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Herpetological notes from the islands of São Vicente and Santo Antão, Cabo Verde

Jiří Moravec^{1,*}

¹ Department of Zoology, National Museum, Václavské náměstí 68, 110 00 Praha 1, Czech Republic

* Corresponding author e-mail: jiri.moravec@nm.cz

RESUMO

Este estudo resume a informação faunística e de história natural de um anfíbio e seis espécies de répteis registadas nas ilhas de São Vicente e Santo Antão entre 3–22 de Outubro de 2022. Foi observada uma forte predação de ovos e juvenis de *Caretta caretta* por cães selvagens na costa nordeste de São Vicente. A osga sinantrópica *Hemidactylus mabouia* é considerada uma espécie invasora que pode estar a afectar a distribuição da rara espécie endémica do mesmo género, pois ocupa agora uma grande variedade de habitats antropogénicos. A omnívoros foi documentada em *Chioninia stangeri*.

Palavras-chave: *Caretta*, *Chioninia*, *Hemidactylus*, história natural, *Sclerophrys*, *Tarentola*

ABSTRACT

This study summarizes the faunistic and natural history information for one amphibian and six reptile species recorded on the islands of São Vicente and Santo Antão from 3–22 October 2022. Strong predation of *Caretta caretta* nests by feral dogs was observed on the northeastern coast of São Vicente. The synanthropic gecko *Hemidactylus mabouia* is considered an invasive species that may be affecting the distribution of the rare endemic species of the same genus, as it is now occupying widely different types of anthropogenic habitats. Omnivory was documented in *Chioninia stangeri*.

Keywords: *Caretta*, *Chioninia*, *Hemidactylus*, natural history, *Sclerophrys*, *Tarentola*,

INTRODUCTION

The Cabo Verde Archipelago hosts a unique herpetofauna, which is characterized by an unusually high degree of local endemism. Whereas the species diversity and phylogenetic relationships of the Cabo Verdean reptile and amphibian species have been studied in detail (e. g. Arnold *et al.* 2008, Miralles *et al.* 2010, Marco *et al.* 2011, Vasconcelos *et al.* 2010, 2012a, b, 2013, 2020), but our knowledge of distribution, habitat requirements and biology of these native and alien species remains incomplete.

Regarding alien species, Vasconcelos *et al.* (2020) pointed out, that taxonomy and

allocation of the Cabo Verdean population of *Hemidactylus mabouia* (Moreau de Jonnès, 1818) needed further investigation with respect to *Hemidactylus mercatorius* Gray, 1842, and Pinho *et al.* (2023) confirmed that Cabo Verde individuals belong to the *Hemidactylus mabouia sensu stricto* lineage. However, little is known about the intra island distribution in most islands (Vasconcelos *et al.* 2013).

With the aim to obtain additional natural history data on endemic and alien amphibians and reptiles, short-term herpetological surveys of the islands of São Vicente and Santo Antão were carried out.

MATERIAL AND METHODS

The field research was conducted in the north and northeastern part of São Vicente (3–13 and 19–22 October 2022) and in the eastern part of Santo Antão (13–19 October 2022). The observed animals were photographed and geolocated using a GPS receiver Garmin eTrex 30x. Snout-vent length (distance from the snout tip to cloaca; SVL) of selected individuals was taken by a digital calliper to the nearest 0.1 mm. Photographs were deposited in the herpetological collection of the National

Museum of Prague (NMP-P6F). Reptile droppings were collected in 50% alcohol tubes and analyzed under a dissecting microscope. Two *Hemidactylus mabouia* specimens from São Vicente were barcoded for the 12S rRNA mitochondrial gene following Šmíd *et al.* (2013) and the obtained nucleotide sequences were compared with sequences available on GenBank. The terminology of the Cabo Verdean plant communities was adopted from Neto *et al.* (2020).

RESULTS

One amphibian and six reptile species were recorded on São Vicente and Santo Antão (Fig. 1). The African common toad (Fig. 1A) *Sclerophrys regularis* (Reuss, 1833), Bufonidae, the alien species of African origin (Vasconcelos *et al.* 2010), was observed in the settlement of Bairro Alto, Santo Antão (17.11838 N, 24.99856 W; 14–16 October 2022; Fig. 1B). The local *S. regularis* population occupied a valley along a permanent stream, Ribeira de Janela, coming from the northeastern slopes of Pico da Cruz. Toads inhabited the surroundings of irrigation pools, fields of taro *Colocasia esculenta*

(Araceae) and margins of banana *Musa* sp. (Musaceae) plantations up to ca. 150 m a.s.l. Frequent remains of road killed animals in the lower part of the valley indicated a relatively high population density. On cloudy days, subadults were active also during the morning hours.

Loggerhead sea turtle *Caretta caretta* (Linnaeus, 1758), Cheloniidae, emerging hatchlings (Fig. 1C) and tracks of nesting females were observed on the beaches between Baía das Gatas and Calhau, São Vicente (16.8900 N, 24.91453 W to 16.86782 N, 24.89838 W; 7–12 October 2022; Fig. 1D).

In total, circa 20 nests were detected along that beach section. Practically all of them (including fresh ones) were predated by feral dogs (Fig. 1E). Tracks showed that they visit

the beaches mainly at night or early in the morning and dig up nests with eggs and hatching turtles. The open nests were frequently visited by crabs.



Fig. 1. Selected herp species and their habitats documented on the islands of São Vicente and Santo Antão (photos by J. Moravec). **A)** Subadult specimen and **B)** habitat of *Sclerophrys regularis*; surroundings of Bairro Alto, Santo Antão. **C)** Hatchling, **D)** nesting beach and **E)** predated nest of *Caretta caretta*; east of Baía das Gatas, São Vicente. **F)** Adult specimen and **G)** habitat of *Hemidactylus mabouia*; Monte Verde, circa 600 m a.s.l., São Vicente. **H)** Adult female and **I)** habitat of *Tarentola caboverdiana*; surroundings of Porto Novo, Santo Antão. **J)** Adult female of *Tarentola substituta*; vicinity of Lazareto, and **K)** habitat of *Tarentola substituta*; the foothills of Monte Verde, 450 m a.s.l., São Vicente. **L)** Adult of *Chioninia fogoensis* at its shelter in a stony wall, and **M)** its habitat on northeastern slopes of Pico da Cruz; ca. 900 m a.s.l, Santo Antão. **N)** Subadult of *Chioninia stangeri* searching for food among the stones covered by *Frankenia ericifolia*, and **O)** its habitat east of Baía das Gatas, ca. 50 m a.s.l., São Vicente, with yellow flowers of *Lotus* sp., part of its diet.

The African house gecko (Fig. 1F) *Hemidactylus mabouia sensu stricto*, Gekkonidae, is an alien synanthropic gecko of African origin. Both São Vicente samples had the same haplotype (GenBank accession OP895105), identical to samples from across the species distribution (Brazil, Equatorial Guinea, Madeira, São Tomé and Príncipe, Uganda, and USA), which is in good agreement with the findings published by Pinho *et al.* (2023). A very dense population was observed in Baía das Gatas (16.90626 N, 24.91017 W; 7–12 October 2022). The geckos occupied both exteriors and interiors of houses, surrounding gardens and other anthropogenic habitats (10 adult and subadult individuals were documented in one house at the NW edge of the village; largest male SVL= 70.0 mm, largest female SVL= 58.0 mm). Another dense population was found in the upper part of the mountain of Monte Verde. Here, the geckos frequently occurred in the agricultural land above 530 m a.s.l. (Fig. 1G). The animals (including gravid females) were hidden under individual stones along the roads and stone walls emarginating fields. The highest elevation of *H. mabouia* records was 660 m a.s.l. (16.86998 N, 24.93296 W).

On Santo Antão the species was very common in Bairro Alto and on the northeast slopes of Pico da Cruz above the village (17.12116 N, 24.99441 W to 17.11303 N, 25.00941 W; circa 10–550 m a.s.l.; 14–16 October 2022). It was associated with anthropogenic habitats only. Basking adult specimens were observed on stony walls during the morning hours.

The single-island endemic Santo Antão wall gecko (Fig. 1H) *Tarentola caboverdiana* Schleich, 1984, Phyllodactylidae, was observed on the south slopes of Gudo de Morro de Vento north of Porto Novo (17.02761 N, 25.06011 W to 17.06495 N, 25.06573 W; circa 50–450 m a.s.l.; 17–18 October 2022; Fig. 1I). It inhabited arid areas with tropophytic Afrotropical *Acacia* savannas. Their diurnal shelters were beneath scattered large stones, often isolated and exposed to high

temperatures. The largest documented specimen was a female (SVL= 58.0 mm).

The single-island endemic São Vicente wall gecko (Fig. 1J) *Tarentola substituta* Joger, 1984, Phyllodactylidae, was observed around Lazareto (16.87638 N, 25.02480 W; 4 and 20 October 2022), Baía das Gatas (16.90626 N, 24.91017 W; 7–12 October 2022), and in the foothills of Monte Verde (16.87304 N, 24.93677 W and 16.87425 N, 24.94395 W to 16.87304 N, 24.93677 W; 9–10 October 2022; Fig. 1K). In lower elevations, it was very common in the habitats corresponding to tropophytic Afrotropical *Acacia* savannas. Less frequently, it entered also coastal habitats covered by halophytic and hydrophytic plant communities. *Tarentola substituta* used the same type of diurnal shelter as *T. caboverdiana*. In the foothills of Monte Verde, *T. substituta* inhabited scree slopes covered by low shrub vegetation dominated by invasive common lantana *Lantana camara* (Verbenaceae) at least up to 450 m a.s.l. In the higher elevation of Monte Verde (above 530 m a.s.l.), only invasive *H. mabouia* was observed. Both these gecko species occurred syntopically in Baía das Gatas, where *T. substituta* sporadically occupied the walls of old houses. In all, 25 live individuals of *T. substituta* were examined; nine juveniles and subadults (SVL= 26.0–41.0 mm) and 16 adults (SVL= 44.0–57.0 mm). Three females (SVL= 44.0–48.0 mm) were carrying one egg each.

The single-island endemic Santo Antão skink (Fig. 1L) *Chioninia fogoensis* (O'Shaughnessy, 1874), Scincidae, was observed on the northeastern slopes of Pico da Cruz above Bairro Alto (17.11145 N, 25.01441 W to 17.11103 N, 25.01553 W; 14–15 October 2022). *Chioninia fogoensis* inhabited stony walls terraces at 820–910 m a.s.l. Skinks were observed only in the walls on the external slopes of Pico da Cruz, which were facing northeast. The walls occurred in the humid zone of persistent clouds prompted by trade wind inversion, with shrubby vegetation dominated by *Lantana camara*. The walls (Fig. 1M) were densely overgrown by chasmophytic

communities of lichen, liverwort, moss and fern species (e.g., *Hypodematum crenatum*, Hypodematiaceae), endemic ‘bálsamo’ *Umbilicus schmidtii* (Crassulaceae), and less frequently also endemic ‘sailão’ *Aeonium gorgoneum* (Crassulaceae). In the foggy weather, individual skinks peered motionless from cracks between stones and crawled into the wall when disturbed.

Stanger’s skink (Fig. 1N) *Chioninia stangeri* (Gray, 1845), an endemic species of São Vicente and Desertas, was observed at the northeastern coast of Baía das Gatas (16.87033 N, 24.90331 W to 16.86609 N, 24.89752 W; 50–80 m a.s.l.; 11 October 2022). It occurred in stony areas and scree slopes bordering coastal sandy dunes covered by plant communities dominated by *Frankenia frankenia ericifolia* (Frankeniaceae),

heliotrope *Heliotropium ramosissimum* (Heliotropiaceae), *Lotus* sp. (Fabaceae), and different Poaceae species (Fig. 1O). During the day, both adults and subadults searched for prey among the stones or basked on the rocks. When disturbed, they sought shelter in crevices between stones. Their agile and fast climbing of rocky surfaces strikingly resembled the behaviour of the wall lizards of the genus *Podarcis*. Analysis of 10 droppings revealed that *C. stangeri* is an omnivorous species. The droppings contained a high number of bracts (glumes) from spikelets of an undetermined Poaceae species, remnants of grass leaves and yellow *Lotus* flowers. In eight of them, the herbaceous rests significantly prevailed over chitinous remnants of insects (e.g., Hymenoptera, Coleoptera, Lepidoptera).

DISCUSSION

The results of the survey of the amphibian and reptile fauna of the islands of São Vicente and Santo Antão brought some findings that could be important for the conservation of the unique herpetofauna of the islands.

According to Marco *et al.* (2011, 2012), predation by dogs and tufted ghost crabs *Ocypode cursor* represents one of the main threats to *Caretta caretta* nests in Cabo Verde. These observations indicate that the combined predation by dogs and crabs dramatically decreases the emergence success of *C. caretta* hatchlings in Baía das Gatas beach on São Vicente. Therefore, appropriate conservation measures should be considered to ensure better turtle nests protection in the area (e.g., placement of protective metal cages on nests as on the island of Zakynthos in Greece; Kornaraki *et al.* 2006).

Hemidactylus mabouia was reported from Cabo Verde (São Vicente) for the first time by Jesus *et al.* (2001). Vasconcelos *et al.* (2013) confirmed its occurrence in São Vicente and reported it also in Santo Antão and Brava. Later, Vasconcelos *et al.* (2020) considered the gecko to be widespread on some islands, and

Pinho *et al.* (2023) determined that the Caboverdean populations belong to the lineage *H. mabouia sensu stricto*. These observations confirm that *H. mabouia* has a character of an invasive species occupying widely different types of anthropogenic habitats. The record from the elevation of 660 m a.s.l. shows that its distribution is not hypsometrically limited on São Vicente (the highest point of the island reaches 750 m a.s.l.). The ability to inhabit the warm and dry coastal areas as well as the higher moist and colder zones of persistent clouds prompted by trade wind inversion proves a high ecological plasticity of *H. mabouia* and raises a question of the possible impact of this alien gecko on the populations of endemic *Hemidactylus* species.

Contrary to the observation made by Mateo *et al.* (1997) and Köhler *et al.* (2007) *Chioninia stangeri* was not entering sandy dunes and its xerophilous vegetation but occupied only the stony habitats. The documented omnivory of *C. stangeri* confirms the assumptions that, similarly as in the case of the extinct giant skink *C. coctei*, also in the smaller *Chioninia* species the omnivory is a strategy to survive in

dry and limited resources islands (Pinho *et al.* 2022). In this respect, a possible negative effect of the growths of invasive *L. camara* moving to the *Chioninia*'s habitats should be evaluated.

CONCLUDING REMARKS

Herpetological observations from the islands of São Vicente and Santo Antão indicate, that (i) more appropriate conservation measures should be adopted to prevent predation of the nests of *Caretta caretta* by feral dogs, (ii) a possible impact of ecologically plastic invasive gecko *Hemidactylus mabouia* on the populations of endemic *Hemidactylus* species should be studied in detail, and (iii) the possible negative effect of the growths of *L. camara* on the habitats of the endemic *Chioninia* skinks should be evaluated, concerning the expected importance of native plants in their diet.

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