The geographical ecology of pond bacteria

August 4, 2015

Overview

We asked whether "Active" and "All" differ in primary aspects of alpha-diversity, beta-diversity, and geographical patterns: the taxa-area relationship (TAR), the distance-decay relationship in taxonomic and phylogenetic community similarity.
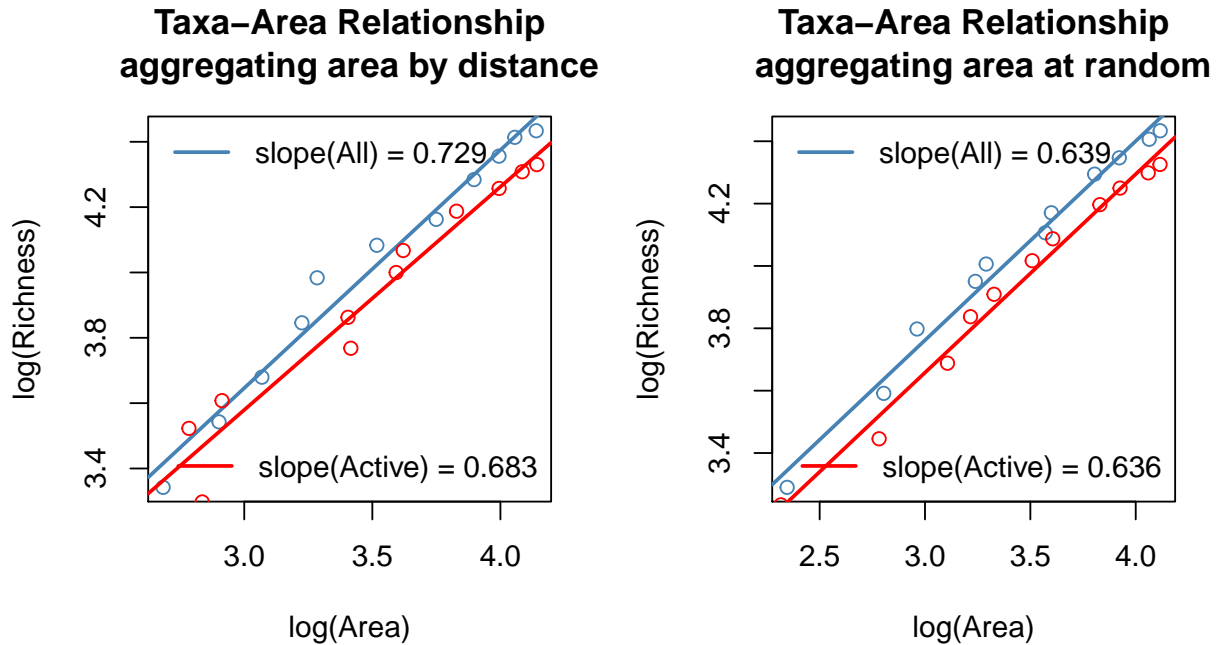
FINDINGS

1.) No differences in distributions of observed N, S, Diversity, and Evenness

For each pond, we used the observed taxonomic richness (S), total number of gene reads (N), and number of gene reads per OTU (Ni) to estimate Shannon's diversity index (H), and Simpson's evenness (D/S).
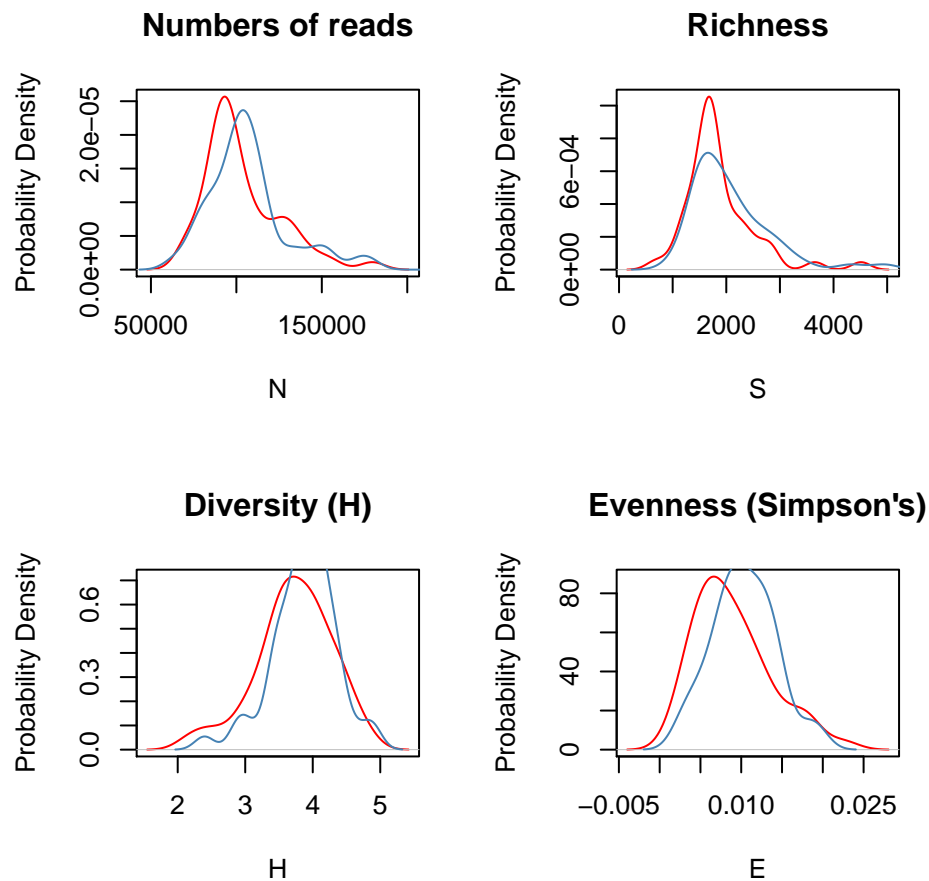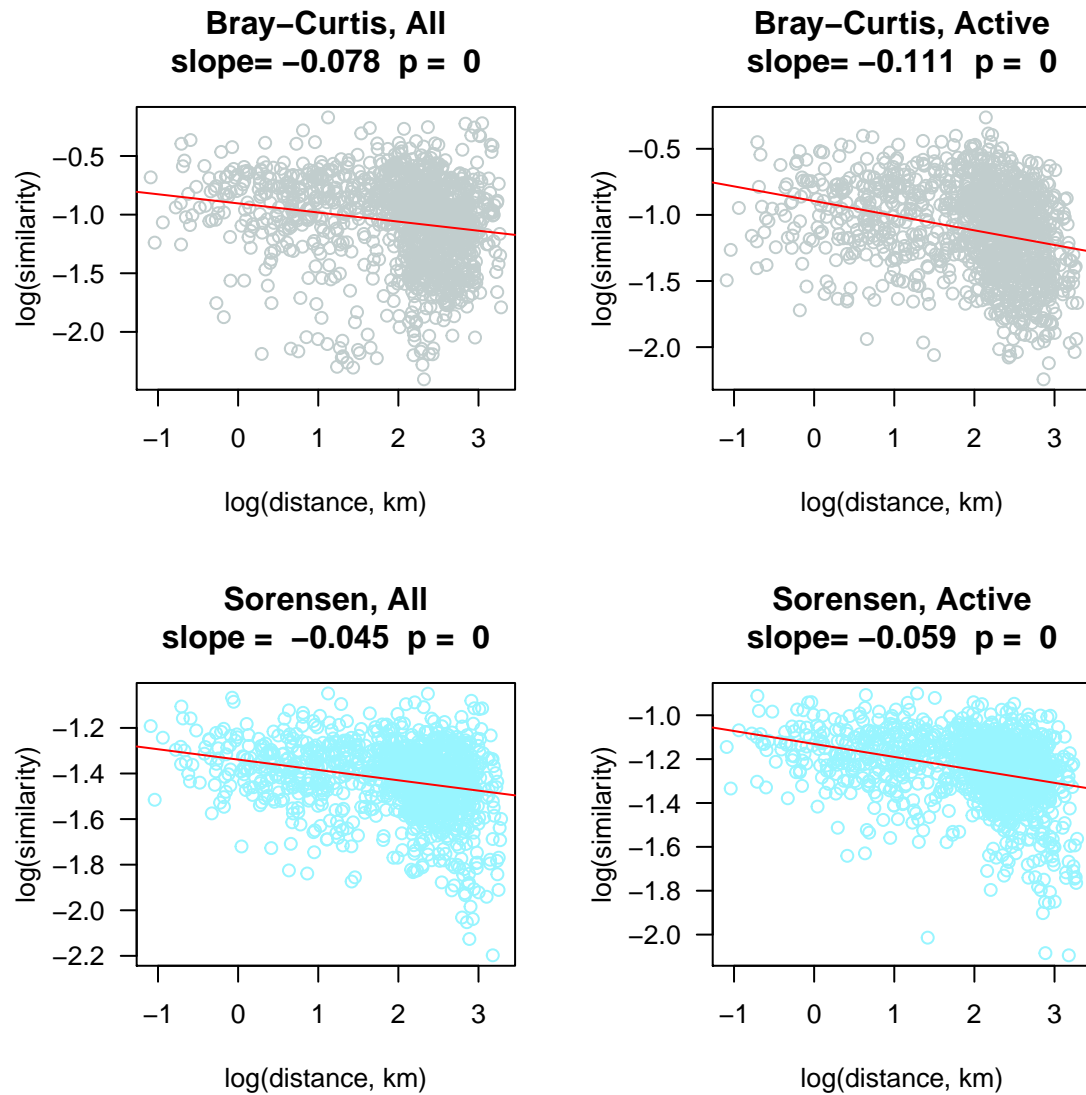
2.) No differences in slopes of taxa-area relationships

The species-area relationshp describes the rate at which species are discovred with increasing area. The SAR one of ecology's oldest and most intensively studied patterns. Arrhenius (1921) first described the general form of the *species-area relationship (SAR)* as a power-law: $S = cA^z$ where S is species richness and A is area. Arrhenius's formula predicts a rate of increase in richness that is approximately linear in log-log space. That is, $log(S) = c + zlog(A)$, where z is the scaling exponent.

Taxa–Area Relationship aggregating area by distance

slope(All) = 0.729
slope(Active) = 0.683

Taxa–Area Relationship aggregating area at random

slope(All) = 0.639
slope(Active) = 0.636

**3.) Slight differences in distance-decay relationships**

Are the slopes of the DD's different?

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## [1] "Bray-Curtis: Difference in slope = -0.033 ; p = 0.015"
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## [1] "Sorensen: Difference in slope = -0.014 ; p = 0.02"
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4.) Little difference in community distance matrices between Active and All when using presence-absence; generally low similarity. Substantial differences between Active and All based on Bray-Curtis.
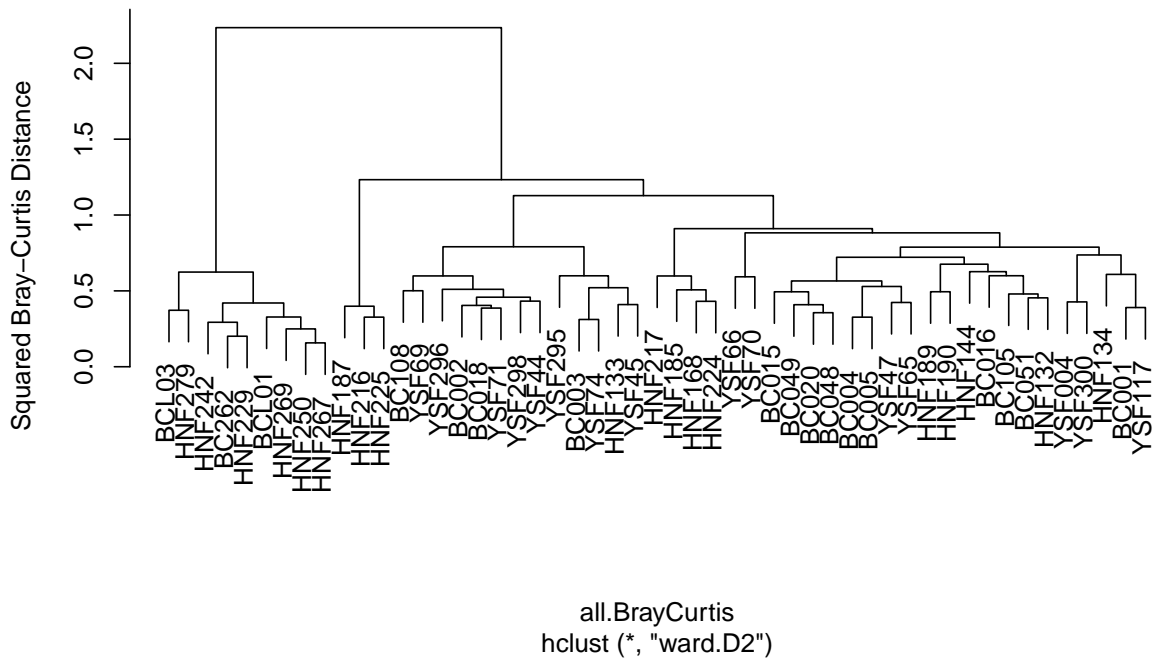

Jaccard (active)

Jaccard (all)

Bray−Curtis (active)

Bray−Curtis (all)
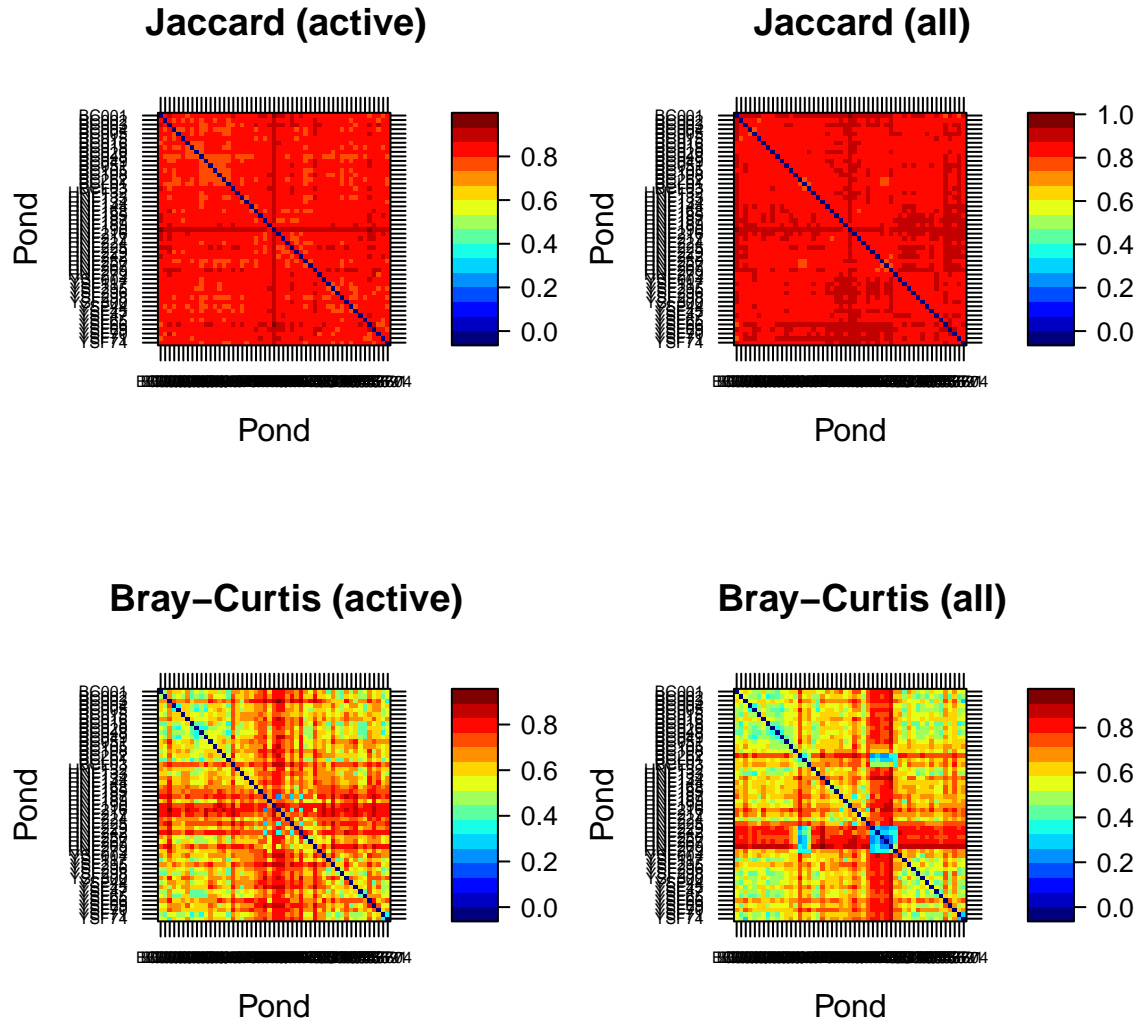
5.) Cluster analysis reveals greater clustering among Active. Note the tight cluster of primarily HNF sites on the left side of Active.

IN Ponds: Ward's Clustering

active.BrayCurtis
hclust (*, "ward.D2")

IN Ponds: Ward's Clustering

all.BrayCurtis
hclust (*, "ward.D2")
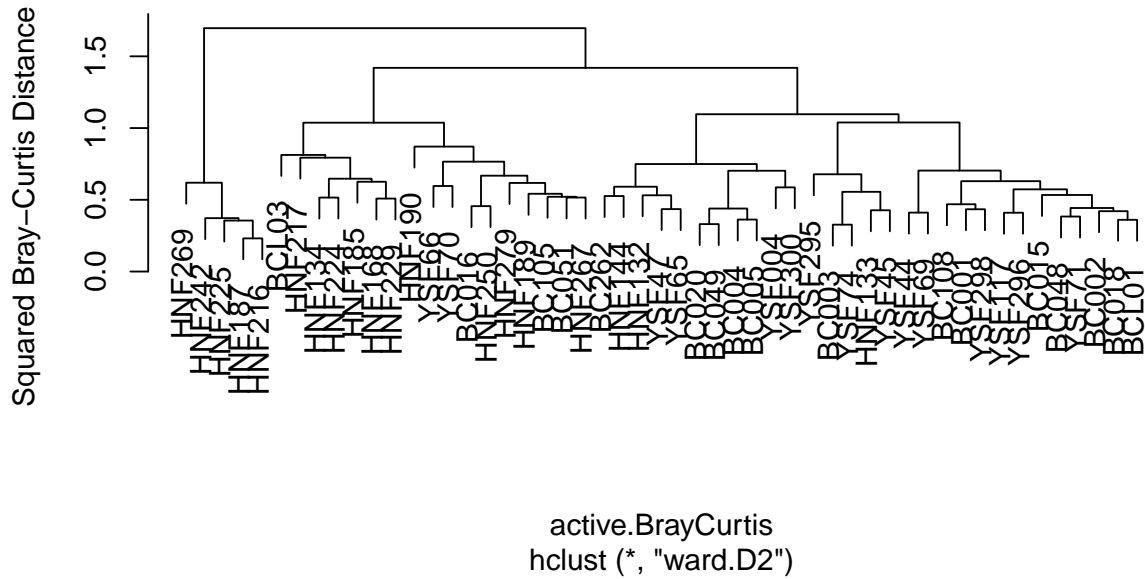
6.) Heat-mapping cluster analysis among dominant OTUs reveals that dominance in abundance does not reflect dominance in activity. Colormap represents log-transformed numbers of reads.

10 most dominant (Active)