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Dispersal Limits and Climate-driven Range Shifts: an Integrodifference Equation Perspective

Climate change is causing many species to shift their ranges poleward in latitude or upward in elevation. For species with limited dispersal abilities, we naturally ask: can they keep up with climate change? How do their growth and dispersal affect their abilities to keep up with the change? In our attempt to assess the impact of climate change on population persistence, we analyze an integrodifference equation with shifting integral limits that combines growth, dispersal, and a constant-speed shift in habitat. In this talk, I will show that, for our model, the population exhibits range shifts for small shifting speeds. On the other hand, if the habitat shifts faster than a critical speed, the population goes extinct. I will also demonstrate how to use our model by applying it to an endangered butterfly species, and illustrate how the critical shifting speed depends on the net reproductive rate, the mean dispersal distance, and the shape of the dispersal kernel.