



Seasonal Immunity in *F. exsecta*

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What's it all about?

Ant colonies are likely to experience different trade-offs regarding resource allocation through the seasons. While in summer frequent pathogen exposure leads to resource investment into immune functions¹, hibernation might require the ants to invest more into energy storage². Here we investigate seasonal differences in susceptibility to oral infection with *S. marcescens* and *P. entomophila*, resistance to starvation, and the change in pathogen susceptibility upon food deprivation in *Formica exsecta* workers collected in summer and fall.

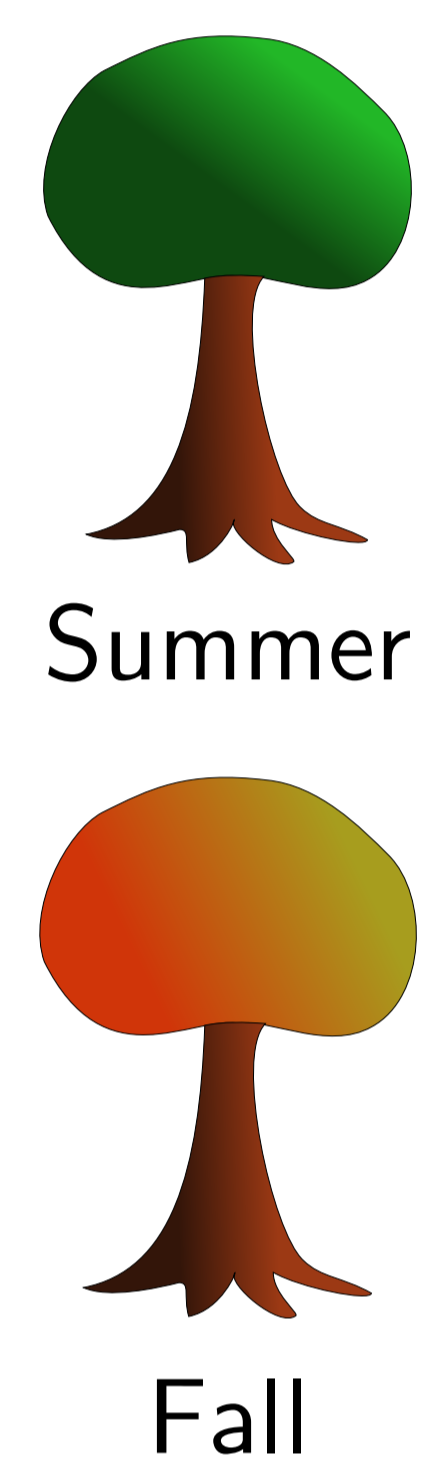


What did we do?

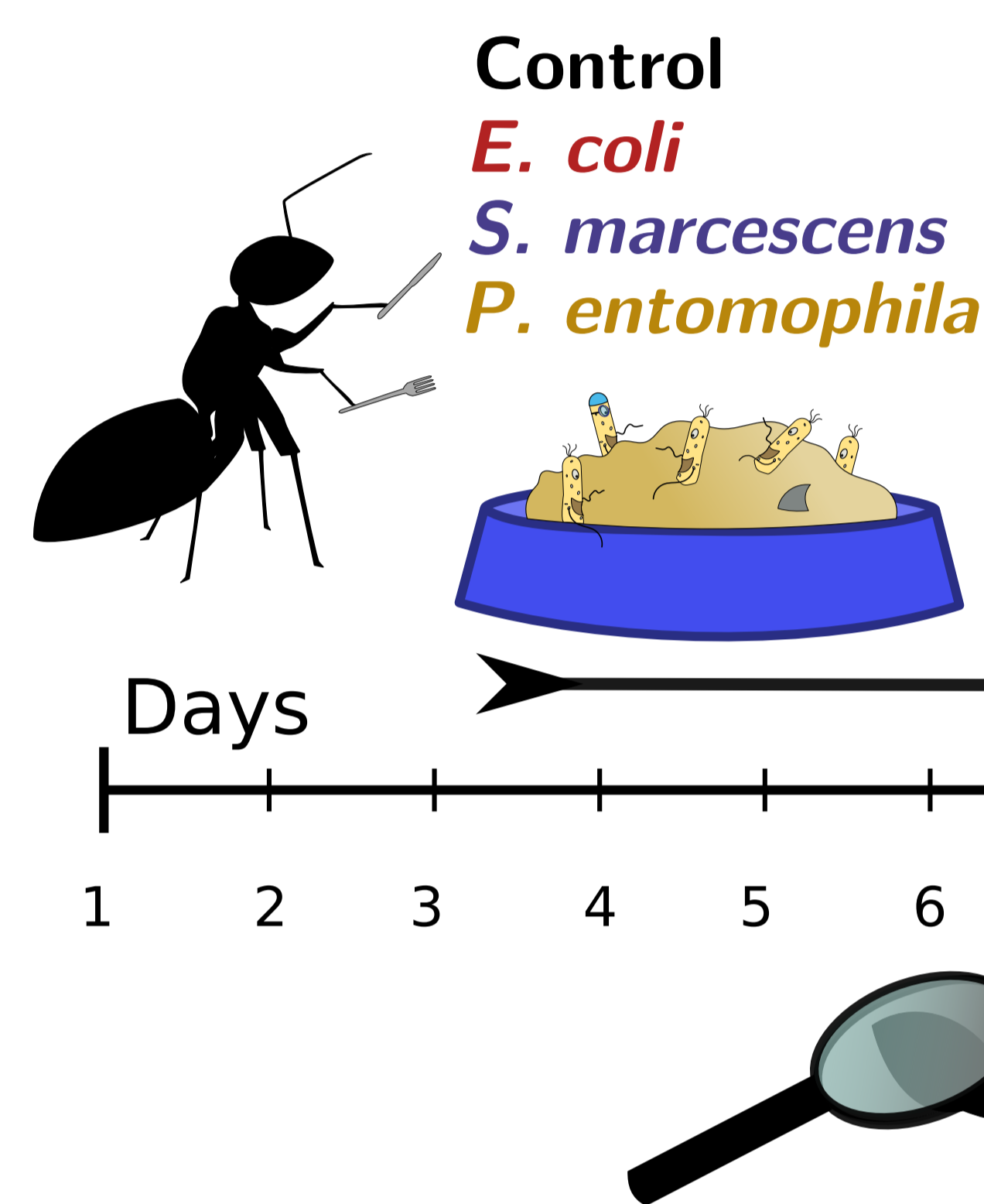
Summer- and fall-workers of *F. exsecta* were fed for seven days with the food being supplemented with LB-medium (Control) or bacteria. Afterwards, one group was starved and a second group continued to get the supplemented diets for another seven days.

Ants were compared on mortality and the level of gene expression of the metabolism related genes Arylphorin, Vitellogenin and the Insulin receptors 1 & 3, and the immune genes LPS binding protein, Toll-receptor, Lysozyme C, Pro-phenoloxidase, Hymenoptaecin and B1,3 glucanase.

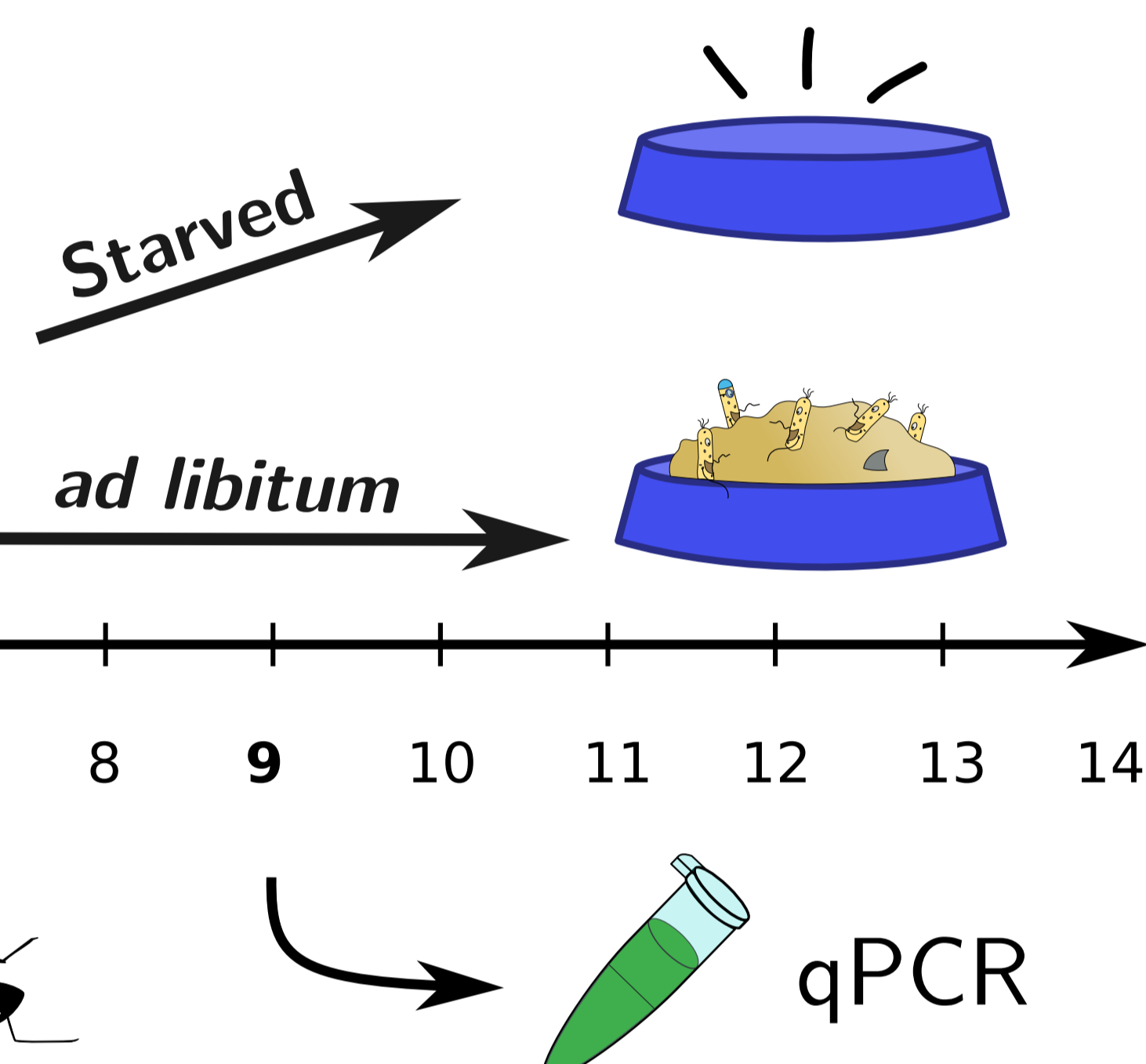
Season



Diet treatment



Starvation treatment



What did we find?

Season affects gene expression and resistance to starvation, but not susceptibility to pathogens in *F. exsecta*.

—◇— Higher resistance to starvation in Fall
—▲— CoxPH (Season x Starvation): HR=0.592; p=0.023

Starvation does not increase susceptibility to bacteria

— CoxPH (SM x Starvation): HR=1.216; p=0.34
— CoxPH (EC x Starvation): HR=1.251; p=0.31
- - - CoxPH (PE x Starvation): HR=0.863; p=0.5

Only one of the considered pathogens induces increased mortality

— CoxPH (SM): HR=1.982; p<0.0001
— CoxPH (EC): HR=1.025; p=0.89
— CoxPH (PE): HR=1.142; p=0.45

No effect of Diet on gene expression

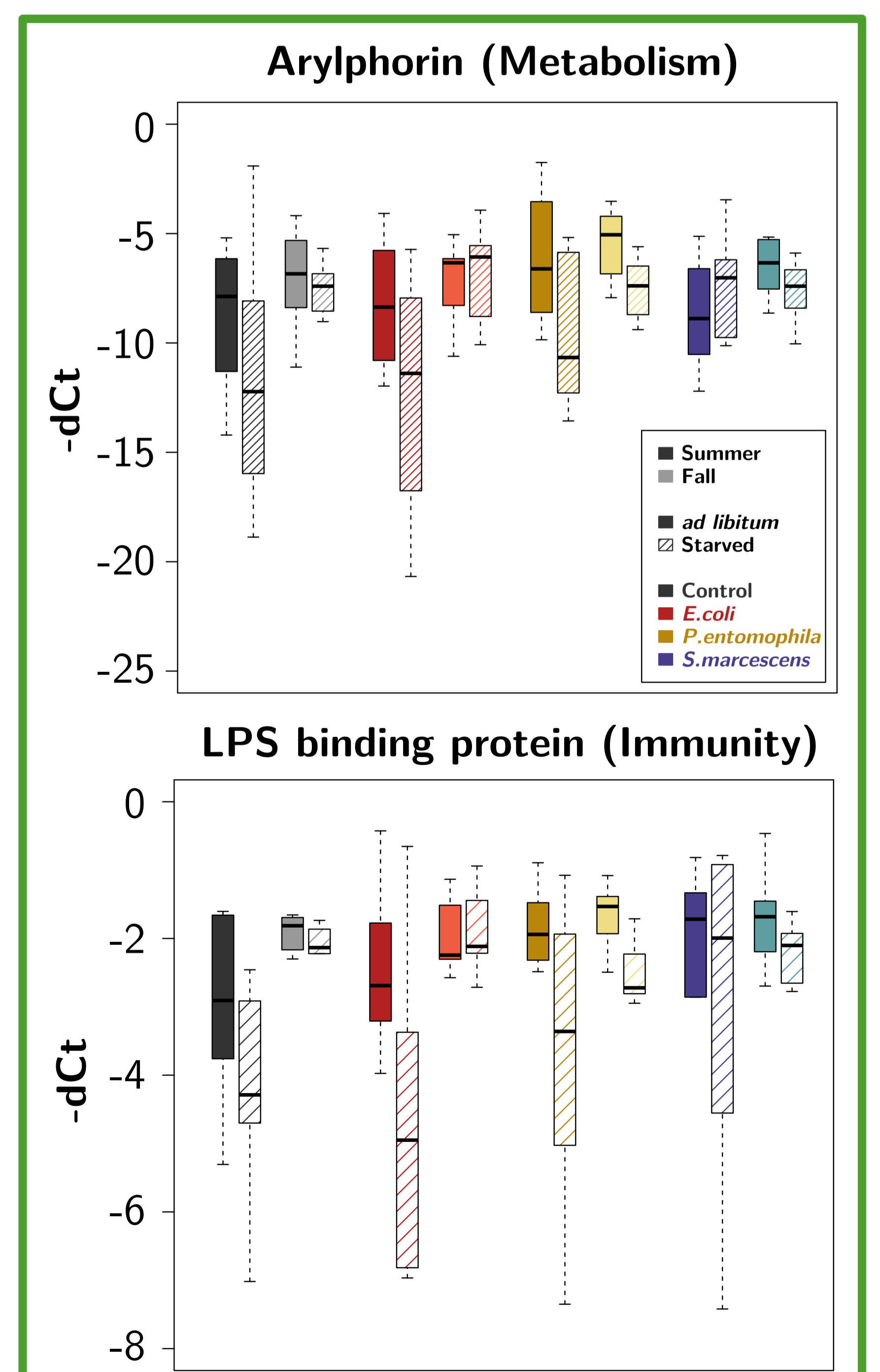
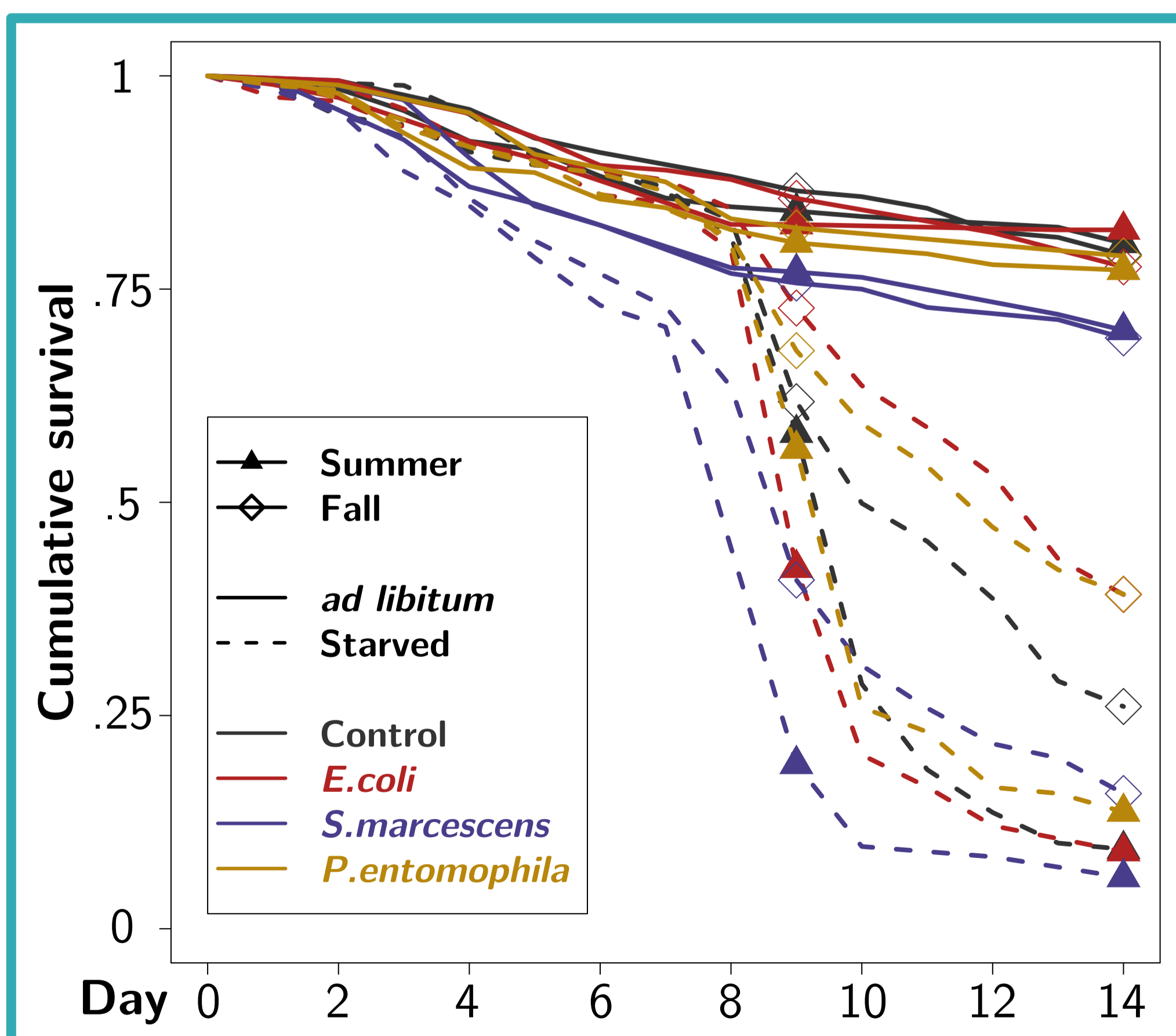
MANOVA (Diet): F=0.945, p=0.55

Generally higher expression levels in Fall compared to Summer

MANOVA (Season): F=4.749, p<0.0001

Starvation down-regulates genes stronger in Summer

MANOVA (Season x Starvation): F=2.138, p=0.0265



Warm thanks to all helpers for their assistance during the project, as well as the Academy of Finland and the Finnish School in Wildlife Biology, Conservation and Management for financial support.

References

- 1) A. Bocher, C.Tirard & C.Doums; 2007, J. Evol. Biol. 20; 2228–2234, Phenotypic plasticity of immune defence linked with foraging activity in the ant *Cataglyphis velox*.
- 2) D. A. Hahn & D. L. Denlinger; 2007, J. Insect Physiol. 53; 760–773, Meeting the energetic demands of insect diapause: Nutrient storage and utilization.

