Exploring Social Interactions and Olfactory Communication in The Common Brushtail Possum: Implications for Management

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Abstract

The common brushtail possum (*Trichosurus vulpecula*) was introduced to New Zealand in the mid-1800's and has since become highly invasive in this country. Causing considerable damage to both native flora and fauna and being a wildlife reservoir of bovine tuberculosis, this species requires intensive management and control. Management will be improved by having a more complete understanding of possum social interactions and communication. The focus of this thesis is to, therefore, improve our understanding in these areas of possum biology.

The first part of this thesis focuses on possum social interactions. Of specific interest is whether or not differences exist in the duration and frequency of interactions between possums during the breeding and non-breeding seasons. Furthermore, the possibility of a relationship between genetic relatedness and tolerance levels between female possums and mate choice between males and females is investigated. The results of this study suggest that male and female possums interact far more than females do with females and than males do with males during both the breeding and non-breeding season. Furthermore, genetic relatedness does not appear to have a strong effect on mate choice or on the amount of time that females spend in close contact with other females during the non-breeding season.

The second part of this study focuses on determining how possums use various scents to communicate with each other. Their responses to sternal gland scent (from both genders and from two different populations) are investigated with the intention of discerning whether or not they have any preferences based on gender and/or familiarity. Also researched is whether or not they show a preference when presented with possum sternal gland scent and a popular food lure to see if possum produced scents may function as a lure which can be used in their management. Due to the low level of response during these trials, it is not possible to come to a conclusion on possum preferences for different possum scents. The trends suggest, however, that they take more interest in the scents of familiar females over familiar males and in foreign possums over familiar possums. What is evident, however, is that they take more interest in the scent of cinnamon apples over that of foreign female sternal gland scent.

The final part of this thesis is a pilot study which investigates using a molecular technique, denaturing gradient gel electrophoresis (DGGE), to examine the composition and dynamics of the bacterial communities that inhabit the cutaneal surface of the possum sternal gland. Unique bacterial profiles during the same season as well as changes in individual profiles between the breeding and non-breeding seasons are investigated. It was determined that new technologies, such as amplicon sequencing, should be utilized to conduct such evaluations due to problems encountered with DGGE. Although conclusions could not be made due to a small sample size, the trends suggest that these bacterial communities do not change based on season (i.e. physiological state of the possum) and that possums do not have unique bacterial profiles in this specific anatomical region. The issues associated with this technique as well as the need for further research are discussed.

Due to the adverse effects that this species has on New Zealand's economy and ecology, it is imperative that their numbers are reduced, hopefully to the point that they are

completely removed. Hopefully with the understanding gained by this study, our ability to control possums will improve, further enabling us to reach this goal.

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Photo by Olivia Hamilton

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