

Comparative transcriptomics of Venus flytraps during various stages of prey capture & digestion

Summer Rose Blanco¹, Jeremy D. Rentsch², Jim H. Leebens-Mack¹
University of Georgia¹, Francis Marion University²



UNIVERSITY OF
GEORGIA

Background



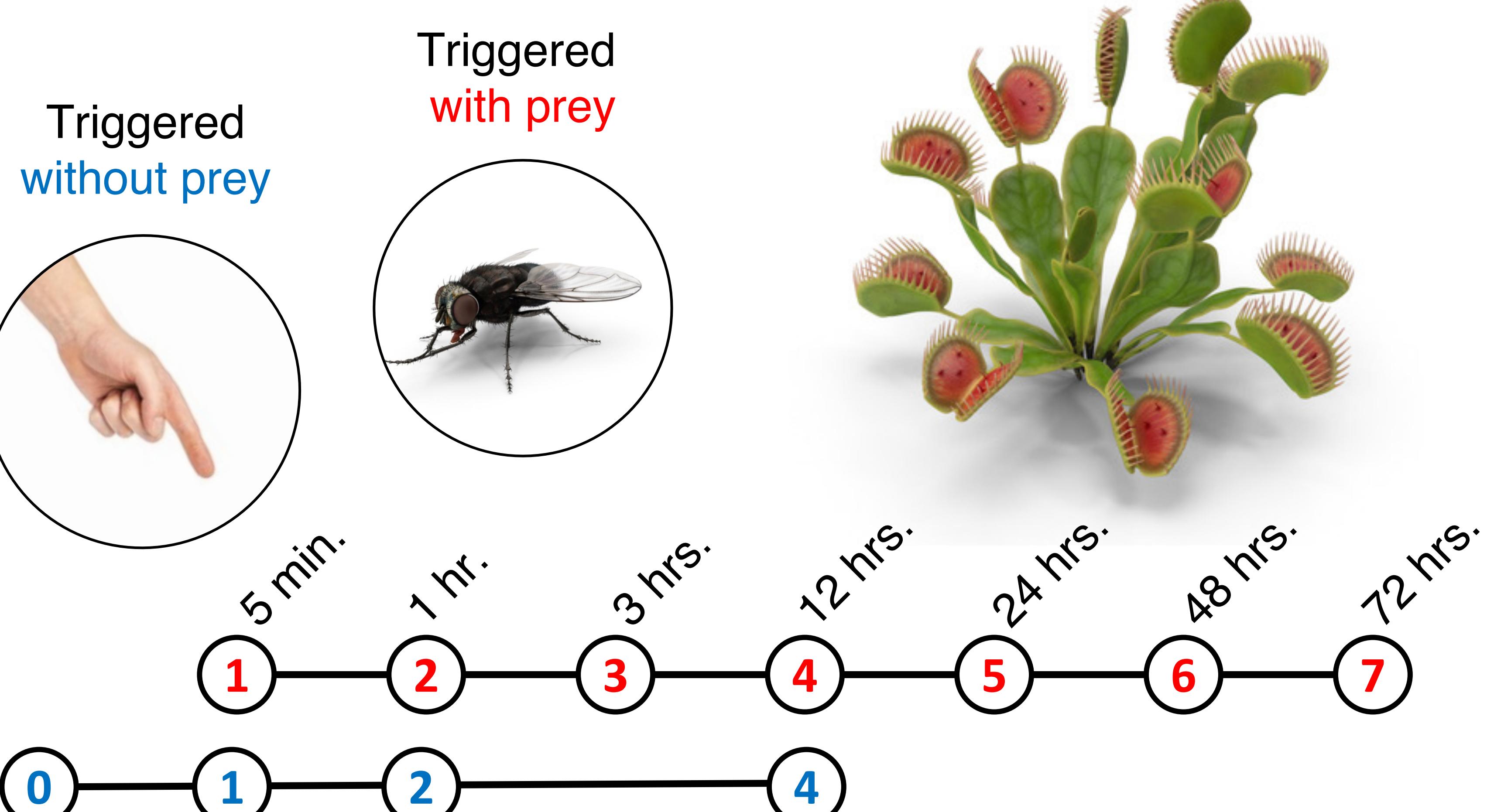
- Plant carnivory evolved independently at least 6 times as an adaptation to nutrient-poor soils¹
- Venus flytrap, *D. muscipula*, has trigger hairs that can distinguish between prey or “false positives”¹
- Venus flytrap creates an air-tight seal to trap prey, then releases a cocktail of digestive enzymes¹

We present the results of a comparative transcriptomics (RNA-seq) experiment where we sampled 48 traps at various stages of prey capture, digestion, and “false positives”

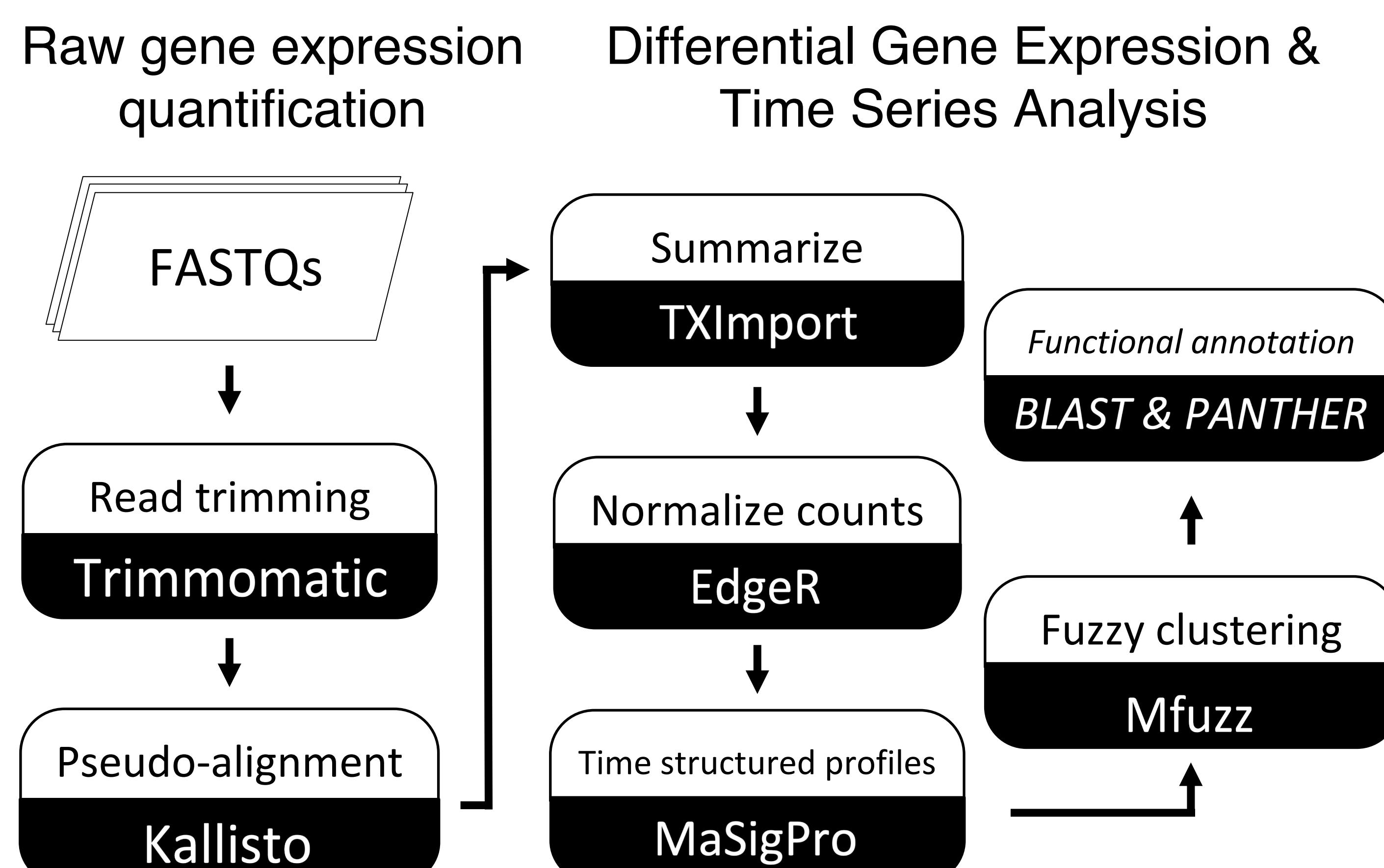


Methods

Sampling design



RNA-seq workflow

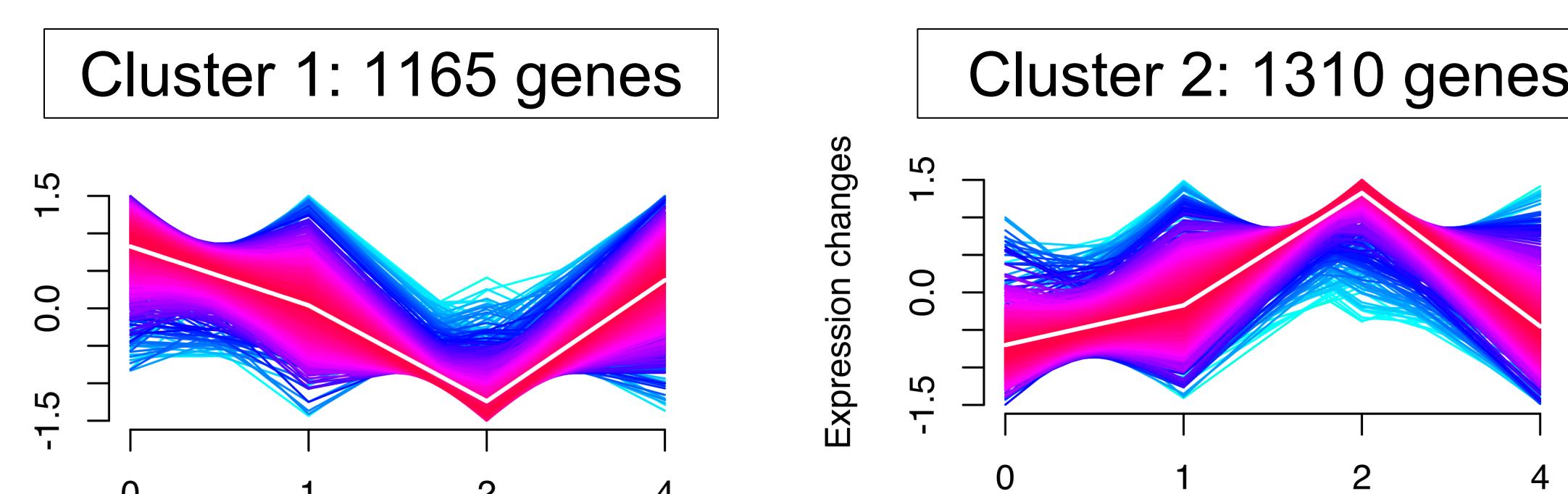


Results

Time structured expression profiles

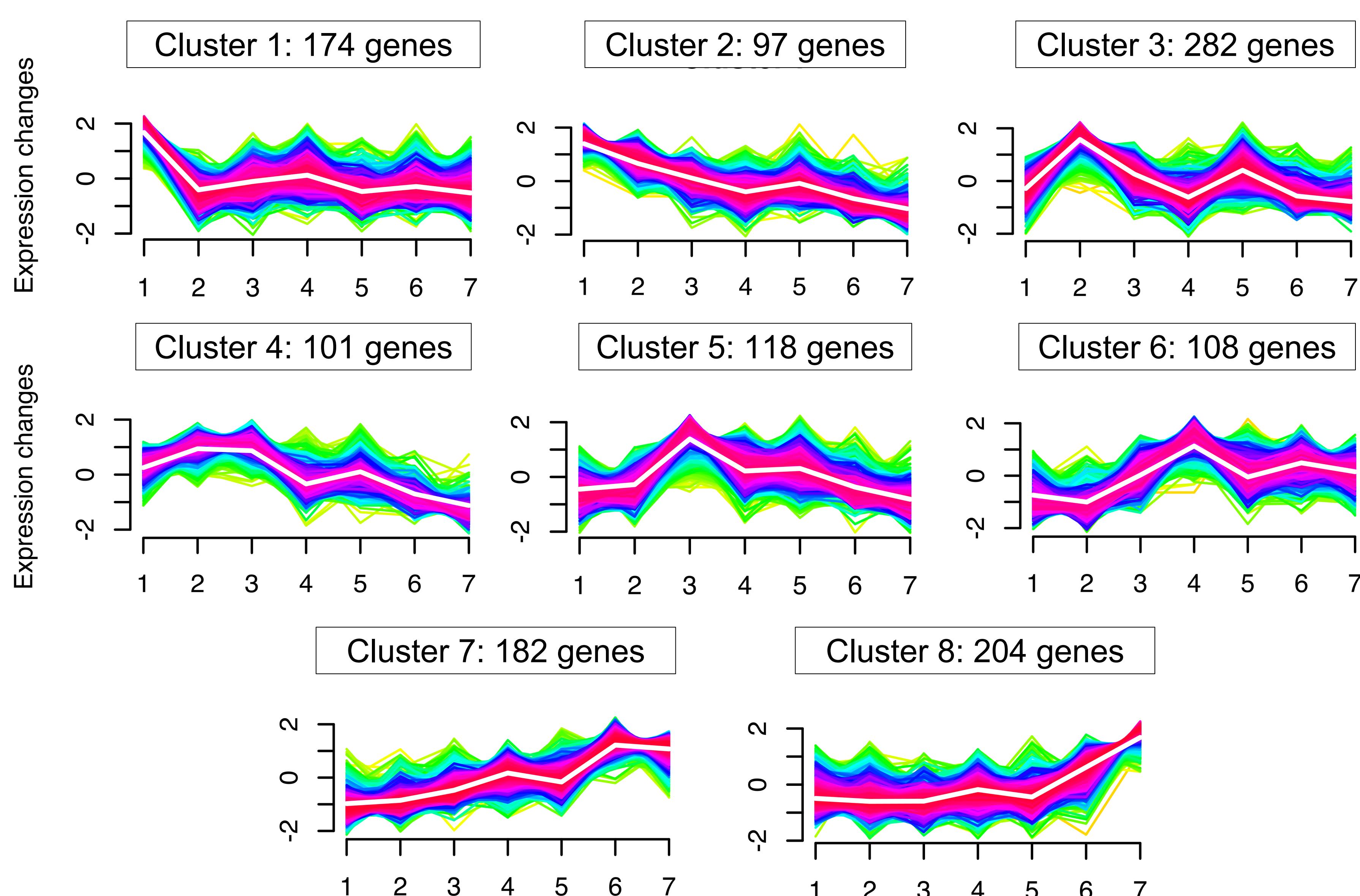
Triggered without prey

2475 time structured genes, 2 unique profiles

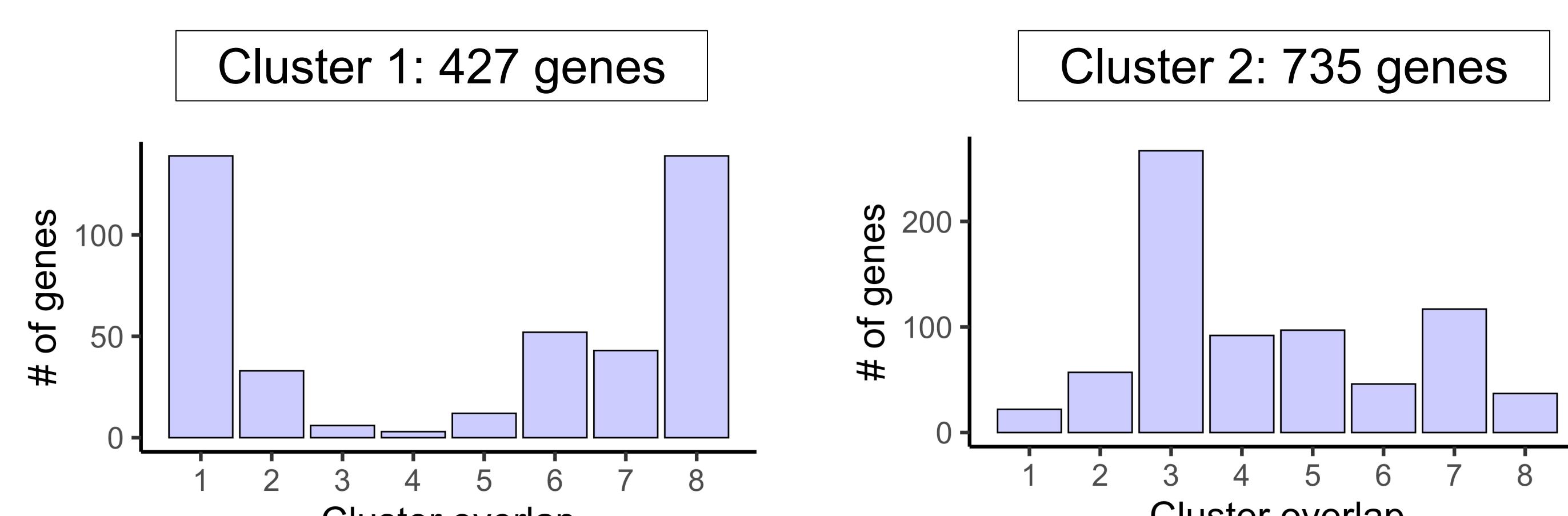
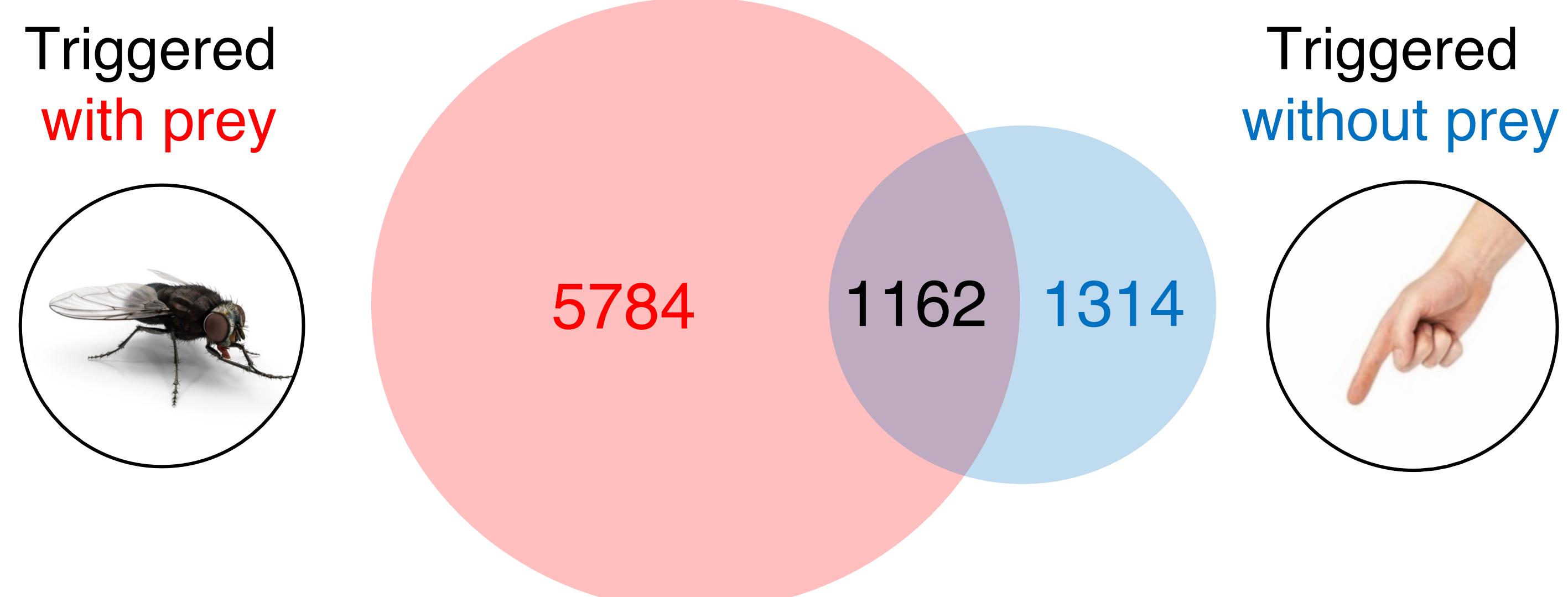


Triggered with prey

6946 time structured genes, 8 unique profiles



Cluster overlap



Conclusions

- Differential gene expression analysis of traps triggered with prey revealed ~7000 genes that fall into 8 unique time-course profiles over a 72 hr period
- Cluster assignments for traps triggered with prey show peaks in gene expression that correspond to each time point sampled, suggesting step-wise changes relating to digestion
- Elevated gene expression 72 hours after feeding suggests processes related to digestion are active even after prey is no longer visible in the trap
- ~50% of time-structured genes from mechanically stimulated traps overlap with traps that were fed prey and are likely related to trap movement

Acknowledgments

This material is based upon work supported by the National Science Foundation Graduate Research Fellowship under Grant No. 184239. We thank Francis Marion University, the University of Georgia, & Hudson Alpha for financial support. We also thank Dr. Karolina Heyduk for consultation regarding time series analysis methods. Venus flytrap images by Mason McNair.

¹Bemm, Felix et al. “Venus flytrap carnivorous lifestyle builds on herbivore defense strategies.” Genome research vol. 26,6 (2016): 812-25.