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ABSTRACTS

foxes in photographs. This technique provides a safe, relatively rapid and non-invasive method for monitoring flying fox camps and is particularly suitable for the study of camps that are remote and/or difficult to access.

Multivariate morphological analysis of niche partitioning between a mainland and island bat community

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The notion of "ecological niche" has been defined a variety of ways; a significant one is as a multi-dimensional hypervolume constituted by factors influencing an animal's environment and behavior. This concept of a niche may be approximated from a morphological perspective by measuring morphological features, thereby visualizing how animals in a community partition multivariate niche space. Many researchers have theorized that island communities will not be densely packed in niche space because stochastic colonization events have formed the communities. To test this hypothesis, I quantified the ecological niches of a Costa Rican bat community (mainland) and a Sulawesi bat community (island) using multivariate statistical analyses of 76 cranial and skeletal measurements. Measurements were taken using digital calipers from skins and skulls of specimens preserved in natural history museums. Data were analyzed using principal component analysis to visualize niche partitioning within the bat community and assess niche breadth and overlap. I predicted that there would be little overlap among species in both communities. In the mainland community I predicted that all of the multivariate morphological space would be optimally occupied: that is, maximal utilization of morphological multivariate niche space will lead to little or no overlap among species, but high density of those species present. In contrast, I predicted the island community would have fewer taxa that were much less densely packed. My data to date do in fact support this hypothesis. These ecomorphological data suggest that tropical mainland bat communities divide niche space—hence use their habitat—extremely finely, potentially leading to extensive and strong interactions at the community level, whereas tropical oceanic island communities were formed by stochastic colonization events.

Assesment to bat reproductive condition in two areas in Colombian coffee region: use of vaginal smears as an indicator of estral stage.

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Development and use of techniques to describe bat reproductive cycles under natural conditions are crucial for a better understanding of their population dynamics. Variables such as climate, temperature, altitude and temporal fluctuations of food availability influence reproduction seasonality. In this study, reproductive status of a bat assemblage was evaluated by describing sex proportions, male (immature, sexually active or inactive) and female reproductive stages (inactive, pregnant, lactating and post lactating) and proportion of pregnancy. In addition, vaginal smears were standardized and applied to evidence the estral stage for the first time in Colombia. Data was collected from March to May of 2006 in the Reserva Natural la Montaña del Ocaso (state of Quindío) and on January of 2007 in the Santuario de Fauna y Flora Otún Quimbaya (state of Risaralda). The identified reproductive stages

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coincided with previous reports for other studies in Colombia; moreover, a protocol was developed to perform vaginal cytologies on bats. The results showed that this non-invasive technique is easy to use, affordable and reliable to determine estral stages and describe estral cycles.

Male reproductive activity in hibernating bats indicates early male advantage.

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Reproduction in hibernating bats from the temperate zones is shaped by a highly seasonal and predictable environment. Females exhibit sperm storage and delayed ovulation. During optimal food availability in the summer, male bats produce spermatozoa in their testes, which are released to the epididymes in late summer to early fall. During this period, many species accumulate at caves and display swarming behavior. In order to investigate interspecific differences in annual activity patterns, we mist netted bats during their active season at a cave over three consecutive years. Additionally, we measured testis and epididymis sizes and thereby assessed the progress of male reproductive status in four sympatrically occurring species. We found no variation in spermatogenic timing over the years within species, indicating consistent annual male reproductive seasonality. However, we observed marked deviations in the annual spermatogenic timing of almost two months between species. As a general pattern, all four species underwent maximal spermatogenic activity shortly before females abandoned their nursery colonies. Afterwards, males and females met at the cave and displayed swarming behavior. Within this period, epididymes reached their greatest volumes and regressed considerably until the end of the swarming period. We argue, that female availability rather than climatic and nutritional factors triggers the male spermatogenic timing. Furthermore, we conclude that the swarming period constitutes the main mating period and later copulations are less important. Due to the close matching of male reproductive activity and early female availability, we propose that the mating system and reproductive timing in these species is governed by an early male advantage within a regime of intense sperm competition.

Functional wing morphology in phyllostomid bats and its relation to feeding habits, foraging strategies, and forest types using Relative Warp Analysis.

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Wing morphology places energetic and mechanical limitations on where and how a bat forages efficiently. Wing shape determines generation of thrust and maneuverability whereas size (wing area and wingspan) determines lifting capacity. Consequently, differences in wing morphology are expected to reflect differences in flight performance and foraging behavior. We studied wing shape of 41 species of phyllostomid bats. We took 3 digital pictures of the right wing of each individual from every species captured and measured 11 aerodynamic parameters: arm and hand wing length, arm and hand wing area, wingspan, total wing area, aspect ratio, wing loading, wing length and area ratio, and wing tip shape. We subsequently digitalized 19 homologous landmarks on the wing pictures in



Functional groups of bats associated to natural and transformed systems in the Colombian coffee ecorregion

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In the Eje Cafetero Region (Colombia), aprox 20% of the natural forest persist as immerse fragments of the productive systems dedicated to agriculture and cattle raising. The changes in the functional role of bats will depend on the nature of the matrix surrounding the fragments and the present vegetation coverage. The structure and the assemblage composition of bats are described in natural and transformed environments (regional productive systems of extensive cattle raising for meat and/or milk) in Risaralda and Quindío (Colombia, South America) (2005-2006). The type of vegetation cover (forest, gradual, high grasses, shade coffee plantation and perennial crop) was considered. Mist nets at different heights were used. The forests showed the most amount and richness in species, followed by guaduales, crops and high grasses. Complementariness was low on forest, but high on crops and high grasses. The greatest variety of functional groups was found on forests. Pollinators were more abundant on the coffee plantations; in the grasses only seed dispersers were found. The structure and composition of assemblage is simplifying locally. The increase in the complementariness on a regional level reflects that the functional groups have very concerning differential answer to the type of vegetation cover present.

A novel behaviour of depositing masticated plant materials inside tent roosts in the fruit bat *Cynopterus sphinx* (Chiroptera: Pteropodidae), in southern India

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We observed deposited plant materials inside palm roosts of the tent-making bat *Cynopterus sphinx* in and around Madurai, Tamil Nadu, India. Herein, we describe a new behaviour of depositing masticated green plant materials on the interior of the palm tents. Our observations and videography revealed that typically only males deposit masticated green plant materials on the interior of their roosting tents. Males T7 and T3 spent 6.4 ± 0.6 h ($n=8$ nights) and 5.8 ± 0.7 h ($n=6$ nights) respectively in the new tents that were being constructed by them and spent 0.74 ± 0.2 h and 0.56 ± 0.1 h in licking the interior of the tent and 3.8 ± 0.6 h and 4.4 ± 0.4 h for foraging, respectively. Though both these males were observed to lick the interior of the new tents being constructed, no obvious markings were observed during this study. Further observations on other males revealed that they deposited plant materials. T2 and T27 spent more than 60% of the time (T2: 6.7 ± 0.9 h, $n=9$ nights; T27: 6.4 ± 1.3 h, $n=10$ nights) inside the tent interspersed with many short foraging bouts. The number of foraging bouts per night varied from 12 to 41 and each foraging bout varied from 28 s to 48 min. T2 and T27 spent 0.8 ± 0.3 h and 0.65 ± 0.2 h in actively depositing the plant material inside the tent and 4.0 ± 0.6 h and 4.2 ± 0.5 h in foraging, respectively. We identified the fruit rind of the 'wild lime', *Atalantia monophylla* (Rutaceae) as one of