Biodiversity Monitoring in Tropical Commodity Certification Schemes

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If you have any questions/suggestions and don't know who I am – this is what I look like most of the time. Or send me an email: **at417@kent.ac.uk**

Unsustainable forestry and agriculture are major threats to tropical biodiversity. Over the next 50 years agricultural land cover in the tropics is predicted to increase dramatically. Certification schemes offer the forestry and agricultural industries an opportunity to minimise their impact on biodiversity whilst maintaining viable profit margins. The Roundtable on Sustainable Palm Oil (RSPO) is an initiative, like the Forest Stewardship Council, to produce a sustainable, environmentally friendly product. These schemes require land-owners to identify areas of High Conservation Value (HCV) and to encourage and maintain biodiversity within estates.

This calls for a cost and time-efficient system for monitoring biodiversity within production landscapes. Recent advances in technology illustrate the potential for using remote methods, such as camera-trapping and acoustic monitoring, in field ecology studies. As part of my PhD research I propose to test such methods by capitalising unique opportunity that the Stability of Altered Forest Ecosystems (SAFE) project presents.



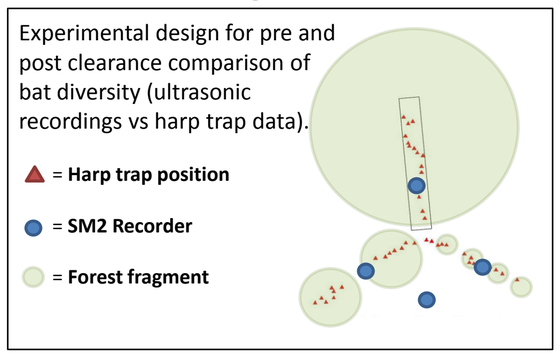

Aims

- Investigate the impact of habitat disturbance/conversion on the *soundscape* of the rainforest. Using wildlife recording equipment, sample a range of frequencies across the disturbance gradient (including old growth forest, logged forest, riparian zones and forest fragments within agricultural land).
- Assess the potential for acoustic methods to monitor biodiversity (sound-producing species, e.g. bats, birds, amphibians, insects) by comparing results with those produced by other survey methods used at the SAFE project.

Methods

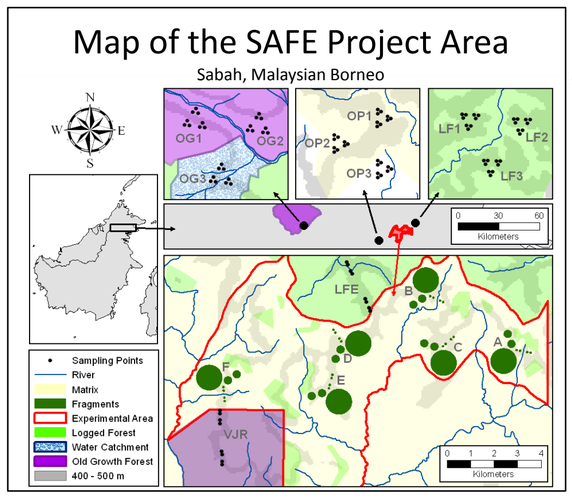
Acoustic Monitoring

- Song-Meter2 (SM2) Wildlife Recorders (Wildlife Acoustics ®) will be placed at a selection of 4th order sampling points (●) in the SAFE project landscape and left in position for two days at a time. Environmental variables taken at each point will help determine a gradient of forest disturbance.

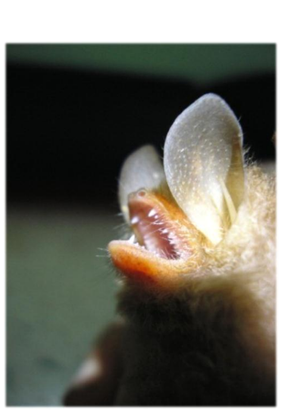


Recording Schedule:

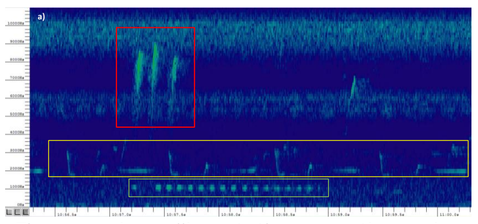
- **Daytime (Frequencies 20Hz-20KHz; e.g. birds)** 15min continuous each hour; 06:00-18:00hrs.
- **Night time (16KHz-160KHz; e.g. bats)** record when triggered by ultrasonic frequencies, such as bat echolocation calls.



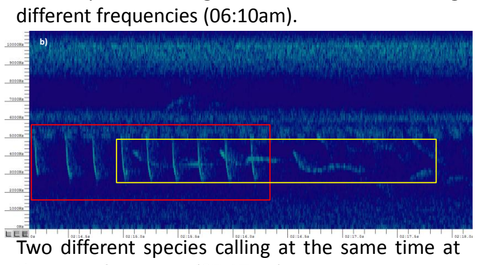


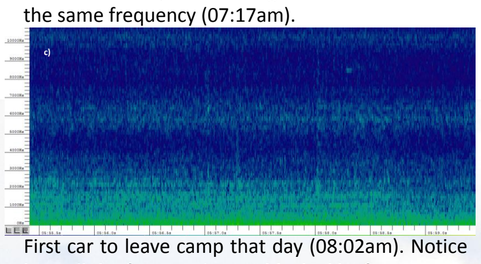
1. Day-Time Sonograms (20Hz-20KHz) SAFE Camp. 16th June 2012 (05:00am – 09:00am).



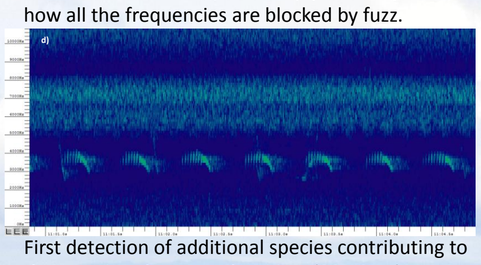
Three species calling at the same time using different frequencies (06:10am).



Two different species calling at the same time at the same frequency (07:17am).

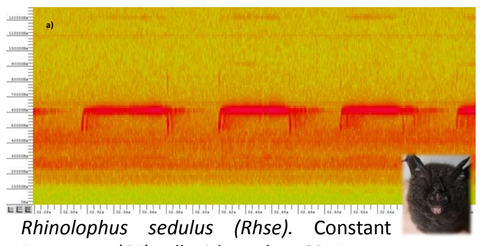


First car to leave camp that day (08:02am). Notice how all the frequencies are blocked by fuzz.

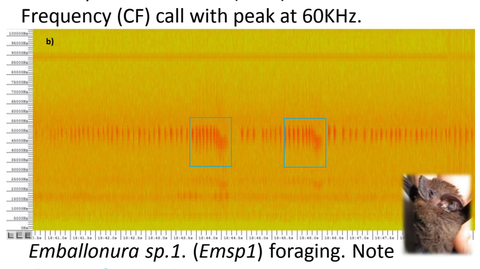


First detection of additional species contributing to the morning chorus - a late riser (08:56am).

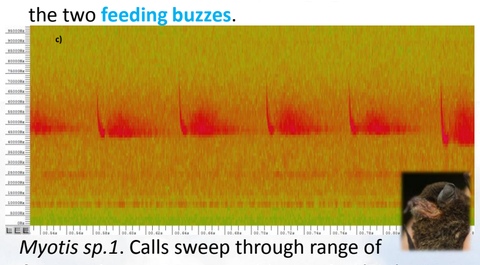
2. Night-Time Sonograms (16KHz-160KHz) at SAFE project sites April-June 2011/2012



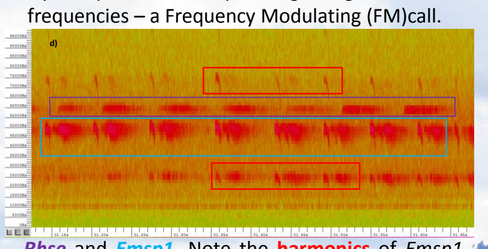
Rhinolophus sedulus (Rhse). Constant Frequency (CF) call with peak at 60KHz.



Emballonura sp.1. (*Emsp1*) foraging. Note the two **feeding buzzes**.



Myotis sp.1. Calls sweep through range of frequencies – a Frequency Modulating (FM)call.



Rhse and ***Emsp1.*** Note the **harmonics** of *Emsp1* calls – don't confuse as different species!

Sonogram Analysis

- Sonograms will be analysed using Song Scope Software (Wildlife Acoustics ®).

Species Richness

- Species will be identified from their call structure and assigned a species ID (e.g. Fig. 2a). Rarefaction will be used to estimate species-richness, which may be compared with other SAFE outputs.

Ultrasonic Frequency

- Ultrasonic night recordings are available from 15 forest (pre-clearance), *Acacia* and oil palm sites, equating to 1440night hours (3months!). Post-clearance sampling will allow for a comparison of bat activity and species-richness using acoustic and harp trap data.

Sonogram Composition

- Sonograms from *continuous* daytime recordings will be analysed in their entirety, using visual/structural methods. Species identification will not considered in these analyses.
- Sonograms from undisturbed habitats are predicted to exhibit higher levels of frequency partitioning (e.g. Fig. 1a) than in more disturbed areas (e.g. Fig. 1b).
- Frequency of sonic disturbance events will also be assessed as they can have negative affects on wildlife. Events may include human disturbance (e.g. Fig. 1c) and natural disturbance events (e.g. land-slides, tree-falls).

Other Components of My PhD

- **Explore possibilities of creating artificial roost-sites for tree-cavity dwelling species (bats, birds, frogs). Investigate the suitability of these for monitoring and enhancing biodiversity in conservation set-asides within estates.**
- **Investigate public understanding (in Malaysia and UK) of the issues surrounding oil palm agriculture. How are people affected by oil palm agriculture and how do they envision future practice?**

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