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ABSTRACT

CLIMATE-DRIVEN DYNAMICS OF BIRD POPULATIONS: PROCESSES AND PATTERNS

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In a world where the climate is now rapidly changing many important ecological processes will be affected. A challenge to population ecology as a predictive science will be to develop reliable predictions for the ecological impacts of these expected changes in climate. Reviewing a large number of recent quantitative studies of the impacts of climate variation on bird population dynamics in space and time, some surprisingly clear patterns emerge. After accounting for other factors affecting changes in population size such as density dependence and demographic stochasticity, we show climate variation generates specific footprints in the population dynamics of many bird species that will ultimately affect their viability. The robustness and generality of these dynamical fingerprints are likely to be high because they are well supported by general conclusions from stochastic population theory. Because the characteristics of these climate-induced footprints show large inter-specific variation, some species with particular life history traits will be more sensitive to climate changes than others. For instance, species at the slow end of the slow-fast continuum of life history variation seem especially vulnerable. Our analyses also show that both local climate and large-scale climate phenomenon such as the North Atlantic Oscillation (NAO) can induce a common footprint in avian population fluctuations that can be visible over large geographical areas. However, the characteristics of this footprint in space are different from the spatial scaling of the underlying climate driver due to the other factors affecting the population fluctuations. These patterns show that stochastic population theory can have wide applicability for developing reliable predictions of the ecological impact on bird populations of future changes in the climate.

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