

Honeydew abundance in two areas at St Arnaud

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Summary

There was a similar density of honeydew threads on the flanks of the StArnaud Range and in southern Big Bush, and we suggest that the abundance of honeydew threads need not be a consideration in deciding which of the two areas is selected as a "mainland island". The abundance of honeydew threads/ha was highly variable, particularly along the St Arnaud Range, and this area tended to have more honeydew threads than Big Bush. The abundance of honeydew threads was not measured in the canopy. We may have underestimated the abundance of honeydew threads by a greater degree in Big Bush than StArnaud because the trees tended to be larger there.

1. Introduction

The Department of Conservation (DoC) plans to establish a "mainland island" in the Nelson Lakes area. They wanted to quantify the abundance of honeydew-producing scale insects (*Ultracoelostoma* spp.) in two areas being considered for the project as honeydew is one of the key resources for many invertebrates and birds in a *Nothofagus* community. This information will assist with making the decision as to which area to choose as the "mainland island". In addition, a honeydew survey will provide a baseline measure prior to the start of any pest control.

This research answers the following questions posed by DoC:

- Is the quantity of honeydew on trees in the red/black/mountain beech vegetation zones of the proposed "mainland island" site on the flanks of the St Arnaud Range, less than that on trees in similar vegetation zones in Southern Big Bush?
- If it is less, by how much?

2. Methods

A 1000 m transect was marked along the flanks of the St Arnaud Range and another in Southern Big Bush. Permanent markers were used so that the survey could be repeated. The transects ran through similar vegetation zones, selected after consultation with DoC staff. We randomly selected four points along each transect, and at each point counted the honeydew threads on the ten closest honeydew-bearing trees. Only trees that reached into the canopy were included. We measured the distance to the tenth and eleventh furthest honeydew-bearing trees, and used the distance mid-way between these trees as the radius in order to calculate the area under study.

On each of the first ten trees, we measured the circumference at chest height (about 1.5 m) and estimated the average canopy height. We also counted the number of honeydew threads in three 5 x 50 cm quadrats placed at random on the tree trunk at chest height. We visually estimated the abundance of honeydew threads in the upper two thirds of the tree trunk and recorded as:

- 0 = no honeydew (honeydew/quadrat x 0)
- 1 = less honeydew than lowest third (honeydew/quadrat x 0.5)
- 2 = about the same amount of honeydew as lowest third (honeydew/quadrat x 1)
- 3 = more honeydew than lowest third (honeydew/quadrat x 1.5)
- 4 = much more honeydew than lowest third (honeydew/quadrat x 2)

If all three quadrats had no honeydew threads, then a value of 0.33 threads/quadrat was assigned to avoid multiplying through by zero. This may slightly overestimate the abundance of honeydew on some trees, but our method of calculating honeydew threads/ha excluded measuring trees with zero honeydew. The three estimates of the abundance of honeydew **threads/m²** (lower, middle and upper third of the tree) were averaged and multiplied by the estimated surface area of the tree trunk. We calculated surface area using the formula (Husch et al. 1972):

$$\text{Surface area} = \frac{(2\pi r) \times [(r^2 + 4h^2)^{3/2} - r^3]}{(12h^2)}$$

where r = radius of tree at 1.5 m height
 h = height of tree

The 10 estimates of honeydew threads/tree for each of the four sampled points were converted to honeydew **threads/m²** forest, and then averaged for each site to give an estimate of honeydew threads/ha of forest.

3. Results

Our estimate of honeydew abundance along the St Arnaud range (0.86 million threads/ha; sd = 0.74) was similar (t-test, p = 0.401) to our estimate for Big Bush (0.50 million threads/ha; sd = 0.16). The number of honeydew **threads/m²** decreased as tree diameter increased (Figure 1). Mean tree diameter was bigger in Big Bush (1.00 m; sd = 0.42) compared to St Arnaud (0.85 m; sd = 0.37), but was not statistically significant (t-test, p = 0.133).

4. Discussion

The abundance of honeydew threads was similar in Big Bush and St Arnaud, although the latter tended to have more honeydew. The abundance of honey-

dew threads was highly variable, particularly along the St Arnaud range, so we would have only detected a statistical difference between the sites if the densities had been very different.

A limitation of the estimates provided is the exclusion of branches in the survey. Other authors have also ignored branches (Moller & Huryn 1996, Kelly 1990). However, many bird species, such as kaka (Beggs & Wilson 1991) feed on honeydew almost exclusively in the canopy of trees. Our estimates are likely to underestimate the abundance of honeydew threads, and more importantly, not accurately reflect the resource that the birds are using. A quantitative study is required to determine the role of branches in hosting *Ultracoelostoma* spp.

Trees with a large diameter tend to have fewer honeydew **threads/m²** on the trunk at 1.5 m height, than smaller trees (Kelly 1990, Fig. 1). This is thought to be because the scale insect is unable to insert its stylet through the thickened bark to feed from phloem vessels. However, we have observed abundant honeydew in the branches of some of these larger trees. Thus, the abundance of honeydew threads in areas with larger trees, such as Big Bush, may be underestimated by a larger amount than areas with smaller trees, such as St Arnaud.

The abundance of honeydew threads at the two sites was relatively low when compared to other beech forests in the region. The average honeydew abundance for Nelson & Marlborough was 2.02 million threads/ha (95% CI = 0.97, n = 15 sites) (Moller & Huryn 1996). The abundance of honeydew is lower on the West Coast (mean = 0.45 million threads/ha, 95% CI = 0.43, n= 7 sites) and higher in Canterbury (mean = 6.56 million threads/ha, 95% CI = 3.43, n = 9 sites) (Moller & Huryn 1996). The abundance of honeydew threads declines with altitude - no threads were recorded on trees above 1050 m a.s.l. on Mt Misery, Nelson Lakes National Park (Beggs 1991). The relatively high altitude of the St Arnaud region may explain the relatively low abundance of honeydew threads recorded in this study.

5. Recommendation

The abundance of honeydew threads is similar enough in the two areas for it not to be a consideration in deciding which area should become a "mainland island".

6. Acknowledgements

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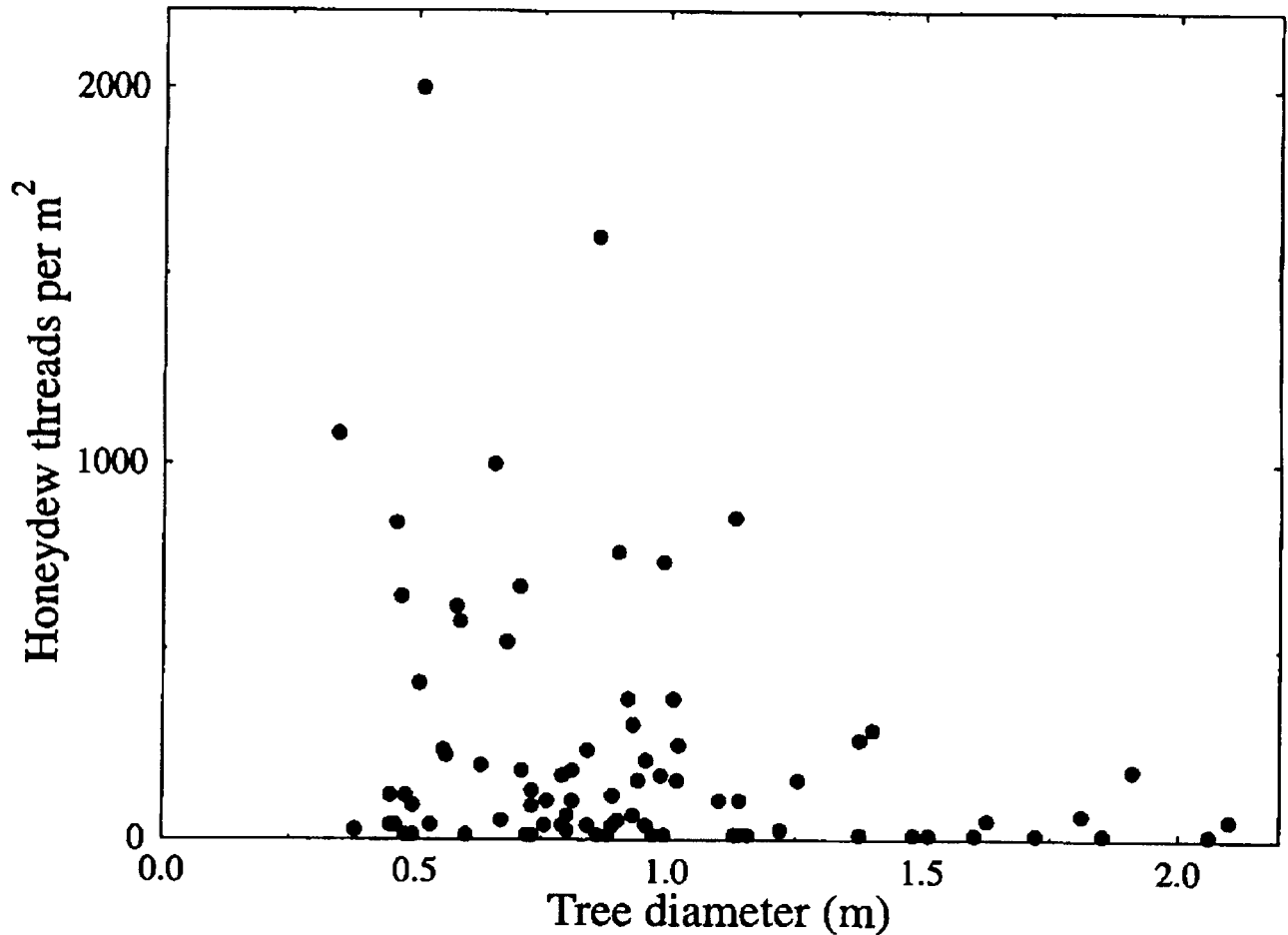


Figure 1. Relationship of tree diameter to honeydew threads.