

Young and adult Song Sparrows will respond differently to climate change

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Climate change scientists have predicted dramatic shifts in species' ranges in response to climate change, but models of species distributions reveal little about how these shifts will occur or how climate change will affect individual populations. How will changing weather patterns affect reproduction and survival rates? The answer to this question is complex because the effects of weather may depend on the season, and may differ between adults and young. Further, weather may have direct effects on survival, such as by causing heat stress, as well as indirect, delayed effects, such as by affecting plant growth, which eventually impacts food availability. To successfully include multiple effects of weather, throughout the year, on multiple age groups requires extensive long-term data, such as the data collected at the Palomarin Field Station.

We used over 30 years of Song Sparrow banding data and daily weather data to examine how multiple direct and indirect weather factors affect adult and juvenile survival rates. The local subspecies is non-migratory, so we were able to examine the effects of weather on survival throughout the year. We found that adult survival was highest in years with relatively warm,

dry winters, reflecting a direct negative effect of cold, wet winters. However, juvenile survival was highest in the years *after* cold, wet winters, reflecting an indirect effect of wet winters on plant growth.

In the Mediterranean climate of coastal California, wet winters promote plant growth, which in turn promotes insect abundance, both of which are important food sources for young birds still learning how to forage.

Because climate scientists project significant increases in winter temperatures and fewer wet winters, we projected a 12-17% increase in average adult survival, but a 4-6% decrease in average juvenile survival, resulting in a net increase in the population's growth rate. Our results underscore the importance of examining multiple effects of weather on all age groups to gain a deeper understanding of the specific ways climate change may affect wildlife populations, which can in turn inform climate change adaptation strategies, help prioritize future research, and identify where conservation resources will be most effectively spent.

Main Points

A deeper understanding of the specific ways climate change effects individual wildlife populations is important to developing effective conservation plans in the context of climate change.

We examined effects of weather throughout the year on adult and juvenile survival in a Song Sparrow population, and found that weather affected each age group differently.

We expect adult survival to increase by about 15% and juvenile survival to decrease by about 5% by 2100 due to climate change effects, resulting in a net increase in the population's growth rate.

Dybala, K.E., J.M. Eadie, T. Gardali, N.E. Seavy, and M.P. Herzog. 2013. Projecting demographic responses to climate change: adult and juvenile survival respond differently to direct and indirect effects of weather in a passerine population. *Global Change Biology* 19:1584-1593.

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