iCASE Project / AY 2026 -2027

Genetic basis for improvement of the black soldier fly

Project Reference: ICS-ZOO-CJ26

Supervisor: Professor Chris Jiggins (cj107@cam.ac.uk)

Department/Institute: Zoology

Website: https://www.heliconius.zoo.cam.ac.uk/

Industrial Partner: Beta Bugs

Main BBSRC strategic theme: Bioscience for sustainable agriculture and food

Secondary BBSRC strategic theme: Understanding the rules of life, Bioscience for renewable resources and clean growth

Project outline:

By feeding on organic waste biomass, such as food, agricultural and manure wastes, BSF larvae are capable of converting waste biomass into a sustainable and renewable source of sought-after nutrients – BSF larvae are rich in lipids and proteins, and BSF larvae-derived meals are effective feedstuffs for a range of commonly farmed livestock species ranging from poultry to farmed fish. We have obtained a high quality assembly of the BSF genome. However to improve the BSF for economic purposes we need to characterise genetic variation in economically relevant traits. This project aims to identify genes underlying traits such as growth rate and egg production, and to use artificial selection to drive trait improvement.

The BSF is genetically diverse with high divergence between strains derived from different populations around the world. However little is understood about this variation - do these strains harbour genetic variation that could be useful for domestication purposes. The project will characterise variation in economically relevant phenotypes among strains of the BSF derived from around the world and their performance on different food substrates. Using GWAS or crossing experiments we will aim to identify the genetic basis for variation between families and/or strains in their ability to feed on different substrates. This will contribute to understanding the genetic basis for phenotypic and genetic differences between strains of the BSF. The project could also use artificial selection followed by resequencing to identify genes underlying economically relevant traits. In summary this project will look at evolutionary change and genetic diversity in an economically important organism.

The student will rear flies and conduct selection and performance experiments. They will extract DNA and perform genome sequencing and bioinformatic analysis. The project will involve training in rearing and experimental techniques, genomics and bioinformatic analysis. This will include formal courses offered by the University as well as informal training in the laboratory and from the industrial partner, which has considerable experience and expertise in these areas.