Can spatial variation in epiphyte diversity and community structure be predicted from sampling vascular epiphytes alone?

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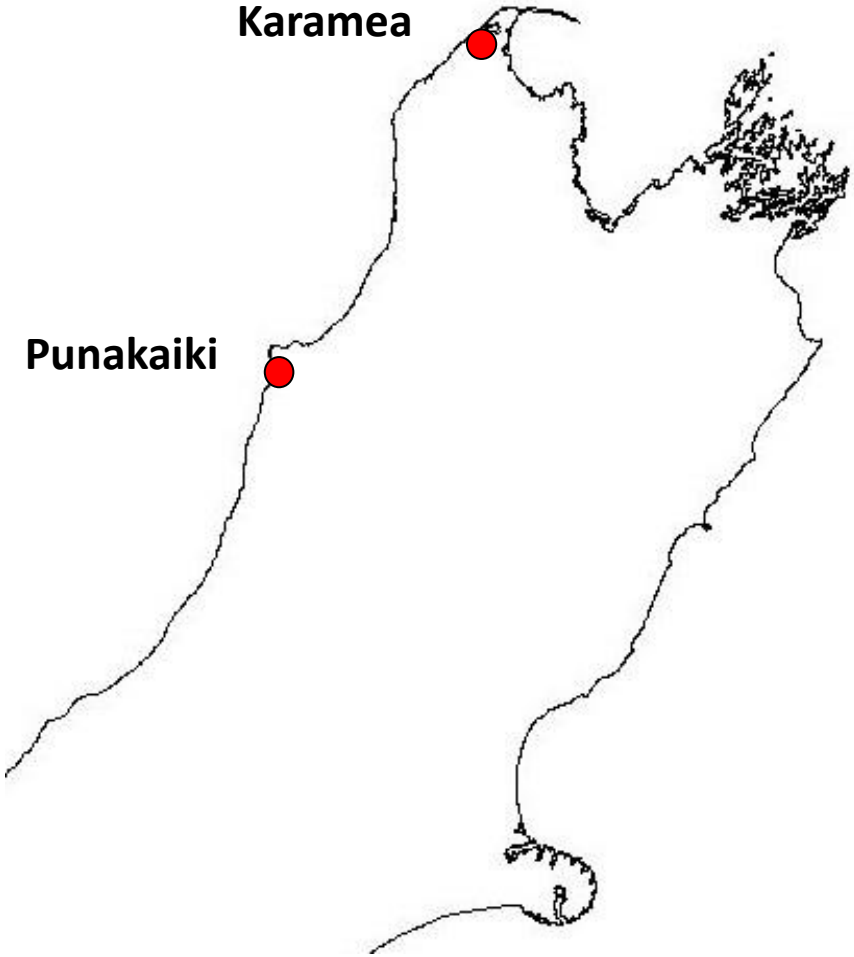
Canopy epiphytes and forest processes

- Photosynthetic productivity
- CO_2 exchange
- Water regulation
- Nutrient cycling
- Food resource

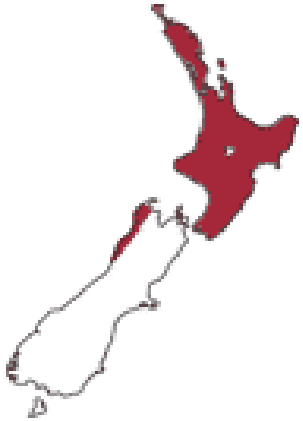
Objectives

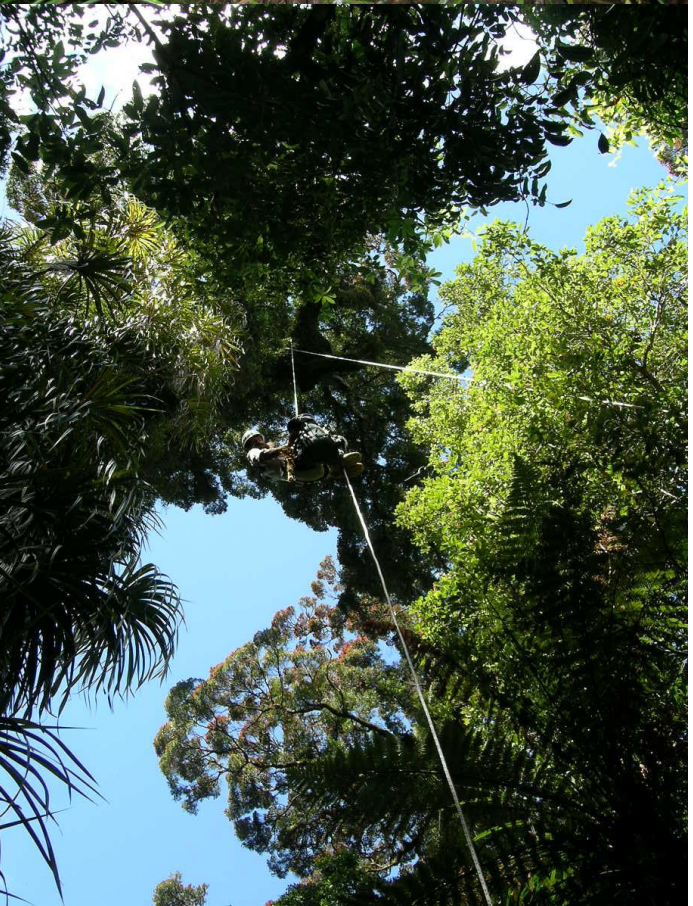
- Test whether the spatial patterns of species richness, biomass and community composition across geographic regions, among trees and within trees are consistent between non-vascular and vascular epiphytes

Study Sites



The host – Northern rata



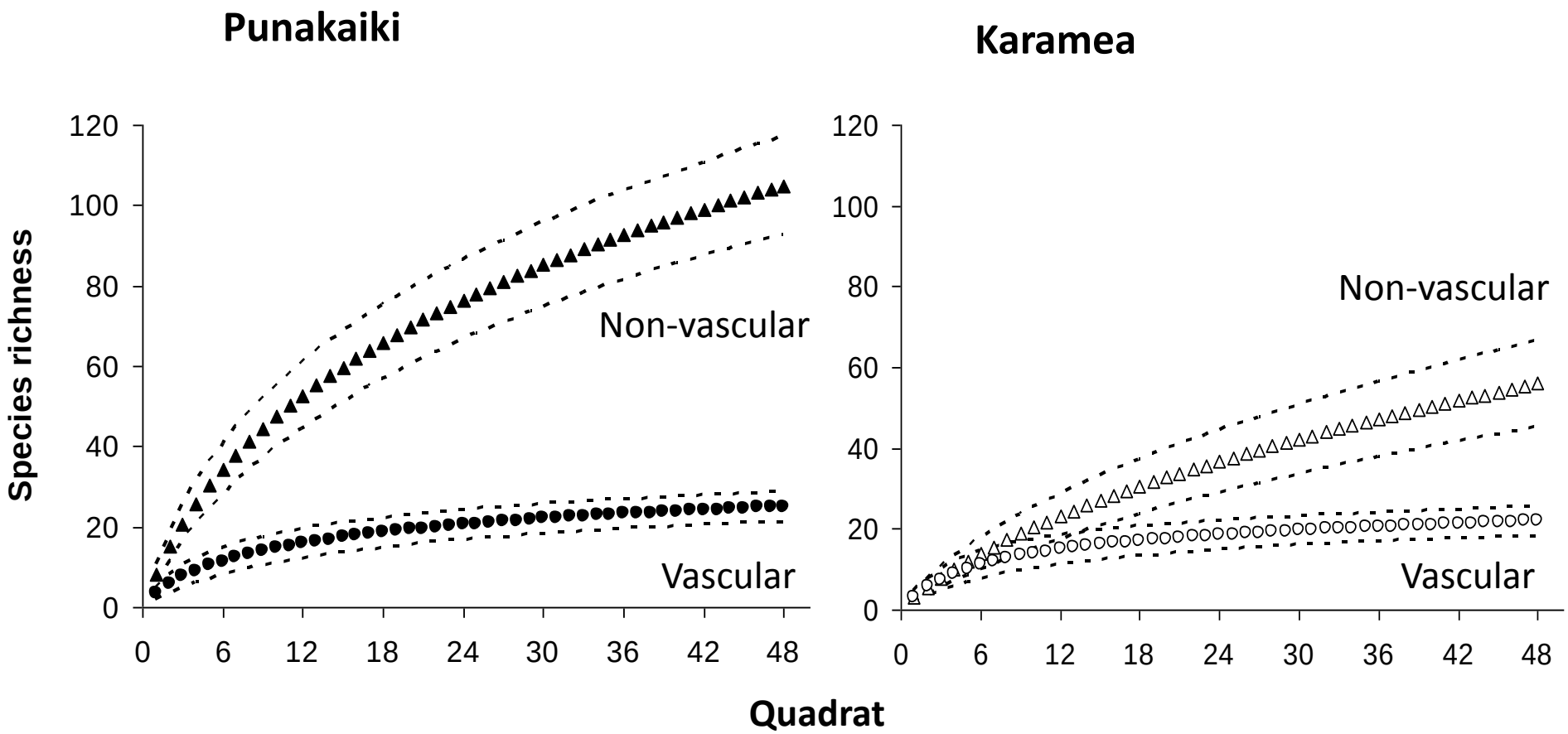


Methods

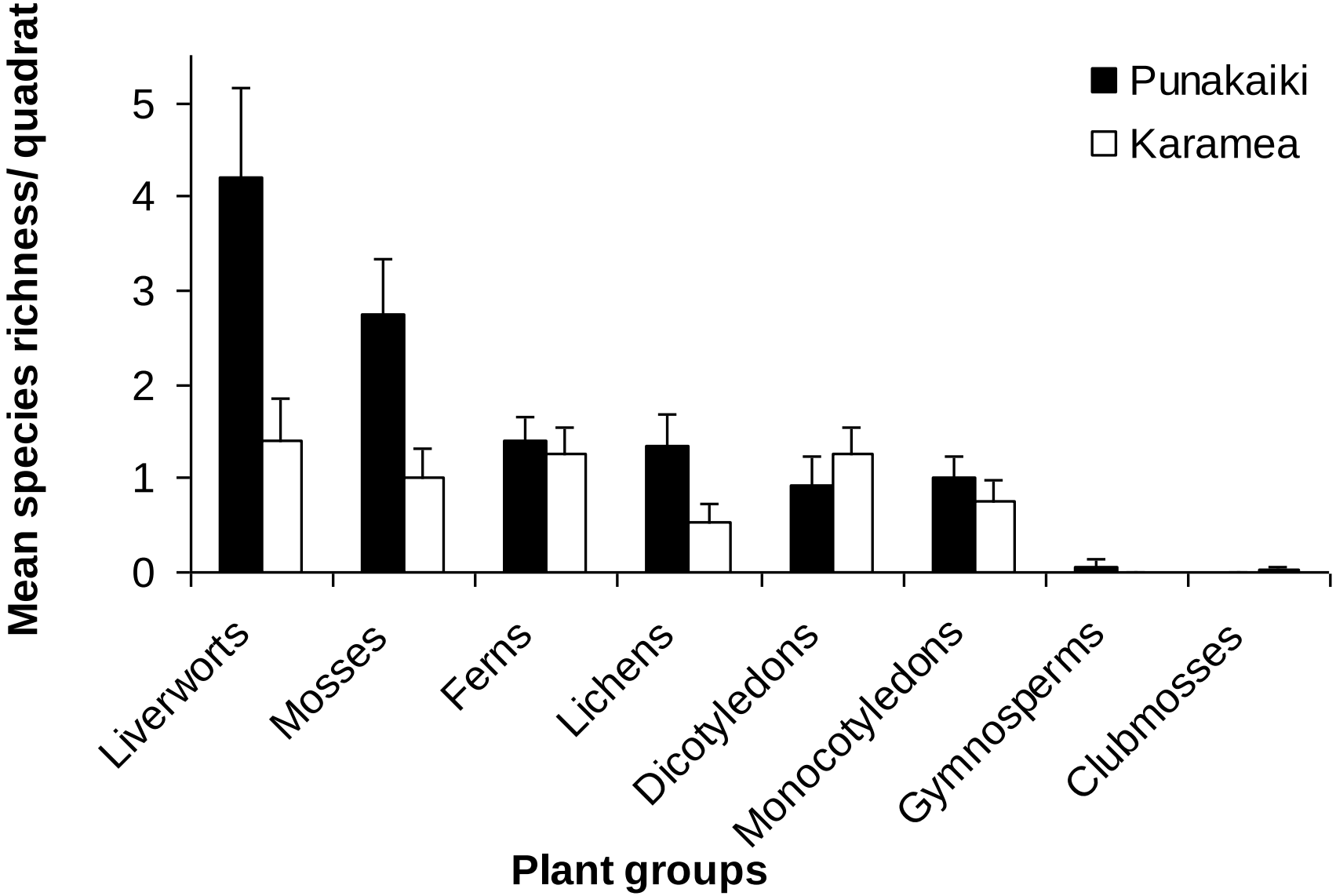
- Single rope technique
- 48 samples from 20 trees/site
- Epiphyte mats (30 x 21 cm)
- Recording of abiotic factors

Results

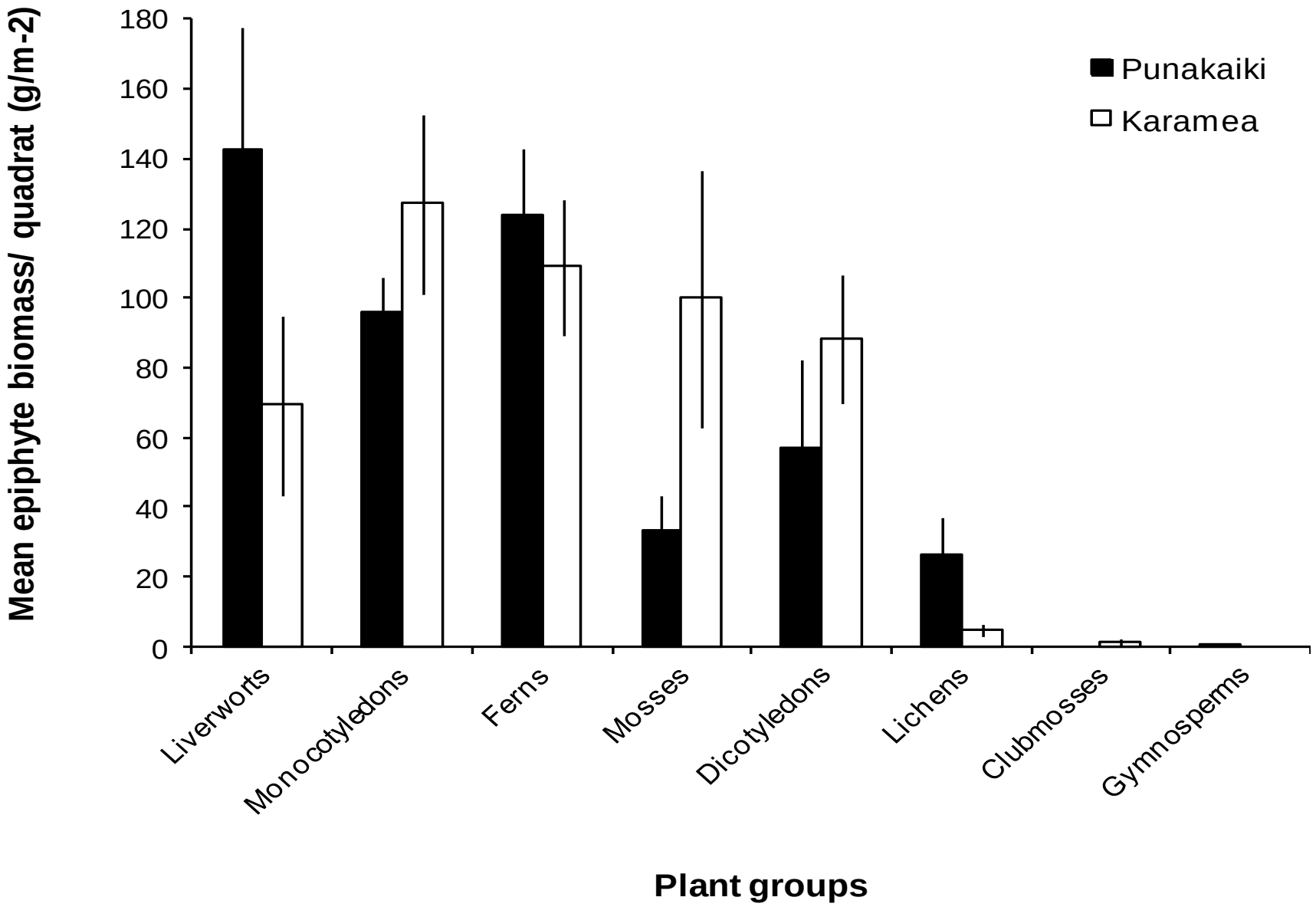
- total of 154 species from 79 genera and 51 families
- Punakaiki 127 spp. vs Karamea 78 spp.
- 51 spp shared between sites
- ~ 80% non-vascular species


Punakaiki
Karamea
Species richness
Quadrat
Non-vascular
Vascular
Non-vascular
Vascular
0
20
40
60
80
100
120
0
6
12
18
24
30
36
42
48

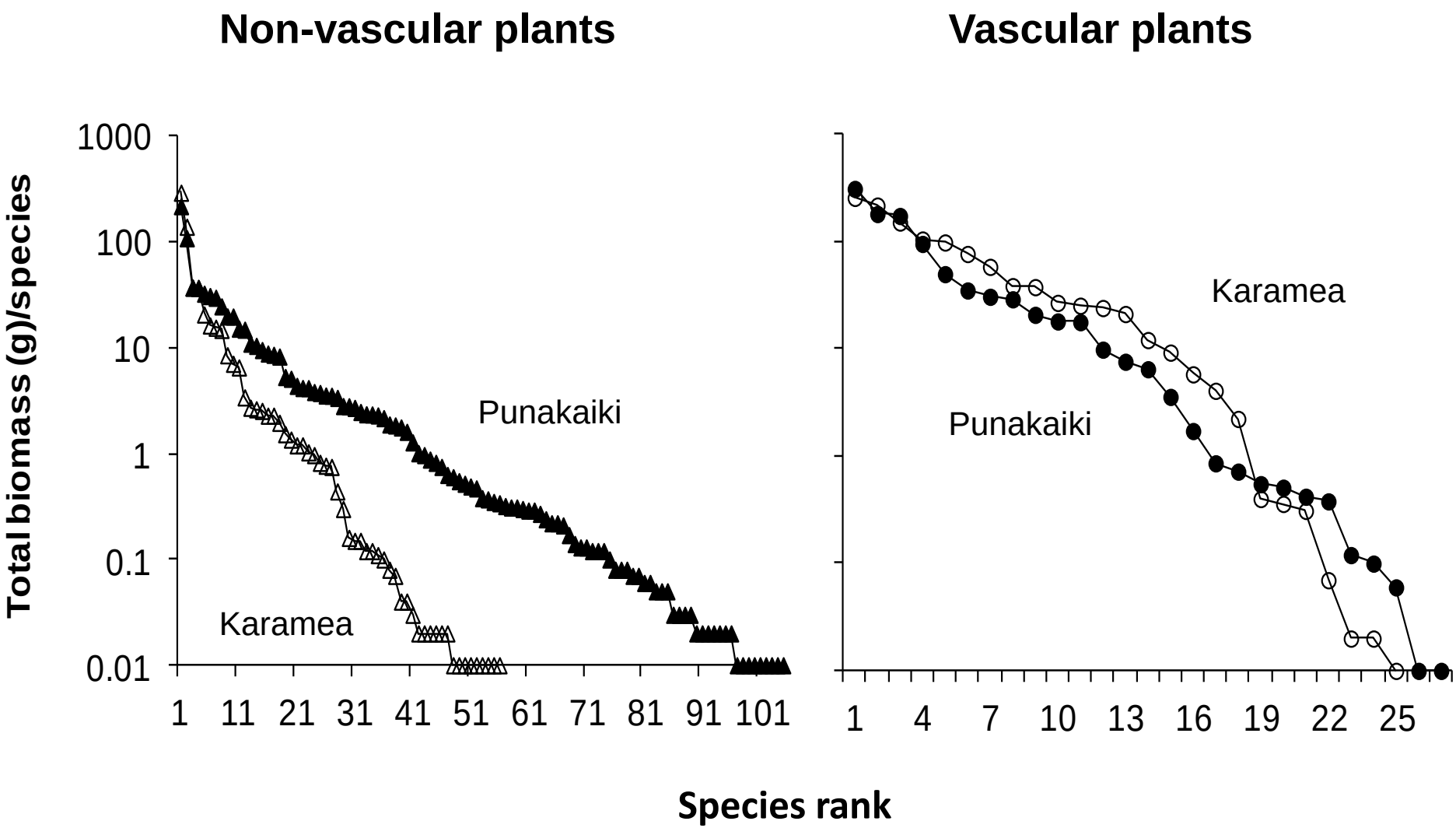
Epiphyte species richness



Epiphyte biomass



	Variance components		
	Site	**Tree (site)**	**Branch (tree, site)**
Species richness (%)			
Total	13.97 ± 20.75* (40)	9.10 ± 3.34* (26)	11.50 ± 2.17 (34)
Monocotyledons	0.003 ± 0.03 (1)	0.16 ± 0.09*** (27)	0.42 ± 0.08 (72)
Dicotyledons	0.03 ± 0.08 (3)	0.18 ± 0.14 (17)	0.83 ± 0.16 (80)
Pteridophytes	0.00 ± 0.03 (0)	0.12 ± 0.13 (12)	0.85 ± 0.16 (88)
Liverworts	3.85 ± 5.79* (35)	2.96 ± 1.14** (27)	4.25 ± 0.80 (38)
Mosses	1.38 ± 2.09** (33)	1.35 ± 0.46* (33)	1.40 ± 0.27 (34)
Lichens	0.31 ± 0.47* (26)	0.02 ± 0.11 (1)	0.87 ± 0.16 (72)
Biomass (%)			
Total	0.0 ± 22.9 (0)	70.6 ± 85.6 (11)	592.7 ± 111.1 (89)
Monocotyledons	0.0 ± 4.3 (0)	2.2 ± 17.0 (2)	137.5 ± 25.7 (98)
Dicotyledons	0.0 ± 4.9 (0)	21.3 ± 17.9 (16)	112.5 ± 21.1 (84)
Pteridophytes	0.0 ± 3.1 (0)	0.0 ± 12.6 (0)	105.4 ± 19.6 (100)
Liverworts	9.6 ± 21.3 (4)	7.4 ± 30.8 (3)	243.7 ± 45.5 (93)
Mosses	7.1 ± 18.2 (3)	48.5 ± 28.7 (23)	154.7 ± 29.1 (74)
Lichens	1.0 ± 1.9 (6)	1.3 ± 2.1 (7)	15.3 ± 2.9 (87)
Ordination scores (%)			
Total	0.04 ± 0.08 (9)	0.21 ± 0.07* (47)	0.20 ± 0.04 (44)
Monocotyledons	0.02 ± 0.07 (3)	0.13 ± 0.10 (25)	0.38 ± 0.09 (72)
Dicotyledons	0.02 ± 0.01 (3)	0.19 ± 0.11 (40)	0.27 ± 0.09 (57)
Pteridophytes	0.07 ± 0.14 (12)	0.40 ± 0.11* (70)	0.10 ± 0.02 (18)
Liverworts	0.02 ± 0.00 (3)	0.05 ± 0.06 (10)	0.43 ± 0.09 (87)
Mosses	0.02 ± 0.01 (4)	0.24 ± 0.10** (46)	0.26 ± 0.06 (50)
Lichens	0.04 ± 0.01** (6)	0.66 ± 0.13* (88)	0.05 ± 0.01 (6)


Non-vascular plants
Vascular plants
Total biomass (g)/species
1000
100
10
1
0.1
0.01
Punakaiki
Karamea
1 11 21 31 41 51 61 71 81 91 101
Karamea
Punakaiki
1 4 7 10 13 16 19 22 25
Species rank

Conclusions

- Substantial differences in spatial patterns of species richness, biomass and composition for vascular and non-vascular epiphytes
- Variation unexplained by abiotic factors measured
- Stochastic dispersal and colonisation success likely important

Vascular epiphytes are poor indicators of total epiphyte diversity!

Acknowledgements

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