

# Range extension of *Iguana iguana* Linnaeus, 1758 (Squamata: Iguanidae): the first record of an established population in southeastern Brazil

Jane C. F. de Oliveira<sup>1,3</sup> & Thiago Marcial de Castro<sup>2</sup>

<sup>1</sup>Departamento de Ecologia, Instituto de Biologia Roberto de Alcântara Gomes, Universidade do Estado do Rio de Janeiro, Rua São Francisco Xavier 524, Maracanã, 20550-019, Rio de Janeiro, Rio de Janeiro, Brazil

<sup>2</sup>Centro Universitário São Camilo, Rua São Camilo de Lellis, 1, Paraíso, 29304-910, Cachoeiro de Itapemirim, ES, Brazil.

<sup>3</sup>Corresponding author. E-mail: [janeherpeto@gmail.com](mailto:janeherpeto@gmail.com)

**Abstract:** We report a population of the Green Iguana, *Iguana iguana*, in a remnant of Atlantic Forest in the municipality of Vila Velha, Espírito Santo state, southeastern Brazil. We found both adult and subadult specimens, which indicates the existence of an established population. This is the southernmost record of the species, located at 820 km south from the previous southern extreme of the species' range in the Atlantic Forest (Amargosa, Bahia).

**Key words:** lizard; Atlantic Rainforest; green iguana; geographic distribution; reptile; squamates; introduced species

The Green Iguana, *Iguana iguana*, is one of the best-studied species of the family Iguanidae (e.g., BURGHARDT & RAND 1982; BOCK et al. 2016). The adults are typically found in the upper vegetation, while the juveniles are more often observed near the ground (ÁVILA-PIRES 1995). In general, this species feeds on plant material, insects, bird eggs, other invertebrates, small mammals, and carrion (LÓPES-TORRES et al. 2012). The diet varies ontogenetically, with the juveniles feeding mainly on invertebrates and the adults on plant material (FREITAS & PAVIE 2002). Breeding is distinctly seasonal (RAND & GREENE 1982), with clutches of 10–70 eggs being produced in the dry season (e.g., ZUG & RAND 1987; ÁVILA-PIRES 1995; LÓPES-TORRES et al. 2012).

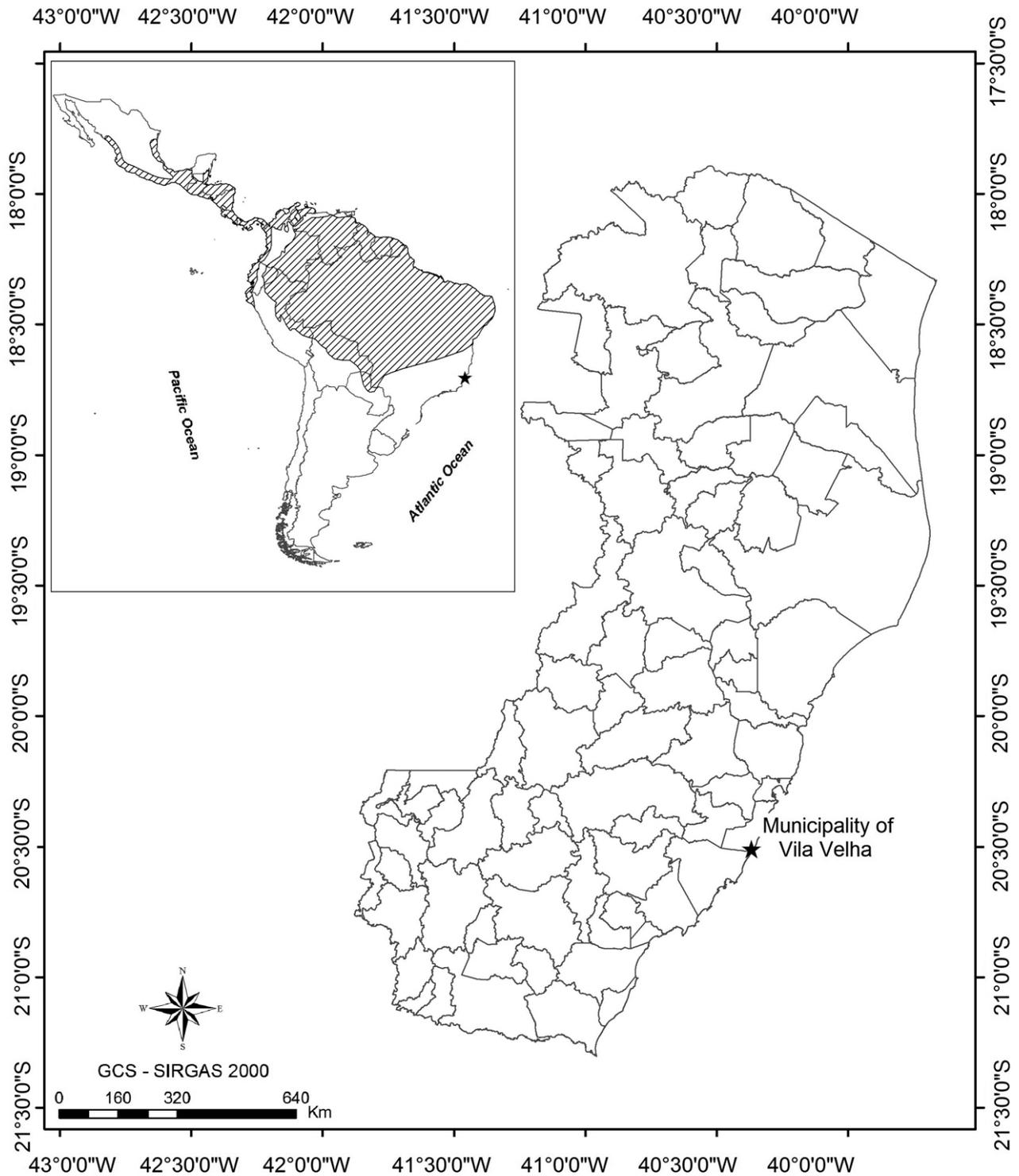
*Iguana iguana* is widely distributed, ranging from northern Mexico, through Central America to northern South America, and many adjacent islands (BUCKLEY et al. 2016). In Brazil, the species occurs naturally in the Amazon region, where it is found primarily in riparian forests (ZIMMERMAN & RODRIGUES 1990), in the gallery forests of the Cerrado savannas, and in various environments of the Caatinga dry forest biome (ÁVILA-PIRES 1995). The natural occurrence of the species in the Brazilian Atlantic Forest is limited to the northern Brazil, in the Municipality of Amargosa, in the Center-South of Bahia state (FREITAS 2014). In this

study, we present an established population of the species in southeastern Brazil, the southeasternmost record along its entire range.

This study was conducted over 3 days between October and December 2016 in a fragment of Atlantic Forest in the municipality of Vila Velha, in Espírito Santo, southeastern Brazil, region of Ponta da Fruta (40°22'S, 020°30'W, WGS84; 15 m elev.; Figure 1). The *I. iguana* population reported here was first noted by local residents. We conducted 12 person-hours of time-limited visual searches (CAMPBELL & CHRISTMAN 1982; MARTINS & OLIVEIRA 1998). The specimens found were counted, and data were collected on the age class (adult, subadult, juvenile), height above the ground, time of the observation, and geographic location. To avoid pseudo-replication in finding specimens, we sampled distinct areas during different search sections. We manually collected an adult male as a voucher specimen (SVL: 370 mm; body mass: 1650 g, catalog number MBML3890), which was euthanized with intravenous anesthetic Propofol. Specimen collection was authorized by license SISBIO/52838-1, and the voucher specimen was deposited in the National Atlantic Forest Institute at the Mello Leitão Museum in Santa Teresa, Espírito Santo, Brazil.

We followed ÁVILA-PIRES (1995) and CASTRO & SILVA-SOARES (2016) to identify the species. *Iguana iguana* can be easily identified on the basis of its morphological traits, such as the crest of dorsal spines that run from the neck to the tail end; the pronounced dewlap; the large and rounded subtympanic scale; and the well-developed members (Figure 2).

We present here the first record of an established population of *I. iguana* for the southeastern Brazil, representing a range extension of 820 km from the closest record. We observed five specimens of *I. iguana*, including four adults and one subadult (Table 1). No juveniles were observed,



**Figure 1.** Known geographic distribution of *Iguana iguana* (hatched area) and the new record in the Municipality of Vila Velha, (black star), Espírito Santo state, Brazil. Modified from BUCKLEY et al. (2016).

**Table 1.** Life stage and microhabitat height of the specimens of *Iguana iguana* observed in the Espírito Santo, southeastern Brazil.

Date	Latitude	Longitude	Life stage	Microhabitat height (m)
25 October 2016	-20.5109	-40.3670	Adult	12
3 December 2016	-20.5101	-40.3682	Adult	10
4 December 2016	-20.5110	-40.3675	Adult	23
4 December 2016	-20.5105	-40.3683	Adult	11
4 December 2016	-20.5108	-40.3664	Subadult	8



**Figure 2.** Adult male *Iguana iguana* from Municipality of Vila Velha, Espírito Santo, Brazil. Photo: Thiago Marcial de Castro.

which indicates that the study period did not coincide with the species' recruitment season (e.g., ZUG & RAND 1987; ÁVILA-PIRES 1995; LÓPES-TORRES et al. 2012). All the individuals (adult and subadult) were observed in the upper strata of the vegetation, between eight and 23 m above the ground (Table 1), which is typical of the species (ÁVILA-PIRES 1995). The observation of both adults and subadults at the study site indicates that the population is well established. Local residents report the presence of adult and immature iguanas in the forest since 2006.

Our findings suggest that *I. iguana* was recently introduced in the state of Espírito Santo. *Iguana iguana* is one of the most popular reptiles in the pet trade and represents about 45% of all reptilian imports in the world (TOWNSEND et al 2003). Additionally, no record of *I. iguana* is known to occur between our record and the native species distribution. So, this isolated population is a possible introduction through pet trade in our study area. Although we cannot confirm that the species negatively impacts on the native biodiversity, a number of factors may facilitate the range extension, such as the small size of the forest fragment (ca. 3.5 ha), the proximity of other forest fragments, the species high dispersal capacity, its ability to occupy open areas, and the territorial behavior of the males (ÁVILA-PIRES 1995; TOWNSEND et al 2003).

## ACKNOWLEDGEMENTS

JCFO thanks the Brazilian National Council for Technological and Scientific Development (Conselho Nacional de Desenvolvimento Científico e Tecnológico – CNPq) for a postdoctoral fellowship. We also thank Marcelia Basto da Silva for reviewing an initial draft of the manuscript.

## LITERATURE CITED

- ÁVILA-PIRES, T.C.S. 1995. Lizards of Brazilian Amazonian (Reptilia: Squamata). *Journal, Zoologische Verhandelingen* 299: 1–706. <http://www.repository.naturalis.nl/record/317788>
- BURGHARDT, G.M., & A.S. RAND. 1982. Iguanas of the world: their behavior, ecology, and conservation. Park Ridge, NJ: Noyes Publications. 491 pp.
- BOCK, C.B., V.P. PÁEZ, A.S. RAND & G.M. BURGHARDT. 2016. Life table and stochastic matrix projection analysis for a population of Green Iguanas (*Iguana iguana*): implications for conservation and control; pp. 47–60, in: J.B. IVERSON, T.D. GRANT, C.R. KNAPP, AND S.A. PASACHNIK (eds.). Iguanas: biology, systematics, and conservation. *Herpetological Conservation and Biology* 11 (Monograph 6).
- BUCKLEY, L.J., K.T. QUEIROZ, T.D. GRANT, B.D. HOLLINGSWORTH, J.B. IVERSON, S.A. PASACHNIK & C.L. STEPHEN. 2016. A checklist of Iguanas of the world (Iguanidae: Iguaninae); pp. 4–46, in: J.B. IVERSON, T.D. GRANT, C.R. KNAPP, AND S.A. PASACHNIK

- (eds.). Iguanas: biology, systematics, and conservation. *Herpetological Conservation and Biology* 11 (Monograph 6).
- CAMPBELL, H.W. & S.P. CHRISTMAN. 1982. Field techniques for herpetofaunal community analysis; pp. 193–200, in: N.J. SCOTT JUNIOR (ed.). *Herpetological communities: a symposium of the Society for the Study of Amphibians and Reptiles and the Herpetologist's League*. Washington, DC: US Fish Wildlife Service.
- CASTRO, T.M. & T. SILVA-SOARES. 2016. Répteis da restinga do Parque Estadual Paulo César Vinha, Guarapari, Espírito Santo, Sudeste do Brasil. 1 ed. Cachoeiro de Itapemirim: Universidade São Camilo. 192 pp.
- FREITAS, M.A. 2014. Squamates reptiles of the Atlantic Forest of northern Bahia, Brazil. *Check list* 10(5): 1020–1030. <https://doi.org/10.15560/10.5.1020>
- FREITAS, M.A. & I. PAVIE. 2002. Guia de répteis da região metropolitana de Salvador e litoral norte da Bahia. Lauro de Freitas: Editora Malha-de-sapo-Publicações. 72 pp.
- LÓPEZ-TORRES, A.L., CLAUDIO-HERNÁNDEZ, H.J., C.A. RODRÍGUEZ-GÓMEZ, A.V. LONGO & R.L. JOGLAR. 2012. Green Iguanas (*Iguana iguana*) in Puerto Rico: is it time for management? *Biological Invasions* 14(1): 35–45. <https://doi.org/10.1007/s10530-011-0057-0>
- MARTINS, M. & M.E. OLIVEIRA. 1998. Natural history of snakes in forests of the Manaus Region, central Amazonia, Brazil. *Herpetological Natural History* 6: 78–150.
- RAND, A.S. & H.W. GREENE. 1982. Latitude and climate in the phenology of reproduction in the green iguana, *Iguana iguana*; pp. 142–149, in: G.M. BRUGHARDT AND A.S. RAND (eds.). *Iguanas of the world: their behavior, ecology, and conservation*. Park Ridge, NJ: Noyes Publications.
- TOWNSEND, J.H., K.L. KRYSKO & K.M. ENGE. 2003. Introduced iguanas in southern Florida: a history of more than 35 years. *Iguana* 10: 111–118.
- ZIMMERMAN, B.L. & M.T. RODRIGUES. 1990. Frogs, snakes, and lizards of the INPA-WWF reserves near Manaus, Brazil; pp. 426–454, in: A.H. GENTRY (ed.). *Four Neotropical rainforests*. London: Yale University Press.
- ZUG, G.R. & A.S. RAND. 1987. Estimation of age in nesting female *Iguana iguana*: testing skeletochronology in a tropical lizard. *Amphibia-Reptilia* 8: 237–250.

**Authors' contributions:** TMC and JCFO equally collected the data and wrote the text.

**Received:** 31 December 2016

**Accepted:** 29 March 2017

**Academic editor:** Rafael de Fraga