Project title: Diet, sex and pathogens: Within- and between-generational effects on life history trade-offs in *Drosophila*

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Background: How the trade-off between life history traits shapes their evolution is one of the central themes of evolutionary biology. Environment variation plays a key role in determining the outcome of these processes. In particular, variation in the nutritional environment has received much attention. However, the majority of research to date has focussed on one particular aspect of the nutritional environment, the amount of energy available. More recent research suggests that variation in other aspects of the nutritional environment, such as the relative amounts of the major macronutrients protein, carbohydrate and lipid may also be important. Theory predicts that other variables such as sex and environmental stressors such as pathogen exposure should alter how the nutritional environment affects life history trade-offs. Finally, the environment of the parents is known to have important consequences for the resolution of trade-offs between life history traits in offspring. This PhD project will investigate the effect of variation in the nutritional environment, sex, pathogen exposure and the maternal environment on variation in life history traits and the resolution of trade-offs between life history traits using *Drosophila melanogaster* as a model organism.

Drosophila melanogaster in the wild. ©Darren Obbard

Key research questions: How does variation in macronutrient composition influence the trade-off between life history traits such as survival and reproduction? Does this effect vary between the sexes and when exposed to environmental stress such as pathogens? Does variation in the nutritional composition of the environment of the parents influence life history trade-offs in offspring?

Methodology: These questions will be investigated by rearing *Drosophila melanogaster* on diets that vary in macronutrient composition and assaying life history traits such as survival and reproduction under different environments. Experiments in the first year will involve rearing males and females on different diets and under different social and pathogen exposure environments and assaying life history traits. In the second year experiments will manipulate the nutritional environment of male and female flies and then allow them to reproduce. Offspring from these flies will then be assayed for life history traits in various environments to look at the interaction between parental and offspring environment on life history traits and trade-offs. The third year will involve experiments that investigate the mechanisms by which parental effects on offspring are transmitted.

Training: A comprehensive training programme will be provided comprising both specialist scientific training and generic transferable and professional skills. More specifically students will receive training in the design, implementation and analysis of complex multi-generational experiments. Students will also receive training in the care and maintenance of experimental animals and in the measurement of numerous behavioural, physiological and life history traits.

Requirements: Candidates should possess at least a 2-1 hons degree or its equivalent in a biology related subject and a strong interest in evolutionary ecology or related disciplines. Ideally candidates would be able to demonstrate experience in research in a relevant field and show strong evidence of independent thinking. This project will involve large scale experiments that will require good time management and planning skills. Training in statistical analysis will be provided but previous experience with large scale life history or behavioural experiments and their analysis would be a benefit.

References: Project summary (30 words): This project will investigate the effect of diet on the resolution of life history trade-offs in *Drosophila*, how this varies across environments and any cross-generational effects.