

## Project Update: June 2020

### Aims and Objectives

The major goal of our project is to see if bats are good pest suppressors in cacao plantations and how this pest suppression affects cacao productivity. Our project is divided in two phases: 1) conduct mist-netting sessions to see what bat species occur in the cacao plantations; and 2) do an exclusion experiment to detect changes in cacao productivity and to see what is causing these changes.

### Activity 1 - Building phase

The building phase went according to plan. In February 2020, we spent 3 days in each of the eight cacao plantations building two full enclosures and two controls. In total we successfully built 16 full enclosures and 16 controls (figure 1).



Figure 1 – Left: Placing fishing net above the finished bamboo structure. From left to right: Patrick Jules Atagana, local farmer, Diogo F. Ferreira, two local workers, Alan Wandji and Crinan Jarrett. Right: Crinan Jarrett standing near a finished enclosure containing a cacao tree inside (photos by Alexandra Darling).

### Activity 2 - Monitoring phase

To be able to correlate the absence of bats with the increase/decrease of a specific arthropod group and cacao yields, we are monitoring arthropod communities, herbivory, flower development and cacao pod growth in our trees (figure 3). So far, we were able to conduct five visits to each plantation, once per month, and we have six more visits planned until the end of the year.

Although it is still too early to ascertain patterns, it is possible to observe some differences between controls and enclosures (figure 4). Hemiptera, mealybugs (secondary pest) and Arachnida (arthropod predators) seem to be more prevalent in the enclosures, while Lepidoptera, Neuroptera and Formicidae seem to be more prevalent in the control trees. Contrary to what was expected, more pest feeding events were recorded so far in control trees. However, it is not clear if these pest feeding events will directly affect the cacao production and what are the relation of these with the higher prevalence of Hemiptera and mealybugs in the enclosures. The next few months will be important to understand how the presence of the pests (Hemiptera and mealybugs) is related to the pest feeding events.

### Activity 3 - Mist-netting

In January 2020 (dry season) we conducted 8 nights of mist-netting in our eight cacao farms, capturing 90 bats from 13 species. Almost 70% of captures were

insectivorous bats, and more than 70% of these were gleaning bats (*Rhinolophus alcyone*, *R. landeri*, *Hipposideros ruber*, *H. fuliginosus*, *H. curtus* and *Doryrhina cyclops*; Figure 2). Due to the life cycle of the main pest, the brown capsid (*Sahlbergella singularis*; Hemiptera), gleaning insectivores are the ones most likely to perform ecosystem services such as pest suppression. So, our mist-netting data showed some very promising results.



Figure 2 – Left: Halcyon Horseshoe Bat (*Rhinolophus alcyone*) hanging on a tree after being released (photo by Alexandra Darling). Right: Cyclops Roundleaf Bat (*Hipposideros cyclops*) trapped in a mist-net (photo by Diogo F. Ferreira).



Figure 3: Alan Wandji monitoring the arthropod community on a cacao tree inside

of the enclosure.

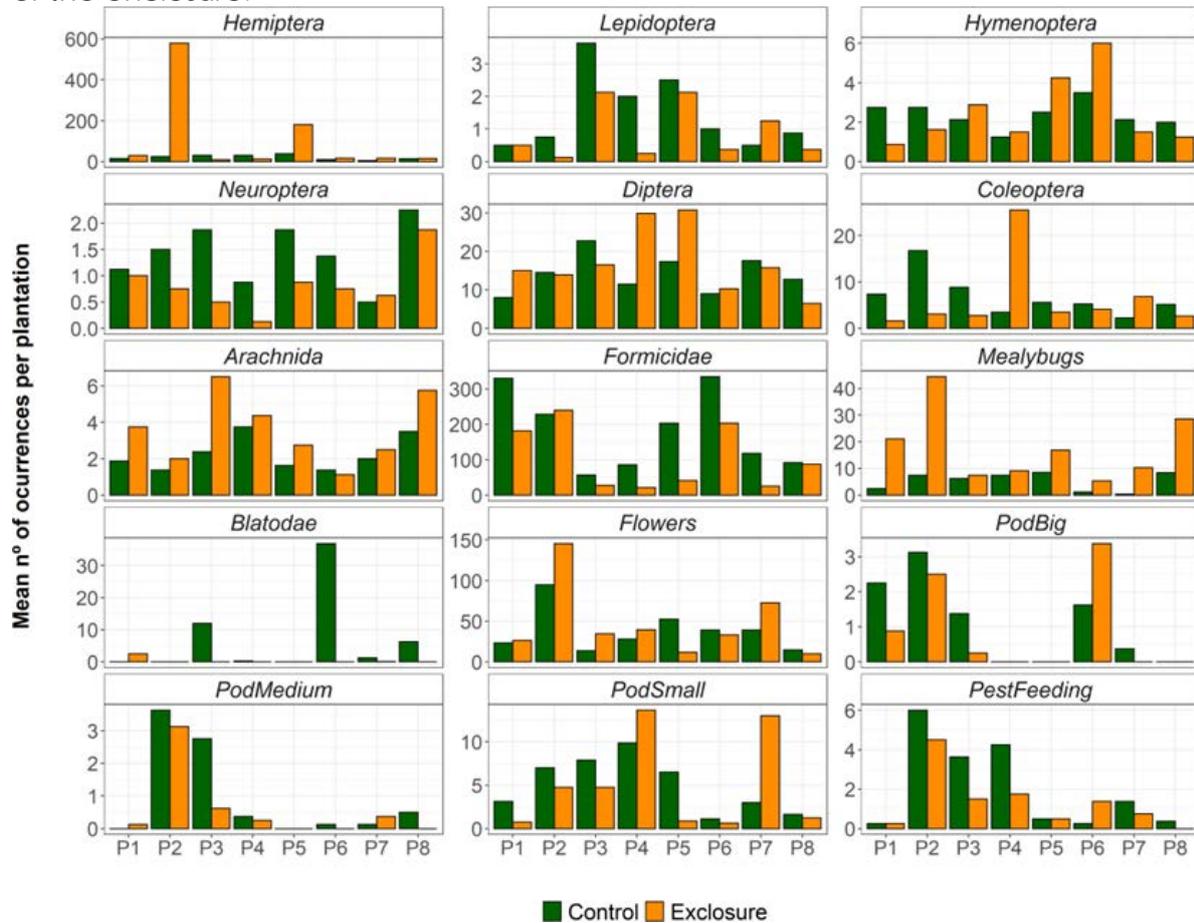


Figure 4: Mean number of occurrences of the different orders/group of insects, flowers, cacao pods (sizes vary between small, medium, and big) and pest feeding events. The eight plantations are ordered by percentage of shade (e.g. P1 represents a full-sun plantation, while P8 represents a plantation with more than 80% of shade).

### Future

- We will visit the plantations six more times, once per month until December 2020.
- Another mist-netting session will be conducted in each plantation during August 2020 (wet season).
- Harvesting of cacao pods from excluded trees and controls.
- Analysis of results
- Activity 4: Information dissemination.

