

Population biology and population genetics of the White-crowned Pigeon, *Patagioenas leucocephala*, and the Scaly-naped Pigeon, *P. squamosa*, in the insular Caribbean

population biology # conservation # endemic species

Context

The White-crowned Pigeon and the Scaly-naped Pigeon are two Caribbean-endemic species of colombids much appreciated by local hunters and of patrimonial interest. They are on the IUCN Red List of Endangered Species ("Near Threatened" and "Least Concern" status, respectively). However, across the French Antilles, their conservation status have been considered as higher. The White-crowned Pigeon has thus been reclassified as "Endangered" and "Vulnerable", respectively in Guadeloupe and Martinique, while the Scaly-naped Pigeon is considered "Near Threatened" in Martinique. These frugivorous birds consume the fruits of several trees and thus play an important role in the dissemination of seeds and regeneration of tropical Caribbean tree communities. The flight ability and the vagrancy of these species also induce large-scale seed dispersal. Despite their important role, data on the ecology of these two species and the demography of their populations, both on a large scale and in the French Antilles, are still limited.

Objectives

The project aims at documenting the ecology and demographic dynamics of the two species on a regional scale and to propose a method for monitoring their populations. The data collected will be aim at:

- Proposing a monitoring method for annual assessments;
- Identifying the connectivity between the islands in the geographical range of the two species using genetic tools and determine their genetic diversity;
- Estimating the effective sizes of their populations;
- Documenting the current connectivity between the islands of the geographical distribution of the White-crowned Pigeon by GPS tracking;
- Determining the prevalence of infection with blood parasites of the genus *Haemoproteus/Plasmodium* and compare the genetic structure of the parasites to that of their hosts.

Methods

Survey method

Two methods for the detection of the two species were compared, the so-called passive method which consists in the detection of birds based on their spontaneous behaviors (songs, movements) and the call-broadcast method which consists in broadcasting the song of the species in order to induce a behavioral



P. squamosa © A. Levesque

DATES
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COUNTRY
Guadeloupe

STUDENT
Christopher Cambrone

EDUCATION LEVEL
Doctorate



CONTACT
christopher.cambrone@yahoo.com

response (singing or movements). Seventeen counting sites were visited. Each consisted of 10 points of counting, spaced 300 meters apart. At each point, pigeons of both species that were seen and heard were counted for 10 minutes, using both methods.

Genetic analyzes

Thanks to several collaborations, 238 biological samples of White-crowned pigeons and 128 of Scaly-naped pigeons were collected. After DNA extraction, mitochondrial genes and microsatellite loci were amplified, sequenced and analyzed. Genetic analyzes were also used to detect blood parasites and to sequence them in order to determine the lineages of parasites infecting the populations of pigeons to understand their genetic structure.

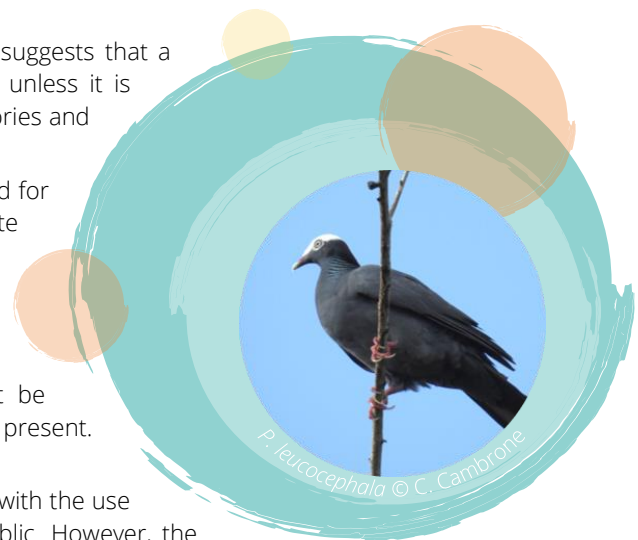
GPS tracking

In the Dominican Republic, 29 White-crowned Pigeons were captured using mist nets and marked with rings. GPS/Argos devices were deployed on seven of them to record their GPS coordinates several times a day.

Results

The first results provide information that needs to be considered for the adjustment of the conservation status of the White-crowned Pigeon and the Scaly-naped Pigeon, as well as the establishment of appropriate management measures in Guadeloupe and at the scale of the Caribbean region:

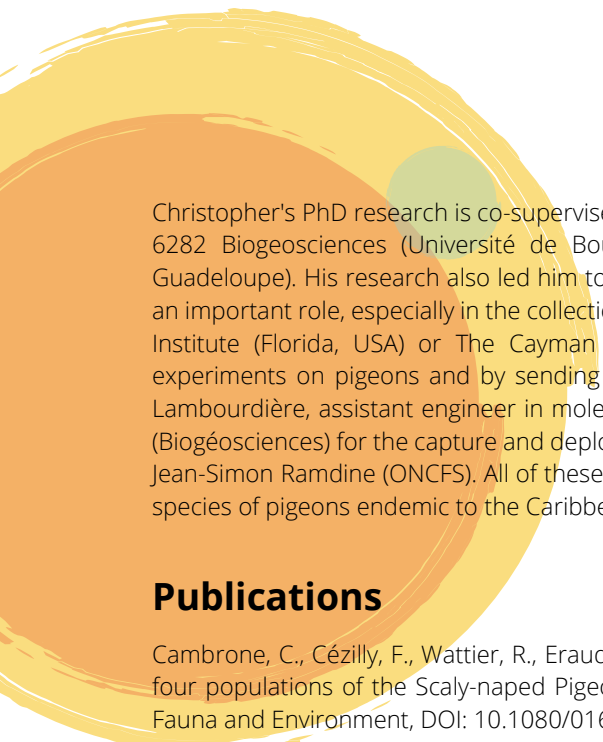
- The possible existence of a single population in the Caribbean suggests that a management plan for the two species cannot be fully effective unless it is applied in a coordinated manner in the different Caribbean territories and states that belong to the geographical range of each species.
- The call-broadcast method seems to be the most effective method for detecting the two columbid species and allows for a more accurate representation of demographic fluctuations over time. This method is therefore recommended for future monitoring of the two species.
- The White-crowned Pigeon and the Scaly-naped Pigeon are not found in the same habitats in Guadeloupe. This result might be transposable to other Caribbean territories where both species are present. A similar study within these territories would confirm this.
- Satellite tracking of the movements of the White-crowned Pigeon with the use of GPS-Argos devices was implemented in the Dominican Republic. However, the partial results obtained encourage rethinking the methodology used.
- The populations of White-crowned Pigeon that were sampled and tested are all infected by haematozoa, with high prevalence rates. In order to confirm the haematozoan lineages infecting these populations, additional genetic analyzes are being carried out. This procedure should easily be transposed to the Scaly-naped Pigeon and other Guadeloupean and Caribbean columbid species.



About the research team

Christopher works as a PhD student since 2018 at the Université des Antilles, in Guadeloupe. His doctorate is co-funded by Caribaea Initiative and the Conseil Régional de Guadeloupe. The research project is co-funded by the Office Français de la Biodiversité (OFB), the Direction de l'Environnement, de l'Aménagement et du Logement (DEAL) from Guadeloupe, the Fédération des Chasseurs from Guadeloupe and Caribaea initiative.

Prior to his PhD research, Christopher studied at the Université de Bourgogne (Dijon, France), specializing in Behavioral Ecology. He obtained his master's degree by graduating as first of his class. Christopher joined Caribaea Initiative in 2016, during his first year of master's degree, during which he began his research on the two species of pigeons in Guadeloupe, within the Office National de la Chasse et de la Faune Sauvage (currently OFB).



Christopher's PhD research is co-supervised by Prof. Frank Cézilly and Dr. Etienne Bezault, respectively from the UMR CNRS 6282 Biogeosciences (Université de Bourgogne, Dijon, France) and the UMR 8067 BOREA (Université des Antilles, Guadeloupe). His research also led him to work in close collaboration with the OFB. Hunters and their federation also play an important role, especially in the collection of biological samples. Other partners such as the Avian Research Conservation Institute (Florida, USA) or The Cayman Turtle Center (Cayman Islands) provided support by sharing their research experiments on pigeons and by sending tissue samples. In the laboratory, Christopher is assisted and advised by Josie Lambourdière, assistant engineer in molecular biology at UMR BOREA. In the field, he was assisted by Sébastien Motreuil (Biogéosciences) for the capture and deployment of GPS / Argos devices, by Anthony Levesque (Birding Guadeloupe) and by Jean-Simon Ramdine (ONCFS). All of these people and partners are contributing to the progress of his research on the two species of pigeons endemic to the Caribbean.

Publications

Cambrone, C., Cézilly, F., Wattier, R., Eraud, C. & Bezault, E. (2021). Levels of genetic differentiation and gene flow between four populations of the Scaly-naped Pigeon, *Patagioenas squamosa*: implications for conservation. *Studies on Neotropical Fauna and Environment*, DOI: 10.1080/01650521.2021.1878765.

Cambrone, C., Bezault, E. & Cézilly, F. (2021) Efficiency of the call-broadcast method for detecting two Caribbean-endemic columbid game species. *European Journal of Wildlife Research* 67:65.

