

Assessment of the distribution and ecological impact of invasive exotic freshwater turtles in Guadeloupe and Martinique

endemic species # invasive alien species

Context

Island environments, such as the Caribbean region, are ecosystems extremely rich in biodiversity. However, they are subject to various anthropogenic pressures, making this region one of the world's major hotspots of biodiversity loss. Caribbean biodiversity is particularly exposed to the threat posed by invasive alien species (IAS). In this region, management efforts have primarily focused on mammals intentionally introduced by humans or on certain high-profile species such as the lionfish. However, other IAS, often more discreet in their behavior, are equally likely to disrupt ecosystem balance. This is notably the case for certain reptile species, which display several characteristics that promote their invasive potential: generalist diet, high fecundity, strong dispersal capacity, large population size, or small body size facilitating transport and reducing detectability.

In Martinique and Guadeloupe, three common freshwater turtle species are considered invasive alien species: the Yellow-bellied slider turtle (*Trachemys scripta*), native to the United States and listed among the 100 worst invasive species worldwide; the Antillean slider (*Trachemys stejnegeri*), native to Puerto Rico and the island of Hispaniola; and the African slider (*Pelusios castaneus*), originating from the African continent. Despite growing recognition of their invasive status in the French West Indies, available data on their distribution and ecological impacts on native biodiversity remain limited.

Objectives

This Master's internship is part of the DEVIMTOR project led by the NGO Caribaea Initiative. It aims to determine the spatial distribution of these species by developing a method based on environmental DNA (eDNA). In addition, the ecological impact of these exotic species in freshwater bodies of Martinique and Guadeloupe will be quantified through the analysis of their diet using a genetic metabarcoding approach.

Methods

Measurements carried out in selected water bodies

A total of 71 preselected water bodies, distributed between Guadeloupe (43) and Martinique (28), are being surveyed. Ecological data collected include turtle and odonate densities, the presence of bird species frequenting the sites, and vegetation composition. Physico-chemical parameters are also measured: pH, temperature, percentage of dissolved oxygen, and conductivity.



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Once these parameters are recorded, two litters of water and six to eight scoops of sediment are collected to assess the detectability of the three turtle species using environmental DNA released into their surroundings.

Collection of environmental DNA (eDNA)

Environmental DNA (eDNA) is a non-invasive biodiversity monitoring technique that does not involve direct contact with the organisms studied. It is based on the collection of environmental samples — water, sediments, soils, or other more or less complex substrates — to identify organisms currently present or that have recently occupied the targeted environment. For each water body, eight 250 ml water samples are collected and pooled into two subsamples, as species detection in the environment is imperfect and heterogeneous. Even when a species is present, its DNA may be absent from a given sample. For the same reasons, five to eight sediment scoops are collected per water body, depending on its size. eDNA samples from both water and sediments will allow comparison of the detection efficiency of these two environmental compartments for the three invasive turtle species studied. Occurrence data, combined with physico-chemical and environmental variables, will be used to model the spatial distribution of these species in Guadeloupe and Martinique and to predict, with a certain level of confidence, their presence or absence in unsampled water bodies.

Dietary analysis of turtles using metabarcoding

To determine the ecological impacts of these turtles on local biodiversity, individuals will be captured for dissection and stomach content collection. DNA will be extracted from stomach contents to identify, through metabarcoding, the plant and animal species consumed by the three turtle species, thereby assessing their impact on invaded ecosystems. Metabarcoding is a genetic approach used to identify, at a given taxonomic level, DNA present in a complex sample composed of genetic material from multiple organisms.

Results

At the end of the study, the expected outcomes are: (i) the establishment of an eDNA sampling and analytical protocol to detect the three turtle species; (ii) a spatial distribution map of the three species across Martinique and Guadeloupe; (iii) a description of their diet based on stomach content analysis.

The student and his team

Osno Fils-Aimé, originally from Haiti, completed his studies in Agricultural Sciences in January 2024 at Université Quisqueya in Port-au-Prince, Haiti. He began his Master's degree (Master 2) in Environmental Management in September 2025 at Université des Antilles in Martinique.

In February 2026, he started his academic internship with Caribaea Initiative as part of the DEVIMTOR project, which aims to analyze the demography and assess the impacts of invasive exotic freshwater turtles in the French West Indies. His work is supervised by Dr. Christopher Cambrone, Scientific Coordinator at Caribaea Initiative.

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