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Genetic bases of collective decisions in Drosophila

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Fruit flies (*Drosophila melanogaster*) hatch and feed collectively in a single host fruit during their entire larval development. Larvae exhibit two distinct foraging strategies attributed to variations in a single polymorphic foraging gene: the 'rovers' (forR/R) cover larger distances and are more likely to leave a food patch, whereas the 'sitters' (forR/s) cover smaller distances and stay longer in patches. Sitter-like behaviour can be obtained in mutants lines 'S2' by knocking down the expression of forR in individuals with a rover background. These two behavioural phenotypes occur at stable frequencies of 70% rovers and 30% sitters in wild populations and are maintained through frequency-dependent competitive advantages over food acquisition. Here we investigated whether and how these behavioural differences at the individual level affect higher-level phenomena such as collective foraging decisions. Using different arrangements of artificial food patches in agar-based arenas and automated video tracking systems, we conducted a series of laboratory experiments to compare the foraging behaviour of individuals and groups of sitters, rovers and S2s. At the individual level, rovers were more efficient in finding foods with an optimal ratio of protein to carbohydrate than sitters, but did not stop feeding for long. At the collective level, however, sitters showed higher tendencies to follow each other and to form feeding aggregations than rovers. These preliminary results suggest that variations in the proportions of rovers and sitters within *Drosophila* populations mediate variations in the amplitude, speed and accuracy of collective foraging decisions through a subtle combination of exploration and social attraction. Specific ratios of rovers and sitters might be adaptive in different nutritional environments.