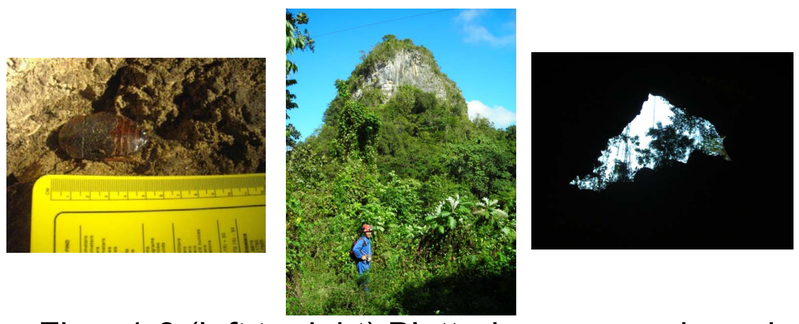
Arthropod diversity in caves with moderate and high anthropogenic presence.

INTRODUCTION

• Extensive diversity of organisms are found in subterranean habitats varying in degrees of permanence and residence (Culver 2009).

• Cave organisms are classified as *trogloxenes,* those that are accidental and temporal subterranean visitors, and as *troglobionts* (Fig.1), permanent residents of subterranenan caves (Culver 1982).

• Scattered taxonomical literature pressume tropics (Fig.2) have low subterranean species diversity (Fig.3) and most cave surface dwelling species are undescribed (Mitchell 1969 and Trajano 2001).

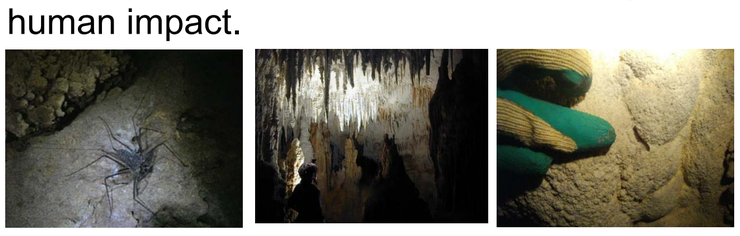


Figs. 1-3 (left to right) Blattaria: cave cockroach, *Mogote*, cave entrance, and appearance

OBJECTIVES

Study the potential association between arthropod diversity and the abiotic environment (thermal, luminar and humidity) in caves within the Northern Karstic region of Puerto Rico (Fig.5).

Identify and compare arthropods diversity (Figs. 4 and 6) in caves with moderate and high human impact.



Figs. 4-6 (left to right) Amblipygi: whip spider, abiotic envionment in dark zone, and Millipede

HYPOTHESES

• Cave arthropod diversity and composition will relate to light availability, relative humidity, and temperature.

• More diversity will be present in the zone near the entrance of the cave.

• Arthropods diversity will be lower in caves with higher high human presence.

METHODOLOGY

Study Site (Fig.1)

• The North Karst Belt of Puerto Rico (Fig.7) is located along 160 km in the north coast of Puerto Rico between the municipalities of Loíza and Aguadilla. (Miller 2009)

• Four caves (Fig.7) with moderate and high human presence located in the municipalities:
- Cueva Balcones, Morovis,
- Cueva Infierno, Florida,
- Cueva #41 y #50 en Utuado.

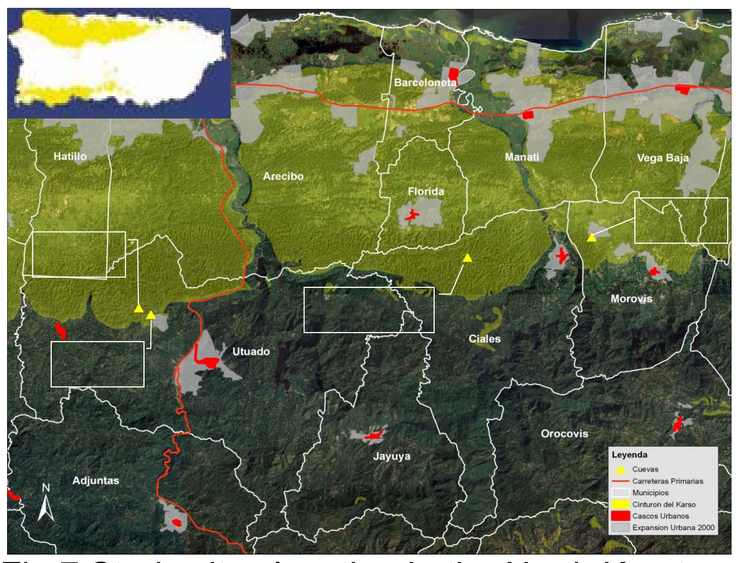


Fig.7 Study sites location in the North Karst Belt

The caves were divided along gradient of visible: next to the entrance, twilight and dark (Fig.8).

• We placed randomly 5 pitfall traps within a 2m2 plots in each abiotic zone of the cave at each cave for a total of 60 pitfall traps.

• We recorded relative humidity and temperature with HOBO® H8 Pro for three days

• Pitfalls were collected after 72 hours during rainy season (October 2009)

• Pitfall will be set also in dry season (February 2010).

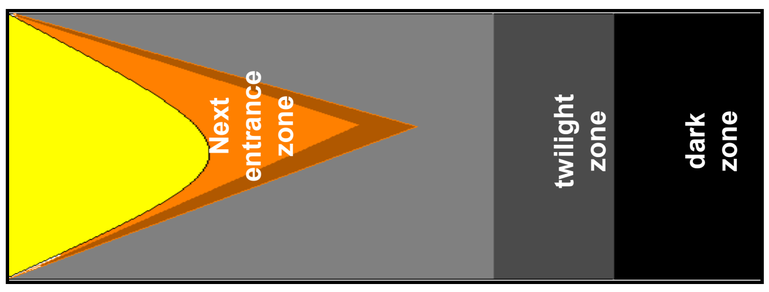


Fig. 2 Diagram of three light zones in the cave

Laboratory Methods

• Classification of morpho species and orders with taxonomical keys in the laboratory.

• Heptane flotation

• Digital photography to create digital reference collection

• Data analysis will be conducted in the laboratory with taxonomical keys

Fig.9-11 Pitfall trap, filling traps with alcohol, and traps in plot

• Statistical analysis of diversity and composition across environments and caves

RESULTS TO DATE

• We placed and collected the 60 pitfall traps.

• Relative humidity, temperature, and light availability were measured in all the caves.

• 12 Pitfall of Cueva Infierno have been processed to date.

• We have counted morphospecies Hymenoptera, Blattaria, and Coleoptera orders

• Coleoptera is the most abundant order of the three.

Fig.12-14 (left to right) Most common order: Hymenoptera, Hemiptera, and Blattaria

DISCUSSION

Preliminary results show Hemiptera order is more abundant within three zones in Infierno cave. After collecting all the pitfalls, observations suggest that diversity for Coleptera and Hymenoptera is highest at the most luminic zone (next to entrance). This research will contribute to update the records for cave organisms in Puerto Rico and set more rigurous baseline studies for future ecological research in biospeleology.

AKNOWLEDGEMENTS

This research is possible to many friends help me constantly in the subterranean world. Thanks: Waldemar Alcobas, Fernando Castro, Lourdes Lastra, Larisa Martínez, Johanna Colón, Ginna Malley, Zevio Schnitzer, and specially to José Luis Gómez. Also my mentor Elvia Meléndez-Ackerman for the patience and guidance in the surface.

LITERATURE CITED

Culver, D.C. (1982). *Cave life.* Harvard University Press, Cambridge, MA.

Culver, D.C. (2009). *The biology of caves and other subterranean habitats*. Oxford Uiversity Press, Oxford, NY.

Miller, T. (2009). Caves and Karst of the USA *14: Neighboring Countries,* pp.332-341. Huntsville , AL: National Speleological Society.

Trajano, E. (2001). Mapping subterranean biodiversity in Brazilian karst areas. In D.C. Culver, L. Deharveng, J. Gilbert, and I.D. Sasowsky, eds. *Mapping subterranean biodiversity. Cartographie de la Biodiversité Souterraine*, pp.67-70. Karst Waters Institute Special Publication 6, Charles Town, West Virginia.

Miriam Toro Rosario[1] and Elvia Meléndez-Ackerman[2]

[1] Environmental Science Program, University of Puerto Rico, Río Piedras Campus and Fundación de Investigaciones Espeleológicas del Karso Puertorriqueño (FIEKP)

[2]Center for Applied Tropical Ecology and Conservation and Institute for Tropical Ecosystem Studies, University of Puerto Rico, Río Piedras Campus

Funded by National Science Foundation, HRD #0734826 and University of Puerto Rico, Central Administration and Río Piedras Campus