Evolution of foraging behavior in Drosophilid larvae MARTA RIVERA-ALBA, MAYANK KABRA, KRISTIN BRANSON, Janelia Research Campus, HHMI, CHRISTEN MIRTH, Instituto Gulbenkian de Ciencia — Drosophilids, like other insects, go through a larval phase before metamorphosing into adults. Larvae increase their body weight by several orders of magnitude in a few days. We therefore hypothesized that foraging behavior is under strong evolutionary pressure to best fit the larval environment. To test our hypothesis we used a multidisciplinary approach to analyze foraging behavior across species and larval stages. First, we recorded several videos of larvae foraging for each of 47 Drosophilid species. Then, using a supervised machine learning approach, we automatically annotated the video collection for the foraging sub-behaviors, including crawling, turning, head casting or burrowing. We also computed over 100 features to describe the posture and dynamics of each animal in each video frame. From these data, we fit models to the behavior of each species. The models each had the same parametric form, but differed in the exact parameters. By simulating larva behavior in virtual arenas we can infer which properties of the environments are better for each species. Comparisons between these inferred environments and the actual environments where these animals live will give us a deeper understanding about the evolution of foraging behavior in Drosophilid larvae.

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