

# ZOOLOGIA CABOVERDIANA

REVISTA DA SOCIEDADE CABOVERDIANA DE ZOOLOGIA



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*Zoologia Caboverdiana* é uma revista científica com arbitragem científica (*peer-review*) e de acesso livre. Nela são publicados artigos de investigação original, artigos de síntese e notas breves sobre Zoologia, Paleontologia, Biogeografia, Etnozoologia e Conservação nas ilhas de Cabo Verde. Também publicamos artigos originais ou de revisão de uma área geográfica mais ampla desde que debruçados sobre espécies que ocorrem no arquipélago de Cabo Verde.

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## Nota editorial

### Arregaçar as nossas mangas

Os desafios de levar em frente o projecto ambicioso para publicar números regulares da *Zoologia Caboverdiana* está cada vez maior. A revista tem ganhado notoriedade no seio da comunidade científica com os vários números publicados até então. Agradecemos à Editora-chefe cessante das funções, os revisores, bem como a todos os autores que têm vindo a depositar confiança na nossa revista para a divulgação dos trabalhos científicos deles. Com a equipa editorial remodelada, é tempo de arregaçar as nossas mangas e cumprir com o designo que nos foi atribuído e retribuir a confiança que foi depositada em nós. E é nesta lógica que este número vem trazer novas abordagens científicas com metodologias de observação implementadas em três dos grupos de organismos mais publicados na revista, nomeadamente: aves, répteis e peixes.

No presente número, a primeira publicação intitula-se "*Notas herpetológicas das ilhas de São Vicente e Santo Antão, Cabo Verde*". O autor deste trabalho utilizou censos visuais para efectuar um levantamento da fauna de anfíbios e répteis das ilhas de São Vicente e Santo Antão. Os resultados revelaram a forte predação de ovos e juvenis da tartaruga *Caretta caretta* por cães selvagens na costa nordeste de São Vicente, bem como muitos locais com a presença da osga *Hemidactylus mabouia*, considerada uma espécie invasora.

A segunda publicação apresenta os primeiros casos documentados de hipomelanose nas águas territoriais de Cabo Verde. No artigo intitulado "*Pigmentação anormal da pele em tubarões no Atlântico Oriental: um caso de estudo da ilha do Maio, Cabo Verde*", os autores revelam a presença de pigmentação anormal da pele em três tubarões-enfermeiros *Ginglymostoma cirratum* nessa ilha. Convém realçar que a coloração anormal

é muito rara nos peixes cartilagosos em comparação com outros grupos animais. Esse estudo recomenda futuras investigações sobre essa condição anormal de pigmentação e que seja feita recolha de amostras de tecido para identificar e melhor avaliar esta condição.

A terceira e última publicação é uma nota breve que reporta, pela primeira vez, a presença de novas espécies de aves em Cabo Verde. Os autores da nota "*Novos registos de aves terrestres para a ilha do Fogo e o arquipélago de Cabo Verde*", fizeram censos visuais entre Março e Novembro de 2022 e fotografaram cinco espécies de aves que não constavam das listas de espécies reportadas para Cabo Verde. Esse estudo demonstra a importância dos censos sazonais bem como do trabalho que as ONGs ambientais têm feito na monitorização e no conhecimento da biodiversidade cabo-verdiana.

Dito tudo isso, resta-me desejar-vos boa leitura e que apreciem este número que vem demarcar mais uma nova viragem da revista.

Evandro Lopes  
Editor-chefe interino da *Zoologia Caboverdiana*

## Editorial Note

### Rolling up our sleeves

The challenge of carrying on the ambitious project to publish regular issues of *Zoologia Caboverdiana* is becoming ever greater. The journal has gained notoriety within the scientific community with the various issues published up to now. We express our gratitude to the outgoing Editor-in-chief, the reviewers, as well as all the authors who have placed their trust in our journal to disseminate their scientific work. With a remodeled editorial team, it is time to roll up our sleeves and fulfill the mission that has been entrusted to us and reciprocate the trust that has been placed in this journal. It is in this spirit that this issue brings new scientific approaches with observation methodologies implemented in three groups of organisms most featured in the journal, namely: birds, reptiles, and fishes.

In this present issue, the first publication is entitled "*Herpetological notes from the islands of São Vicente and Santo Antão, Cabo Verde.*" The author of this work used visual census to carry out a survey of the amphibian and reptile fauna of the islands of São Vicente and Santo Antão. The results revealed the strong predation of eggs and juveniles of the *Caretta caretta* turtle by feral dogs on the northeast coast of São Vicente, as well as in many locations where the *Hemidactylus mabouia* gecko, considered an invasive species, is present.

The second publication presents the first documented cases of hypomelanososis in the territorial waters of Cabo Verde. In the article entitled "*Abnormal skin pigmentation in sharks in the Eastern Atlantic: a case study from Maio island, Cabo Verde*", the authors reveal the presence of abnormal skin pigmentation in three nurse sharks *Ginglymostoma cirratum* on that Island. It is worth noting that abnormal pigmentation is very rare in cartilaginous fishes

compared to other animal groups. This study recommends future investigations into this abnormal pigmentation condition and the collection of tissue samples to identify and better assess this condition.

The third and final publication is a short note that reports, for the first time, the presence of new bird species in Cabo Verde. The authors of the note "*New records of terrestrial birds for Fogo Island and Cabo Verde Archipelago*" performed visual census between March and November 2022 and photographed five bird species that were not included in the reported species lists for Cabo Verde. This study demonstrates the importance of seasonal census, as well as the hard work that environmental NGOs have been doing in monitoring and understanding the Caboverdean biodiversity.

Having said all that, I wish you a good read and hope you enjoy this issue, which marks yet another new milestone for the journal.

Evandro Lopes  
Interim Editor-in-chief of *Zoologia Caboverdiana*



Artigo original | Original article

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

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### 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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## Abnormal skin pigmentation in sharks in the Eastern Atlantic: a case study from Maio Island, Cabo Verde

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### RESUMO

A pigmentação anormal (hipomelanose) tem sido registada em diferentes grupos de animais e inclui o albinismo, o leucismo e o piebaldismo. Nos peixes cartilaginosos, a coloração anormal é incomum em comparação com outros grupos animais, com relatos de apenas alguns casos em cerca de 60 espécies. Entre 2014 e 2019, foram registados três tubarões-enfermeiros *Ginglymostoma cirratum* com pigmentação anormal da pele em Cabo Verde, mais especificamente na ilha do Maio, dos quais dois foram registados na Baía da Praia Real (2015 e 2019, respectivamente). Este estudo apresenta os primeiros casos documentados de hipomelanose a nível nacional. Os três tubarões foram fotografados ou filmados apenas uma vez cada e a sobrevivência de nenhum dos três espécimes adultos parecia comprometida pela pigmentação anormal. Consideramos a Praia Real um local de amostragem com potencial para futuras investigações sobre pigmentação da pele em tubarões.

**Palavras-chave:** África, condríctios, conservação, doença genética, hipomelanose

## ABSTRACT

Abnormal pigmentation (hypomelanosis) has been reported in different groups of animals, and it includes albinism, leucism and piebaldism. In chondrichthyan fishes, abnormal coloration is uncommon compared to other animal groups, with reports of only a few cases in circa 60 species. Between 2014 and 2019, three nurse sharks *Ginglymostoma cirratum* with abnormal skin pigmentation were recorded in Cabo Verde, more specifically in Maio Island, of which two were recorded in Praia Real Bay (2015 and 2019, respectively). This study presents the first documented cases of hypomelanosis at a national level. The three sharks were photographed or filmed only once each, and none of the three specimens seemed compromised by their colouration in terms of survival, having been observed as adults. We consider Praia Real as a potential sampling site for future research on the abnormal skin pigmentation conditions.

**Keywords:** Africa, chondrichthyans, conservation, genetic disorder, hypomelanosis

## INTRODUCTION

Different types of abnormal colouration (hypomelanosis) have been documented in several shark species, as a result of genetically inherited genes or disorders (Quigley *et al.* 2018, Shipley *et al.* 2023). Albinism, a genetically inherited condition, is expressed as the complete lack of integumentary and retinal pigmentation, in which the individual shows no dark body pigments, including in the eyes (Clark 2002). Leucism is a genetic disorder in which a specimen has reduced or absent pigmentation, but the body extremities and eyes remain pigmented (Bechtel 1995, Clark 2002, Ramos-Luna *et al.* 2022). Finally, piebaldism is a rare autosomal dominant disorder where there is a partial loss of body pigmentation, but with regular coloration of eyes, typically characterized as variable patches of depigmentation (Fertl & Rosel 2009, Leroux *et al.* 2022, Shipley *et al.* 2023). The lack of pigmentation is often associated with health deficiencies, malformations, behavioural changes, and low survival rate (Kehas *et al.* 2005, Krecsák 2008, Slavik *et al.* 2015 & 2016, Perrault & Coppenrath 2019), although it is not clear if this is the case for all the species (Corn 1986). Even though these conditions in the wild are rare, abnormal pigmentation has been documented in animals around the world, including in fish (Protas *et al.* 2006, Beirl *et al.* 2014, Li *et al.* 2017).

In chondrichthyans (a group consisting of sharks, rays, skates and chimaeras) these events seem to be even rarer (circa 5% in all species), having been documented in 61 species of this group (e.g., Clark 2002, Bottaro *et al.* 2008, Veena *et al.* 2011, Quigley *et al.* 2018, Arronte *et al.* 2022). In Cabo Verde, as far as we know, there are no published reports of such events in chondrichthyans.

Praia Real Bay on Maio Island, Cabo Verde, seems to be particularly important as a mating and nursery ground for nurse sharks *Ginglymostoma cirratum*, but also for species such as lemon sharks *Negaprion brevirostris*, supported by the local observations of neonates in the area and mating events (Ratão unpub. data). The nurse shark is a large (>2.5–3 m) coastal shark, found in tropical and subtropical waters and is plain brownish coloured with dark spots in their young (Compagno 1984). It is a common shark in Cabo Verde and is still relatively abundant on Maio (Ratão unpub. data, Lopes *et al.* 2016). Regardless of being reported as the most abundant shark species in coastal shallow waters (Castro 2000, Hazin *et al.* 2000, Castro & Rosa 2005, Heithaus *et al.* 2007, Karl *et al.* 2011), it is classified as vulnerable by the IUCN Red List (Carlson *et al.* 2021).

Shark skin depigmentation is a relatively understudied topic compared to other aspects

of their biology, resulting in unclear understanding of the causes leading to abnormal pigmentation in chondrichthyans. Therefore, this study aimed to report cases of

hypomelanosis in sharks observed during shark monitoring in Praia Real Bay, Cabo Verde, and to propose it as a potential sampling area for further investigations in this field.

## MATERIAL AND METHODS

The environmental non-governmental organization (NGO) Maio Biodiversity Foundation (FMB) has been monitoring sharks at Praia Real Bay, inserted within the Natural Park, located in the north of Maio Island, south-east of the Cabo Verde Archipelago (Fig. 1), since 2014. Praia Real is a small (1.6 x 1.7 km), shallow (4–7 m deep at the centre)

bay, characterized mainly by a mixed substrate of algae, corals and rocks, with some sandy patches. In this area is possible to regularly observe several shark species, such as nurse sharks *Ginglymostoma cirratum*, tiger sharks *Galeocerdo cuvier*, and lemon sharks *Negaprion brevirostris* (Ratão unpub. data).



**Fig. 1.** Location of the study area and the study site. **A)** Location of the study area, Maio Island, in the Cabo Verde Archipelago, next to West Africa. **B)** Location of the study site on Maio Island. **C)** Detailed map of the study site, Praia Real Bay at the north, one of the no-take zones of the Natural Park of the North of Maio Island.

To monitor, a minimum of two snorkellers swam next to each other, and run one single transect parallel to the north facing coastline approximately in the centre of the bay between its northern and southern extremities. One snorkeller recorded in a dive slate the transect start and end time, the start and end geographical positions (geographic coordinates marked through the GPS receiver) and the environmental conditions, namely: wind direction, visibility in the water (use of Secchi disk at the beginning, middle and end of the transect), sea state, and swell. This snorkeller also recorded all sharks encountered (start and end time of the sighting, the

geographical coordinates (decimal degrees), the number of individuals (N), the total length of each individual (m), the depth (m), the behaviour, and the type of substrate (rock, stone, mixed, etc.). The second snorkeller kept vigilant on the surroundings and supported the colleague when needed. The snorkellers filmed the observed sharks with either a GoPro 3 action camera or an Olympus Tough TG-4 camera. These surveys run with different frequencies throughout the years due to changes in monitoring plans, staffing, and funding availability (once a week, once a month, or twice a month) between 2014 and 2019, and each lasted circa 1 hour.

## RESULTS

The first two nurse sharks *Ginglymostoma cirratum* with hypomelanosis were seen outside the transect line, before starting the transect at Praia Real. The first nurse shark observed with colour aberrations in Praia Real was on 10<sup>th</sup> July 2015 (Fig. 2). This individual was estimated to have 1.5–2.0 m of the total length. It was swimming at knee-high water depths with several other “normal looking” nurse sharks during mating season. This individual was not seen again since. On 9<sup>th</sup> July 2019, another nurse shark with clear hypomelanosis was also observed in Praia Real. This shark was estimated to be around 2 m long, with similar skin colour pigmentation

to the previous, although the white patches were mainly in the head (Fig. 3). As an example, part of the footage of the first record was deposited in Figshare repository (<https://figshare.com/s/8b00fea5d9110227b5d2>). Finally, a third record of an adult nurse shark with skin depigmentation was caught on Maio Island by a sport fishing company (Maio Fishing Club), however, the date (likely caught between 2019 and 2020) and the location are uncertain (Maio Fishing Club 2023a, 2023b). The distinctive white patch patterns in all three sharks indicate that they are different individuals.



**Fig. 2.** A nurse shark with patchy depigmentation along its body, observed in Praia Real Bay, Maio Island, Cabo Verde, on 10<sup>th</sup> July 2015 (photos by FMB).





**Fig. 3.** A nurse shark exhibiting white patches on its head, observed in Praia Real Bay, Maio Island, Cabo Verde, on 9th July 2019 (photos by FMB).

## DISCUSSION

This is the first time that abnormal pigmentation in sharks is reported in Cabo Verde. Neither specimen seemed compromised by their colouration in terms of survival, as they had all grown to adult-size sharks and showed typical swimming behaviour at the time when they were observed. Both nurse sharks seen in Praia Real, and the individual caught by the sport fishing company were predominantly brown, with obvious small white patches on the body or head. They resembled a nurse shark with abnormal pigmentation observed in São Tomé (Porriños 2020), indicating a possible case of piebaldism or leucism. The third observation although it is from an unknown location on Maio Island, further supports the idea of Maio being a good place to study abnormal pigmentation conditions in sharks. The distinct shapes and distribution of the white patches on the bodies of all three individual sharks imply that they were all different individuals, providing

additional evidence for considering this location as a promising sampling area.

Globally, five other reports of abnormal pigmentation in similar species were reported, namely: i) a dead adult tawny nurse shark *Nebrius ferrugineus* caught on a net off Ugui, Wakayama Prefecture, Japan in 1986 (Taniuchi & Yanagisawa 1987), ii) a live Atlantic nurse shark *Ginglymostoma cirratum* caught on a fishing line off Captiva Pass, Florida, USA in 2014 (NBC2 News 2014), iii) an individual *G. cirratum* observed swimming off Grand Turk at Turks and Caicos Islands in 2016 (Keartes 2016), iv) another *G. cirratum* recorded swimming past a Baited Remoted Underwater Video Station (BRUVs) in São Tomé and Príncipe (Porriños 2020), and v) a single female *G. cirratum* observed by divers at Utila, Honduras (Shipley *et al.* 2023).

Given that these and other studies have found colour aberrations in elasmobranchs of adult size could indicate that this condition does

not necessarily impact growth or lead to a lower survival rate (Taniuchi & Yanagisawa 1987, Bigman *et al.* 2016, Shipley *et al.* 2023). The causes leading to abnormal pigmentation in chondrichthyans are still unclear. It is known that genetic alterations in melanin production cause it, however, there are other factors such as inbreeding within isolated populations, environmental stress associated with areas of high human activity, exposure to elevated temperatures, interspecific hybridization, hormonal imbalance or diet might play a role too (Gervais *et al.* 2016, Quigley *et al.* 2017,

Bruckner & Coward 2018).

Given that two distinct nurse sharks were observed within four years in a small bay where this species is abundant, we propose Praia Real as a valuable main sampling site for future research on abnormal pigmentation conditions and recommend collecting tissue samples to accurately identify and assess the condition. By investigating it, we can gain insights into the potential vulnerabilities or disadvantages they may pose to chondrichthyans, as well as to the local nurse shark population.

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Nota breve | Short note

## New records of terrestrial birds for Fogo Island and Cabo Verde Archipelago

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The Fogo Island, Cabo Verde is one of the least studied whenever it comes to terrestrial avifauna (Barone & Rubén 2010), therefore here we list five new sightings obtained from March to November 2022: Common pheasant, *Phasianus colchicus*, found on March 3rd 2022 in Santa Catarina; Black-crowned night heron, *Nycticorax nycticorax*, found on March 11th and November 10th 2022 in Monte Vermelho and São Filipe respectively. Both sightings were juvenile birds with no difference in plumage therefore difficult to know if it was the same or a different bird; Lesser moorhen, *Paragallinula angulate*, found on May 30th 2022 in São Filipe; Eurasian spoonbill, *Platalea leucorodia*, found on October 2nd 2022 in São Filipe; Glossy ibis, *Plegadis falcinellus*, found in October 9th 2022 in São Filipe.

Birds were reported to Projecto Vitó staff that inspected, photographed and released them

afterwards. All were found in good condition except the lesser moorhen that died a few hours later.

These sightings (Fig. 1) represent new records for Fogo and provide the first known record of the common pheasant for Cabo Verde (Lepage & Warnier 2014, Garcia-del-Rey 2016). Though the black-crowned night heron, Eurasian spoonbill and glossy ibis (Fig. 1B, D, E) are considered to be vagrant or seasonal visitors to Fogo, due to their relatively common sightings on other islands of the country (Garcia-del-Rey 2016), the common pheasant (Fig. 1A) is thought to be a different case. The natural distribution of the latter (before introduced in different places for hunting) is from the Black Sea to Indochina and Afghanistan, and it is known to have reduced flight ability, thus cannot sustain long migrations (Shen *et al.* 2009, Garcia-del Rey 2016, Kayvanfar *et al.* 2017).

Since in Cabo Verde there is no hunting, this pheasant probably was brought to Fogo as an ornamental captive bird, which then escaped (Gonzales 2008).



**Fig. 1.** New bird records for Fogo Island in 2022. **A)** Common pheasant *Phasianus colchicus*, from March 11<sup>th</sup>, Santa Catarina (photo by Marco Paulo), **B)** black-crowned night heron *Nycticorax nycticorax*, juvenile plumage, November 11<sup>th</sup>, São Filipe (photo by Carla Lopes), **C)** lesser moorhen *Paragallinula angulata*, May 30, São Filipe (photo by Nildiana Gomes), **D)** Eurasian spoonbill *Platalea leucorodia*, October 2, São Filipe (Photo by Emanuel da Silva), and **E)** Glossy ibis *Plegadis falcinellus*, October 9, São Filipe (photo by Adilson Silva).

The black-crowned night heron (Fig. 1B) and the Eurasian spoonbill (Fig. 1D) are irregular winter migrant in Cabo Verde, both already reported on the neighbouring islands of Brava and Santiago, therefore on Fogo were expected (Hazevoet 1995, Garcia-del-Rey 2016). Regarding the lesser moorhen (Fig. 1C), there were only three records until 2019: on Santiago Island in February 2019, on Sal Island in March 2019, and on Boavista in July 2019 (Lepage & Warnier 2014). It is a widespread bird in Africa, being present in Senegal, and already found as vagrant in the Canary Islands, southern Spain and Madeira Island, possibly aided by calima storms (Matias 2009). These

storms, which occur in early summer, are a known cause of vagrancy in Macaronesia as shown by the 59 rare African passerine species recorded on the Canary Islands after the February 2020 calima storm occurred on this region (Gutiérrez *et al.* 2022). This matches the date of this sighting on Fogo. Finally, the glossy ibis (Fig. 1 E) is a vagrant species in Cabo Verde previously recorded on islands such as Boavista, Maio or Santiago (Clark 2006, Garcia-del-Rey 2016).

These observations represent important findings and reinforce the need for periodic surveys of the terrestrial avifauna on Fogo Island.

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Lagartixa de Stanger *Chioninia stangeri* fotografado na costa nordeste da Baía das Gatas, São Vicente, 11 Outubro 2022 | Stanger's skink *Chioninia stangeri* photographed on northeastern coast of Baía das Gatas, São Vicente, 11 October 2022 (fotografia de | photo by Jiří Moravec).

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