Research project of counterparts funded at IPB

Name	Counterpart	Title
Agus Priyono Kartono (RIP), **Ellena Yusti**	**B09**	Bat point counts: A new method for surveying bats

Research Summary

We have developed a new bat survey method, called bat point count, to detect, and if possible, identify all bats flying at night, analogously to bird point counts. We then compared its efficiency with established bat survey methods (mist netting and ultrasound recordings). In this study, we sampled three sites within the oil palm company estate of Humusindo, in Bungku, regency of Batanghari. Each site is sampled with each method on three different nights. We chose each site to be close (20 m) to a river and roads to maximize the likelihood of finding insectivorous and frugivorous bats. We used four 12 m nets (height 2.5 m; mesh size: 19 mm and 20 mm) for four hours starting at sunset. Nets were installed along flight ways and checked regularly every 15 minutes from sunset to 22:00. Bats identification for known species was done in the field and they were released with tags (nail polish on the claws with codes) to count re-captures. Recordings of echolocation calls for the insect-eating bats were made using flight tents and a SM2Bat+ sound recorder (Wildlife Acoustics, Massachussets, USA) with one Bio-SMX-US microphone sampling at 384 kHz sampling frequency. The harp traps were not used due to the low catch rates that we experienced in oil palm plantations in previous studies. For bat point counts, we used thermal imagery to visually detect bats, ultrasound microphones that record echolocation calls for insectivorous bats identification, and infrared photography to capture the bat morphology as a support for species identification (Figure 1 and 2). We assessed bat point counts against mist netting and autonomous ultrasound recording, which are established sampling methods, by comparing the bat species communities sampled with each method. Nine 10-minute point counts were made between sunset and 22:00, for a total sampling time of 60 minutes per plot, and each plot was surveyed equally in 3 different directions.

Figure 1. Point count methods using a thermal imagery, camera, LED lamps and song meter

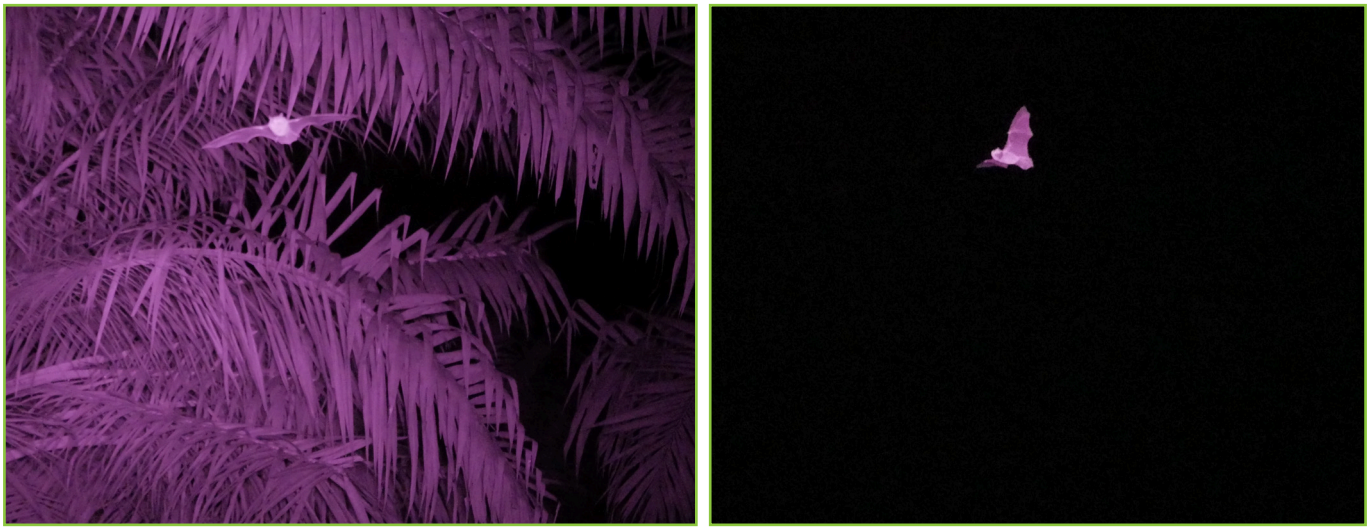

Figure 2. Infrared photography of insectivorous bats in point count methods

In all, the 3 sampling methods detected 12 species of bats in the study area and revealed the differences between bat communities according to the sampling method. A total of 83 individuals of bats were captured by mist netting in three sites during 9 nights, which are represented by six species (five genera), they are *Cynopterus brachyotis* (Müller,1838) (65 individuals), *Cynopterus minutus* (Miller, 1906) (4 individuals), *Cynopterus sphinx* (Vahl, 1797) (2 individuals), *Macroglossus minimus* (É.Geoffroy Saint-Hilaire,1810) (2 individuals), *Scotophilus kuhlii* (Leach, 1821) (6 individuals), *Kerivoula papilosa* (Temmick, 1840) (1 individual) and an unidentified *Myotis* sp.1 (1 individual). For the point count method, we detected 607 passes of insectivorous bats represented by four genera: *Scotophilus* (could be *S. kuhlii*), *Kerivoula* (could be *K. papillosa*), *Rhinolophus* (could be *R. luctus*), *Megaderma* (Could be *M. spasma*) and also one species of frugivorous bats (based on picture). In the Autonomous recordings, we detected 2014 insectivorous bat passes represented by five species that was identified based on the spectrograms. They were *Scotophilus kuhlii, Kerivoula papillosa, Megaderma spasma, Rhinolophus luctus* and an unidentified *Hipposiderus* sp. We identified the calls based on our own ultrasound recordings reference collection.

We found no detectable differences in mean richness and abundance per night between sampling methods, except for a lower mean richness with mist-netting. The abundance and richness measured from acoustic recordings and bat point counts are conservative because we still have not processed all data: many call morph types are not yet assigned to species, and the infrared pictures have not yet been analyzed to differentiate between morphologically different bats. We found that the species abundance of insectivorous bats was highest with the autonomous recording than with point count methods, but both methods only record the calls from insectivorous bats. For the point count method, we have distinguished between insectivorous and frugivorous bats based on the presence or absence of ultrasound calls and the visible flying patterns. Infrared pictures will be used additionally to support identification of bats to family, genus, or species level. The number of frugivorous bats that were detected using point counts was lower than the number of individuals captured using the mist nets. This is because the duration of point count was shorter than the mist-netting when we made 10-minute point counts in three directions between sunset and 22:00, while the nets were installed for four hours. We predicted that frugivorous bats fly low under the canopy to forage (searching for fruits and flower) and they will roost in other trees to eat. In addition, the insectivorous bats were actively foraging (searching for insects) in the air and the ground for arthropods.