



**Beta Bugs Ltd.**



Biotechnology and  
Biological Sciences  
Research Council



**Accelerating black soldier fly genetic improvement through  
automated high-throughput trait measurement and  
collaborative innovation**



**Beta Bugs** is an innovative insect-genetics company developing and distributing genetically enhanced breeds of the Black Soldier Fly (BSF) to help the insect-farming sector increase productivity through selective breeding and high-throughput technologies. By improving key traits in BSF eggs and larvae, the company supports sustainable protein production for animal feed while reducing reliance on imported soy and fishmeal. Their targeted genetic programme aligns with the circular-economy and agri-food innovation goals in Scotland and internationally.

Located at the Roslin Innovation Centre, the company benefits from a collaborative ecosystem that enables them to scale their genetic improvement programmes effectively.

The insect-farming sector faces a major challenge in generating accurate, high-throughput trait data needed to drive effective genetic improvement in Black Soldier Fly populations. Traditional manual counting and weighing of larvae and pupae are extremely time-consuming, labour-intensive and prone to variability, limiting the precision of selection decisions and slowing genetic progress. Without automated, standardised measurement systems, breeding programmes struggle to maintain consistent population sizes or reliably compare performance across families. This creates barriers to faster genetic gain, delays product improvement and restricts the sector's ability to supply high-quality, sustainable insect protein at commercial scale.



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Enabled by the Campus Innovation Award, this high-throughput trait-measurement system project to enhance Beta Bugs' data-driven Black Soldier Fly breeding programme whilst strengthening collaboration with academic partners at the Roslin Institute. Beta Bugs implemented automated counting and weighing of pupae—a time-sensitive and critical step central for accurate genetic evaluation. This new system enabled a shift from variable to fixed population sizes, improving the precision of performance comparisons and increasing confidence in the selection outcomes.

The collaboration with Roslin provided access to academic expertise, breeding simulation tools and expanded research engagement, including MSc and PhD involvement. Early proof-of-principle results demonstrated major gains: early-stage sorting significantly reduced labour requirements and the accuracy of both family-level and within-family selection increased considerably. The project also generated a large, high-resolution phenotypic dataset to refine breeding-programme models and support research into sex-based weight prediction.

Overall, the project has accelerated Beta Bugs' genetic-improvement pipeline, reduced time to market for enhanced lines, and laid the groundwork for integrating phenomics tools into future programmes. It has also strengthened long-term R&D collaboration with the Roslin Institute, positioning the company for continued innovation in sustainable insect breeding.



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“The Campus Innovation Award enabled us to develop high-throughput measurement tools that fundamentally improve our breeding programme. This support accelerated our genetic progress and strengthened our collaboration with world-class researchers at the Roslin Institute.”

*Thomas Farrugia, CEO and co-founder of Beta Bugs Ltd*