7.11 Electivity

The electivity (selection index) describe a predator's preference for prey. It scales from -1 to 1; where -1 indicates total avoidance of a prey; 0 indicates that a prey is taken in proportion to its abundance in the ecosystem; and 1 indicates total preference for a prey. The electivity values are highlighted using a colour scale for the background, scaling from -1 (white) to 1 (red) using shades of red for intermediate values. The electivity index displayed is the standardized forage ration of Chesson (1983), see below.

One of the most widely used indices for selection is the Ivlev electivity index, E_i (Ivlev 1961) defined for a group (*i*) as:

$E_i = (r_i - P_i) / (r_i + P_i)$

where r_i is the relative abundance of a prey in a predator's diet and P_i is the prey's relative abundance in the ecosystem. E*i* is scaled so that E_i = -1 corresponds to total avoidance of, E_i = 0 represents non-selective feeding on, and E_i = 1 shows exclusive feeding on a given prey *i*. Note that within Ecopath, r_i and P_i refer to biomass, not numbers.

The Ivlev electivity index was included in the DOS version of Ecopath because it often shows up in the literature. This index has, however, a major shortcoming, seriously limiting its usefulness as a selection index: as shown by several authors, e.g., Jacobs (1974): the Ivlev index is not independent of prey density.

A better approach is to use the standardized forage ratio (S_i) as suggested by Chesson (1983). This index is independent of prey availability, and is given by:

$$S_i = \frac{(r_i / P_i)}{\sum_{n=1}^{n} r_n / P_n}$$

where r_i and P_i are defined as above, and *n* is the number of groups in the system. The standardized forage ratio as originally presented takes values between 0 and 1, with S_i = 0 representing avoidance and S_i = 1 exclusive feeding.

As implemented in Ecopath, the forage ratio has been transformed (linearly) such as to vary between -1 and 1, so that -1, 0 and 1 can be interpreted as for the Ivlev index.