Genetic Influences on Parental Care in *Nicrophorus vespilloides.*

Submitted by Chloe. J. Bird, to the University of Exeter as a thesis for the Degree of Doctor of Philosophy in Biological Sciences, July 2010.

I certify that all material in this thesis which is not my own work has been identified and that no material has previously been submitted and approved for the award of a degree by this or any other University.

Signed: Chloe. J. Bird

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ABSTRACT

The burying beetle (*Nicrophorus vespilloides*) has unusually highly developed parental care; parents prepare and maintain a food resource (thereby providing indirect parental care), feed through direct provisioning by regurgitation, and protect their larvae. Parental care is highly variable and can be uniparental female care, uniparental male care, or biparental. There are genetic components to the parenting behaviour of the burying beetle, the amount of direct and indirect care given, and the size of the brood are heritable and therefore genetic traits.

In this thesis I have focused on two candidate genes that I predicted would influence parental care behaviour. The first is *foraging*, which has been shown to influence a range of social and reproductive behaviours in other insect species. Using QRTPCR and pharmacological manipulations I have investigated the role of *Nvfor* in adult and juvenile burying beetles. The second gene is *inotocin,* the insect orthologue of oxytocin. Oxytocin has been shown to influence social behaviour as well as many behaviours associated with reproduction in vertebrates and invertebrates, however the effects of inotocin have not yet been investigated in insects. I have used pharmacological manipulations to investigate the role of inotocin in parental behaviour in female burying beetles.

Collectively my results demonstrate the central role of *Nvfor* in the control of direct parental care and the association with major behavioural changes in both adult and larval burying beetles. I have also demonstrated the possible involvement of oxytocin in the control of aggression towards conspecific larvae. These insights suggest the controlling mechanism for the behavioural changes seen in burying beetles is complex and involves interactions between many genes. Combined with previous research on these genes, it is clear they are key components in the evolution of sociality. Finally, my research indicates the power of the candidate gene approach, and suggests additional components of the related pathways that could be investigated.

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AUTHOR'S DECLARATIONS

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All of the chapters presented in this thesis were written by Chloe J. Bird, with comments and editing from A. Moore.

Chapter 3: I developed the injection protocol in collaboration with Amy Simpson, who also ran some of the observation experiments that are included in my data set.