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sensibilización a los conductores con el fin de disminuir el impacto sobre este grupo. Agradecemos la colaboración de los miembros del área de Fauna de MCS Consultoría y Monitoreo Ambiental S.A.S por la depuración de la información y la toma de fotografías y a David Castañeda por la generación del mapa de atropellamientos.

Figura 1. Distribución de los reportes de atropellamiento por especie en Colombia.Fuente: MCS CONSULTORÍA Y MONITOREO AMBIENTAL S.A.S, 2014

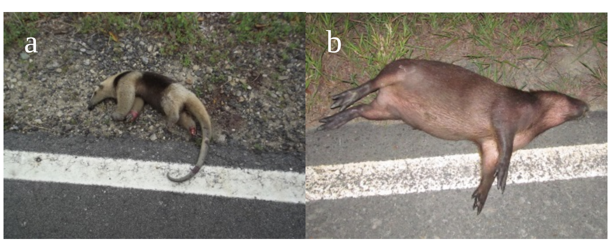

Figura 2. Individuos atropellados. A) *Tamandua mexicana* (Salamanca, 2014) y B) *Hydrochoerus hydrochaeris* (Riaño, 2013).

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Advances in arboreal mammal research techniques for tropical rainforest canopy exploration.

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Techniques for mammal research in the rainforest canopy presents a number of challenges; including difficulties accessing and maneuvering within the three-dimensional study area and thereby acquiring an adequate sample size. In addition, rainforest mammals are not evenly distributed in the canopy, resulting in stratification of species within the three dimensional environment (Grelle 2003), and all non-volant mammals are limited to the architecture of the forest (ie to the branches and other structures) – which changes spatially and temporally. Considering these physical and conceptual challenges it is no surprise that very little few studies have attempted to systematically study the arboreal environment to the same extent that we have the terrestrial. Part of the problem lies in the fact that the two-dimensional methods and models create and test on the ground have assumptions that cannot be met in a three-dimensional environment.

Terrestrial mammal studies often employ lengthy trap lines where the traps can easily be checked and maintained, and both sample sizes and trapping-hours tend to be large. Achieving large sample sizes in the canopy has proven difficult and sampling among all of the canopy strata has proven nearly impossible. Malcolm (1991) proposed an excellent method using a platform and pulley system so that climbing effort is reduced. This technique has become a standard for species inventories, but because only one or two traps are used per tree this method does not provide an adequate means of investigating how species are using the three-dimensional space within and between tree crowns (and thus stratification). Tucker & Powell (1999) have also developed new techniques for access – however such methods developed for the architecture of northern forests is not easily translated to multi-strata tropical forests. McClearn et al. (1994) and Lambert et al. (2005) have developed successful means of evaluating mammal richness by trap height, but neither of these methods adequately addressed the multi-dimensionality of life above the forest floor.

We present a three-dimensional array trapping technique from a pilot project aimed at assessing the density, diversity and distribution of non-volant mammals in a tropical forest canopy in Costa Rica (Figure 1). This original field work which initiated the development of a new technique was begun in 1994 in Rio Molinete, Costa Rica, and later piloted in Tortuguero, Costa Rica and has since been applied elsewhere with live traps and with camera traps. Please note that where the techniques presented can be used for either camera or live traps, evidence based on camera-trap avoidance in canopy mammals (Schipper, 2007) indicated that probabilities of recapture for many species may be quite low when using camera traps and thus methods should not be mixed.

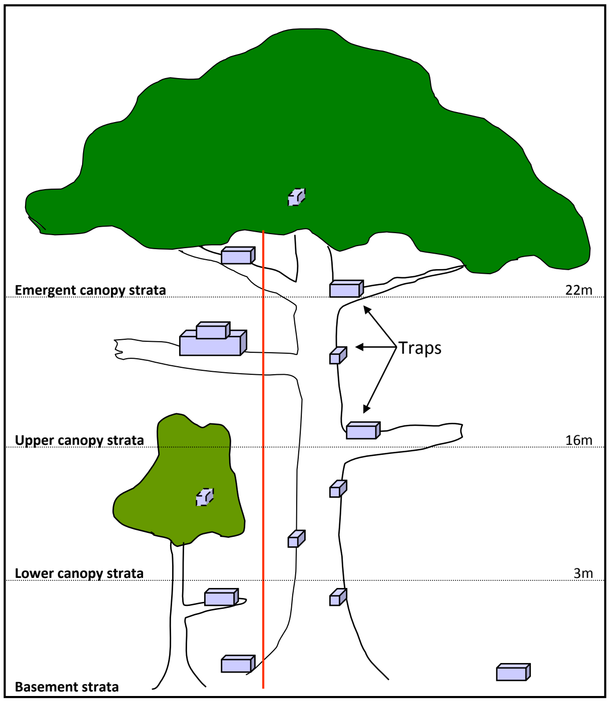

Figure 1. Three-dimensional array trapping technique, where the line descending from crown is the climbing rope (transect lines), boxes represent the various traps, and strata (on left) and height (on right) are identified.

The means of getting the original line into the canopy is varied and the most important factor to make this technique work is initially placing a line as far up in the canopy as possible. However placement of the line can be rectified during the initial ascent, when another rope is hung from the highest achievable point in the tree, so that is hangs near the main trunk and intersects as many branches along the way as possible. At this point a vertical "line transect" has been established with a fixed length, and thus every attempt is made to systematically set a trap at predetermined increments from the forest floor to the crown. Often other trees will be accessible from the transect providing additional attachment substrate. In our trials of this technique we stratified the canopy by heights using artificial cut offs based on general forest architecture, but ultimately we felt this was biased to which categorization was followed so instead we attempted to ensure equal spacing along the transect – one trap every 3 to 5 meters. In so doing we also randomly assign the trap size at each location (small, large or coupled) to ensure trap size is distributed equally. The capture data resulting from this technique, like the environment, are three dimensional and can be easily organized spatially or by height, and when combined with recapture techniques can equally be used to examine species movement patterns. We believe this new technique can further advance on canopy science, and specifically can significantly facilitate the understanding of mammal assemblages considering the complex structure of tropical forests.

Figure 2. Photograph of authors deploying a rope between trees to access the canopy between the crowns of tall emergent (Photo by Donald Perry).

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