The Bias of Bat Netting

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Most bat studies, whether on ecology, behavior, natural history, community structure, or sensory ecology, entail the capture of the animals. For the past decades mist netting has been the most commonly used and most effective technique to capture bats. Though mist netting is a common method and the presence of a 'capture-bias' is known through many anecdotal experiences and often discussed, the biases of mist netting are not well understood. Supposedly there are disparate netting biases for different bat species caused by the behavior, foraging strategy, echolocation skills, and spatial memory of the bats, as well as environmental factors such as location of the net, light conditions, precipitation, and wind. Although some species appear to be fairly well sampled by mist netting, others seem to be underrepresented. To date there are no studies addressing the problem of netting biases directly, and for the analysis of mist netting data, assumptions are often based on anecdotal information. This field season we monitored a mist net set in the understory of the tropical forest of Barro Colorado Island (Panama) with an infrared surveillance camera system for the first four hours of the night. In combination with simultaneous ultrasound recordings, we were able to classify approaching bats in different feeding guilds. The bats showed a variety of responses to the nets and only a fragment of the bats were actually caught in the mist net. Most bats that did fly into the net were able to free themselves within seconds or minutes. The results of this study provide adequate data on mist net biases for the understory bat community of Barro Colorado Island, which will make it possible to assess the abundance of bats based upon mist netting data much more accurately. In addition, the study allows us to improve our standardized mist netting procedures to assess tropical bat communities. The probabilities of different bat species being captured in mist nets, as well as the influence of light conditions, netting site, and weather on netting success, will be discussed.

Bats in Motion: Stereo Object Recognition and Trajectory Analysis of Flying Bats

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The flight activity of Brazilian free-tailed bats (*Tadarida brasiliensis*) was recorded at 60 Hz with two infrared thermal cameras in a stereoscopic configuration. The use of stereoscopic imaging made it possible to develop a number of tools for image analysis that could not have been applied to data collected with a single camera. In particular, a method was developed to reconstruct flight paths in three dimensions and calculate additional spatial information, such as distances between points in the scene. Flight characteristics such as velocity, acceleration, and turning radius were computed. The methods were tested on stereoscopic data collected from bats emerging from a cave at dusk, foraging over a cotton field, and returning to a cave at dawn from high altitude. Flight characteristics during those activities were then calculated and analyzed. The analytical tools that we developed have the potential to be invaluable for modeling the flight behavior of Brazilian free-tailed bats and their insect prey.