

17 Conservation State of the Saba Green Iguana in Saba

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Status

Table 1. Overview of the international Conservation State of the Saba Green Iguana.

Name				IUCN category	SPAW Annex	CMS Annex	CITES Appendix
Scientific	Common	Local	Dutch				
<i>Iguana iguana</i> OR <i>Iguana melanoderma</i> (Breuil et al. 2020)	Saba Green Iguana	iguana	Sabaanse groene leguaan	CR	3	-	II

The native *Iguana iguana* population of Saba had not received nearly any scientific and or conservation attention prior to the proposed taxonomic elevation to *Iguana melanoderma* by Breuil et al. (2020). Prior to 2022, it was considered as a species of Least Concern within the IUCN assessment of *Iguana iguana* (Bock et al., 2018) but, based on its unique island genetic status, has since been individually assessed as Critically Endangered (van den Burg and Debrot, 2022). Since the discussion on its taxonomy is still ongoing, it is considered as a native population of green iguana, *Iguana iguana*, on the SPAW Annex 3.

Characteristics

Description:

The native Saban *Iguana iguana* is part of the proposed taxon *Iguana melanoderma* that is also present on Montserrat, St. Croix and St. Thomas (De Jesús Villanueva et al., 2021), and a yet undefined region in northern Venezuela (Breuil et al., 2020). Even so, the Iguana Taxonomy Working Group (2022) still is in discussion about its taxonomic status.

This account is limited to the Saba population, known as the Saba Green Iguana. In contrast to the Lesser Antillean Iguana, *I. delicatissima*, of neighbouring St. Eustatius, this species can often be seen on the ground, in addition to in trees like most populations within the *Iguana iguana* species complex. Saban Green Iguanas also often appear to seek nocturnal refuge in rock crevices and under boulders. Despite little available data, Saban iguanas have been found to reach SVL up to 43.9 cm and tail lengths over 110 cm (van den Burg et al., 2022a), which is smaller compared to max. SVL from mainland *Iguana iguana* locations that can exceed 55 cm (Fitch and Henderson, 1977). Saba Island Green Iguanas are particularly black, more so than the Montserrat population (Breuil et al., 2020). Very little has been published about the Saba population, but see Breuil et al. (2020), and some minor comments by Blankenship (1990) and Lazell (1973).

Hybridization between Saban Green Iguanas and other (invasive) members of the *I. iguana* species complex remains possible. This process is currently ongoing on Saba with multiple non-native iguanas

from St.-Martin/St. Maarten having made their way to Saba (van den Burg et al., 2023, unpublished data). Exact details about the outcome of long-term on-island hybridization on Saba remains unknown but it's believed the native Saba Green Iguana population will face a similar declining effect as *I. delicatissima* if hybridization with non-native iguanas should occur more extensively (van den Burg et al., 2018a). While data on clutch size is limited, these suggests Saba Green Iguanas lay smaller clutches compared to invasive *Iguana iguana* from mainland populations (Bock et al., 2018), and more in line with other island iguana populations, like *Iguana delicatissima* (Knapp et al., 2016). Similarly to populations of *I. delicatissima*, the Saba Green Iguana population is likely very vulnerable to hurricanes (van den Burg et al., 2022b).

Relative Importance within Caribbean: Only two native populations of the *Iguana iguana* "species complex" occur in the northern Lesser Antilles which are on Saba and Montserrat. These two populations share a mitochondrial ND4 haplotype and are most closely related to iguanas from the area of Cumana on the northern coast of Venezuela (Stephen et al., 2013), which have together been proposed to be part of *Iguana melanoderma* (Breuil et al., 2020). Other samples from Venezuela have not been analyzed yet so there is currently no understanding of the possible mainland range of this melanistic group within Venezuela. Fortunately, while non-native, invasive iguanas have been identified on Saba, a genetic analysis of over 70 samples did not yet show any sign of non-native iguana presence on Montserrat (van den Burg et al., 2023).

Ecological Aspects

Habitat: Lazell (1973) reported observing iguanas all over Saba, including towards the summit of Mount Scenery (887 m). More recent assessments indicate iguanas likely occur up to a maximum elevation of ~550 m (Gerber, 1999; Breuil et al., 2020; van den Burg et al., 2022a); a discrepancy presumably caused by the former degraded and open state of habitats at higher elevations due to the former presence of plantations (Esperen, 2017). In contrast, data from recent transect surveys and opportunistic sightings in 2021 suggest iguanas occur in all vegetation types (de Freitas et al., 2016), except for the two highest occurring vegetation types at above >550 m (van den Burg et al., 2022a). Although the "*Bothriochloa* mountains vegetation type" on the north side of Saba (de Freitas et al., 2016) was not assessed, its occurrence at elevations below 500 m suggests iguanas are likely present there as well, though presumably at low densities.

Food: Similarly to *Iguana delicatissima* this species is fully herbivorous, feeding on the leaves, fruits and flowers of a wide variety of plants, and is versatile in its habitat choice. Observations on Saba show that the animals can inhabit areas with sparse vegetation (van den Burg et al., 2022a), such as the lower southeast slopes of the island with a high percentage of grass. Food availability is probably not a limiting factor, even in areas that are heavily grazed or overgrown by the invasive coralita vine; preliminary genetic data from microbiome samples show that Saba Green Iguanas do eat some coralita.

Disturbance/mortality: As indicated by van den Burg et al. (2022a), recruitment appears to be low within the Saba population, which is likely being affected by the large feral goat population (Lotz et al., 2020) and the island-wide feral cat population (Debrot et al., 2014). Feral goats are known to have strong negative impacts on nesting sites, both being able to destroy the site itself as well as to trample the incubating nests (Alberts, 2004), whilst cats are known to predate, even multiple hatchlings from the same nest (van den Burg et al., 2018). A study on nest site availability and quality, as well as recruitment of young animals is urgently needed.

Within a one-month period during August-September of 2021, we recorded three large adults that had become victims of car collisions. Given that highest iguana densities occur in urban habitat, we recommend a study on road-mortality during the nesting season, when female iguanas migrate outside their home range and need to cross roads to reach nest sites.

Minimum size viable population: a minimum viable population (MVP) means a 5% extinction risk within 100 years. Although a MVP for small-island populations within the *Iguana iguana* species complex has not been proposed, the proposed MVP for *Iguana delicatissima* can be used as a substitute; 5000 individuals (Breuil, 2002). The population of Saba is larger than this proposed MVP, estimated at >6,000 (van den Burg et al., 2022a).

Present Distribution and Reference Values

In pre-historic times, when the species arrived on Saba, it likely established itself across the entire island, except for the higher slopes of Mount Scenery. Especially the windward side of the island has suitable and high-quality habitats for the iguana under natural conditions, while instead the habitats on the northwest-to-north side (the leeward side) often fall in the shade of clouds that surround Mount Scenery. Currently, and in contrast to in former times when forests dominated at lower altitudes (de Freitas et al., 2016), much of the east and southern lower elevations (>400 m) are barely vegetated or have large patches of grass due to the large feral goat population; iguanas are present, and even in high densities, but only together with large boulders (for shelter) and suitable vegetation. It remains unclear why there are so few iguanas in Spring Bay, despite its highly heterogeneous landscape and vegetation structure.

In 2021, morphologic and genetic data of 58 iguanas demonstrated the presence of non-native iguanas on Saba. A rapid action campaign was employed to identify their distribution across the island and start their removal. Prior to 2024, eight non-native iguanas have been removed, and non-native presence has been confirmed from the immediate and approximate vicinity of the Fort Bay harbour, as well as the northern part of Windward Side village, and along the road towards Zion's Hill (Figure 1). During December 2024 another 14 non-native iguanas were removed from these two regions on Saba, whilst at least another six non-native iguanas remain present. At least another nine iguanas are of doubtful origin and an island-wide assessment to understand the presence and distribution of non-native iguanas is urgently needed.

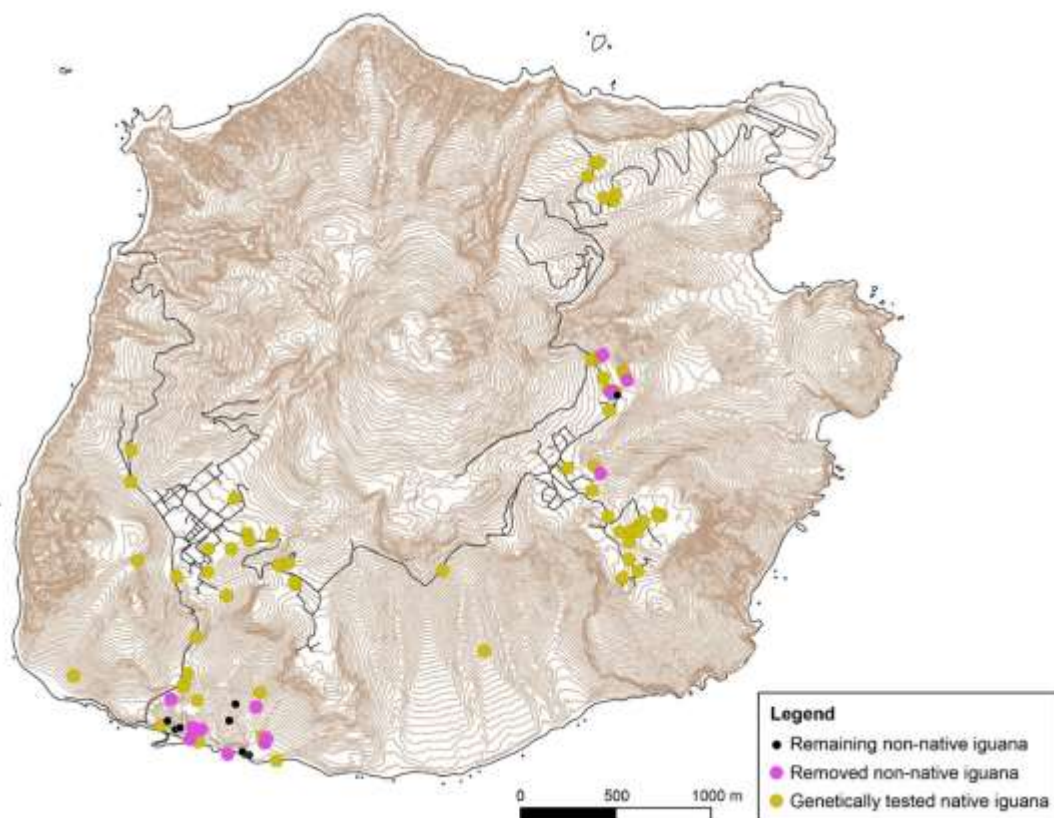


Figure 1. Distribution of non-native and genetically assessed native iguanas on Saba.

Reference values for population size and distribution on Saba: 15,000

Apart from elevations above 550 m, available habitat for the iguana population is present across ~11.75 km². Van den Burg et al. (2022a) found that iguana densities are highest in urban habitat (15 ind/ha) and the *Aristida-Bothriochloa* habitat (8 ind/ha) which runs along the southern lower slopes of the island (de Freitas et al., 2016). These densities are much lower than found for other populations, like in a recent study from a native population in Colombia (46-75 ind/ha; Ramos et al., 2023), or from the non-native population in Puerto Rico (223 ind/ha; López-Torres et al., 2012). As habitats across Saba have been affected by feral goats, it is not possible to assess how “natural” the current iguana densities are, or to what extent it is recovering from the major hurricane season of 2017 (van den Burg et al., 2022b). A conservative density of 30 ind/ha for areas below 500 m, excluding the north(western) region of the island, would result in a pre-human island population estimate of ~15,000 animals.

Assessment of National Conservation State

Trends: The exact arrival of the melanistic iguanas on Saba might have been through translocation by prehistoric Amerindian inhabitants (Breuil et al., 2020; van den Burg et al., in prep). As only a single and first population assessment has currently been performed, no more recent population trend can be identified at this stage. However, compared to pre-colonial times, we believe the population size has declined; Currently, the population is likely recovering from the major hurricane season of 2017, which reduced the *Iguana delicatissima* on neighbouring St. Eustatius presumably by 25% (van den Burg et al., 2022b).

Recent developments: Troubling is the recent discovery of non-native iguanas on Saba which are present in two different areas; around the Fort Bay harbour, and on the northern edge of Windward Side towards Zion’s Hill. Morphological data suggests hybridization is already ongoing. A few morphological characteristics have so far been identified that can aid identification of non-native iguanas in the field, but more study is necessary for 100% accurate identifications (van den Burg et al., 2023). Preliminary data from cloacal samples of both native and non-native iguanas from Saba furthermore suggests that non-native iguanas have introduced bacteria (e.g., *Devriesea agamarum* and *Mycoplasma iguanae*) and ectoparasites which have spilled over to the native population. This is similar as on St. Barthelémy where non-native iguanas from St. Martin/St. Maarten have introduced the bacterium *Devriesea agamarum* (Hellebuyck et al., 2017).

In recent years it has become evident that Saba Green Iguanas have been illegally taken from Saba and transported to St. Maarten (van den Burg and Weissgold, 2020). Genetic analyses of melanistic iguanas in the pet trade proof that illegal trade has occurred and show that the non-native iguana population on St. Maarten has been used to “white-wash” illegal wild-caught Saba Green Iguanas for trade purposes (Mitchell et al., 2022). Conservation and iguana experts have called for a complete halt of the live trade in *Iguana* both from and between Caribbean islands (van den Burg et al., 2022c).

Assessment of distribution: Favourable

The unique and endangered Saba Green Iguana is present throughout most of the island, with most animals occurring at medium elevations, between 180-390 m (van den Burg et al., 2022a). There is an apparent distribution gap on the eastern slopes below 350 m, with areas which hold far less iguanas compared to similar areas on the southern slopes (see below). Highest densities are found in and around urban areas, which likely results in anthropogenically-induced conflicts and mortality, though no study has yet assessed these threats.

Assessment of population: Favourable

Our preliminary estimate of current population size indicates minimally 6,000 iguanas occur on Saba (van den Burg et al., 2022a). This is marginally above a proposed MVP of 5000 for the closely related *I. delicatissima* (Breuil, 2002). As hurricanes can reduce iguanid population sizes by 25% (van den

Burg et al., 2022b), a direct hit by a major hurricane could quickly see the population size fall below the MVP. Periodic population size monitoring should be given priority. No study on the genetic diversity of the native population has yet been performed.

Assessment of habitat: Favourable

Although habitat availability is not limiting the iguana population, habitats on Saba have been negatively affected by a large feral goat population for decades (Lotz et al., 2020). An eradication campaign is ongoing through which many goats have already been removed, with reforestation and recovery of understory vegetation (hopefully) underway. However, goats are extremely prolific and annual removal rates typically need to be well above 50% to achieve significant reductions within a 4–5-year timeframe (Debrot, 2016). As goat reductions since 2020 appear to have removed about 90% as per the end of 2024, it means that removal rates on Saba have been suitably high. Much of the southeastern and eastern mid- and low-elevation slopes are degraded by goats and iguanas are much less abundant if present at all. Once (if) restored, these areas could sustain high numbers of iguanas as shown by the higher densities of iguanas typical of less-degraded areas within similar vegetation and elevation. Habitat quality for now does not seem to be the major limitation to iguana population size or distribution nor a long-term threat.

Assessment of future prospects: Unfavourable-bad

In the absence of improved biosecurity to halt incursions and a structural financial system for extermination of non-native iguanas, it is unlikely that further hybridization can be prevented. This is predicted to ultimately cause the local extinction of this unique population.

Table 2. Summary overview of the status of the Saba Green Iguana in the Caribbean Netherlands (only Saba) in terms of different conservations aspects.

Aspect of Saba Green Iguana	2024
Distribution	Favourable
Population	Favourable
Habitat	Favourable
Data quality and completeness	Unfavourable-bad
Future prospects	Unfavourable-bad
Overall Assessment of Conservation State	Unfavourable-bad

Comparison to the 2018 State of Nature Report

This is the first CS assessment made for the Saba Green Iguana and hence no comparison can be made to any earlier report.

Recommendations for National Conservation Objective

Safeguard the species from hybridization and non-native incursions, study the presence and impacts of bacterial and parasite pathogens spillover to native reptile species, as well as gain a better understanding on factors endangering nesting and recruitment in this unique melanistic iguana population within the *Iguana iguana* species complex.

Goals:

- a) Improvement of regional and local biosecurity to halt non-native iguana incursions; urgently needed prior to imports for construction of Black Rock harbour
- b) Island-wide survey and eradication of all non-native iguanas and hybrid iguanas
- c) Better understand pathogen threats due to bacteria and parasite spillover from non-native iguanas to native reptilian species
- d) Map and study nest sites and recruitment; allowing protection and mitigation during spatial development projects

Key Threats and Management Implications

The major threat to the survival of the Saba Green Iguana is the presence of non-native green iguanas and potential hybrids, including their continuous incursions from (principally) St.-Martin/St. Maarten and associated with the importation of goods. The NEPP for the Caribbean Netherlands assigns a high priority to invasive species threats like this one (Min. LNV et al., 2020). If non-native iguanas are not continuously identified and eradicated, long-term survival of a pure and unique melanistic *Iguana iguana* population on Saba is impossible. These non-native iguanas have introduced invasive and detrimental bacteria as well as ectoparasites that can harm both the native iguana population as well as other native reptiles. A broad study is urgently necessary to understand the diversity of introduced pathogens like bacteria and viruses, as well as their spread to native reptilian species on Saba including the unique native Saba Green Iguana. A further anthropogenetic threat is the illegal trade in the Saba Green Iguanas, which have been taken to neighbouring St. Martin/St. Maarten for subsequent shipments across the globe. More strict cargo control between Saba and St. Maarten could prevent further illegal trade. Lastly, no study on iguana nesting availability and distribution has been performed on Saba, which is impeding legal protection and conservation of these sites. Likely nesting sites have been negatively impacted by the feral goat population, thereby reducing iguana recruitment. Nesting locations should be rapidly mapped so these can be assessed in terms of quality and functionality and provide a baseline data set for further studies (e.g., on recruitment). We note that it is unknown whether large communal nesting sites are present on Saba, and whether those are present in areas (to be) identified for future spatial development, e.g., the Black Rock harbour. It is unknown whether the presence of iguana nesting sites has been assessed within an environmental impact assessment for the Black Rock harbour project.

Data Quality and Completeness

Knowledge about the presence of non-native iguanas is sufficient to document the poor Conservation State of the Saba Green Iguana, however most other population details remain un(der)studied. For example, the presence, quality and distribution of nesting sites remains a high-importance conservation issue, including the recruitment rates for young animals within the population. Small iguanas and iguana nests may also fall prey to the many rats present on the island. As this is a baseline assessment, there has yet not been any continuous or repeated effort to monitor population size or trends. An assessment of anthropogenic mortalities, which can be high as shown by data from St. Eustatius (Debrot and Boman, 2014; van den Burg et al., 2018b), has likewise not been performed so far. Effort is best invested in the prevention of further non-native/hybrid iguana incursion by stringent control at ports of entry, the removal of any or all non-native iguanas, and an assessment of present non-native bacteria and diseases. Further efforts should be directed towards knowledge on nesting and recruitment characteristics.

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Photo cover: An extreme example from St. Eustatius of how uncontrolled livestock husbandry can overgraze vulnerable slopes to the point at which even infrastructure at the top of the cliff comes in danger from erosion.

Photo: J. Hazenbosch

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