

# A unified evolutionary framework for understanding parasite infection and host migratory behavior

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## Abstract

Animal migration impacts organismal health and disease transmission: migrants are simultaneously exposed to parasites and able to reduce infection at the population and individual levels. However, these dynamics are difficult to study; empirical studies reveal disparate results while existing theory makes assumptions that simplify natural complexity. Here, we systematically review empirical studies of migration and infection across taxa, highlighting key gaps in our understanding. Next, we develop a unified evolutionary framework incorporating different mechanisms of parasite-migration interactions while accounting for ecological complexity that goes beyond previous theory. Our framework generates diverse migration-infection patterns paralleling those seen in empirical systems, including partial and differential migration. Finally, we generate predictions about which mechanisms dominate which empirical systems to guide future studies. Our framework provides an overarching understanding of selective pressures shaping migration patterns in the context of animal health and disease, which is critical for predicting how environmental change may threaten migration.

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