The curious case of the termites: how rainfall affects diversity in the Australian tropics

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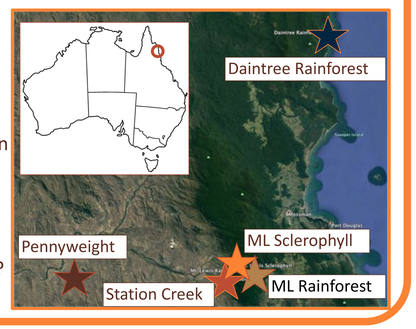
Introduction

- Termites are critical components of tropical systems where they may **decompose up to 50% of plant organic material** in litter, wood and soil.
- In contrast to most tropical systems, where termite diversity and abundance is greatest in areas with the most annual rainfall, in tropical Northern Queensland, Australia, there seems to be a **termite diversity anomaly**, with greatest termite diversity in savannah rather than rainforest areas.

Questions

- How does rainfall affect termite diversity and abundance in Northern Queensland?
- How does termite distribution change across sites (mounds and dead wood)?
- How much turnover can be observed in termite species or feeding guilds across sites?

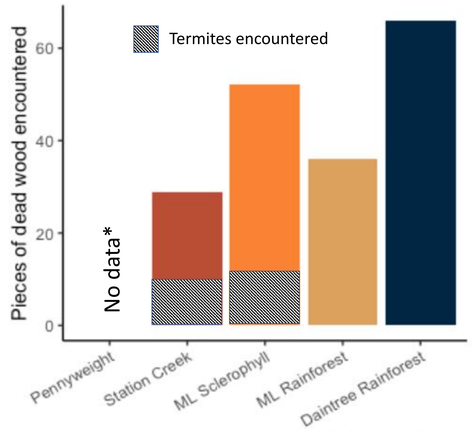


Methods

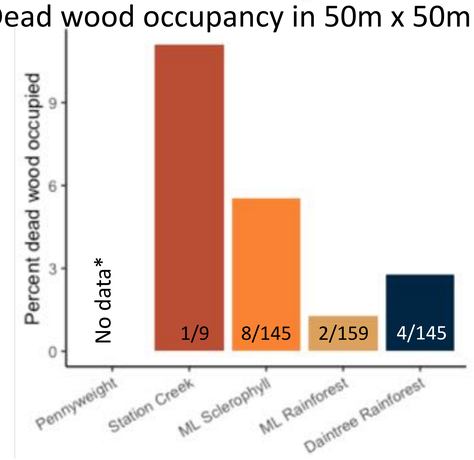
- Five sites in Northern Queensland within 100km of each other with a rainfall gradient of 600-700mm/year to 6000-7000mm/year.
- At each site, we set up 50x50m plots subdivided into 10x10 squares.
- We measured mound occupancy within each plot.
- We measured dead wood occupancy in 2 - 50 m transects, as well as additional dead wood occupancy within the 50x50m plots.
- We collected termite specimens from each site and identified them to compare termite diversity.

Results

Dead wood occupancy in 50m transects



Dead wood occupancy in 50m x 50m plots



*Because of extreme weather events, we were unable to obtain a complete dataset from the Pennyweight site. Updated results will be available after July 2019

Driest (600-700mm/year) → Wettest (6000-7000mm/year)

Mound Occupancy

5	8	4	3	

5 mounds/square*

4	4	6	7	6
3	3	5	6	3
4	3	3	4	5
6	2	3	2	0
5	3	6	9	5

4.3 mounds/square

0	1	0	0	0
0	0	0	0	0
1	0	0	1	0
0	0	0	0	0
0	0	0	0	0

0.12 mounds/square

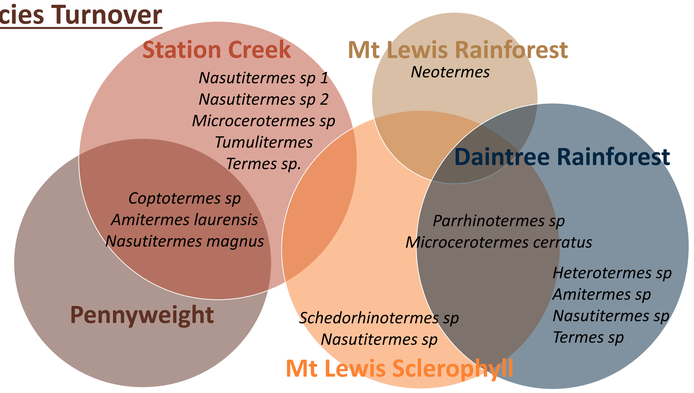
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

0 mounds/square

1	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

0.04 mounds/square

Species Turnover



- Mound abundance and dead wood occupancy decrease across rainfall gradient.
- Termite species and feeding guilds correspond more closely with habitat type than with distance from other sites

Conclusions

Litter and grass feeding termites were found only in the savannah sites, while wood feeders were found in both rainforest and savannah sites. These **results support the termite diversity anomaly** and point to turnover in feeding guild with greater diversity in savannah, suggesting that part of the anomaly lies in the adaptations to food resources across habitats. The presence of several species of termites in sites that are more similar in rainfall instead of geographic distance from other sites suggests that **termite communities in Northern Queensland assemble in large part based on habitat type**.

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