What is the definition of Bray-Curtis dissimilarity and what are some examples of its application?

Authored by

stats writer

April 27, 2024

The Bray-Curtis dissimilarity is a statistical measure used to quantify the similarity or dissimilarity between two data sets. It is often used in ecological studies to compare the composition of species in different locations or environments.

The formula for calculating the Bray-Curtis dissimilarity takes into account the relative abundance of each species in the two data sets, rather than just the presence or absence of the species. This allows for a more comprehensive comparison of the species composition.

One example of its application is in studying the diversity of plant species in different habitats. By calculating the Bray-Curtis dissimilarity between the plant communities in two habitats, researchers can determine how similar or different the two habitats are in terms of their plant species composition.

Another application is in analyzing the microbial communities in different soil samples. By using the Bray-Curtis dissimilarity, researchers can compare the abundance of different microbial species in each sample and identify any significant differences.

Overall, the Bray-Curtis dissimilarity is a useful tool in various fields of study, providing a quantitative measure of similarity or dissimilarity between data sets and aiding in the understanding of ecological and biological patterns.

Bray-Curtis Dissimilarity: Definition & Examples

Named after and , the Bray-Curtis Dissimilarity is a way to measure the dissimilarity between two different sites.

It's often used in ecology and biology to quantify how different two sites are in terms of the species found in those sites.

The Bray-Curtis Dissimilarity is calculated as:

BCij = 1 - (2*Cij) / (Si + Sj)

where:

Cij: The sum of the lesser values for the species found in each site.Si: The total number of specimens counted at site *i*Sj: The total number of specimens counted at site *j*

The Bray-Curtis Dissimilarity always ranges between 0 and 1 where:

0 indicates that two sites have zero dissimilarity. In other words, they share the exact same number of each type of species.1 indicates that two sites have complete dissimilarity. In other words, they share none of the same type of species.

The following example shows how to calculate the Bray-Curtis Dissimilarity for two sites.

Example: Calculating the Bray-Curtis Dissimilarity

Suppose a botanist goes out and counts the number of five different plant species (A, B, C, D, and E) in two different sites.

The following table summarizes the data she collected:

Count of Species					
	A	B	C	D	E
Site 1	4	0	2	7	8
Site 2	3	6	0	4	11

Using this data, she can calculate the Bray-Curtis dissimilarity as:

Count of Species					
	A	B	C	D	E
Site 1	4	0	2	7	8
Site 2	3	6	0	4	11

$C_{ij} = 3 + 0 + 0 + 4 + 8 = \mathbf{15}$

$S_i = 4 + 0 + 2 + 7 + 8 = \mathbf{21}$

$S_j = 3 + 6 + 0 + 4 + 11 = \mathbf{24}$

Plugging these numbers into the Bray-Curtis dissimilarity formula, we get:

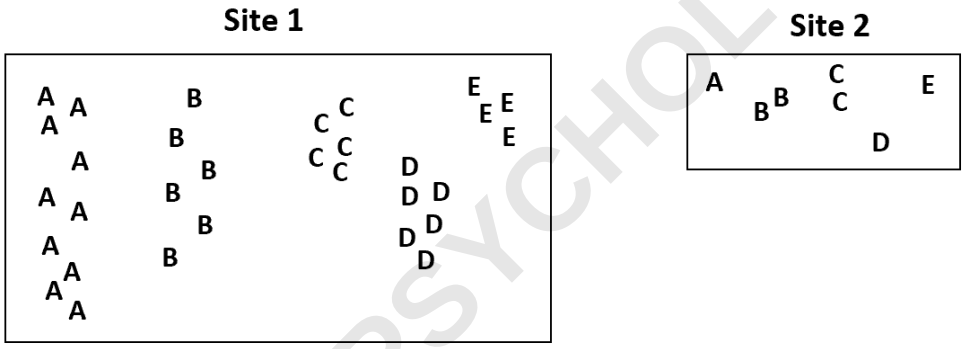
BCij = 1 - (2*Cij) / (Si + Sj)BCij = 1 - (2*15) / (21 + 24)BCij = 0.33

Key Assumption of the Bray-Curtis Dissimilarity

The Bray-Curtis dissimilarity assumes that the two sites are of equal size.

This is a crucial assumption because if one site is four times larger than the other site, then we'll naturally count more species in the larger site compared to the smaller site simply because there is so much more area to cover.

To illustrate this, suppose that one of the sites that the botanist collected data for was four times larger than the other site:



We would expect much higher frequencies of the species in Site 1 simply because it's so much larger than Site 2.

Thus, when we go to calculate the Bray-Curtis Dissimilarity, it would be quite large. However, this would be misleading because the difference between the two sites isn't in their composition, but rather in

their size.