High Impact Publication Selected for Special Recognition in 2020

Unit: Entomology and Nematology **PDF Download(s):** Publication

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Publication Impact: This work addresses a fundamental topic in biology – how is an animal built? What tissues receive maximal investment, and what tissues are compromised when resources are lacking? Insects are perfect subjects to address this fundamental topic because of the ability to raise hundreds of individuals with ease and to perform experimentation. Further, understanding these crucial underlying decisions that are made during insect development has the potential to inform all applied fields of entomology, including pest management and insect conservation. Remarkably little is known about the resource allocation patterns underlying investment in insect tissues and why trade-offs in investment among traits are found in some cases and not others. A “hot-topic” in recent years in the fields of ecology, evolution, and physiology has been that animal weapons and testes should be expected to trade off due to their common reproductive function in males. This assumption has informed dozens of studies, but without critical evaluation. Here, we take a step back to ask whether a documented weapons-testes trade off might be due to developmental timing or tissue expense rather than a shared reproductive function. We used phenotypic engineering and a comparison of homologous structures in males and females of the leaf-footed cactus bug, Narnia femorata. We found that a documented trade-off of weapons and testes in males of this species is even more pronounced in female hind limbs and ovaries. Our results are consistent with both males and females experiencing a resource allocation trade-off between their gonads and their legs. The similarity in allocation patterns across the sexes suggests the possibility of a common mechanism influencing trait allocation, one that may be based on developmental timing or tissue expense. This paper was published online on July 31st, 2019 and received online attention via an article in Medium. It has a score of 25 on Altmetric with a 91% high attention score. We are hopeful that this article will help inspire new research directions and perspectives in physiological ecology and evolutionary biology. This work is a cumulation of thinking and idea-exchange during my time at the University of Cambridge, UK in 2018, and capitalized on a great data set collected by a previous M.S. student in my laboratory. The co-authors of this manuscript include the M.S. graduate (Joseph), a graduating Ph.D. student from my laboratory (Emberts), and the Director of the Zoology Museum at the University of Cambridge (Kilner). Thank you for your consideration.