DAVIS EXPEDITION FUND

REPORT ON EXPEDITION / PROJECT

Expedition/Project Title:	Assessment of bat species presence by ultrasonic detection methods in Iwokrama and Surama
Travel Dates:	12-06-2014 to 18-08-2014
Location:	Iwokrama and Surama, Guyana
Group Members:	Stefanie Bonat, Burton Lim, Thomas Horsley
Aims:	Collect acoustic data for bats in the areas of Iwokrama and Surama
	Build a call library from the recorded calls

Outcome (not less than 300 words):-

Introduction

Bats are important in both natural and anthropic environments. They are key controllers of insect populations, which if left unchecked, can negatively affect crops and forest habitats on which humans and animals depend (Boyles *et al*, 2011) and they are important seed dispersers and pollinators (Kunz *et al*, 2011). Bat activity can be related to the status of the plant or insect populations that they feed on: stressors like climate change, deforestation and intensification of agriculture can affect their activity by a considerable amount. Monitoring of bat populations with respect to these factors is required to assess the quality of the environment in which they live, and is therefore an important tool in conservation (Jones *et al*, 2009).

Guyana features one of the largest areas of untouched rainforest in the world. The wealth of plant and animal species of this area is being threatened by mining and logging industries. In this context, researchers are trying to provide evidence for the importance of conserving biodiversity and implementing ecologically friendly plans of development for local populations.

Tropical bat species inventories have been carried out in Guyana throughout the last twenty years (Lim and Engstrom, 2001) and Operation Wallacea started a long term study in Iwokrama and Surama four years ago, using mist netting techniques (Fig 1.; Bicknell *et al*, 2011). This is providing long term data allowing scientists to see what impact climate change and human activities are having on rainforest fauna. However mist netting has some limitations other than the physical height of the nets: species flying in the open and on forest edges usually will not be captured. Acoustic monitoring techniques involve the detection of echolocation calls, and allow to determine the presence of bat species flying in open areas. It can provide more complete data species present in the area when used in conjunction with mist netting (Barlow, 1999). Information on species richness will eventually be combined with GIS information to create maps on species distribution which are used in determining which areas of the Guyanese rainforest should be prioritised for conservation, and to aid the government in the choice of protected areas. These monitoring studies will also be used to determine what effect current sustainable development plans are having on the wildlife.

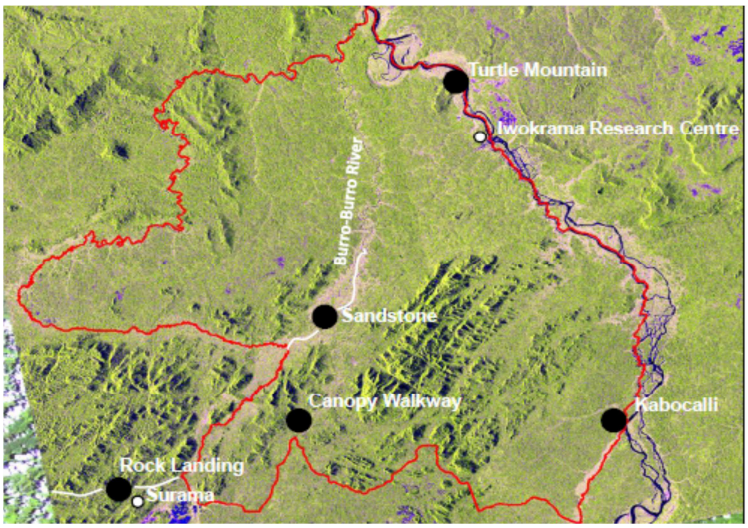

Fig. 1. Locations of camp sites relative to Surama and the Iwokrama Research Centre (Bicknell *et al*, 2011). A new camp, called Surama Lake, was added this year as part of the survey.

Aims

The aim is to provide an inventory of the bat species foraging in open areas and forest edges complementing mist netting data from the forest understorey within the areas of Iwokrama and Surama, and to build an acoustic library of bats in Guyana.

Methods

Field techniques

Bat detectors were used to record calls in open areas from 6 pm to 6 am of the following day. Bats were also captured through mist nets. Release calls were recorded by standing 2-4 m away from the bat being hand-released in the open, to obtain identifiers of local species. Reference calls from literature will be used to identify the remaining calls (Jung *et al*, 2007). Passive monitoring was not possible in the second month of surveying due to the malfunctioning of two of the sound recording units, therefore only release calls were recorded during that time.

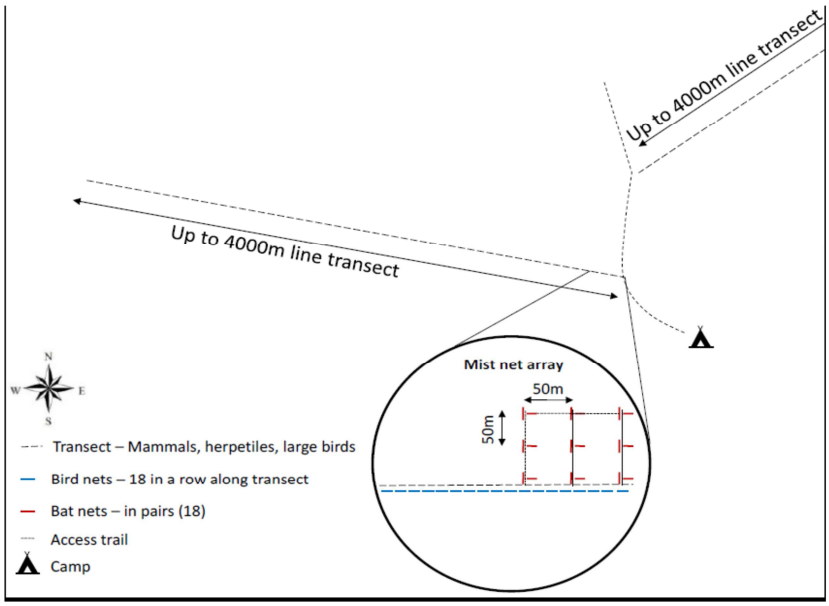

Fig 2. Arrangement of bat mist nets. Mist nets array for bats shown in red (Bicknell *et al*, 2011).

Mist nets were set up along a transect in a grid and a canopy net was set up at camp (Fig. 2). Nets were open from 18.00 to 00.00 and checked at 1 hour intervals. Captured bats were brought to camp where forearm and weight measurements were taken, then the bat was marked and released (Bicknell *et al*, 2011).

Sound analysis:

Recordings will be analysed through the software Kaleidoscope, which will be used for parameter extraction. Six parameters are relevant for species identification, i.e. call duration, time between pulses, peak frequency, start, end and centre frequency and these are commonly extracted from the harmonic with most power (Vaughan *et al*, 1997).

Statistical analysis:

Once call parameters are extracted, statistical analysis will be required in order to determine differences between species. Multivariate analysis of variance (MANOVA) will be used to examine the variation in call structure among species (Jung et al, 2007). Multiple linear regression will be used in order to discriminate between bat species. Statistical analysis will be carried out using SPSS software.

Preliminary results

The preliminary results from this study show that most of the species that were caught in the nets are bats from the family Phyllostomidae (Table 1)

Table 1. Total number of bats captured, divided by species.

Species	**Number caught**
Ametrida centurio	2
Artibeus cinereus	9
Artibeus glaucus	2
Artibeus gnomus	2
Artibeus lituratus	29
Artibeus obscurus	34
Artibeus planirostris	81
Carollia brevicauda	6
Carollia perspicillata	32
Chiroderma trinitatum	2
Chrotopterus auritus	5
Cormura brevirostris	2
Cynomops sp.	3

Desmodus rotundus	8
Eptesicus furinalis	1
Glossophaga soricina	8
Lonchophylla thomasi	13
Lophostoma brasiliense	1
Lophostoma schulzi	5
Lophostoma silvicolum	17
Micronycteris brosseti	1
Micronycteris megalotis	1
Micronycteris microtis	2
Micronycteris minuta	2
Mimon bennetti	2
Mimon crenulatum	4
Molossus molossus	8
Myotis riparius	2
Noctilio albiventris	4
Phyllostomus elongatus	13
Phyllostomus hastatus	1
Pteronotus parnellii	6
Rhinophylla pumilio	11
Saccopteryx bilineata	1
Sturnira tildae	2
Tonatia saurophila	3
Trachops cirrhosus	11
Trinycteris nicefori	1
Uroderma bilobatum	2
Vampyressa bidens	3
Vampyrum spectrum	1
TOTAL	343

A total of 343 bats were captured, and 252 were released and recorded. Some were taken as specimens in the first month of the expedition. Others were not recorded since they did not fly when hand released. 22.6 GB of recordings have been obtained during the two months of the expedition (excluding noise files).

Analysis of data still has to be carried out. High quality recordings are being filtered out i.e. recordings containing at least 10 good echolocation pulses, well above background noise and without evidence of interference by other individuals (Biscardi *et al*, 2004).

Discussion

The identification of species or at least family and genus will have to rely heavily on previous literature. Most of the individuals caught in mist nets belong to the family Phyllostomidae (leaf nosed bats), also known as whispering bats, as their echolocation calls are very faint (Korine and Kalko, 2005). Release calls from Phyllostomids have been recorded, and will compose part of the Guyanese call library. However, these are not useful for species identification in passive monitoring, as they are rarely caught on recordings. In order to be recorded, they would have to be flying very close to the bat detector (Korine and Kalko, 2005). This is due to the methodology employed for capturing bats. 18 nets were placed in the forest understorey, where Phyllostomids are more common, and there was only one canopy net in the open area around camp.

There is a lot of call variation within species, and this varies between geographical areas, therefore more complete data needs to be collected before using echolocation calls to identify species of bats. I am aiming to continue this project in future years, and to record more signature calls from open flying bats. More effort will be put into capturing loud-calling open flying species, by rationalizing the use of canopy nets. Information on bat flight behaviour will be useful for identification (Jung *et al*, 2007), it would therefore be helpful to observe the bats in the field. Once this has been done, the information about species richness will be used to complement the mist netting data in the ongoing monitoring project in the areas of Iwokrama and Surama.

Personal statement

The two months of expedition I attended were very exciting and interesting. The environment was challenging, both mentally and physically, however I can call the expedition a success. I joined the same expedition last year as a volunteer, but this year I was part of the teaching and researching staff. Teaching was an interesting experience, as most of the volunteers were around my age, but it was very nice being able to transmit my enthusiasm about conservation and about bats, which often are seen as creepy and ugly, and therefore

not commonly liked. I had to teach how to handle bats, how to extract them from the nets, and how to identify them. On top of that I had to explain what my research was about and showing how I did my recordings and how I sorted the data the morning after. Being a researcher was challenging, as I had to become familiar with ultrasonic recording equipment, and at the same time improving at identifying bats. The data collecting went very well, even though passive monitoring data is only available for the first month due to equipment malfunctioning. This constitutes a good basis to work on in the future, if the project is carried on.

Acknowledgements

A special thanks goes to Burton Lim from the Royal Ontario Museum, who supervised my project for the first month of the project and Thomas Horsley, who supervised it in the second month. I also had the chance of learning more about other taxa, by occasionally working with or watching the other researchers: the ornithologists Jake Bicknell, Brian O'Shea and Meshach Pierre, the herpetologist Monique Hölting, the ichthyologist Bryce Hubbell, the mammal expert Matt Hallett and the entomologists Michael Geiser, all of whom I thank for the good time spent together and for the learning opportunities. A special mention goes to the medic, Bridget Grain, who was very supportive and helped me out when I got sick. I also thank the Amerindian communities of Iwokrama and Surama, who followed us during the whole trip and gave us some essential help with the setting up and maintenance of camps, and with the surveys. Thanks to the staff of the Iwokrama River Lodge and the Surama Eco Lodge who are always so kind and helpful, and to Dr Raquel Thomas-Caesar for the support. Last but not least, I thank the Weir Fund for Field Studies and the Davis Expedition Fund from the University of Edinburgh, who funded my project and therefore made it possible.

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