Supplementary materials

Reduced abundance and species richness of forest beetles associated with dieback of kauri (*Agathis australis*) trees due to *Phytophthora agathidicida*

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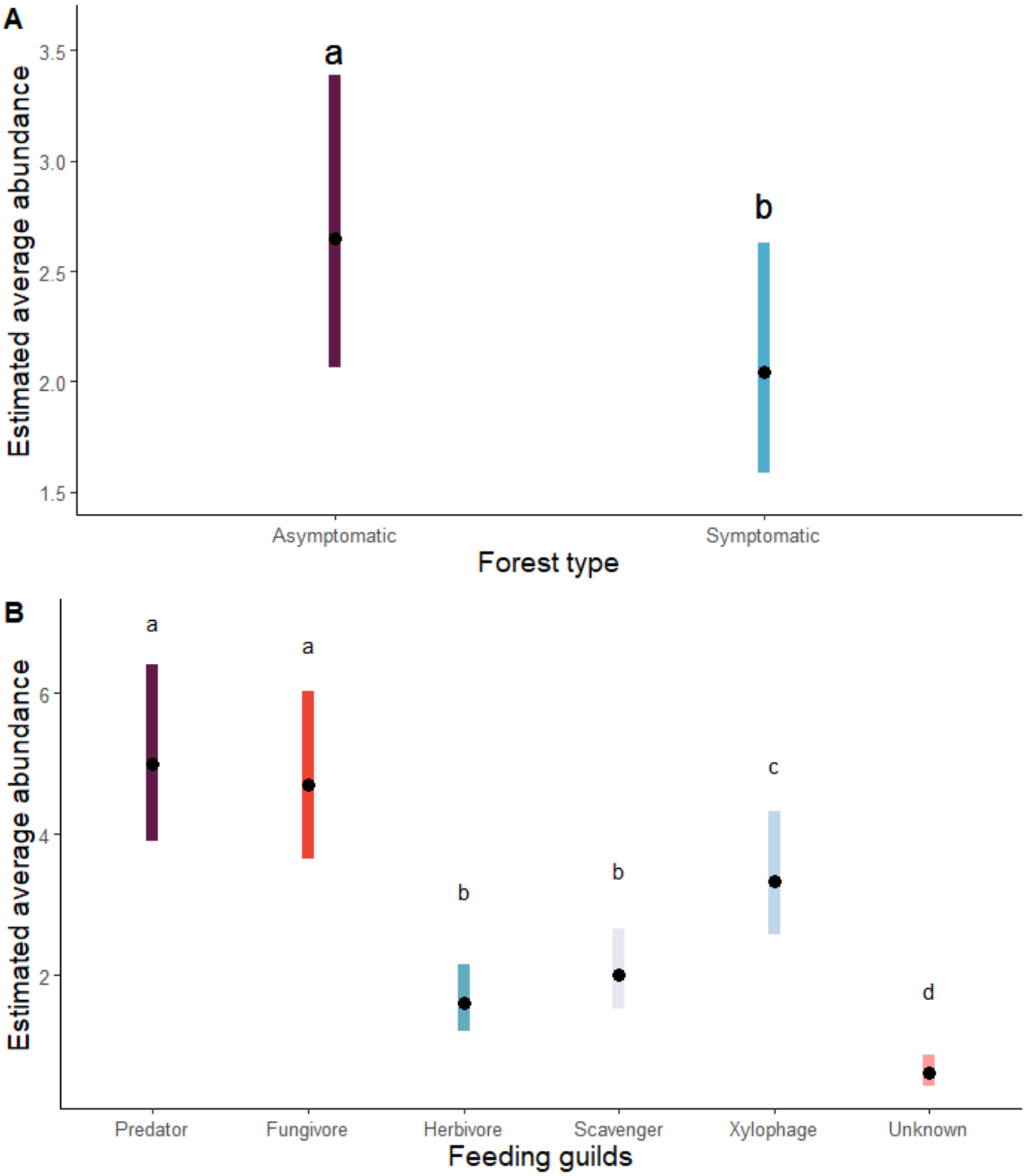
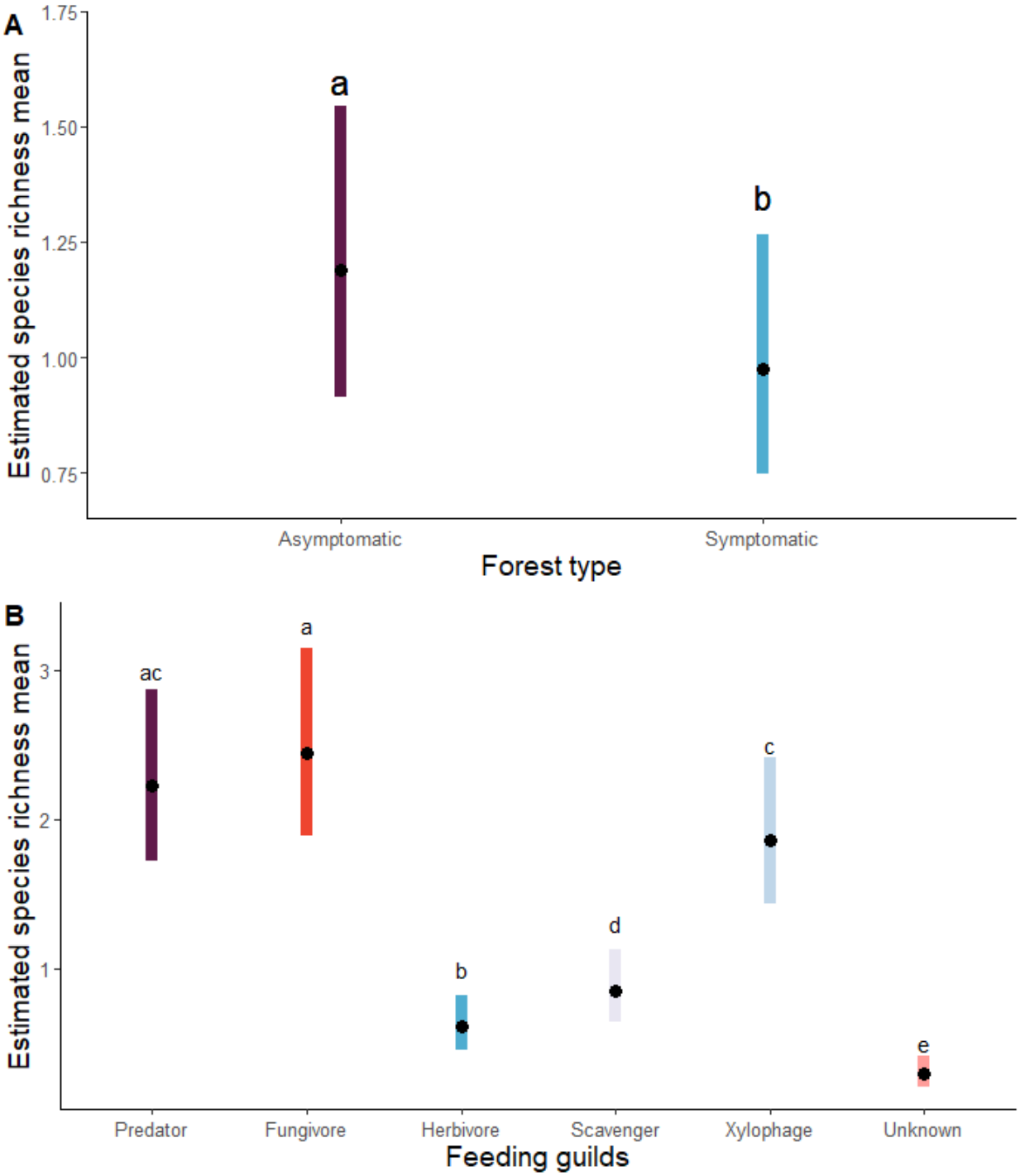
Appendix S1: A flight-intercept trap at the Huia site in Waitākere Ranges Regional Park, New Zealand (left), and an example of the kind of pitfall trap we used in this study (right).



Appendix S2: Mean abundance (± 95% CI) of A) all beetles combined from asymptomatic and symptomatic sites and B) different feeding guilds in kauri (*Agathis australis*) forest in Waitākere Ranges Regional Park, New Zealand. Points represent estimated marginal means predicted from the model. Samples collected using pitfall traps and flight-intercept traps were pooled. Different lowercase letters indicate statistically significant differences among feeding guilds.

Appendix S3: Abundance comparisons among beetle feeding guilds from kauri (*Agathis australis*) forest in Waitākere Ranges Regional Park, New Zealand. Post-hoc pairwise comparisons between feeding guilds were conducted using estimated marginal means (EMMs) derived from the reduced model. Pairwise contrasts were adjusted for multiple testing using the Sidak correction to control the family-wise error rate (Lenth 2023). Abundance results were averaged across the six symptomatic and asymptomatic sites. SE = Standard Error. df = degrees of freedom.

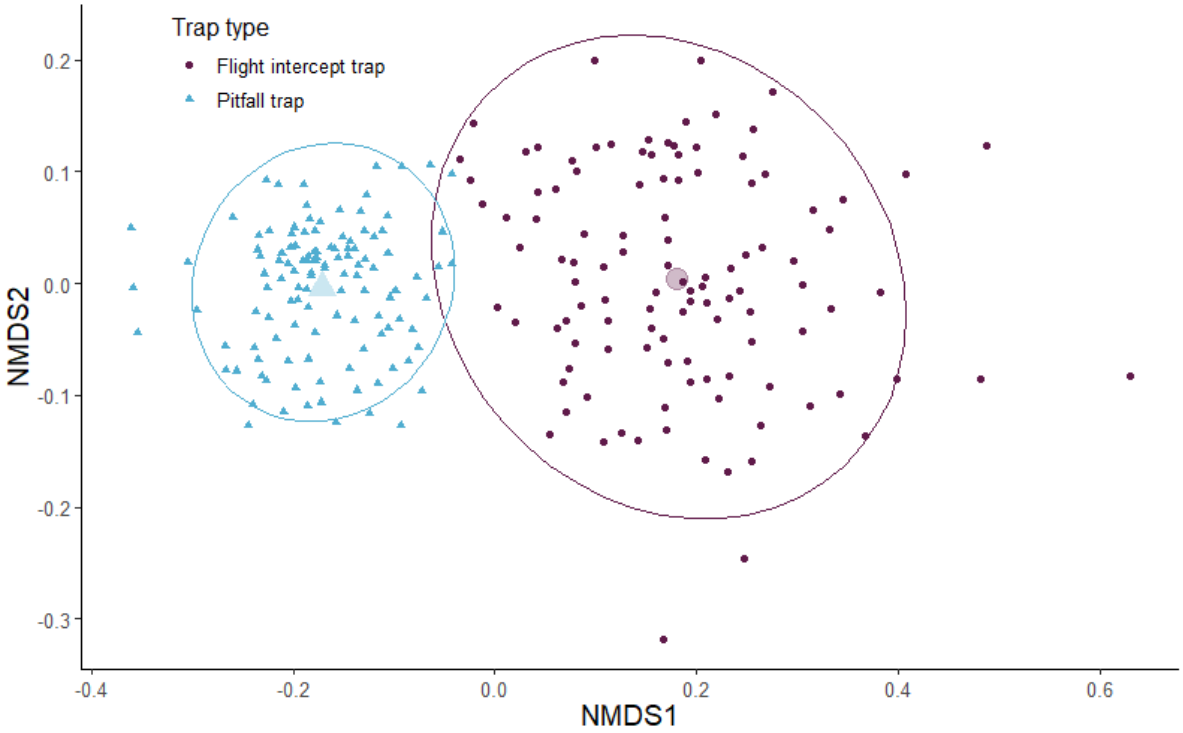
Contrast	**Ratio**	**SE**	**df**	**Z ratio**	***P* value**
Fungivore / Herbivore	2.905	0.317	Inf	9.769	< **0.0001**
Fungivore / Predator	0.938	0.076	Inf	-0.792	0.999
Fungivore / Scavenger	2.327	0.228	Inf	8.589	< **0.0001**
Fungivore / Unknown	7.556	1.102	Inf	13.855	< **0.0001**
Fungivore / Xylophage	1.407	0.125	Inf	3.839	**0.0019**
Herbivore / Predator	0.323	0.035	Inf	-10.228	< **0.0001**
Herbivore / Scavenger	0.801	0.098	Inf	-1.807	0.667
Herbivore / Unknown	2.601	0.423	Inf	5.865	< **0.0001**
Herbivore / Xylophage	0.484	0.055	Inf	-6.287	< **0.0001**
Predator / Scavenger	2.480	0.246	Inf	9.155	< **0.0001**
Predator / Unknown	8.053	1.183	Inf	14.198	< **0.0001**
Predator / Xylophage	1.499	0.135	Inf	4.482	**0.0001**
Scavenger / Unknown	3.247	0.506	Inf	7.546	< **0.0001**
Scavenger / Xylophage	0.605	0.063	Inf	-4.766	< **0.0001**
Unknown / Xylophage	0.186	0.028	Inf	-11.132	< **0.0001**



Appendix S4: Mean species richness (± 95% CI) of A) all beetles combined from asymptomatic and symptomatic sites and B) different feeding guilds in kauri (*Agathis australis*) forest in Waitākere Ranges Regional Park, New Zealand. Points represent estimated marginal means predicted from the model. Samples collected using pitfall traps and flight-intercept traps were pooled. Different lowercase letters indicate statistically significant differences among feeding guilds.

Appendix S5: Pairwise comparisons of species richness from kauri (*Agathis australis*) forest in Waitākere Ranges Regional Park, New Zealand. Post-hoc pairwise comparisons between feeding guilds were conducted using estimated marginal means (EMMs) derived from the reduced model. Pairwise contrasts were adjusted for multiple testing using the Sidak correction to control the family-wise error rate (Lenth 2023). Species richness results are averaged across sites. SE = Standard Error. Df = degrees of freedom.

Contrast	**Ratio**	**SE**	**df**	**Z ratio**	***P* value**
Fungivore / Herbivore	3.993	0.389	Inf	14.189	**< 0.0001**
Fungivore / Predator	1.098	0.070	Inf	1.469	0.899
Fungivore / Scavenger	2.859	0.245	Inf	12.249	**< 0.0001**
Fungivore / Unknown	8.283	1.104	Inf	15.853	**< 0.0001**
Fungivore / Xylophage	1.309	0.088	Inf	3.986	**0.001**
Herbivore / Predator	0.275	0.027	Inf	-13.064	**< 0.0001**
Herbivore / Scavenger	0.716	0.081	Inf	-2.933	**0.049**
Herbivore / Unknown	2.075	0.317	Inf	4.768	**< 0.0001**
Herbivore / Xylophage	0.328	0.033	Inf	-11.006	**< 0.0001**
Predator / Scavenger	2.603	0.227	Inf	10.975	**< 0.0001**
Predator / Unknown	7.541	1.012	Inf	15.053	**< 0.0001**
Predator / Xylophage	1.192	0.082	Inf	2.545	0.152
Scavenger / Unknown	2.897	0.422	Inf	7.296	**< 0.0001**
Scavenger / Xylophage	0.458	0.041	Inf	-8.672	**< 0.0001**
Unknown / Xylophage	0.158	0.021	Inf	-13.562	**< 0.0001**



Appendix S6: Ordination plot using non-metric multidimensional scaling (NMDS, stress = 0.122) and showing the similarity of beetle communities between samples collected using pitfall traps (blue) and flight-intercept traps (red) in kauri (*Agathis australis*) forest in Waitākere Ranges Regional Park, New Zealand**.** Each small point represents a sampling event, and sampling events with similar beetle community composition are closer together in the ordination space. The two larger points represent the centroids for beetle communities captured using each trap type and ellipses represent 95% confidence intervals around each centroid. Six samples were omitted from the analysis as these were outliers that decreased stress to 0.0004. For a good representation of the data, the stress value should ideally be between 0.1 and 0.2. Permutational Analysis of Variance (PERMANOVA) indicated that beetle community composition differed between trap types ($F_{(1, 229)} = 16.04$, $P = 0.001$).