Effects of temperature during non-breeding months on size of three species of sparrow

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Earth's climate has warmed at an average rate of 0.17°C (0.31°F) per decade since 1970, and many scientists question how birds might adapt to this temperature change. Vertebrate body size likely has been associated with temperature based on two prominent hypotheses. Bergmann's rule states that body size is larger in cooler climates because larger-bodied animals are better able to maintain stable internal temperatures. Allen's rule states that appendages are smaller in cooler climates to decrease the amount surface area to lose heat. We hypothesize that as temperatures increase, body mass will decrease and wing chord will increase. We captured 932 swamp sparrows, 794 song sparrows, and 373 field sparrows at Panola Mountain State Park, in Stockbridge, GA between 2007-2017. We recorded the hatch year by back-calculating from age at capture, body mass, and wing chord length. We compared these measurements to the average temperature during non-breeding months at Panola Mountain, obtained from the National Oceanic and Atmospheric Administration database. Swamp sparrows born in warmer years were smaller in eight out of the nine years, as predicted by Bergmann's rule. Similarly, Swamp sparrows born in warmer years had larger wing chords in eight out of nine years, as predicted by Allen's rule. Neither Song sparrow nor Field sparrow mass or wing chord length were associated with temperature in any years. Our study shows that Swamp sparrow size may be affected by the temperature during their first winter and may be more susceptible to climate changes than other sparrow species.

Key Words:
Climate change, Bergmann's rule, Allen's rule, Temperature, Swamp sparrow, Conservation