



Determinants of the fecundity-longevity association in social and non-social insects

Author(s): Jenny Louise Donelan, Jenny Louise Donelan , David Henry Collins , David Charles Prince , Tracey Chapman , Andrew Frederick George Bourke

Institution(s): School of Biological Sciences, The University of East Anglia, Norwich, United Kingdom ; School of Biological Sciences, The University of East Anglia, Norwich, United Kingdom ; School of Biological Sciences, The University of East Anglia, Norwich, United Kingdom ; School of Biological Sciences, The University of East Anglia, Norwich, United Kingdom ; School of Biological Sciences, The University of East Anglia, Norwich, United Kingdom ; School of Biological Sciences, The University of East Anglia, Norwich, United Kingdom

In most organisms there is a negative association between fecundity and longevity. This is hypothesized to arise from a trade-off whereby individuals receive limited lifetime resources and must therefore compromise between increasing reproduction and increasing longevity, so leading to reproduction having survival costs. In eusocial insects the longest-lived individuals (queens) are also the most reproductive, implying that the fecundity-longevity trade-off has been reversed and that costs of reproduction are lacking. However, it is also possible that, as suggested for non-social organisms, unequal resourcing leads to better-provisioned individuals being both more reproductive and longer-lived, such that there is no fundamental reversal of the fecundity-longevity trade-off. In the eusocial bumble bee, *Bombus terrestris*, workers exhibit a positive association between fecundity and longevity when they are free to activate their ovaries in whole colonies, but a negative one when reproduction is experimentally induced in randomly-selected workers (Blacher *et al.* 2017). We therefore hypothesized that both queen and ovary-active worker *B. terrestris* show a positive fecundity-longevity association because they are better provisioned as larvae. To investigate the generality of such a phenomenon, we tested whether, in the fruit fly *Drosophila melanogaster*, a negative fecundity-longevity association can be reversed by manipulating the quality of larval diets. We reared *D. melanogaster* on different quality larval diets and recorded their reproduction and longevity as adults. Our preliminary results suggest that larvae fed a higher quality diet showed a flat or even a positive fecundity-longevity relationship whereas larvae fed a standard diet showed the usual negative fecundity-longevity relationship. This suggests that the sign of the fecundity-longevity association is indeed sensitive to larval nutrition and our experiments are ongoing to explore this further.