

## Egg development time and hatchlings morphology of Neotropical Lava Lizard *Tropidurus hispidus* (Spix, 1825) (Squamata: Tropiduridae) in Northeast Brazil

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**RESUMEN:** El lagarto de lava neotropical *Tropidurus hispidus* (Spix, 1825) está ampliamente distribuido en el noreste de Brasil, encontrándose comúnmente tanto en áreas naturales como antropogénicas. Aquí presentamos información sobre el tamaño y la masa de los huevos, el período de incubación y la morfología de las crías de dos nidadas de *T. hispidus*, que contenían 7 y 10 huevos, encontradas en la Mata Atlántica brasileña. El tiempo de incubación varía de 77 a 93 días. Los datos biométricos de los recién nacidos son todavía escasos para muchas especies de lagartos y podrían utilizarse para llenar las lagunas en la historia natural de *T. hispidus*.

The genus *Tropidurus* Wied-Neuwied, 1825 (Squamata: Tropiduridae) currently includes 28 species which occupy open habitats of tropical and subtropical cis-Andean South America (Carvalho *et al.*, 2013; Uetz *et al.*, 2021). In Brazil, 23 species are currently known (Costa & Bérnills, 2018), of which 15 species occur in the Northeast region: *T. cocorobensis* Rodrigues, 1987, *T. erythrocephalus* Rodrigues, 1987, *T. etheridgei* Cei, 1982, *T. helenae* (Manzani & Abe, 1990), *T. hispidus* (Spix, 1825), *T. hygomi* Reinhardt & Lütken, 1862, *T. jaguaribanus* Passos, Lima & Borges-Nojosa, 2011, *T. montanus* Rodrigues, 1987, *T. mucujensis* Rodrigues, 1987, *T. oreadicus* Rodrigues, 1987, *T. pinima* (Rodrigues, 1984), *T. psammonastes* Rodrigues, Kasahara, Yonenaga-Yassuda, 1988, *T. semitaeniatus* (Spix, 1825), *T. sertanejo* Carvalho, Sena, Peloso, Machado, Montesinos, Silva, Campbell & Rodrigues, 2016, *T. torquatus* (Wied-Neuwied, 1820).

The neotropical lava lizard *Tropidurus hispidus* has a wide distribution in Brazil, both in natural habitats, such as coastal sand dunes, semiarid environments of Caatinga, grasslands and savannas of Cerrado, tropical forests of Amazonia and Atlantic Forest, and in anthropic and urbanized landscapes (Rodrigues, 1987; Carvalho *et al.*, 2005; Andrade, 2020). The species is terrestrial, medium-sized (89–140 mm of snout-vent length), and sit-and-wait forager (Ribeiro & Freire, 2011). However, data about the reproduction of *T. hispidus* is still scarce (Prieto *et al.*, 1976; Ribeiro *et al.*, 2012; Albuquerque *et al.*, 2018). Herein, we report information about two clutches of *T. hispidus* found in an anthropic area of Atlantic Forest located in the Mamanguape municipality, Paraíba State, northeast Brazil, with description of eggs' size and mass, incubation period and morphometry of hatchlings.

On April 12<sup>th</sup>, 2020, a female of *Tropidurus hispidus* was found laying seven eggs in a plowed clayey soil, near a stream (6°39'43" S; 35°08'54" W; WGS 84; elevation 30 masl.). The average measure of the eggs were 9.13 ± 0.34 mm width, 16.75 ± 0.28 mm length and 0.82 ± 0.04 g mass. During the incubation, two eggs dried after 14 days and five hatchlings were born; the first hatched after 77 days (June 28<sup>th</sup>, 2020), three hatched after 78 days (June 29<sup>th</sup>, 2020), and the last hatchling was born after 79 days (June 30<sup>th</sup>, 2020). All hatchlings were measured and weighed soon after they were born (Table 1), with an average length

of 25.83 ± 1.06 mm and average weight of 0.62 ± 0.04 g.

On August 2<sup>nd</sup>, 2020, a second female was found laying 10 eggs in a sandy soil (6°39'50" S; 35°08'47" W; WGS 84; elevation 41 masl.). The eggs presented an average of 8.76 ± 1.16 mm width, 15.53 ± 2.15 mm length and 0.71 ± 0.21 g mass. Four eggs did not develop during the incubation period, and six hatchlings were born after 93 days (November 3<sup>th</sup>, 2020), with an average length of 25.77 ± 1.55 mm and average weight of 0.61 ± 0.04 g (Table 1).

All measurements were performed with the aid of a digital caliper (accuracy = 0.1 mm),

**Table 1:** Morphological measurements (in mm) and weight (in g) of the neonates of the two *Tropidurus hispidus* clutches in the Atlantic Forest, Paraíba, Northeast Brazil. Abbreviations are: snout-vent length (SVL); tail length (TL); head width (HW); head height (HH); head length (HL); body width (BW); body height (BH); forelimb length (FLL); hindlimb length (HLL); inter-nasal width (INW); distance between the navel and the cloaca (DU); mass (M). \*Individuals deposited in the Herpetological Collection of UFPB.

**Tabla 1:** Medidas morfológicas (en milímetros) y peso (en gramos) de los neonatos de dos puestas de *Tropidurus hispidus* en el Bosque Atlántico, Paraíba, Brasil Nordeste. Abreviaturas: longitud hocico-cloaca (SVL); longitud de la cola (TL); anchura de la cabeza (HW); altura de la cabeza (HH); longitud de la cabeza (HL); anchura del cuerpo (BW); altura del cuerpo (BH); longitud de la extremidad anterior (FLL); longitud de la extremidad posterior (HLL); anchura internasal (INW); distancia entre el ombligo y la cloaca (DU); peso (M).

ID	SVL	TL	HH	HW	HL	FLL	HLL	BW	BH	INW	DU	M
Hatch 1												
Indv. 1	27.23	42.38	4.48	6.43	8.52	21.72	12.7	7.02	3.91	1.75	5.83	0.7
Indv. 2	26.56	42.1	4.29	5.74	8.1	22.24	12.67	5.71	3.71	1.71	5.39	0.6
Indv. 3	24.55	41.92	4.15	5.73	8.61	20.12	12.71	6.57	3.8	2.46	5.06	0.6
Indv. 4*	25.34	39.27	4.14	5.72	8.48	19.01	12.82	5.8	3.91	2.41	4.83	0.6
Indv. 5	25.47	39.31	3.56	5.28	8.12	18.96	12.43	5.28	3.05	1.53	4.63	0.6
Mean	25.83	40.99	4.12	5.78	8.36	20.41	12.66	6.07	3.67	1.97	5.14	0.62
SD	1.06	1.56	0.34	0.41	0.23	1.51	0.14	0.7	0.35	0.43	0.47	0.04
Hatch 2												
Indv. 1	25.43	41.14	3.86	5.44	8.63	21.23	13.38	4.84	2.87	2.33	5.09	0.6
Indv. 2	24.51	37.15	3.87	5.16	8.47	20.27	14.03	4.74	2.68	1.92	4.55	0.6
Indv. 3*	26.75	40.38	4.01	5.63	8.68	21.56	13.46	5.34	3.57	2.41	5.18	0.6
Indv. 4	28.22	43.19	4.54	5.99	9.14	22.24	14.99	5.94	3.46	2.88	5.55	0.7
Indv. 5	23.92	38.47	4.04	4.96	8.33	20.11	12.07	4.89	3.06	2.62	4.57	0.6
Indv. 6	25.8	39.26	4.33	5.36	8.7	20.73	13.14	4.52	2.97	2.84	4.57	0.6
Mean	25.77	39.93	4.1	5.42	8.65	21.02	13.51	5.04	3.1	2.5	4.91	0.61
SD	1.55	2.12	0.27	0.36	0.27	0.81	0.96	0.51	0.34	0.35	0.41	0.04

weighed with a digital scale (accuracy = 0.1 g) and kept for incubation semi-buried in vermiculite. The measurements taken from all hatched lizards were: snout-vent length (SVL); tail length (TL); head width (HW); head height (HH); head length (HL); body width (BW); body height (BH); forelimb length (FLL); hindlimb length (HLL); inter-nasal width (INW); mass (M) and the distance between the navel and the cloaca (DU). One newborn from each litter was deposited in the Herpetological Collection of the Universidade Federal da Paraíba (collection permit SISBIO 22940-1). All other individuals were released in the same places as the ovipositions.

In natural environments of Atlantic Forest females of *Tropidurus hispidus* are reproductively active during the entire year, but with a peak observed in the rainy season (March to September). Our data of the two clutches in anthropic areas (April to June and August to November) also indicate the same pattern. The clutch size of the species is similar in different environments:  $8 \pm 2$  in Caatinga (Ribeiro *et al.*, 2012),  $6 \pm 4$  in Atlantic Forest

(Albuquerque *et al.*, 2018), and  $6 \pm 2$  in Amazon savanna (Prieto *et al.*, 1976). We found clutches with 7 and 10 eggs but some (2 and 4, respectively) did not developed. For both hatches, the morphology of all hatchlings did not vary significantly. The snout-vent length of the hatchlings were similar to the smallest SVL of *T. hispidus* in Atlantic Forest presented by Albuquerque *et al.* (2018) (28 mm) but differs from *T. hispidus* in Caatinga (smallest SVL: 41 mm in Albuquerque *et al.* (2018) and 56 mm in Ribeiro *et al.* (2012)).

The knowledge of morphometric variation of lizard eggs and hatchlings can be important to elucidate systematic questions, and to determine phenotypic plasticity in ecological traits of wide distributed species.

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