**Species Diversity Calculations**

The following discussion of species diversity and evenness is slightly modified (with permission) from:

Beals, M, Gross, L, and S Harrell. 2000. DIVERSITY INDICES: SHANNON'S *H* AND *E.* <http://www.tiem.utk.edu/~mbeals/shannonDI.html>

Beals, M, Gross, L, and S Harrell. 1999. DIVERSITY INDICES: SIMPSON'S *D* AND *E*

<http://www.tiem.utk.edu/~mbeals/simpsonDI.html>

A diversity index is a mathematical measure of species diversity in a community. Diversity indices provide more information about *community* composition than species richness alone because they also take into account the relative abundances of different species. For example, consider two communities of 100 individuals each, composed of 10 different species. One community has 10 individuals of each species; the other has one individual of each of nine species, and 91 individuals of the tenth species. Although both communities have the same species richness, the first one is more diverse. *Why?*

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| D | **Simpson's diversity index** |
| S | total number of species in the community (richness) |
| pi | proportion of *S* made up of the *i*th species |
| ED | equitability (evenness) |

In Simpson's diversity index (*D*), the proportion of species *i* relative to the total number of species (*pi*) is calculated and squared. The squared proportions for all the species are summed, and the reciprocal is taken:

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For a given richness (*S*), *D* increases as equitability increases, and for a given equitability *D* increases as richness increases.

Equitability (*ED*) can be calculated by expressing Simpson's index (*D*) as a proportion of the maximum value of *D* if individuals in the community were completely evenly distributed (*D*max, which equals *S* when there is one individual per species). Equitability is a value between 0 and 1, with 1 being complete evenness.



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| H | **Shannon's diversity index** |
| S | total number of species in the community (richness) |
| pi | proportion of *S* made up of the *i*th species |
| EH | evenness |

The proportion of species *i* relative to the total number of species (*pi*) is calculated, then multiplied by the natural logarithm of this proportion (ln*pi*). The resulting product is summed across species, and multiplied by -1:



Shannon's evenness (*EH*) can be calculated by dividing *H* by *H*max (here *H*max = ln*S*). Evenness is a value between 0 and 1, with 1 being complete evenness.



See the web site for an example and explanatory graphs of Shannon’s diversity index.

* *Is there an effect of bird species diversity on the human WNV infections*?
* *Is there a relationship between bird species evenness and human infections?*
* *What have previous authors found about these two indices?*