Chiroderma improvisum © BK Lim et al. 2020

Evaluation of effectiveness of current Protected Areas for conservation of bats diversity priority zones in the insular Caribbean

 # community ecology # biodiversity assessment

DATES
2021

COUNTRY
Cuba

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Context

Bats are the most abundant and diverse group of the mammalian fauna in the Caribbean region, since they survived most of the extinction events that eliminated the rest of the native mammals on the West Indies. Currently, around 60 species of Chiropterans inhabit the Caribbean islands, with a 50% proportion of endemism. Bats are present on the greater majority of islands in the Antilles, where they provide essential ecosystem services, including the pollination of plants, seed dispersal and pest control. This factor is combined with the tendency for high individual densities in bat populations and assemblages, therefore leading to strong effects on their surrounding ecosystems. Chiropterans are globally threatened by anthropogenic changes such as indiscriminate agricultural land transformations, climate change and fragmentation of their natural habitats. In the Caribbean, the rising of sea levels and the loss of landmass due to the island nature of the Antilles and the Lucayan Archipelago are a major concern for the biodiversity of the region, especially for the bat fauna which have a propensity to roost on cave systems which can be easily flooded. One of the most employed methods to protect the biodiversity is to declare protected status in areas with high-priority conservation interest. However, Protected Areas are declared most of the time focusing on geographic considerations above ecological concerns. Chiropterans are very mobile, and their ranges are often much wider than the forest or location where their roosts are located. Therefore, it is possible that current Protected Area Systems do not correspond to the actual bat biodiversity hotspots.

Objectives

The aim of the project is to identify the main priority zones of Chiropteran diversity in the Caribbean islands and to assess the effectiveness of the current Protected Area System regarding bat conservation, employing spatial conservation prioritization tools.

Methods

Presence records

Records of known presences of all bat species found in the Caribbean islands were gathered in a database, excepted for the islands close to the continent (Aruba, Bonaire, Curaçao, Trinidad, Tobago and Margarita) and records older than 1950 or without accurate coordinates. The islands were excluded because most of their fauna is representative of the South American continent. Records were extracted

from several published checklists of Caribbean bat species and from the GBIF database. At first, 27,754 results were gathered, before being screened to filter out duplicate locations for the same species and records with senseless geographic coordinate data. The final database accounted for 3,272 records representing 61 species belonging to 7 families of the order Chiroptera.

All the records were mapped with QGIS v3.16, and the geographic ranges of the bats were turned into polygons representing the separate distributions in each individual island for all species. The polygons were then turned into raster data.

Land features maps

Discerning quality areas for establishing Protected Areas requires a deep knowledge of the surrounding landscape. Promising candidates for Protected status can turn out to be much less attractive when the adjacent zones are already used as croplands. Therefore, the analysis is based on maps describing the use of terrain and human population density in the Caribbean archipelagoes. The map files were downloaded from free online sources. The project Global Cover v2.3 was used to obtain data regarding the actual use of natural, agricultural and urban land in the Caribbean region. The information about human population density was obtained from the Center for International Earth Science Information Network website.

Spatial conservation prioritization

The spatial priority ranking of the high diversity areas was implemented employing the Zonation v4.0 software and methods to identify the priority areas of bat diversity, and to overlay the Protected Areas for evaluation of their coverage of these high diversity zones.

Expected results

A map of bat species richness in the Caribbean will be generated. The map will allow the detection of the main spots of bat species diversity in the region.

The comparison between the distribution proportion curves of the analyzes with or without the Protected Areas used as a priority mask will be employed for the calculation of the coverage by some Protection status of high bat diversity zones in the Caribbean islands.

About the research team

The present research is Saul's project presented to obtain the Master degree in Behavioral Ecology and Wildlife Management at the University of Burgundy. He was selected in 2019 to follow this Master, funded by Caribaea Initiative. His thesis is supervised by Dr. Carlos Mancina, from the Institute of Ecology and Systematics (Havana, Cuba). Saul is also currently employed in the Faculty of Biology of the University of Havana, where he is part of the team of teachers for Ecology and Vertebrate Zoology.