Project Update: May 2015

Expedition period

The field trip was from Tuesday, April 14 to Friday, April 17. During this time, data was collected from the cave entrances to determine those used by our target species (*Natalus primus*), to register its foraging activity around the cave, and to continue communication with personnel from the national park.

Developed Activities

The identification of *N. primus's* foraging areas around the cave were carried out by setting acoustic recorders (see previous report) around the cave and in some of the cave's skylights (missing in our previous field trip) (Fig. 1 A). Previous reports said that *N. primus* suffers severe dehydration outside the cave (Tejedor et al., 2004), implying that the species may not disperse far away from its roost. Therefore, it was decided to explore the areas around the cave. Eight individuals were captured in order to record their echolocation calls. These calls will be used to improve the spectrogram templates of the species (to have as much variability from the species's echolocation calls). These templates will be used to identify *N. primus* in any acoustic recording done in the national park and adjacent areas. These is the first attempt to describe the vocal repertoire of *N. primus*. This data is important in the characterization of the species from an acoustic stand point, and could serve to identify differences, if any, in echolocation calls between both sexes, during foraging activity, and/or any other interspecific interactions. On this field trip we continued our communication with the director of the National Park. We gave him some materials that could be used by the technical staff and forest rangers in the area. The place within the Park that constitutes our working centre is called "Caleta del Mangle" (N21°51'55.7''; W084°44'32.9") and its located 7 km from the cave. Here, my team and other two forest rangers undertake our work with bats. We also delivered posters and tabloids (made in our previous trip) to the forest rangers, given that they could also spread knowledge regarding Cuban bats.

Amount of data collected

We gathered a total of 2 960 sound files from the ARUs in three nights of recordings and obtained 250 additional echolocation calls from *N. primus*. Data from ARUs was daily collected to a laptop computer (Fig. 1 B) and these recorder were re-scheduled for the next day.

Morphological variables were checked from the captured individuals (Fig. 1 C), females were in the breast feeding condition. We additionally took photos from the species (Fig. 1 D). We couldn't get to the gallery known as "hot chamber" because the cave's floor is a guano swamp and it is nearly impossible to cross it on foot. A large number of individuals from different species are in the roof of this chamber. Due to what we have learnt in other Cuban hot caves studies, the new-born bats from many bat species should be located in this gallery.

Bat species select hot caves to breed, new-borns are hairless and unable to control their body temperature during the first weeks of life; conditions of high temperatures and relative humidity allow them to prevent energy expenditure on these purposes. According to previous publications (Tejedor et al., 2004), adults from *N. primus* are localized very near to *Mormoops blainvillei*, and their spatial distribution is so that individuals are separated each by 10 cm. We couldn't check if the new-borns were in the hot gallery and if they shared the same distribution as adults. Probably the fact of been an inaccessible gallery could have offer a refuge for this species allowing them to be undisturbed.

This is a critical time for bat's survival given that most of the species in this cave are in the breeding season. Disruptions in the cave could cause new-born to fall to the cave floor and die. To avoid this, we were inside the cave a minimal period, and used red lights to cause the least disruption possible to the bat assemblage. Most of the individuals from *N. primus* have been captured in the walls near to the hot gallery. Individuals from other species such as *Brachyphylla nana* (in the breastfeeding condition) and *Monophyllus redmani* (pregnant) were also collected here. In many places of the cave, individuals from *Artibeus jamaicensis* were found with their calves, as this species is more abundant in the less hot and well ventilated galleries. New-born from this species were not flying still but they seem to be more than 3 weeks old. *A. jamaicensis* constitute one of the Cuban bat species that has two reproductive periods within the year.

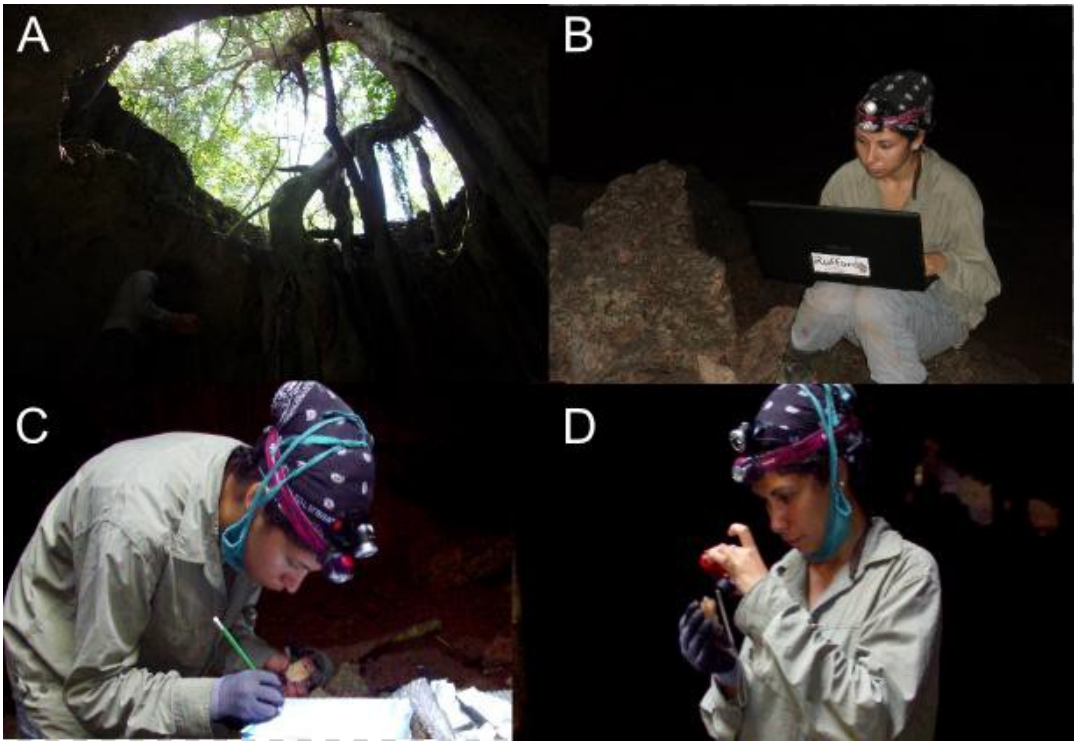

Figure 1. Activities developed within cave La Barca. Recording at skylights (A). Collecting information and re-schedule of automatic recorders (B). Gathering information about morphology and reproductive status from individuals of N. primus (C). Taking photographs to those individuals (D).

A sketch from cave La Barca (Fig. 2), published previously by Tejedor et al., (2005) was used as a reference to mark the recorded places with ARUs. We used the sketch also to mark the places in which we have captured individuals from *N. primus* and have been seen other bat species.

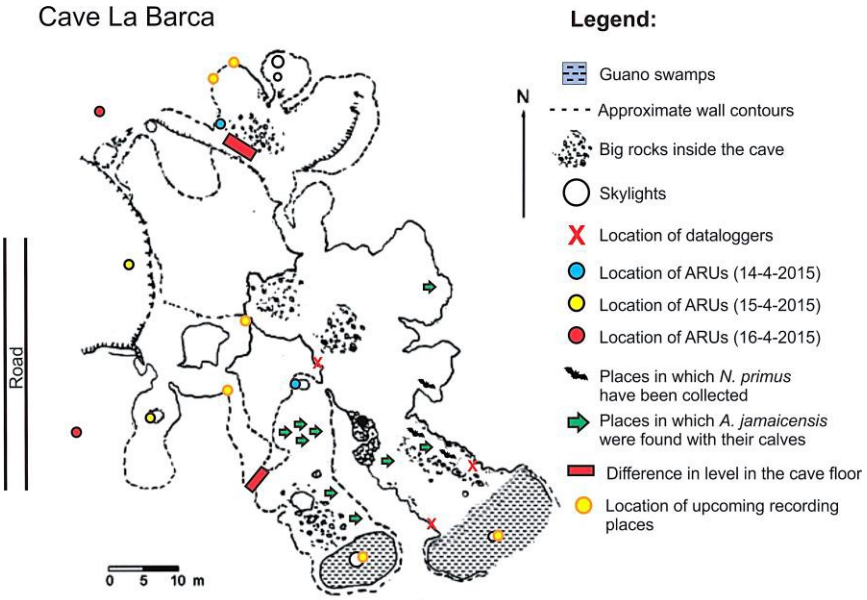

Figure 2. Sketch of Cave La Barca, modified from Tejedor et al. (2005) showing the galleries were ARUs and data-loggers to record climatic variables were set, as well as the sites where other bat species were seen.

As part of our interest to know better the roosting requirements of *N. primus*, we measured temperature and relative humidity in three different locations of the cave, focusing our major attention in the gallery in which we have collected our target species. We set data-loggers 1 m above the cave floor, taking into account that this is the height at which *N. primus* flights within the cave galleries. Data-loggers recorded these climatic variables every 15 minutes during two days.

ARUs were scheduled to record 1minute sound files using the Song Meter Configuration Utility software. Two schedules were used this time, in order to record bat activity during the night exodus in the cave entrances and foraging activity around the cave. We decided to give priority to the hours in which the night exodus occur, assuming that this species will have its maximum activity in this period. If during our data analysis, running the *spectrogram templates*, we found that the activity through the entrances of *N. primus* occur within other period we would re-schedule our recordings, giving priority to those hours.

Obtained results

Profiles from climatic variables showed stable temperatures in places near to the hot gallery, and more variation in galleries very close to one of the skylights in which we could see a peak of decreasing temperature during the sunset (Fig. 3). Relative humidity reach 100% in all galleries.

From the echolocation calls recorded this time from the captured individuals, call variables such as: duration (ms), peak frequency (kHz) and minimum and maximum frequency (kHz) were analyzed. The analysis in this case was more detailed than previous ones, considering each one of these variables per harmonic. Measurements were performed automatically, using a script in MATLab (Skowronski and Fenton, 2008). The analysis per harmonic was carried out in case the species could shift harmonics in other behavioral contexts, similar to what has been found for other Cuban bat species (Mora and Macías, 2006). S*pectrogram templates* including single harmonics (the 1^{st} or the 2^{nd}) were also done in accordance with the potential harmonic shifts. These templates would allow the identification of the species in other behavioural contexts such as foraging activity if it happens to alternate between the 1^{st} and the 2^{nd} .

Educational/Scientific materials made in this period

Unfortunately, we were not able to give the talk to all the personnel from the National Park, as they were engaged in other field works related to other species within the park, such as crocodiles, birds and frogs. Some of staff were also guiding tourist visitors in Eco touristic trails (one of the services offered by the Park). In our talk with the director of the national park, we made reference to the following topics:

- Cuban bat fauna (26 extant species with 7 endemics)
- Natalidae family (species present in Cuba)
- Natural history described for *N. primus*
- Our project goals (with a detailed description of how to implement each one of them)
- Equipment used to collect the acoustic data (automatic recording units and data-loggers features)
- Procedures to analyze the data and their meaning in terms of the conservation of the cave
- Bat threats (which are the elements they need to look out to protect bat assemblages within Guanahacabibes Biosphere Reserve)
- Environmental education activities (which are our plans to promote education regarding bats, with kids and the personnel from the park)

During our conversation he told us the way they develop their environmental education activities. They have specific days within the month in which they visit different schools (8 schools from 7 communities within Guanahacabibes peninsula) and talk to the kids about nature and develop some activities. We showed him our interest in inserting our project in some of those activities and talk to local residents about bats. We are planning to do a science fair related to bats, were kids could see bats alive and they could talk about this flying mammals by themselves. We are planning a drawing contest in which kids could reflect on the way in which they see bats, promoting their creativity. We will support this activity with different materials such as colour pencils, sheets, crayons, etc. We will receive all the support from the park to realize this activity.

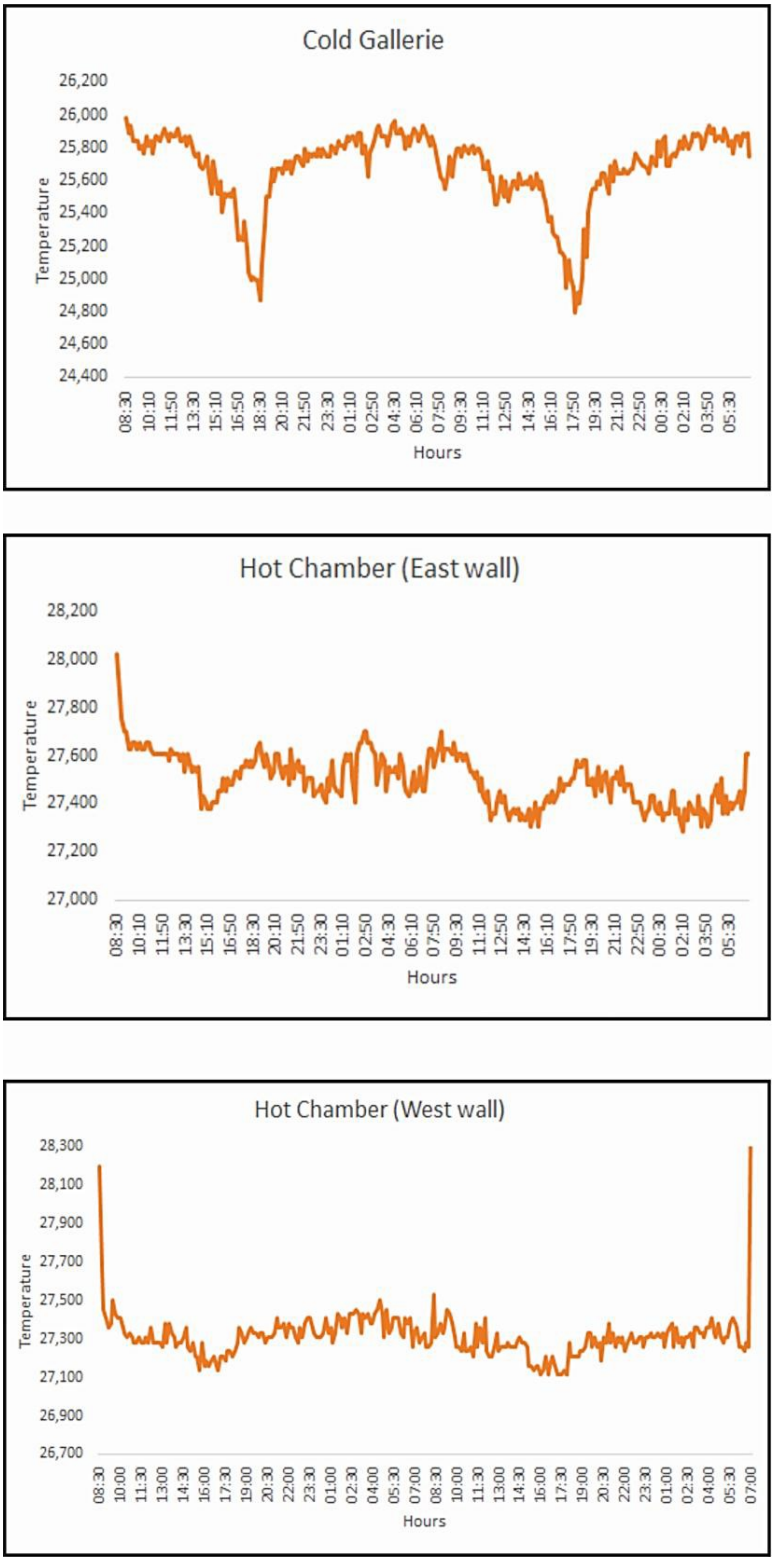

Figure 3.Temperature and relative humidity profiles from 2 main galleries within La Barca Cave, Guanahacabibes, Pinar del Rio, Cuba. Peak temperatures observed at the beginning in some graphs correspond to the moment in which data-loggers were installed.

In most of the schools within the Guanahacabibes Reserve they count with computers, and the Reserve's director told us that we could made power point presentations in an easy and understandable language to the kids and leave them to the teachers and they could use them in their classes. These presentations will focus on highlighting the importance of bats and the key elements to preserve them. Pictures should include few words to make it more entertaining for kids.

Together with these presentations we intend to deliver posters related to bats and how to preserve them to be used in schools. In this field trip we created and printed posters relating bat conservation issues and information from our target species (See attached documents); these were delivered to the director of the National Park (Fig. 4 B-D). We created a tabloid to identify species from Natalidae family and created a poster regarding information of bats inhabiting within the Guanahacabibes National Park delivered also to director (Fig. 4 B).

Figure 4. Pictures from contacts we had with the staff from Guanahacabibes National Park: forest rangers (A) and director from the park (B).

Next Steps

- To coordinate a meeting with the major authorities managing the National Park to let them know which activities we have been developing (to have a feedback).
- To qualify Forest rangers working with us in relation to the techniques of acoustic recording and mist netting. They have been helping us during our field trips and training them could constitute one of our long lasting efforts to continue the work with bats.
- To record bat activity in the skylights from the two galleries of the cave in which the floor is a guano swamp. This time was impossible due to the complexity of the vegetation above the cave.

Signposting and markings were made so as find our way during future expeditions.

- To prepare a practical activity with live bats (NOT our target species) to show the kids and personnel from the park.
- To prepare presentations to leave to the teachers in the schools that could be used during their classes and promote knowledge and conservation of Cuban bat species.
- To prepare educational materials regarding bats, dedicated especially to the kids, to be spread for the schools of the National Park.
- From the sound records obtained in this first field trip, we would be able to start running the *spectrograms templates* from *N. primus* over 4 549 sound files obtained from ARUs and Avisoft so far.

Through talks and practical activities we intend to captivate the people working and living within this National Park to respect and protect bats, to recognize how valuable they are and the importance of keeping them. A report was delivered to the personnel from the National Park with the data collected from this field trip, so they could use them as well. They were very pleased with our visit and very happy that we keep a positive feedback with each one of our field trips.

Additional comments

As one of our first outcomes, we sent a short note to the bulletin from the Latin-American Network for Bat Conservation, regarding our main goals in the project and the results regarding the biology from species that we have achieved so far. This will be published sometime this year.

We bought three headlamps to work during the night and within the cave. One of them was given to one of the forest rangers collaborating with us, given that he help us in most of our work. The other two headlamps were used by Christian and me to our work. We also acquire a laptop for data analysis with a good battery (four hours) to set the schedule of the Song Meters and to download their gathered information without any problem on the field (Fig. 1 B). The Rufford Foundation logo was printed in stickers and were attached to the laptop and other materials. Receipts regarding the prices of these items will be attached in the Final report once the project is finished.

References:

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Mora, E. C., Macías, S., Rojas, D., Rodríguez, A., Quiñonez, I., García, A., Cádiz, A., and Boburg, B., 2002, Aplicacion de metodos bioacusticos y convencionales en la caracterizacion de la comunidad de murcielagos de la cueva del Indio, Tapaste, La Habana, Cuba: Biología, v. 16, no. 2.

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