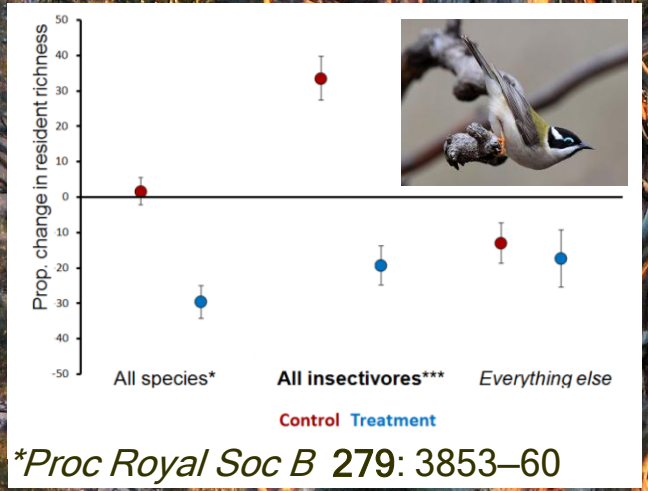
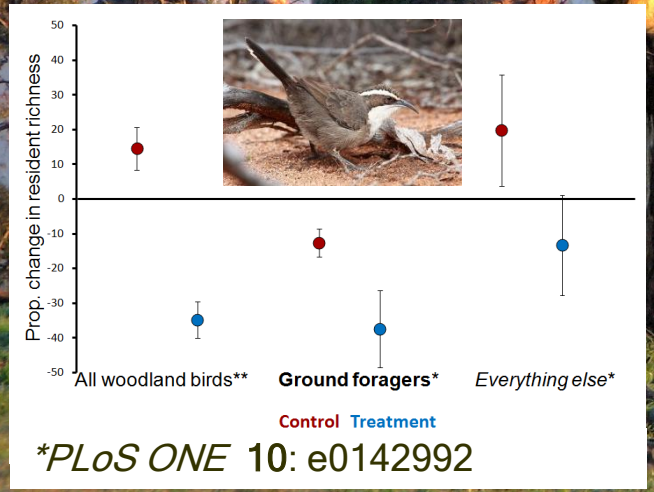
Fleshing out facilitation–reframing interaction networks beyond top-down versus bottom-up

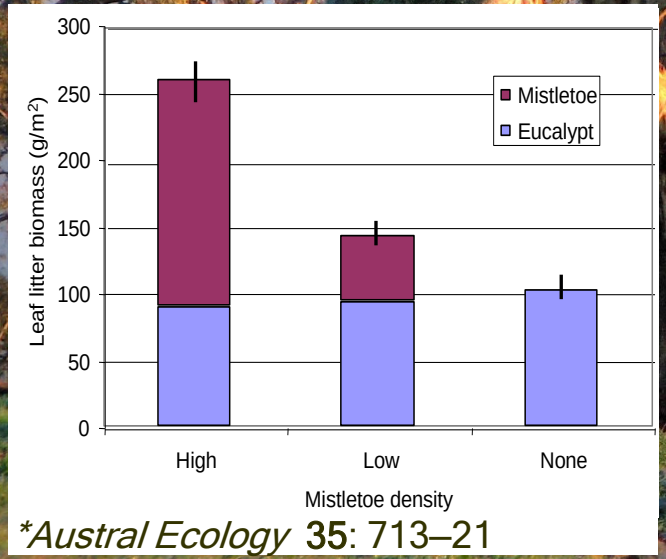
@D0CT0R_Dave



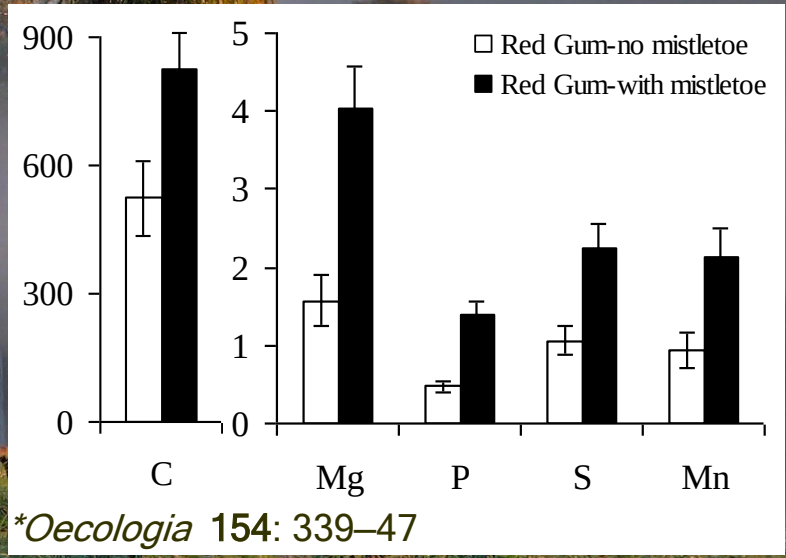
Proc Royal Soc B **279**: 3853–60



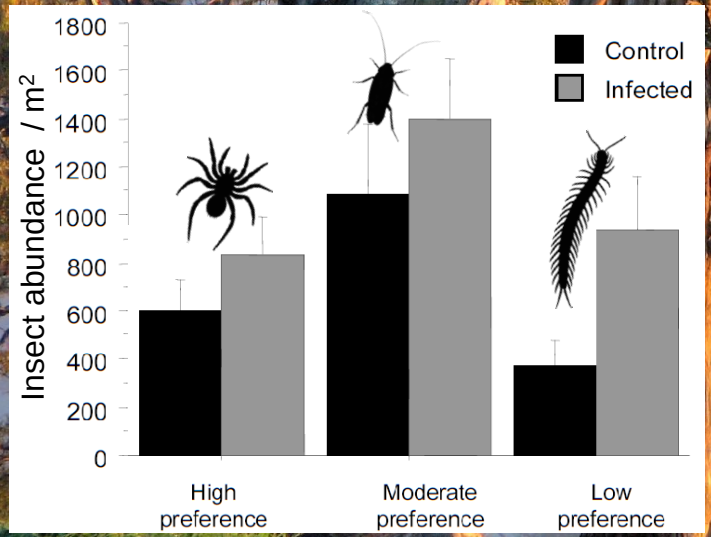
PLoS ONE **10**: e0142992



*Austral Ecology 35: 713–21



*Oecologia 154: 339–47


Insect abundance / m²
1800
1600
1400
1200
1000
800
600
400
200
0
Control
Infected
High preference
Moderate preference
Low preference

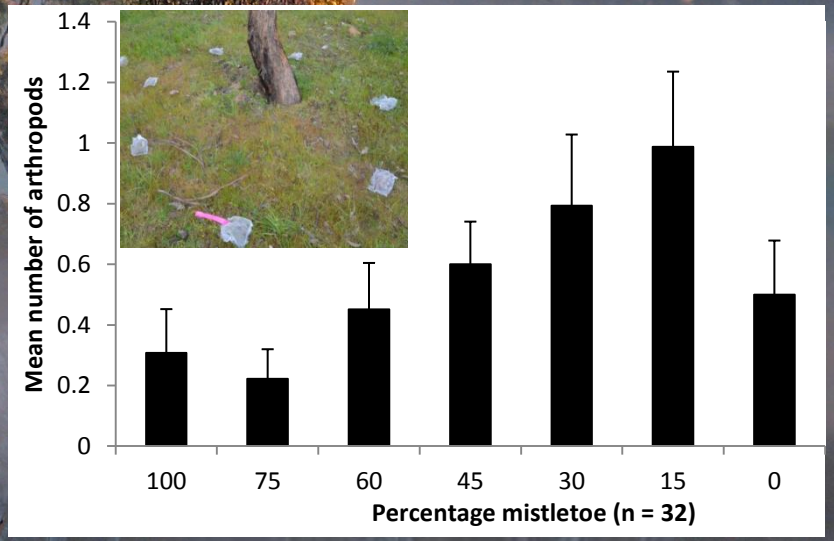
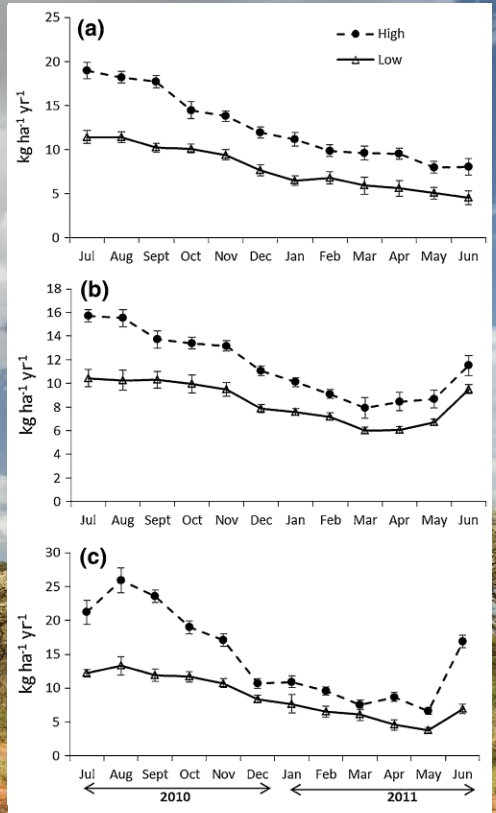

Mean number of arthropods
1.4
1.2
1
0.8
0.6
0.4
0.2
0
100
75
60
45
30
15
0
Percentage mistletoe (n = 32)

Table 5 GLM of the effect of species (*E. ngamicum*, *P. kalachariensis*, *V. verrucosum*, and *A. karroo*, S), mistletoe density (High/Low, D), and their interaction on the nutrients of the surface soil (0–10 cm)

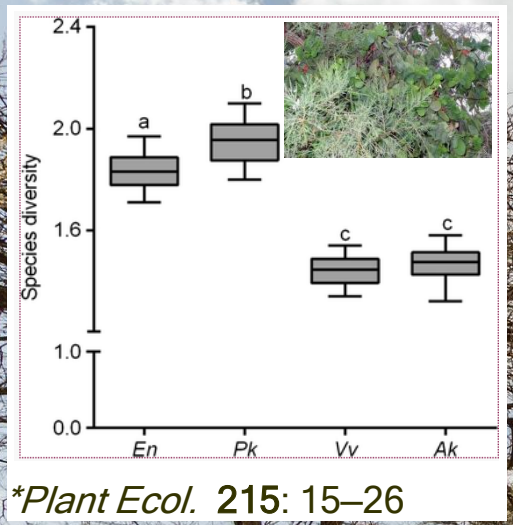
Parameters	Effects		
	Species (S)	Density (*D*)	S × *D*
pH	11.35**	54.94**	21.68***
N	3.97*	70.84**	13.44***
P	0.64*	579.61***	25.17***
K	2.17*	18.96**	1.92
Ca	13.16**	46.22**	24.38**
Mg	0.99*	40.75**	0.68

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$

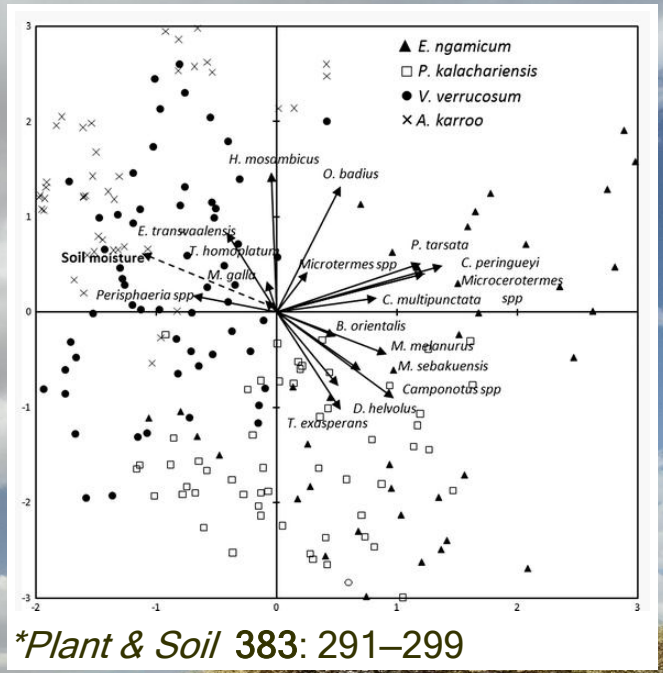
*Plant Ecol. **215**: 15–26



*J. Trop. Ecol. **29**: 147–59



Plant Ecol. **215**: 15–26

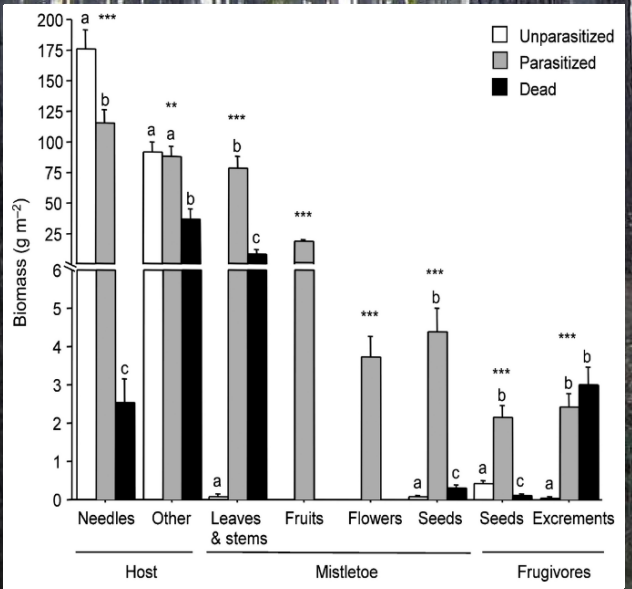


Plant & Soil **383**: 291–299

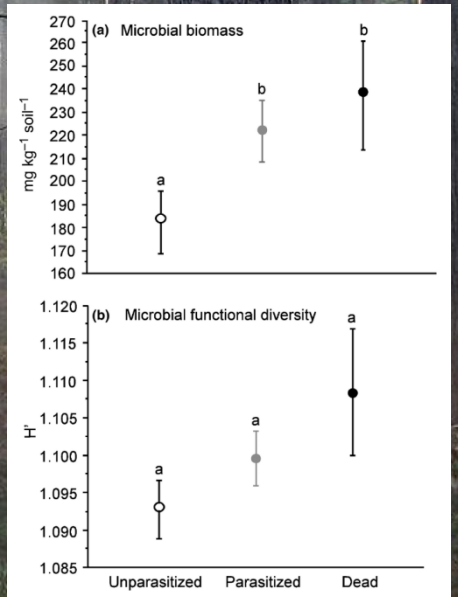




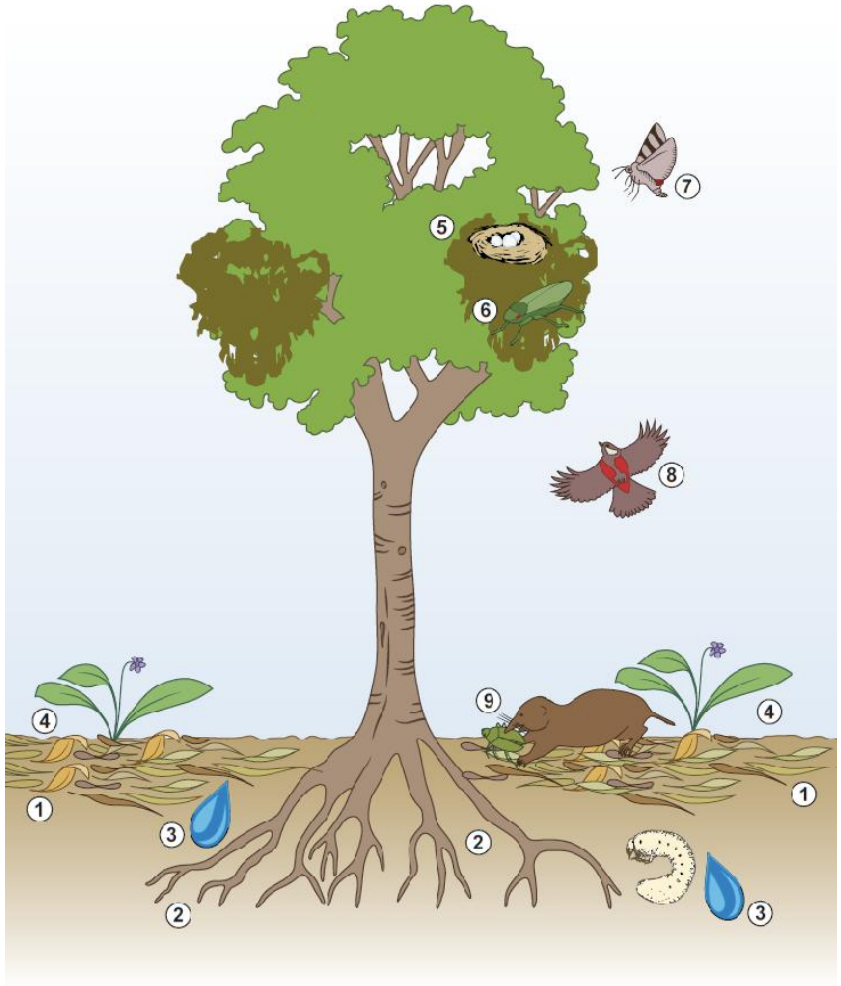




*New Phytologist **211**: 1382–1392



*Functional Ecol. **30**: 3–9

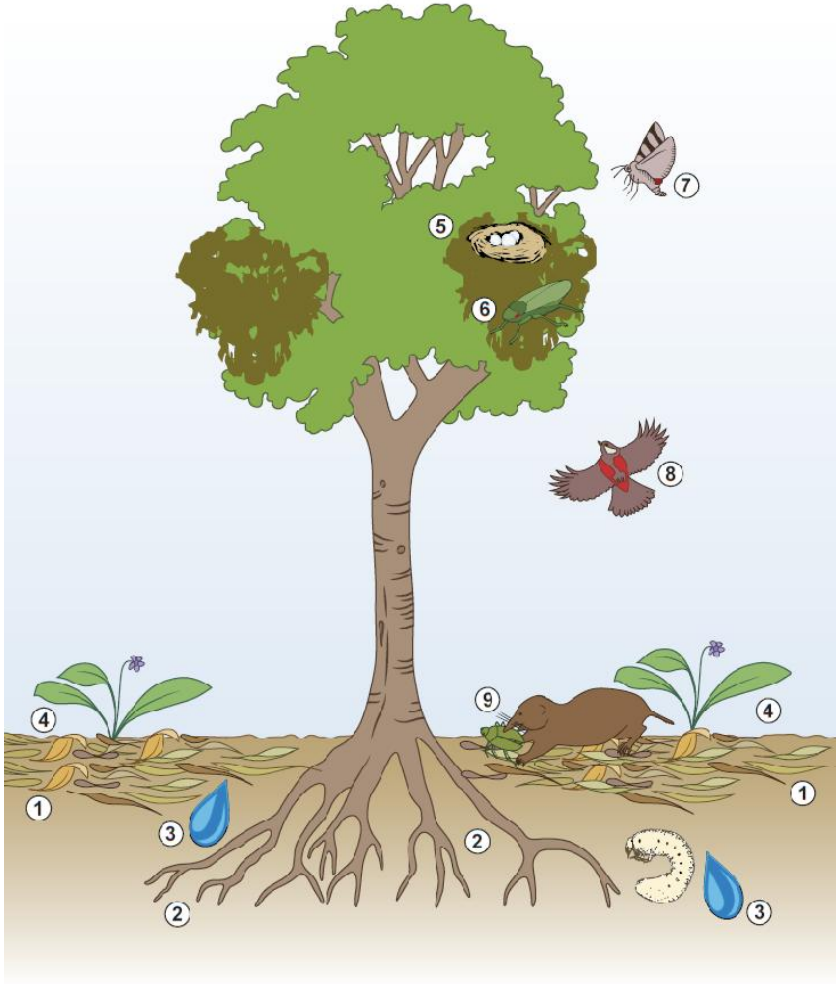

7
5
6
8
4
9
4
1
1
3
2
2
3

① ↑ litterfall

② ↑ microbial biomass

③ ↓ soil moisture

④ ↑ understory biomass & diversity



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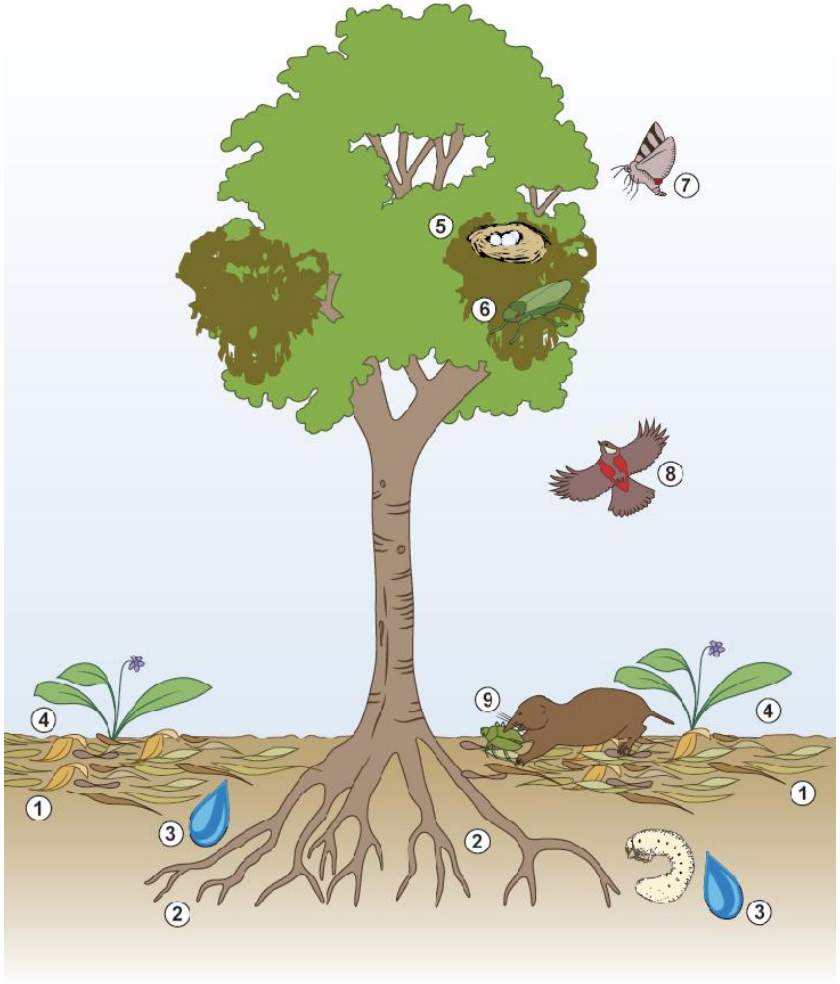
②↑ microbial biomass
③↓ soil moisture
④↑ understory biomass & diversity



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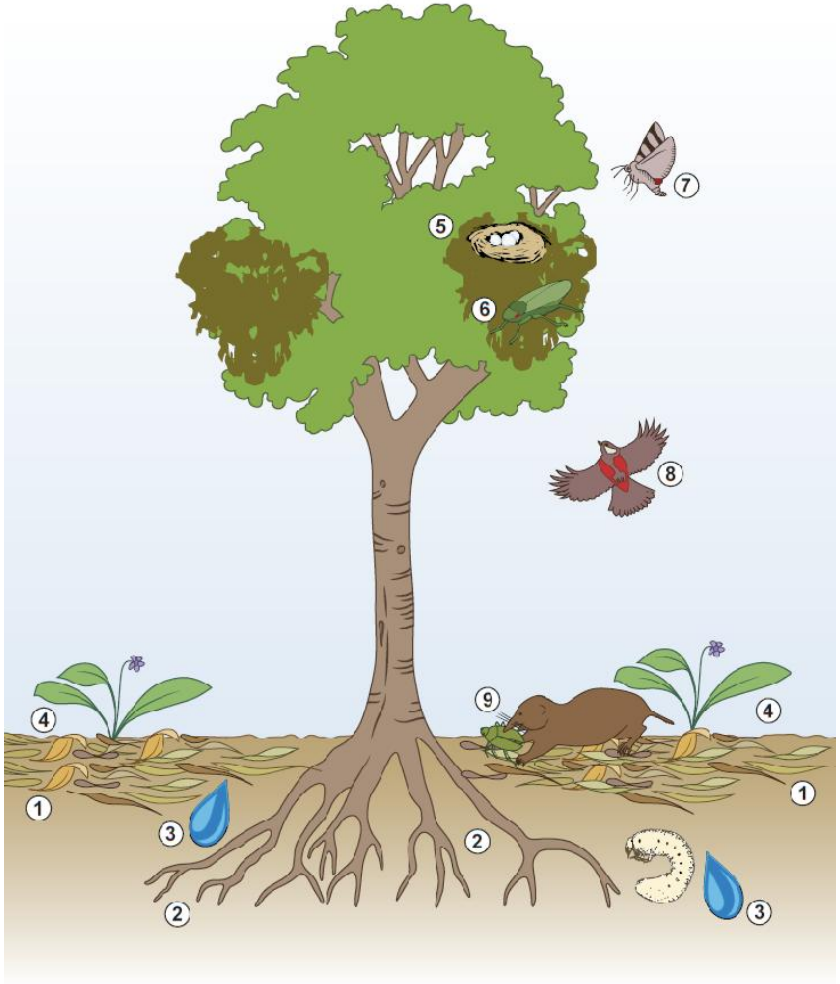
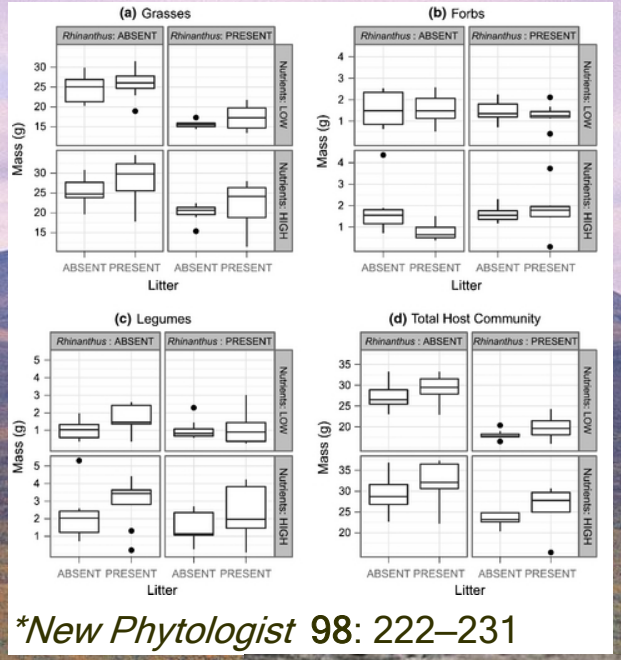
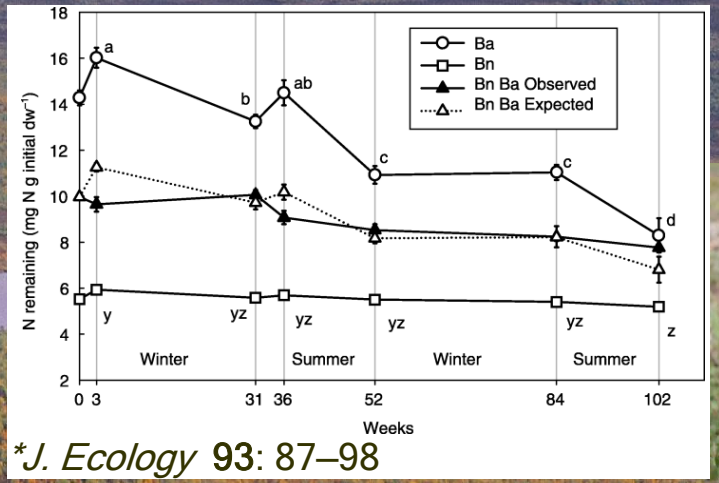


① ↑ litterfall
② ↑ microbial biomass
③ ↓ soil moisture
④ ↑ understory biomass & diversity
⑤ ↑ birds nesting
⑥ ↑ herbivore richness
⑦ ↑ pollinator visitation
⑧ ↑ seed dispersal & nutrient inputs
⑨ ↑ insect / insectivore diversity



*New Phytologist **98**: 222–231



*J. Ecology **93**: 87–98








Research priorities

1. Specificity and redundancy

A persistent challenge in the study of facilitation is the identity of the interactors – are particular roles solely played by individual species or are multiple taxa involved?

In addition to examining these patterns within systems through time, looking across spatial scales (both within and among systems) is crucial to understand the maintenance of facilitative relationships and their resistance to perturbation. In addition to species-scale resolution, examining deeper taxonomic levels will elucidate the evolutionary basis of facilitation cascades, determining whether certain groups are predisposed to involvement.

Research priorities

2. Above-ground below-ground linkages

Building on current efforts to characterize the identity and function of soil micro-organisms, greater scrutiny on epigeic macro-organisms is a priority.

In addition to detritivores, many soil and litter-dwelling organisms burrow, changing the structural properties of soil and enhancing nutrient uptake, litter decomposition and water infiltration. How these biological properties interact with soil chemistry and, therefore microbial and plant function are unknown.

Research priorities

3. Exclosures

Although studies of plant–plant interactions often rely on microcosm experiments, manipulative field experiments are essential to quantify the role of visiting animals.

One of the simplest and most effective ways to quantify the influence of visiting animals on facilitative interactions is installing exclosures. By customizing the design to the organisms of interest (e.g., fences for ground-dwelling browsers, cages for volant pollinators, trunk collars for arboreal species), the magnitude of their influence can be isolated and quantified (relative to procedural controls).

New Phytologist

Review

Tansley insight

Fleshing out facilitation – reframing interaction networks beyond top-down versus bottom-up

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