Statistical Analysis of Amplicon Data

Part 1

October 11, 2019

Count Data

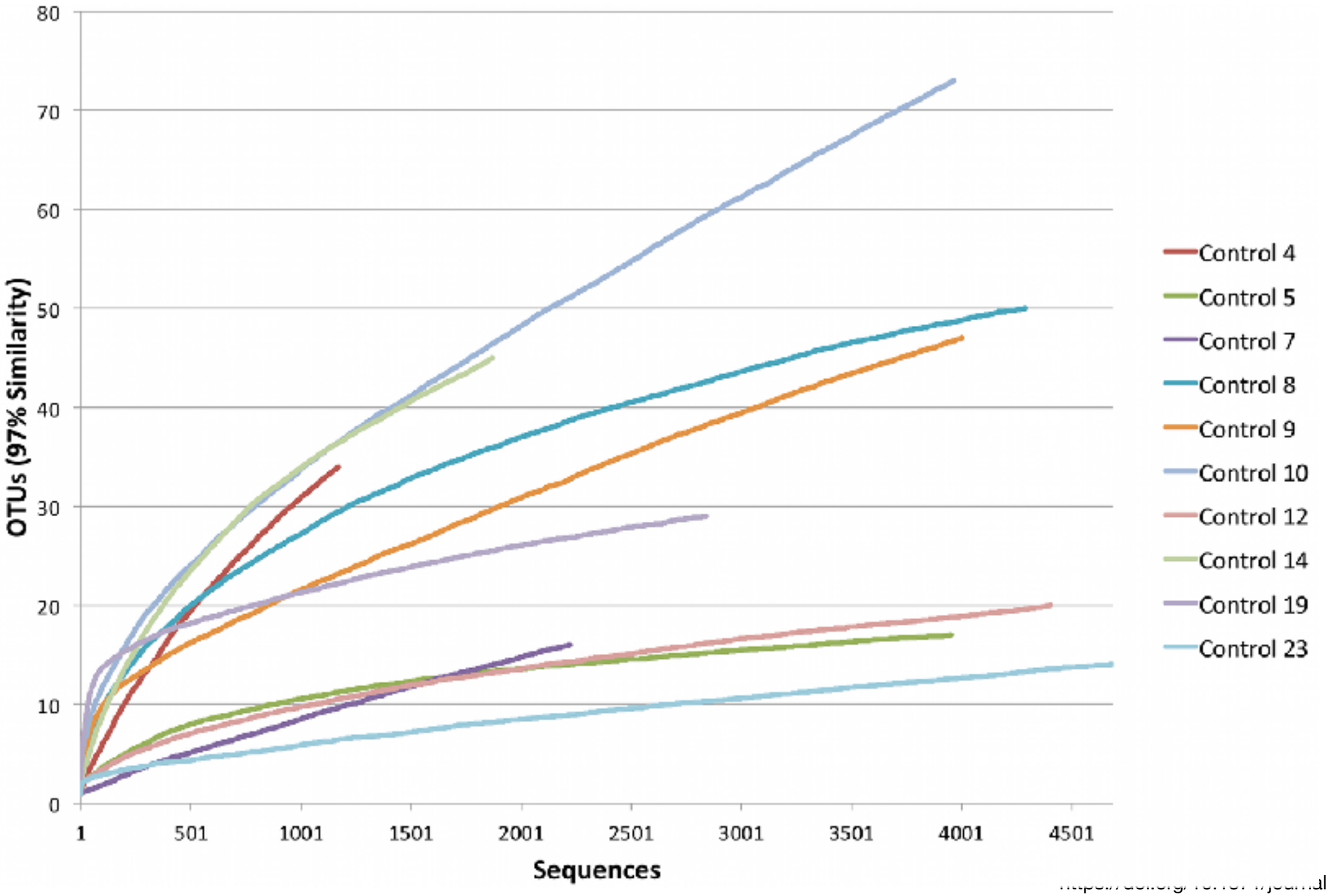
	OTU 1	OTU 2	…	Meta 1	Meta 2	…
Sample 1						
Sample 2						
…						
Sample N						

N

P

Exploratory Analysis and Quality Control

Collector's Curves (aka rarefaction)



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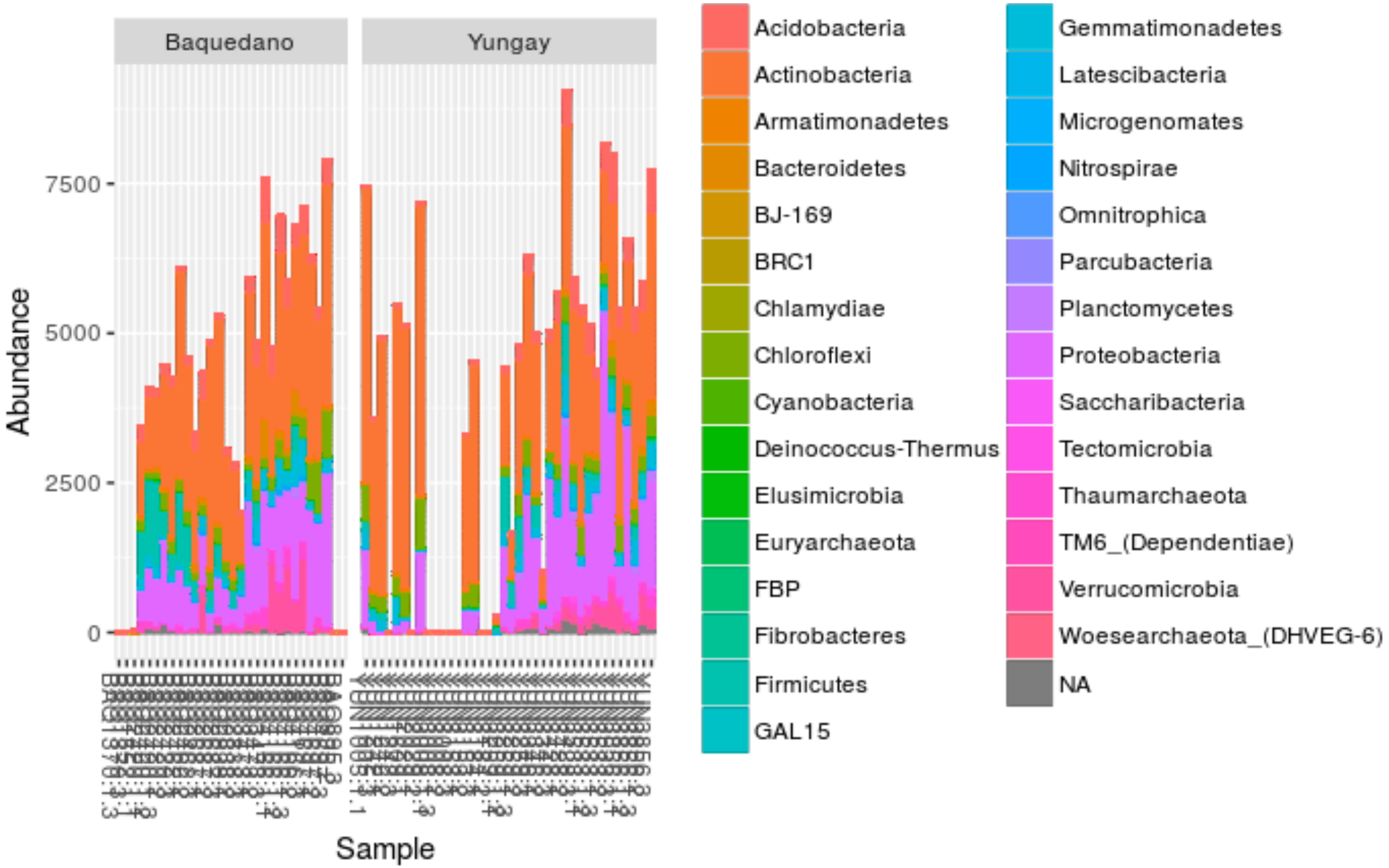
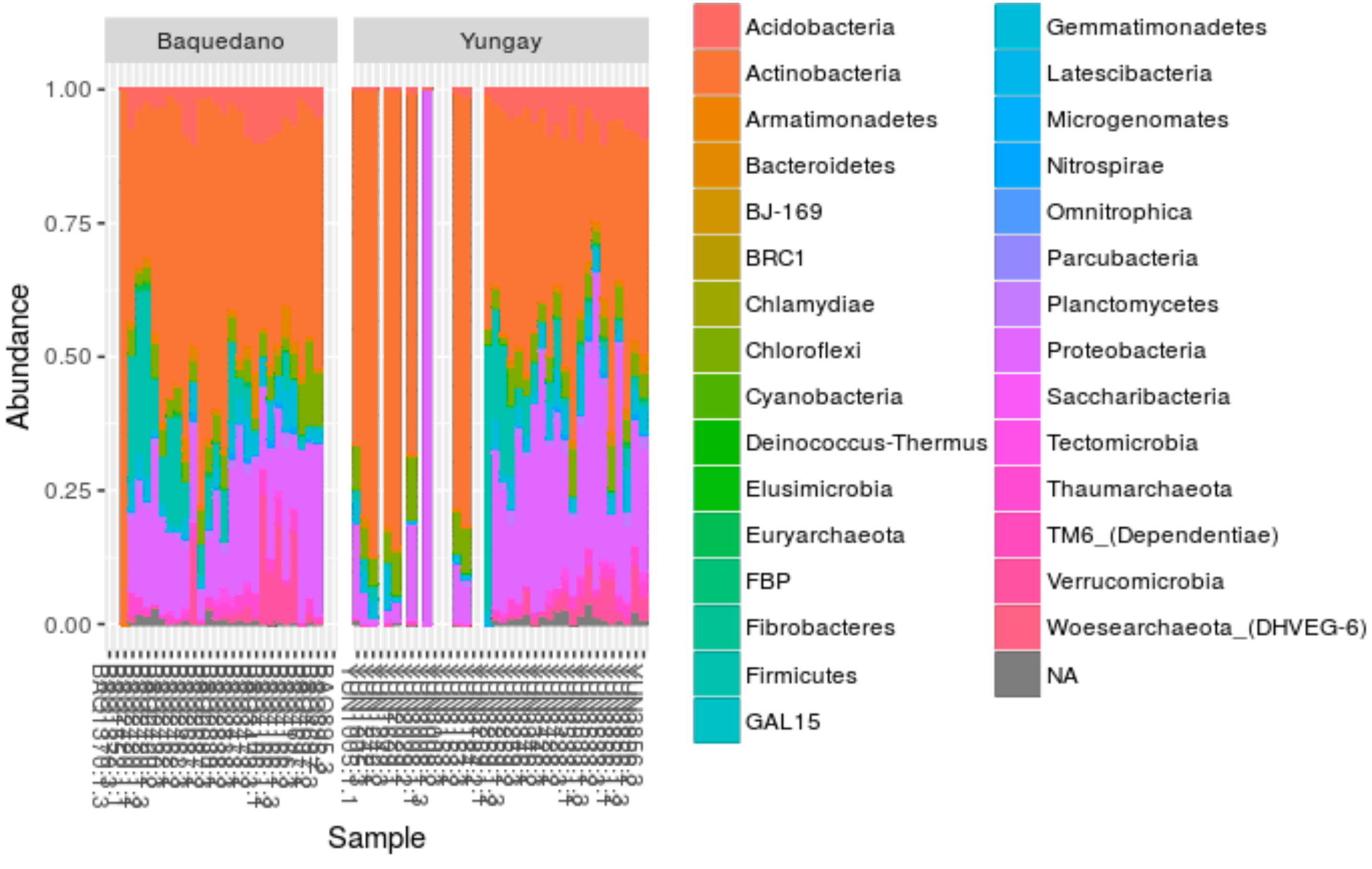
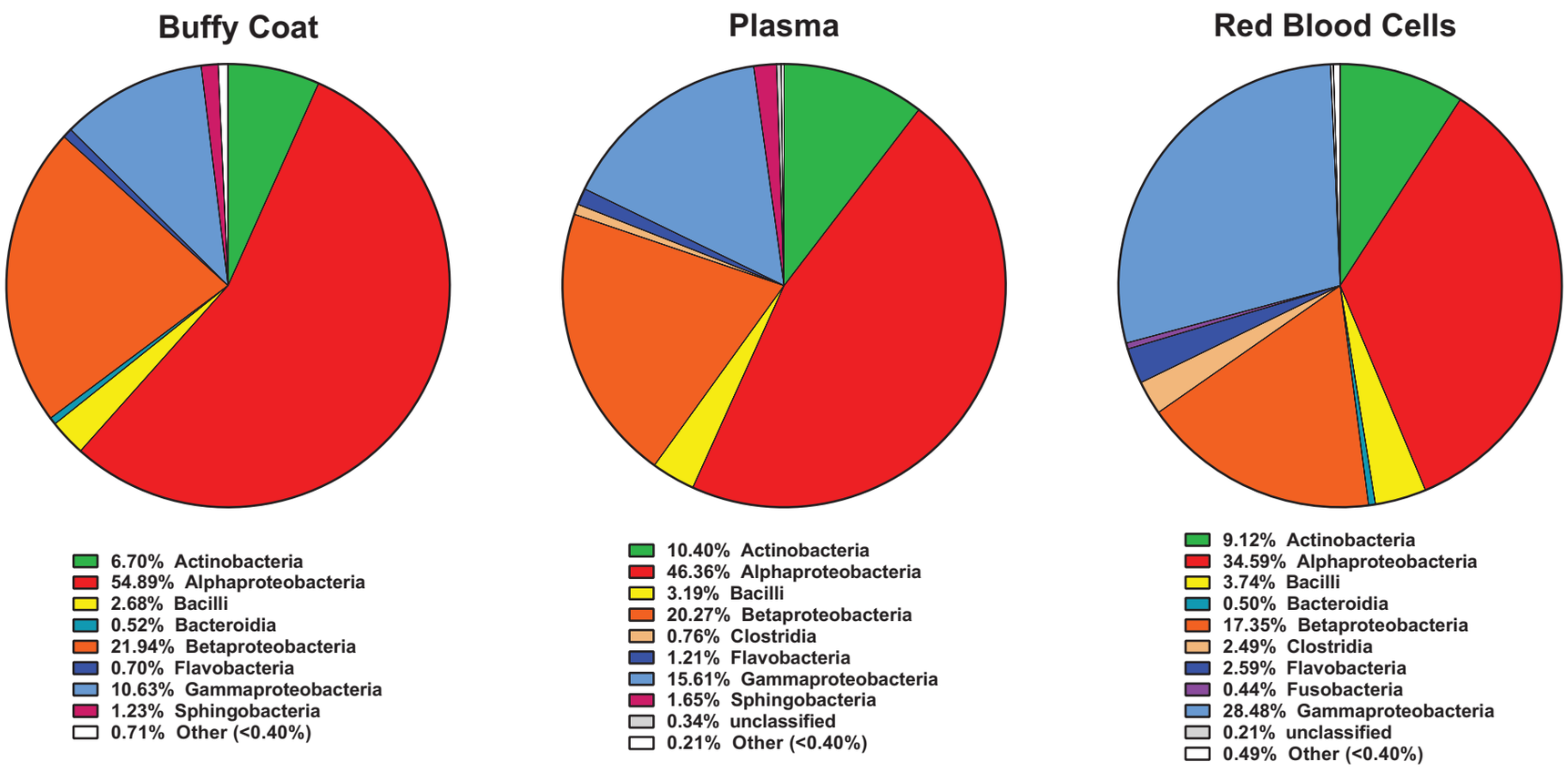
Absolute Abundance



Relative Abundance

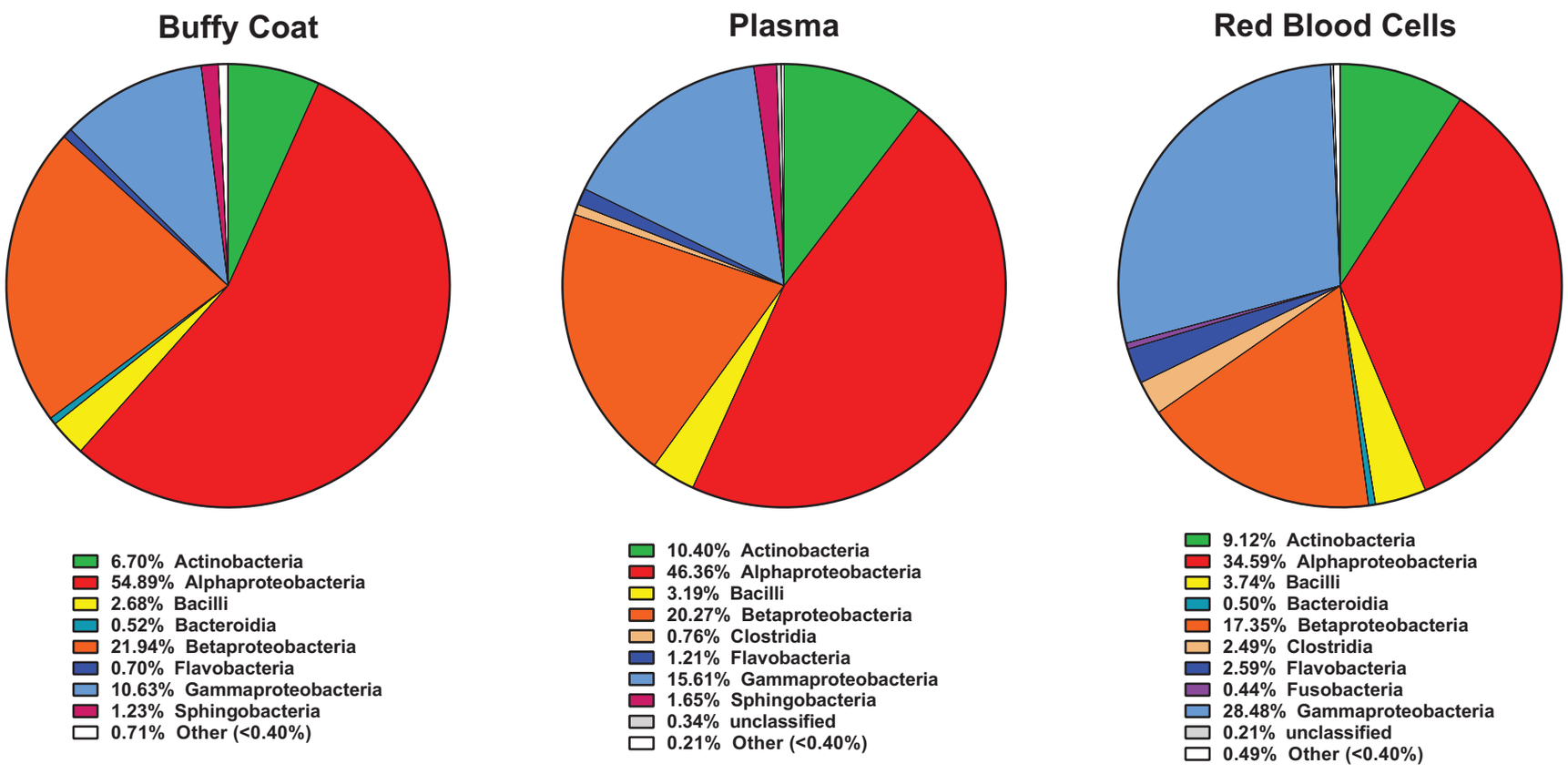


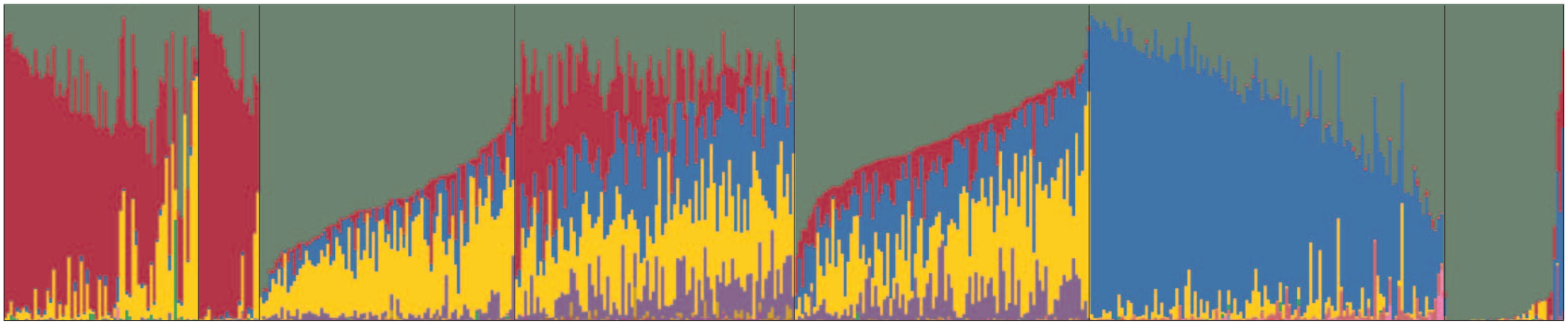
Bad Figures: Pie Charts



https://doi.org/10.1111/trf.13477
https://doi.org/10.1038/nature11234

Bad Figures: Pie Charts





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Diversity

Diversity

https://upload.wikimedia.org/wikipedia/commons/4/4b/Amazon_Manaus_forest.jpg
https://en.wikipedia.org/wiki/File:Clearcutting-Oregon.jpg
https://upload.wikimedia.org/wikipedia/commons/a/a0/Tractors_in_Potato_Field.jpg

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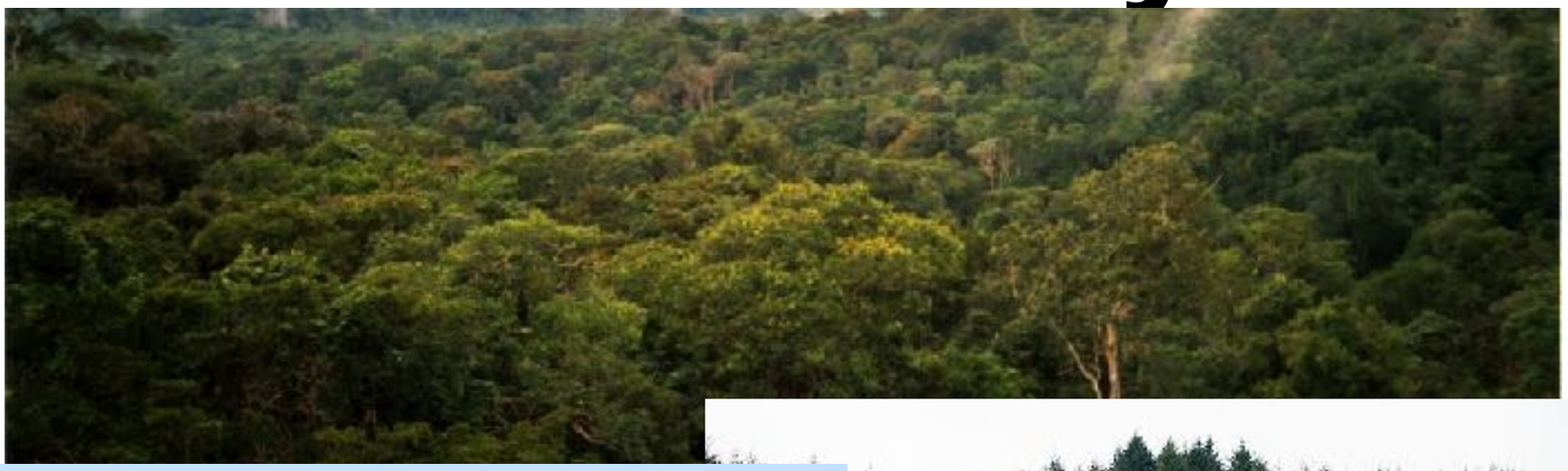
Diversity



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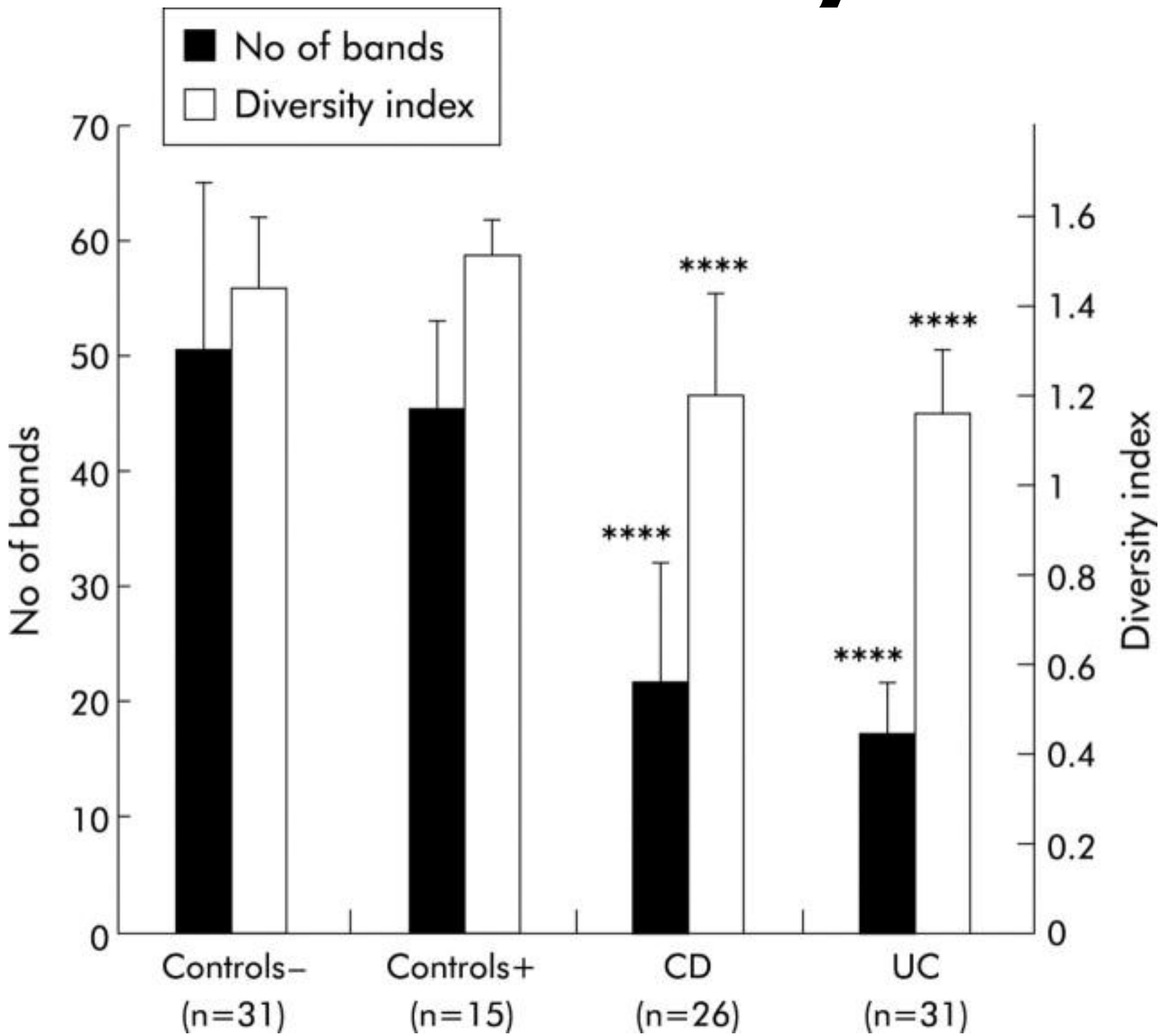
Diversity



https://dx.doi.org/10.1136%2Fgut.2003.025403

Alpha Diversity

- Diversity within a sample
  - Richness: number of different species
  - Evenness: distribution of species (i.e. relative abundance)

Richness

Richness: 5

Richness: 10

http://www.coastalwiki.org/w/images/d/d4/Richness.jpg

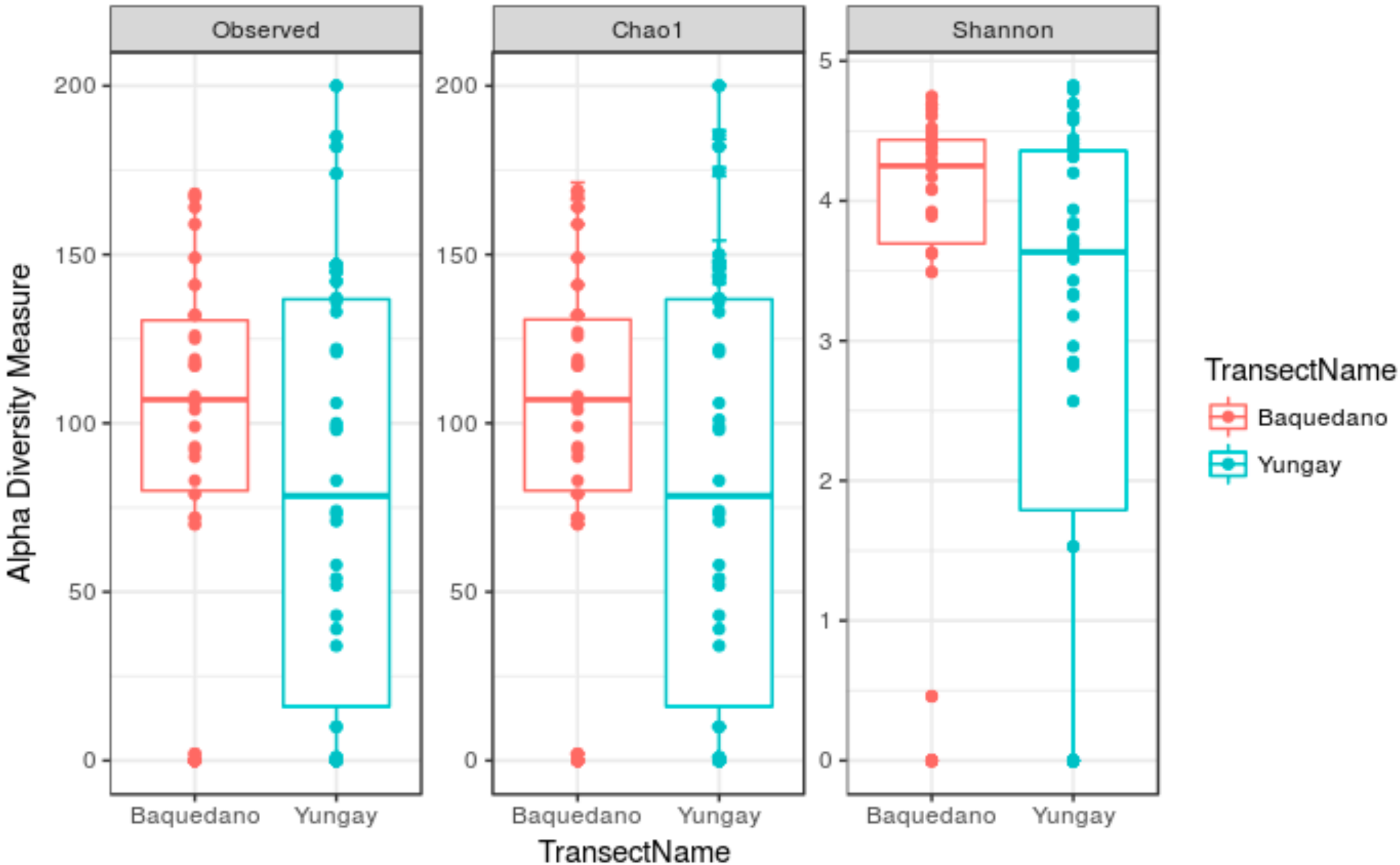
Eveness

Richness: 5

Richness: 5

http://www.coastalwiki.org/w/images/d/dd/Evenness.jpg

Alpha Diversity Metrics



Alpha Diversity Metrics

- Observed Richness
- Shannon (entropy)
- Simpson
- Chao1
- ACE (abundance-based coverage estimators)

Alpha Diversity Metrics

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Alpha Diversity Metrics

- Observed Richness

Counting

- Shannon (entropy)
- Simpson
- Chao1
- ACE (abundance-based coverage estimators)

Alpha Diversity Metrics

- Observed Richness

Counting

- Shannon (entropy)
- Simpson

- Chao1
- ACE (abundance-based coverage estimators)

Alpha Diversity Metrics

- Observed Richness

Counting

- Shannon (entropy)
- Simpson

Gambling

- Chao1
- ACE (abundance-based coverage estimators)

Alpha Diversity Metrics

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Counting

- Shannon (entropy)
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Alpha Diversity Metrics

- Observed Richness

Counting

- Shannon (entropy)
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Gambling

- Chao1
- ACE (abundance-based coverage estimators)

Weirdos

Gambling Metrics

- Jar with 8 balls
  - Shannon: How much would you bet that a randomly selected ball is red?
  - Simpson: How much would you bet that two randomly selected balls are the same color?

	Jar 1	Jar 2	Jar 3	Jar 4
Red	8	5	2	1
Yellow	0	1	2	2
Green	0	1	2	2
Blue	0	1	2	3
Total	8	8	8	8

Weirdo Metrics

- Chao1: How many species are present, and how many are observed only once or twice?
- ACE: How many species are present, and how many are observed less than 10 times?