Marine Education

Formula Feast – Apply data to determine the biodiversity of a marine ecosystem using diversity indices.

Name:

Date:

 QCAA Marine Science 2019 v1.2 General Senior Syllabus. Unit 2. Topic 1. Subject Matter: Biodiversity

Life in a number

The beauty of (and perhaps the frightening part about) diversity indices is that something as complex as biodiversity is brought down to just one single value. That value is used to compare ecosystems (i.e. previous worksheet), rank ecosystems (i.e. high to low diversity) or to classify ecosystems (i.e. to determine trigger values for water quality guidelines). The table below features indices commonly used:

Indices	Formula	Interpretation	Explanation
Simpsons Diversity Index (SDI)	$1-\left[\sum \frac{n(n-1)}{N(N-1)}\right]$	**0 – 1** 0 = no diversity 1 = infinite diversity	The probability that 2 randomly selected individuals will be 2 different species (or categories). 100% chance = infinite diversity
Shannon-Wiener Diversity Index (H)	$-\sum(n/N)\ \ln(n/N)$ (*note*: n/N is often written as P_i)	**0 – 5** <1 = ☹ >3 = ☺	The degree of uncertainty surrounding the identity of an unknown individual. For example, if highly diverse, it could belong to any species (in contrast, a community with only 1 species would have a H value of 0).
Sorrensen Index/Similarity Coefficient (CC)	**2C / (S1+S2)** C=no. of species the same in *both* samples S1=species richness in sample 1 S2=species richness in sample 2	**0 - 1** 0 = complete dissimilarity & no overlap 1 = complete similarity & overlap	Amount of overlap or similarities in species composition between two samples. For example, if sample1 has 20 species and sample2 has 25 species, and between them they have 5 species in common…. CC=(2x5)/(20+25)=10/45=0.222 (dissimilar)
Jaccard Index/Similarity Coefficient (T)	**a / (a+b+c)** a = no. of species the same in *both* samples b = no. of species unique to sample 1 c = no. of species unique to sample 2	**0 – 1** 0 = complete dissimilarity & no overlap 1 = complete similarity & overlap	Compares the similarity between two finite samples. It is essentially the size of their overlap divided by the size of their union. For example, 2 in overlap, 5 in union, Jaccard Index = 2/5 

Activity: Complete the table below. Use data from previous worksheet (titled 'Homer's Index).

See next worksheet (titled Examplar Data Sheet) **to help you get started ☺**

Note: Simpson's index is more sensitive to species evenness than species richness. Shannon index, in turn, does not provide information on rare species which are very important in studies of biodiversity*. Thus, it is advisable to use more than one indices when determining the biodiversity of an ecosystem.

*Shah, J.A. & Pandit, A.K. (2013) Application of diversity indicies to crustacean community of Wular Lake, Kashmir Himalaya. *International Journal of Biodiversity and Conservation*. Vol. 5(6). Pp311-316

Diversity Indices	Species Richness	Simpsons Diversity (SDI)	Shannon-Weiner (H)	Sorrensen (CC)	Jaccard (T)
Sample 1					
Sample 2					

Q. Is your answer still the same as the previous worksheet? Respond by answering the question:

Q Is there a difference in species diversity between an inshore reef and offshore reef? **Ans.** [Yes] [No]
Circle your answer