OR024

Fruit flies in the nutrient space

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Animals select foods and eat them in appropriate amounts in order to maintain physiological states maximising growth and reproduction. These nutritional strategies have profound impacts on the physiology, behaviour and fitness of individuals, and thus affect the ways individuals interact within groups and societies. Social insects, for instance, have evolved extreme levels of nutritional interdependence in which food collection, processing, storage and disposal are performed by different individuals with different requirements. This raises the fundamental question of how nutrient regulation is achieved at multiple organizational levels, by individuals and groups. Here I will discuss how a gregarious insect, the fruit fly (*Drosophila melanogaster*), solves these nutritional trade-offs through collective foraging decisions. I will describe a series of laboratory experiments in which adult flies were observed foraging on chemically defined foods with controlled ratios of protein to carbohydrate. When flies were given a choice between a nutritionally balanced and several nutritionally unbalanced foods, groups made faster and more accurate decisions than individuals. In the presence of several complementary foods, grouped flies balanced their diet collectively by simultaneously switching from food to food, ultimately leading to complex spatio-temporal group dynamics. Agent-based models integrating the concepts of the Geometric Framework for nutrition help unravelling the mechanisms of these collective strategies. These preliminary results in ‘simple' insect groups provide a framework to further explore the role of nutrition as a potential organizer of social life in a wider range of species and social systems.