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Body Condition Dependent Dispersal in a Heterogeneous Environment

Body condition dependent dispersal is a widely evident but barely understood phenomenon. Empirical data display diverse relationships between individual body condition and dispersal between as well as within species.

I develop models that study the evolution of dispersal strategies that depend on individual body condition. In a patchy environment where patches differ in environmental conditions, individuals born in rich (e.g. nutritious) patches are on average stronger than their conspecifics that are born in poorer patches. Body condition (strength) determines competitive ability such that stronger individuals win competition with higher probability than weak individuals. Individuals compete for patches such that kin competition selects for dispersal. Survival probability during dispersal may depend on body condition.

I determine the evolutionarily stable strategy (ESS) for different ecological scenarios. In a fixed environment, patches are abandoned that are too unsafe or that would not produce enough successful dispersers in the future so that all offspring disperse from these patches. In a fluctuating environment where patch qualities change randomly from year to year, all patches are equally worth keeping so that all families keep the same competitive weight in their natal patch and disperse the rest.

From families that invest in both retaining their natal patch and gaining other patches through successful dispersers, offspring with the highest survival probability during dispersal disperse whereas individuals that are less suitable for dispersal defend their natal patch. However, this clear within-family pattern is often not reflected in the population-wide body condition distribution of dispersers or non-dispersers. This may be an explanation why empirical data do not show any general relationship between body condition and dispersal.

When all individuals are equally good dispersers, then there exist equivalence classes of dispersal strategies that are defined by the competitive weight that remains in a patch. An equivalence class consists of infinitely many dispersal strategies that are selectively neutral. This provides an explanation why very diverse patterns found in body condition dependent dispersal data can all be equally evolutionarily stable.

References

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