The effects of honeybees (*Apis mellifera*) on the biodiversity of manuka (*Leptospermum scoparium*) patches

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ABSTRACT

Honeybees (*Apis mellifera*) are important pollinators of many plant species and are employed globally for crop and honey production. However, little is known about the effects of this species on native pollinator and plant species in areas to which they have been introduced; and previous research has not been able to reach a general consensus as to the type of impact honeybees have on pollination systems. In addition to the effects of exotic pollinators, the loss and fragmentation of natural habitats is also of major concern to the continuing diversity of pollinators and plant populations.

Here, the impact of honeybee density on other pollinator guilds, and levels of remaining pollen and nectar standing crop among 18 patches of the New Zealand native shrub – manuka (*Leptospermum scoparium*) is examined at three different regions within the North Island. The same sites were also used to test the reproductive capabilities of manuka and subsequent pollen limitation among patches. A further 11 sites were utilised to examine biodiversity via intercept and pitfall traps within manuka patches, and the patch variables driving taxa composition.

Large fly (Diptera ≥ 5 mm) abundance was negatively correlated with honeybee abundance and instances of physical disturbance of large flies by honeybees were observed. There was no significant correlation between honeybee abundance and other pollinator guilds. Nectar was a limiting resource for both honeybees and large flies, whereas, pollen was not a limiting resource among any of the major pollinating insect guilds. Pollination treatments revealed that manuka is partially self-compatible, but relies more heavily on cross pollination for higher yields of capsule and seed set. Pollen limitation did not occur significantly at any of the sites. A total of 159 Coleoptera, 125 Diptera, 131 Hymenoptera morphospecies, and 50 other groups of

taxa from various orders were collected among sites. Invertebrate richness was higher at lower altitudes and litter invertebrate richness was significantly higher with an increase in the proportion of manuka cover. There were distinct differences in taxa composition between the three regions, with plant community composition and altitude the most significant factors. Patch size also played a part, but a lack of overall variation in patch sizes may understate the effect this has on insect composition.

Overall, honeybees are competing for nectar resources and displacing large flies as a consequence; however, capsule and seed set among manuka patches did not significantly suffer as a consequence. Regional variation in patch characteristics such as altitude, plant community composition, patch size, proportion manuka cover, and plant evenness appear to be influencing insect composition found within manuka patches to varying degrees. Further investigation into the impact of patch size and patch connectivity is also warranted.

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