Abstract

Facing the urgent challenge of fauna biodiversity loss, it is crucial to find viable and robust monitoring techniques that could ensure a reliable assessment of wildlife in a given habitat. However, due to the difficulty to access to remote areas (especially in tropical forest) and the presence of a wide range of species with different life histories and physical features, this issue can be tough to deal with.

In this study, we assessed the efficiency of two non-invasive techniques, camera traps (n = 12) and bioacoustic recorders (n = 4) to detect wildlife in 4 forest environments, including savannah forest that was previously logged (site 1), unlogged forest (site 2), post-logged forest (site 3), and forest reserve (site 4) at Bambidie, Gabon. The first objective of this study was to verify whether there was any temporal effect on the number of unique sonotypes over the study period. The second objective was to compare species richness between sites and check whether there was any significant effect of the site (site 1 to site 4) and daytime (dusk and dawn) variables on the mean number of recorded sonotypes per minute. Finally, the third objective was to compare the two technologies, in terms of the efficiency in assessing biodiversity (speed and number of species).

The results did not show any clear seasonal pattern over the study period (2.5 months). Nevertheless, there were some small temporal variations, with a maximum number of recorded sonotypes from mid-April to mid-May. This suggests a higher acoustic activity during this period, likely due to the rainy season enhancing the movement of wildlife searching for food and water.

Comparison of sonotypes/minute richness between sites showed that unlogged forest was the area where we recorded the highest amount of sonotypes per sampled minute on average, closely followed by savannah forest (site 1) and post-logged forest (site 3), whereas the forest reserve (site 4) seemed to be slightly less rich than the three other sites. However, this difference was not statistically significant. In contrast, we found a significant effect of the site variable on the mean number of insect sonotypes per minute, with a significant difference between sites 1 and 2. The mean number of insect sonotypes per minute in unlogged forest (site 2) was statistically higher than in savannah forest (site 1).

Comparison of species accumulation curves for mammals showed that 16 minutes sampled among the total amount of acoustic data gathered by bioacoustic recorders over the entire study period allowed to identify 25 mammal sonotypes, whereas camera traps managed to capture 22 different mammal species during the same timeframe while working continuously. This was probably due to the ability of bioacoustic recorders to capture sounds from distant vocalizing species, whereas camera traps could be constrained by surrounding environmental features (vegetation cover). Moreover, when looking at total accumulation curves (all taxonomic groups), bioacoustics also arouse to be more efficient than camera traps in detecting wildlife (speed, total number of species). Indeed, when considering the total amount of data collected during the study period all sites and taxonomic groups combined, it appeared that 128 sonotypes were captured by bioacoustics while only 26 different species were spotted by camera traps. The higher efficiency of bioacoustics to assess wildlife biodiversity was likely due to their wider detection range.

Keywords: bioacoustic recorders, camera traps, sonotypes, accumulation curves, biodiversity, wildlife monitoring, tropical forest.