

Individual trajectories and population dynamics shape life history of Atlantic salmon

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Animals from all major animal taxa set out every year on a journey between habitats. For instance, individuals of Atlantic salmon migrate between freshwater (breeding habitat) and seawater (non-breeding habitat). The switch between habitats has enormous consequences for individual life history trajectories such as diet shift, changes in energy storage, growth rate and survival rates. Life–history variation within a species occurs in several taxa, however few examples are comparable with the enormous variation present in Atlantic salmon. We investigate how the interaction between individual trajectories and population dynamics affects individual life–history traits. To address this question we studied three ecological factors that affect individual trajectories: reduction in survival and food availability in the non-breeding habitat and high cost of migration. The effect of these factors on the population dynamics was determined using a size-structure population model. We found high variation in life history traits such as growth rate, fecundity rate and age at first spawning, which can be explained through different mechanisms. Growth rate of psmolts depends on the intensity of competition in the breeding habitat, so it is affected by the three factors. Fecundity rate is mainly dependent of the growth rate of psmolts and the change in food abundance during the habitat switch. Lastly, the age at first spawning depends on the growth rate of psmolts and the cost of migration. Our model explains the high variation in life–history traits present in Atlantic salmon arising from the interactions between individual trajectories and population dynamics.

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