Occurrence and distribution of the exotic lizard *Hemidactylus mabouia* Moreau de Jonnès, 1818 in Ilha Grande, RJ, Brazil

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(With 1 figure)

Abstract

The gekkonid lizard *Hemidactylus mabouia* is an exotic species in Brazil and is found in different ecosystems. This species was recorded at Ilha Grande, RJ, one of the largest insular remains of the Atlantic Rainforest in Brazil. In this study, the occurrence of *H. mabouia* was determined throughout the island, including the rain forest, restinga and anthropic environments. We used the active search method in points along 19 trails that surround Ilha Grande. At each regular interval of 100 m, we searched for the presence of *H. mabouia.* The species was recorded in a total of 100 points among the 719 sampled and, in all cases, the occurrence of the lizard corresponded to points located in anthropic or perianthropic areas. As most of Ilha Grande is covered by dense tropical rain forest, we believe this has restricted the invasion of *H. mabouia* in natural environments within the island.

Keywords: invasive species, exotic species, anthropic and perianthropic areas, invasion of natural habitats, tropical rainforest.

Ocorrência e distribuição do lagarto exótico *Hemidactylus mabouia* Moreau de Jonnès, 1818 na Ilha Grande, RJ, Brasil

Resumo

O lagarto geconídeo *Hemidactylus mabouia* é uma espécie exótica no Brasil, podendo ser encontrada em diferentes ecossistemas. Esta espécie foi registrada na Ilha Grande, um dos maiores remanescentes insulares de Mata Atlântica no Brasil. Neste estudo a ocorrência de *H. mabouia* foi estimada para a ilha, incluindo ambientes de floresta, de restinga e antrópicos. Usamos o método de procura ativa ao longo de 19 trilhas que circundam a Ilha Grande. Em cada intervalo regular de 100 m, procuramos pela presença de *H. mabouia.* A espécie foi registrada em 100 pontos de 719 amostrados e, em todos os casos, a ocorrência do lagarto correspondeu a localizações em áreas antrópicas ou periantrópicas. Como a Ilha Grande é em grande parte coberta por floresta ombrófila densa, acreditamos que isso tenha restringido a invasão da lagartixa *H. mabouia* em ambientes naturais.

Palavras-chave: espécies invasoras, espécie exótica, áreas antrópica e periantrópica, invasão de *habitats* naturais, Mata Atlântica.

1. Introduction

The exotic gekkonid lizard *Hemidactylus mabouia* has been introduced and successfully established itself in the New World, having colonized many countries of South America (including Brazil) (Vanzolini, 1978; Anjos and Rocha, 2008), Central America and the Caribbean (except Jamaica; Kluge, 1969; Howard et al., 2001) and the southern United States, in North America (Meshaka et al., 1994; Meshaka, 2000). This nocturnal lizard is commonly found in anthropic or perianthropic environments (Vanzolini et al., 1980; Anjos et al., 2008) in different Brazilian ecosystems such as the Atlantic rainforest, the Cerrado (savannah-like vegetation of central Brazil), the Caatinga (semi-arid scrublands of notheastern Brazil), the restingas (coastal sand-dune habitats of Brazil – Rocha et al. 2007), the Amazon rainforest, and some islands off the Brazilian coast (Vanzolini, 1968, 1978; Vanzolini et al., 1980; Vitt, 1986; Araújo, 1991; Rocha et al., 2002, 2004; Anjos and Rocha, 2008; Ribeiro et al., 2008; Vitt et al., 2008).

At Ilha Grande, one of the largest insular remains of the Atlantic Rainforest in Brazil and one of the largest State Parks in Rio de Janeiro State, this species is known to occur (Rocha and Van Sluys, 2006; Rocha et al., 2010). However, there is no information about to which extent this species remains in this Conservation Unit simply as

an exotic species associated to anthropic environments or if it has already invaded the natural environments of the island, becoming an exotic invasive species.

The aim of this study is to determine the occurence of *H. mabouia* in different environments on the island, including rain forest, restinga (sand dune habitats with herbaceous and shrubby vegetation at seaside) and anthropic areas.

2 Material and Methods

2.1. Study area

Ilha Grande is located on the southern coast of Rio de Janeiro state (23° 11' S and 44° 12' W) in southeastern Brazil and is the largest island in the state, with an area of approximately 19,000 ha. The island belongs to the municipality of Angra dos Reis and lies some 150 km SW from the city of Rio de Janeiro. The climate of Ilha Grande is wet and warm with a mean annual rainfall of about 2240 mm, with maximum values in January (350 mm) and minimum values in July (75 mm) (Oliveira and Hack, 2004). Mean annual temperature in the area is about 23 °C.

2.2. Sampling method

We sampled monthly (three days/month) from March to December 2009. To determine and map out the current occurrence and distribution of *H. mabouia* at Ilha Grande, we systematically searched for the lizard's occurrence at 719 points established along 19 trails throughout Ilha Grande, using the active search method. The trails crossed areas of tropical rain forest and restinga vegetation and also some anthropic areas; along those trails we established the points at regular intervals of 100 m. At each point within a radius of five meters on both sides of the trail, we made an active search in order to check the presence of *H. mabouia*. At each point, during five minutes the lizards were systematically searched in all microhabitats available by hand or using a wooden stake (to insert in grooves) by two observers up to a height of 2.5 m above ground. Since our proposal was only to register or not the occurrence of the exotic lizard *H. mabouia* in the natural environments within the island, at each point we only registered the conditions "occurrence" or "no occurrence" of the lizard. Each point was georeferenced using a Garmin IV GPS.

3. Results and Discussion

Between January and December, 2009 we walked a total of 71 km of trails registering and mapping the occurrence of *Hemidactylus mabouia* on the island. The lizard was recorded in a total of 100 points among the 719 sampled (Figure 1) and, in all cases, the occurrence of the lizard corresponded only to points located in anthropic or perianthropic areas.

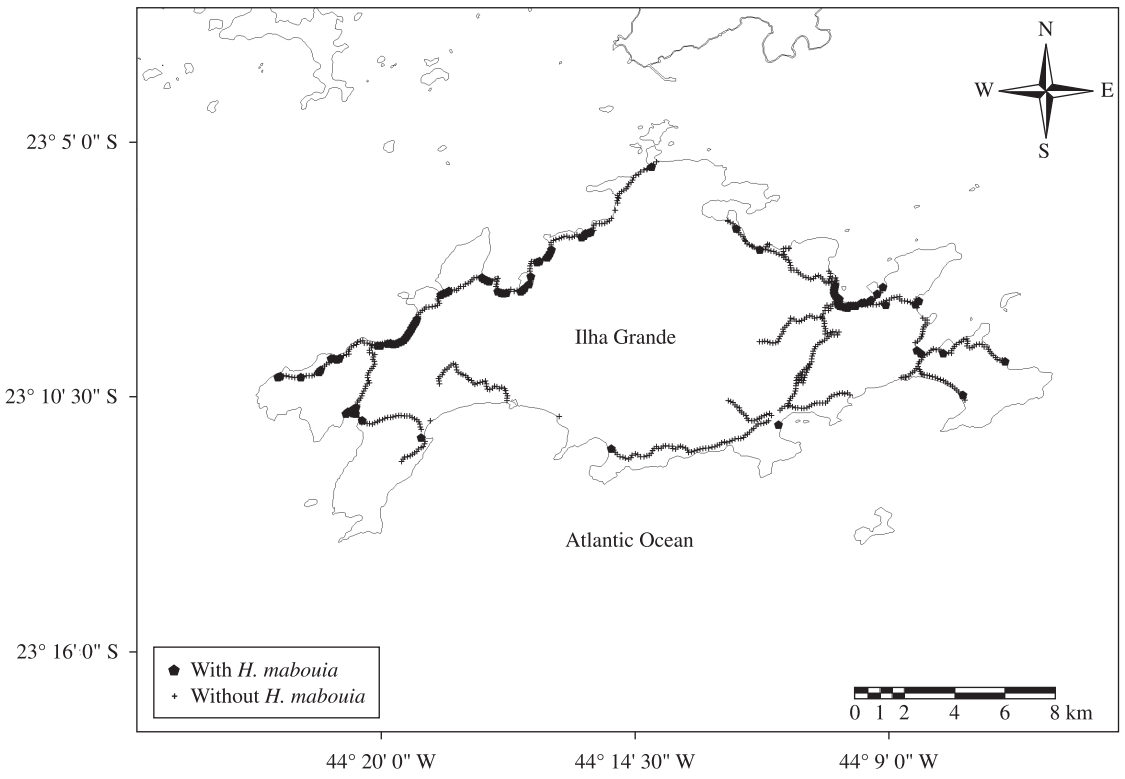

Figure 1. Map showing the trails and the points where the exotic gekkonid lizard *Hemidactylus mabouia* was recorded (closed pentagons) and points were it was nor recorded (crosses) at Ilha Grande, Angra dos Reis Municipality, Rio de Janeiro State, Brazil.

There was no record of occurrence of this gekkonid in any natural environment of Ilha Grande which suggests that it still remains locally as an exotic species, but not as an invasive species. An interesting aspect of the current distribution of *H. mabouia* on Ilha Grande island is its strong restriction to anthropic environments. Whenever a man-made environment occurred in the forest, even in a completely isolated condition, or even if small (small house or commercial kiosk), the species was already established there, but not in the woods of the surroundings. The studies developed at Ilha Grande over the last 13 years reinforce this condition. The herpetofauna of the Island has been studied regularly since the establishment of the Centro de Estudos Ambientais e Desenvolvimento Sustentável da Universidade do Estado do Rio de Janeiro (CEADS/UERJ) in the area in 1996 and since then many studies have investigated the ecology, occurrence and distribution of reptiles in the island environment (e.g. Rocha and Van Sluys, 2006; see Rocha et al., 2010 for a list of references), without any record of *H. mabouia* living under natural conditions in the forest or in the restinga habitats.

This gekkonid occurs virtually in all urban environments in Brazil (Anjos and Rocha, 2008; Dossiê Pernambuco, 2009) and over the last decades, has already been registered as invasive in natural environments of several Brazilian states: in Rio de Janeiro in restinga (Araújo, 1984, 1991, 1994; Freire, 1996; Teixeira, 2001; Hatano et al., 2001; Rocha et al., 2004; Carvalho et al., 2007) and in rain forest environments (Almeida-Gomes et al., 2008; Carvalho et al., 2007), in Bahia in restinga areas (Dias and Rocha, 2005), in sand dune habitats along the Rio São Francisco river (Rodrigues, 1996) and in the insular environment of the Arquipélago dos Abrolhos (Rocha et al., 2002), in Ceará in Cerrado and Cerradão areas (savannah-like vegetation) (Ribeiro et al., 2008), in São Paulo in ruderal field areas (Rocha and Anjos, 2007), and in the Fernando de Noronha Archipelago (which belongs to the State of Pernambuco) (Rocha et al., 2009).

The data from Rocha et al. (submmitted) shows that *H. mabouia* has already invaded different types of natural environments in different regions of Brazil, including continental areas and coastal islands (the latter being very sensitive environments). The invasion by exotic species is considered the main cause of the loss of biological diversity on oceanic islands (GISP, 2005; Ziller and Zalba, 2007). We do not know if the environment of Ilha Grande, which is mostly covered by dense tropical rain forest, has restricted the invasion of its natural habitats by *H. mabouia*. In fact, Rocha et al. (submitted) analyzing the available records of this lizard as invasive in natural environments in Brazil, found that most of the environments where the species successfully invaded (94% or 30 out of 32 cases) were open habitats (such as restingas, sand dunes, Cerrados, coastal rocky hills and rocky islands), with cases of invasion of forested environments which are comparatively rare. These authors suggested that invasion of forested environments by *H. mabouia* seems to be less favored due to more restricted thermal characteristics of forested environments compared with more open habitats or due to the comparatively higher humidity of forests that could not be favorable to this nocturnal gekkonid.

Our data are indicative that the monitoring of *H. mabouia* in Ilha Grande is therefore of great importance, because the species can potentially shift at any moment from a simply exotic condition to an invasive one, which can be more critical in an insular environment.

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