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Skull Shape Divergence Across Three Species of Louisiana Bats

Niche partitioning is an evolutionary process that defines community structure and regulates the co-existence of species that live in sympatry. One fundamental aspect of niche partitioning is resource use, specifically the partitioning of food resources. We conducted geometric morphometric shape analyses comparing the crania and mandibles of three ecologically similar species of vespertilionid bats in Louisiana and Mississippi (*Lasiurus borealis* (n = 72)*, L. seminolus* (n = 22)*,* and *Nycticeius humeralis* (n = 81)) to quantify intraspecific and interspecific skull shape divergences, and better understand the potential influence of skull shape on niche partitioning of diet. Previous work has suggested differences in diets across the species' ranges, but generally that all species share ecologically similar dietary niches. We divided our data into intraspecific and interspecific analyses. To address potential dietary divergence within species, we measured differences in crania and mandible shape as is related to sexual shape dimorphism and size dimorphism in each species individually. For such ecologically similar species, we expected that after accounting for differences in size, there would be minimal sexual shape dimorphism. In our interspecific analyses, we examined whether the three species share similar skull shapes coincident with their proposed similar dietary niches. We predicted that *L. borealis* and *L. seminolus*, which have been found previously to not separate based on cranial measurements would have substantial morphospace overlap, but that all three species would be quite similar due to their similar diets. For our intraspecific analyses, we found that sexual size dimorphism was observed in all species as female skulls were larger than males, though sexual shape dimorphism was not a strong component of cranial shape variation. After parturition, juvenile bats typically stay with their mother until they are weaned, and the female must fly while holding the juveniles. Thus, sexual size dimorphism is commonly found across a wide variety of bat species whereby the female is the larger sex. In our interspecific analyses, we observed considerable overlap in the cranial shape of two species (*L. borealis* and *L. seminolus*) in all configurations. In contrast, *N. humeralis* cranial configurations were entirely distinct in shape from the other two species, although mandible shape separation was observed to be less distinct among the three species. This may be an example of many-to-one mapping where there are multiple solutions (e.g., different skull shape configurations) that evolve to solve the same problem (e.g., eating the same diet). This work is a first step in better understanding the morphological diversity of bats that live in sympatry in the southeastern United States. Future work will be done using species distribution modeling to examine to what degree these three bat species overlap in their ranges and whether they likely forage in the same regions in the southeast.