2016). It is important to emphasize the lack of information on all aspects of its life history (Norman, 1994). In contrast, another Neotropical *Lygodactylus* species, *L. klugei*, has received slightly more attention. This species, endemic to the semi-arid Cerrado and Caatinga biomes of northeastern Brazil, is also diurnal (Lanna *et al*., 2018). It is often seen basking on arboreal surfaces (Ramos *et al*., 2022), with activity patterns influenced by weather. During the dry season, activity peaks occur in the early morning until midday and in the afternoon to avoid the hottest hours. In contrast, during the rainy season, activity follows a continuous pattern from mid-morning to dusk (Andrade *et al*., 2013). Other natural history aspects include thanatosis as a defensive behavior (Matias *et al*., 2024), and a diet based mainly on arthropods (Vanzolini *et al*., 1980; Vitt, 1995; Galdino *et al*., 2011) but also including *Cereus jamacaru* (Cactaceae) fruits of which *L. klugei* is also considered a seed disperser (Silva *et al*., 2021).

Regarding reproduction, *L. klugei* shows a continuous pattern of breeding pattern with egg-laying observed in both rainy and dry seasons (Vitt, 1986; de Andrade Lima *et al*., 2022) with communal

nests located in tree or cactus trunks, a behavioral adaptation enhancing survival rates in its harsh environment (de Andrade Lima *et al*., 2022). With respect to *L. wetzeli*, reproduction is completely unknown (Norman, 1994). This study aims to provide the first documented observations of the mating behavior of *L. wetzeli*, shedding light on the natural history of this little-known dwarf gecko and enhancing knowledge of wildlife endemic to the Dry Chaco.

On 9 January 2025, at 12:37, two female individuals of *L. wetzeli* were observed on a *Libidibia paraguariensis* (D.Parodi) G.P.Lewis tree (21°19'13.2"S, 61°56'10.4"W), about 30 cm apart (Fig. 1A), when the slightly larger female located above ran down and chased away the other female. At 12:42, on the same tree branch, 40 cm above the larger female, a male appeared and approached the female as she moved downwards. Since the individuals were not captured, the male's total length was estimated as a proportion of the female's (ca. 94.4 %) by measuring the individuals from video frames. For about 1 minute, both specimens were moving around, keeping a distance of about ~10 cm. At 60 cm from the couple, on another tree branch, there was another male (fourth individual) that did not interact with them. At 12:45, the male seized the female, biting her left hind leg, and, with a quick movement, the male clasped the female, holding her tightly with his forearms, at the level of her mid thorax (Fig. 1B). The female started to move around with the male attached to her back. Mating occurred at 12:47. Copula seemed to last a few seconds. After that, the female continued climbing up, with the male still attached to her back. The couple disappeared from view 2 minutes later. A video is available at FigShare.org (https://doi.org/10.6084/m9.figshare.30120871).

During the observations, the temperature was 39°C, with no wind, and a relative humidity of 40%. The area where the observation took place is located near the westernmost limit of Paraguay in the Boquerón Department, within the range of the lowest precipitation isohyets of Paraguay (Fig. 2), recording an average rainfall of 440 mm/year. Annual average temperatures are consistent at 24°C across the site, with the hottest months being December and January (absolute highs exceeding 45°C) and the coldest in July. Rainfall is highly seasonal, with a wet season lasting from December to March and a dry season lasting from June to September. The area experiences high levels of direct solar radiation (755-758 W/m²), especially in the north, contributing to high temperatures and elevated evapotranspiration. Due to high evaporation rates further exacerbating water scarcity, vegetation consists of xerophytic drought-resistant shrubs and trees, with an abundance of cacti and bromeliads in the lower stratum. Specifically, in the surroundings of the observation site, the middle stratum was absent due to intense browsing by cattle.

Here, we present the first data related to the reproductive behavior of *L. wetzeli*. Although visual courtship displays are commonly observed in diurnal geckos, including African species of *Lygodactylus*, which perform elaborate postures and movements (Marcellini, 1977), such behaviors were not evident in *L. wetzeli* during our observations. Further investigations, e.g., by utilizing communal nests as in the case of *L. klugei* (de Andrade Lima *et al*., 2022), would provide valuable insights into how reproductive strategies reflect adaptations to environmental pressures and habitat specificity. For instance, the evolutionary history of *L. klugei* is shaped by geographic and ecological barriers, such as the São Francisco River, which has likely driven population fragmentation and genetic diversification (Lanna *et al*., 2020). Understanding how *L. klugei* exploits diverse niches within the Caatinga ecosystem could provide a comparative framework for

examining how the unique environmental conditions of the Dry Chaco influence nesting-shelter choices in *L. wetzeli*. Such studies could illuminate broader patterns of ecological adaptation and diversification in *Lygodactylus* species across different habitats.

Finally, this observation took place around midday, which coincides with the diel activity pattern reported by Andrade *et al*. (2013) for *L. klugei* during the rainy season. Documenting the mating behavior of *L. wetzeli* thus represents a critical step in filling knowledge gaps about the reproductive ecology of geckos in the Dry Chaco. Understanding such behaviors can also provide broader insights into the evolution of life-history traits in the genus *Lygodactylus* and related taxa.

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References

Andrade M.J.M.D., Sales R.F.D. & Freire E.M.X., 2013 – Ecology and diversity of a lizard community in the semiarid region of Brazil. *Biota Neotropica*, 13: 199-209.

Bronstein J.L., 1994 – Our current understanding of mutualism. *The Quarterly Review of Biology*, 69: 31-51.

Cacciali P., Scott N.J., Aquino Ortíz A.L., Fitzgerald L.A. & Smith P., 2016 – The reptiles of Paraguay: literature, distribution, and an annotated taxonomic checklist. *Special Publications of the Museum of Southwestern Biology*, 11: 1-373.

Clutton-Brock T.H., 1991 – The evolution of parental care. *Princeton University Press*, Princeton.

Danchin E., Giraldeau L.A. & Cézilly F., 2008 – Behavioural ecology: an evolutionary perspective on behaviour. *Oxford University Press*, Oxford.

de Andrade Lima J.H., de Araújo Almeida M.E., de Sousa J.D., de Carvalho Kokubum M.N., de Araújo Â.B.P. & Passos D.C., 2022 – Communal nesting and clutch characterization of *Lygodactylus klugei* (Squamata: Gekkonidae) from Brazilian semiarid region. *Phyllomedusa*, 21: 75-82.

Galdino C.A.B., Passos D.C., Zanchi D. & Bezerra C.H., 2011 – *Lygodactylus klugei* (NCN). Sexual dimorphism, habitat, diet. *Herpetological Review*, 42: 275.

Gavin T.A., 1991 – Why ask "why": the importance of evolutionary biology in wildlife science. *Journal of Wildlife Management*, 55: 760-766.

González L., 1998 – La herpetofauna del Izozog. *Ecología en Bolivia*, 31: 45-52.

González L., Muñoz A. & Cortez E., 2006 – Primer reporte sobre la herpetofauna de la Reserva Natural "El Corbalán", Tarija, Bolivia. *Kempffiana*, 2: 72-94.

Lanna F.M., Werneck F.P., Gehara M., Fonseca E.M., Colli G.R., Sites Jr J.W., Rodrigues M.T. & Garda A.A., 2018 – The evolutionary history of *Lygodactylus* lizards in the South American open diagonal. *Molecular Phylogenetics and Evolution*, 127: 638-645.

Lanna F.M., Gehara M., Werneck F.P., Fonseca E.M., Colli G.R., Sites J.W., Rodrigues M.T., Garda A.A., 2020 – Dwarf geckos and giant rivers: the role of the São Francisco River in the evolution of *Lygodactylus klugei* (Squamata: Gekkonidae) in the semi-arid Caatinga of north-eastern Brazil. *Biological Journal of the Linnean Society*, 129: 88-98.

Marcellini D., 1977 – Acoustic and visual display behavior of Gekkonid Lizards. *American Zoologist*, 17: 251-260.

Matias C.S.L., de Araújo D.S. & de Castro D.P., 2024 – Death simulation behavior of the lizard *Lygodactylus klugei* of the Gekkonidae (Reptilia: Squamata) family in northeastern Brazil. *Boletim do Museu Paraense Emílio Goeldi*, 19: e928.

Norman D., 1994 – Anfibios y reptiles del Chaco paraguayo, Tomo I. *Personal Edition*, San José.

Ramos A.R.L., Oliveira J.A.A., da Silva M.M.X., Tavares R.V. & Borges-Nojosa, D.M., 2022 – Tail-break frequency inferences on *Lygodactylus klugei* (Smith, Martin & Swain, 1977) (Squamata: Gekkonidae) in northeastern Brazil. *Cuadernos de Herpetología*, 36: 89-93.

Silva T.L., Andrade H., Dantas W.M. & dos Reis Días E.J., 2021 – *Lygodactylus klugei* as a fruit eater on the cactus *Cereus jamacaru* in the Caatinga of northeastern Brazil. *Herpetology Notes*, 14: 67-71.

Smith H.M., Martin R.L. & Swain T.A., 1977 – A new genus and two new species of South American geckos (Reptilia: Lacertilia). *Papéis Avulsos de Zoologia*, 30: 195-213.

Stearns S.C., 1992 – The evolution of life histories. *Oxford University Press*, Oxford.

Vanzolini P.E., Ramos-Costa A.M.M. & Vitt L.J, 1980 – Répteis das caatingas. *Academia Brasileira de Ciências*, Rio de Janeiro.

Vitt L.J., 1986 – Reproductive tactics of sympatric gekkonid lizards with a comment on the evolutionary and ecological consequences of invariant clutch size. *Copeia*, 1986: 773-786.

Fig. 1 – A) Two female individuals of *L. wetzeli*. A few seconds after the shot, the larger female located above chased away the other female; B) mating occurred at 12:47. In the inset (upper right corner), a red arrow shows the location where the specimens of *L. wetzeli* were observed on the tree. / A) Due esemplari femmina di *L. wetzeli*. Pochi secondi dopo lo scatto, la femmina più grande, situata sopra, ha scacciato l'altra femmina; B) l'accoppiamento è avvenuto alle 12:47. Nell'inserto (angolo in alto a destra) una freccia rossa indica il punto in cui sono stati osservati gli esemplari di *L. wetzeli* sull'albero.

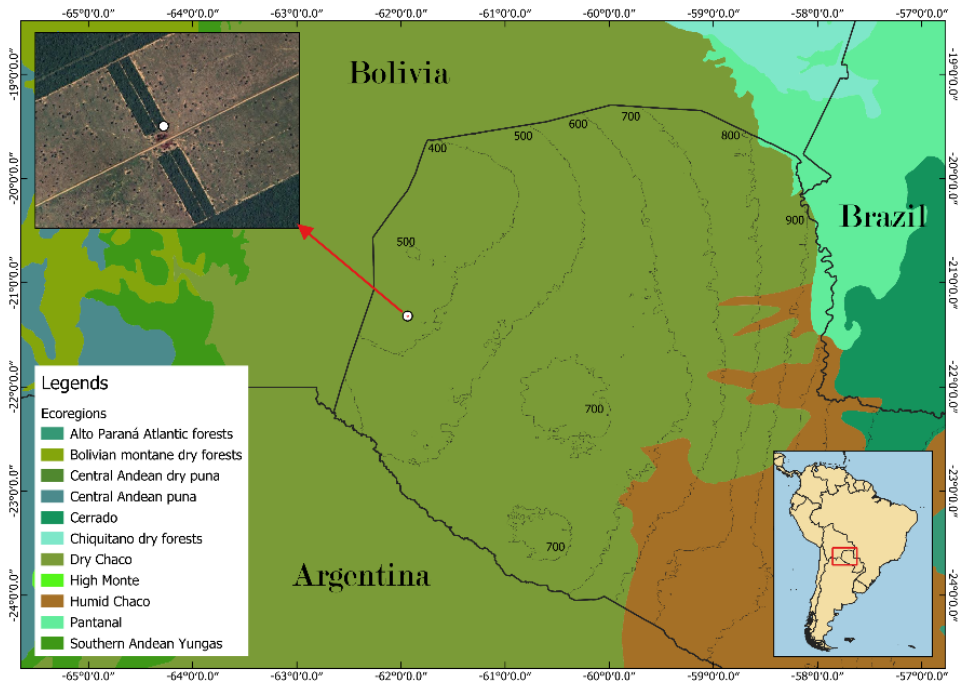

Fig. 2 – Map indicating the location of the observation site, with ecoregions and precipitation isohyets (mm/year); a satellite image of the area is provided as an inset in the upper left corner. / Mappa della localizzazione del sito di osservazione, con ecoregioni e isoiete di precipitazione (mm/anno); nell'angolo in alto a sinistra è riportata un'immagine satellitare dell'area.