

## Invasion dynamics of freshwater turtle species of the genus *Trachemys* in the West Indies

# Caribbean-endemic species # exotic invasive species

### Context

Invasive species constitute one of the five most important threats to biodiversity around the world. Their impact can lead to various negative consequences on local species, through competition, predation or the transmission of pathogens. The Caribbean islands, considered as a major biodiversity hotspot, is particularly affected by this threat. In particular, several invasive exotic reptile species have been identified, including a species of aquatic turtle native to the United States, *Trachemys scripta*, ranked among the world's 100 most invasive species. In the Caribbean, *T. scripta* constitutes a threat for four aquatic turtle species that are endemic to the region. Two of these species are found on the island of Hispaniola: *Trachemys decorata* and *Trachemys stejnegeri*, which has also been introduced on several islands of the French Antilles. So far, quantitative data on the real impact of the introduced *Trachemys* species in the West Indies are lacking, leading to limitations for the management and conservation of local species.

### Objectives

The aim of the project is to study the populations of native and exotic *Trachemys* on three islands of the Caribbean, Hispaniola, Guadeloupe and Martinique. The study will focus on three species: *T. decorata* and *T. stejnegeri*, endemic to the Caribbean, as well as *T. scripta*, an invasive exotic species. The population dynamics of these species, their trophic regime as well as the presence of hybridization within the different populations of the islands will be assessed. More specifically, this project aims to:

- Update data related to the conservation status of the *T. decorata* species in Haiti, in particular by documenting population dynamics;
- Determine the level of hybridization between *T. decorata* and the two congeneric species *T. scripta* and *T. stejnegeri* in Haiti and evaluate the possibility of conserving pure lines of the endemic species;
- Study the impact of invasive *Trachemys* on the biotic communities of freshwater environments in three Caribbean islands in order to provide management guidelines.

### Methods

*Mapping of the presence of Trachemys species*

The location of the populations of *Trachemys* in the West Indies has been poorly documented so far, particularly for *T. decorata* in Haiti. To this end, a large survey



*T. decorata* © B. Gratwicke

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STUDENT  
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of wetlands is being carried out in Haiti that aims at determining the sites of presence of this species. A socio-economic survey is also conducted in order to determine the potential anthropogenic sites of *Trachemys* on the territory. In Guadeloupe and Martinique, a similar study will be carried out on the species *T. stejnegeri* and *T. scripta* in order to better understand their distribution in these territories.

#### *Demographic counting*

In order to assess the relative abundance, demographic parameters and population structure of the three species, Capture-Mark-Recapture (CMR) programs will be set up at selected sites. During these studies, the captured turtles will be marked, sexed, weighed and measured. Pregnancy of females will be established by pelvic palpation.

#### *Determination of hybridization levels*

In order to establish the degree of hybridization between the different species of *Trachemys* on the three islands (Hispaniola, Martinique and Guadeloupe), individuals from different populations, weighing more than 300 g, will be examined. Blood samples will be taken from their dorsal caudal vein, and standardized photographs will be used for colorimetric studies. The blood samples will be analysed using nuclear and mitochondrial gene markers to determine the level of genetic introgression existing in the different populations of *Trachemys* on each island.

#### *Personality tests*

To assess survival and predation resistance abilities in *Trachemys*, a personality test will be performed. For this purpose, turtles with no physical injuries will be placed on the ground on their back on a smooth board and their recovery time (time to return to their initial position) will be evaluated, as well as the latency time before the first movement, the number of recovery attempts and the success / failure of the recovery. The test will be repeated four times for each individual, with a 20 second break between each test. The experiment time will be limited to 120 seconds to minimize individuals stress. All experiments will be performed in sunny, non-rainy weather, in order to keep the same optimal ambient conditions.

#### *Diet analysis and impact of invasive species*

In Guadeloupe and Martinique, the diet of invasive *Trachemys* will be analysed from stomach contents and faeces. This analysis will help document the impact of turtles on their biotic environment.

## Results

In Haiti, the first results obtained show the presence of *Trachemys* in 13 natural sites and 23 anthropized sites, spread over the entire territory. The presence of *T. stejnegeri* has only been confirmed at one natural site.

A pilot study in the Trou-Caïman Pond (Thomazeau) enabled the capture and biometric measurements of 44 *T. decorata* in the wild as well as 48 individuals found in captivity. No significant difference in the sex ratio of turtles was found among individuals measuring over 100 mm (back length), and females were larger than males. The socio-economic survey revealed several uses of *T. decorata* such as local consumption or use in voodoo practices.

At another site, in the Miragoane Pond, 57 *T. decorata* individuals weighing more than 300 g and kept in captivity have already been sampled (sexing, biometric measurements, photographs and blood samples). Among these 57 individuals, 23 had their personality tested .





## About the research team

Jeffrey began his doctorate in December 2020 at the Université des Antilles, Guadeloupe, jointly with the Université Quisqueya in Haiti. His research is funded by Caribaea Initiative and the Agence Universitaire de la Francophonie.

Prior to his doctorate, Jeffrey obtained an Engineer-Agronomist degree specialized in Natural Resources and Environment at the Faculté d'Agronomie et de Médecine Vétérinaire (FAMV) from the Université d'Etat d'Haïti (UEH). He graduated with honours before starting a Master's degree in Tropical Ecology at the Université des Antilles, also obtained with honours. His Master's thesis consisted of an analysis of factors affecting the IUCN Red List status of Caribbean-endemic vertebrate species.

Since 2017, thanks to the financial support of Caribaea Initiative, Jeffrey has specialized in the study of Caribbean herpetofauna. His doctorate thesis is co-supervised by Prof. Frank Cézilly (Université de Bourgogne Franche-Comté, Dijon, France), Dr. Etienne Bezault (Université des Antilles) and Dr. Jean Vilmond Hilaire (Université Quisqueya, Port-au-Prince, Haiti). The research conducted by Jeffrey in the French Antilles (Guadeloupe and Martinique) is part of the MERCI project (Managing Exotic Reptiles in the Caribbean Islands) funded by the Interreg Caribbean program, with technical support from the OFB (Office Français de la Biodiversité).

## Publications

Paul, J.M., Saint-Louis, L.J., Olivier, A., Célestin, W. & Cézilly, F. Conservation status of the Hispaniolan slider *Trachemys decorata* (Barbour & Carr 1940) at Lake Trou Caiman eastern Haiti: first data on an endemic, poorly studied, and endangered species. Soumis.

