

BEEquations & test reasons

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1 Dissimilarity Measures

Metaweb: Regional pool of species and all interactions. (γ diversity)

Realisation: Local network drawn from regional metaweb (α diversity)

β diversity: Differences between two subsets/realisations/local networks

Whittaker's β diversity measure ([Poisot et al., 2012](#))

The 'realisation membership' vector, M , takes the form:

$$M = [c = \|A \notin B\|, b = \|B \notin A\|, a = \|A \cup B\|] \quad (1)$$

Basically:

- c is the number of items unique to realisation A
- b is the number of items unique to realisation B
- a is the number of items common to both realisations.
- items can refer to species, interactions, etc...

$$\beta_w(M) = \frac{a + b + c}{(2a + b + c)/2} - 1 \quad (2)$$

$$\beta_{WN} = \beta_{ST} + \beta_{OS} \quad (3)$$

where:

- β_{WN} : Dissimilarity of interactions (β_{int} in [CaraDonna et al. \(2017\)](#))
- β_{ST} : Dissimilarity of interactions due to species turnover ($\beta_{WN} - \beta_{OS}$)
- β_{OS} : Dissimilarity of interactions established between species common to both realisations (interaction rewiring; β_{rw} in [CaraDonna et al. \(2017\)](#); extract common species of both networks, number of interactions common to both networks, a and unique to each, b & c)

β_S : Dissimilarity in the species composition of communities β ranges from 0 to 1.

A higher β reflects a higher difference between two realisations.

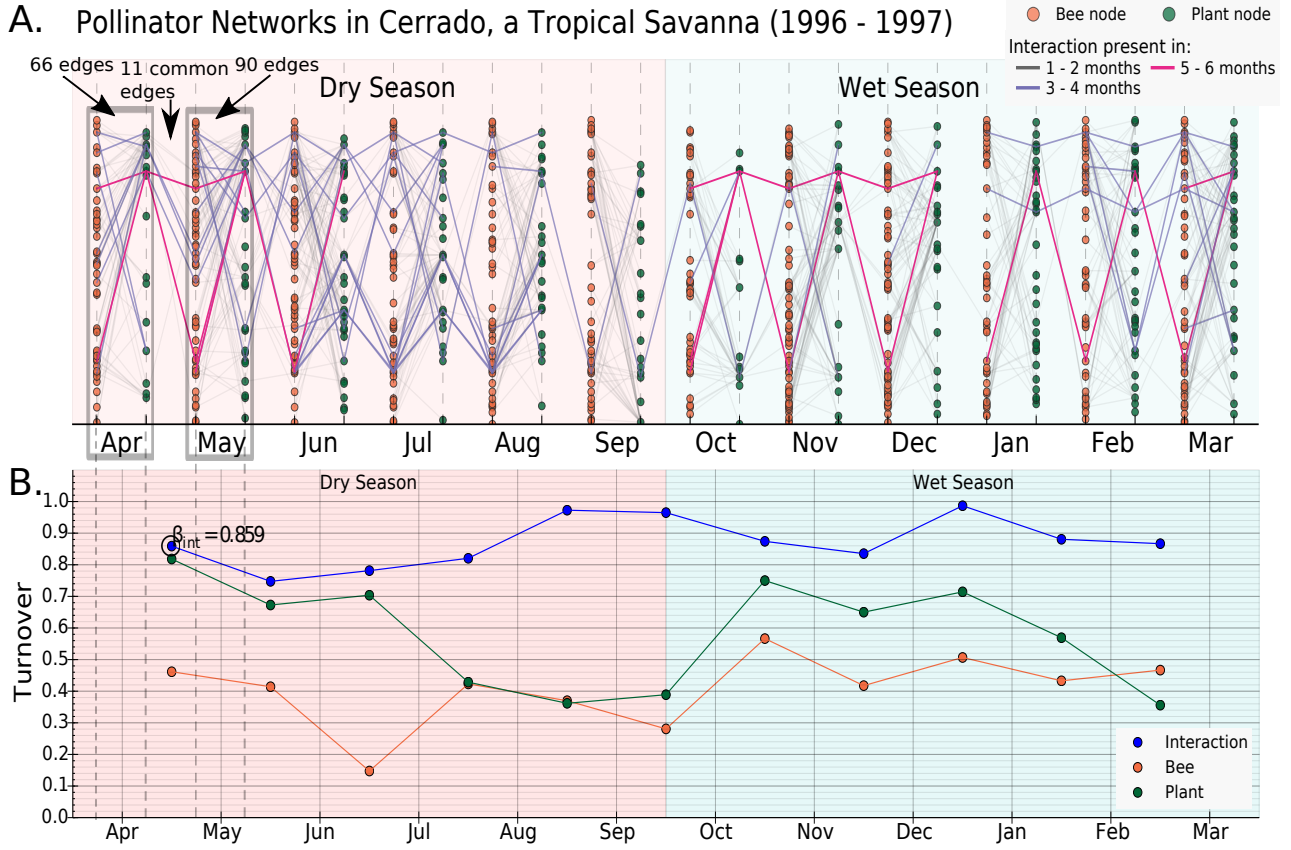


Figure 1: (A) Monthly bee pollinator networks from April 1996 to Mar 1997.

(B) Bee-flower interaction turnover and species turnover from April 1996 to Mar 1997.

Average monthly precipitation sum = 25.3 mm (Dry Season), 239.6mm (Wet Season)

For example, when comparing between April and May networks in [Figure 1](#):

$$\beta_{WN} = \frac{11 + 55 + 79}{(2 \times 11 + 55 + 79)/2} - 1 = 0.859 \quad (4)$$

$$\beta_{OS} = \text{havetofindlistofcommonspecies,extractinteractionsbetweenonlycommonspeciesthanrunturnoverscrip} \quad (5)$$

$$\beta_{ST} = \beta_{WN} - \beta_{OS} = 0.859 - \quad (6)$$

$$(7)$$

Multi-site dissimilarity ([Poisot et al., 2012](#))

A measure of global variability between the different realizations, assuming system is sampled enough, and metaweb a proxy of the regional pools of species and interactions.

Connectance is L/n^2 , where L is number of interactions and n is number of species.

Nope, I don't understand. (Understand the idea but not the equations.)

2 Statistic test

2.1 Spearman's correlation coefficient

Non-parametric measure of rank correlation.

x vs. β_{WN}

How much x explains/correlates with β_{WN} .

How much x is responsible for interaction turnover. x vs. β_{OS}

How much x explains/correlates with β_{OS} .

How much x is responsible for interaction rewiring among common species.

x vs. β_{ST}

How much x explains/correlates with β_{ST} .

How much x is responsible for interaction turnover due to species turnover.

x vs. β_S How much x explains/correlates with β_S .

How much x is responsible for species turnover.

Random shuffling

Spearman coefficient compare with mean of distribution (of coefficients generated from Monte Carlo stimulation)

H_0 : By random chance, x correlated with y.

H_a : Higher than mean- $\hat{\rho}$ how to determine how much higher, Not random, x probably a driving force of y. (What do you mean by systemic?)

What if it is lower than mean... play a smaller role than if random...? or not possible scenerio....?

Where x & y pairs:

- β_{ST} vs. β_{WN}
- β_{OS} vs. β_{WN}
- β_S vs. β_{WN}
- β_S vs. β_{ST}
- climate turnover vs. $\beta_S, \beta_{ST}, \beta_{OS}, \beta_{WN}$
- what about temperature turnover? only for shuffling species within seasons, within years, everything?
- also, shuffle Cerrado and Boa Ventura separately right?

Random shuffling of interactions within months

Ignore climate turnover vs. β_S

Random shuffling of species within seasons

Random shuffling of species within year

Random shuffling of species across all

References

- CaraDonna, P. J., Petry, W. K., Brennan, R. M., Cunningham, J. L., Bronstein, J. L., Waser, N. M. and Sanders, N. J. (2017). Interaction rewiring and the rapid turnover of plant-pollinator networks. *Ecology Letters* 20, 385–394.
- Poisot, T., Canard, E., Mouillot, D., Mouquet, N. and Gravel, D. (2012). The dissimilarity of species interaction networks.