Exploring different turnover metrics

Cape vs SWA publication

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Table 1: Glossary

Symbol	Description	Derivation
A	No. species in site 1	
B	No. species in site 2	
J ($\equiv a$)	No. species shared by sites 1 & 2	$\lvert A \cap B \rvert$
b	No. species exclusively in site 1	$\lvert A - J \rvert$
c	No. species exclusively in site 2	$\lvert B - J \rvert$

Definitions of turnover &/or similarity

Jaccard distance (`vegan::vegdist(x, method = "Jaccard")`)

$$\beta_{d_J} = \frac{A + B - 2J}{A + B - J}$$

Jaccard similarity (Koleff et al. 2003. *J. Anim. Ecol.* 72(3))

$$\beta_{s_J} = \frac{a}{a + b + c}$$

(Note: $\beta_{d_J} = 1 - \beta_{s_J}$*)*

β_g distance (Gaston et al. 2001 in Koleff et al. 2003. *J. Anim. Ecol.* 72(3))

$$\beta_{d_g} = \frac{b + c}{a + b + c}$$

β_{gl} distance (Lennon et al. 2001 *J. Anim. Ecol.* 70(6))

$$\beta_{d_{gl}} = \frac{2|b - c|}{2a + b + c}$$

Expressing turnover in common terms

As above,

$$\beta_{d_J} = \frac{A + B - 2J}{A + B - J}$$

Thus, given the indentities in Table 1,

$$
\begin{aligned}
\beta_{d_g} &= \frac{b+c}{a+b+c} \\
&= \frac{(A-J)+(B-J)}{J+(A-J)+(B-J)} \\
&= \frac{A+B-2J}{A+B-J} \\
&\therefore \beta_{d_g} \equiv \beta_{d_J}
\end{aligned}
$$

And,

$$
\begin{aligned}
\beta_{d_{gl}} &= \frac{2|b-c|}{2a+b+c} \\
&= \frac{2|(A-J)-(B-J)|}{2J+(A-J)+(B-J)} \\
&= \frac{2|A-B|}{A+B}
\end{aligned}
$$

Also, Bray-Curtis distance (`vegan::vegdist(x, method = "bray")`) can be derived from Jaccard distance, as, given by `?vegan::vegdist`

$$
\beta_{d_J} = \frac{2\beta_{d_{BC}}}{1+\beta_{d_{BC}}}
$$

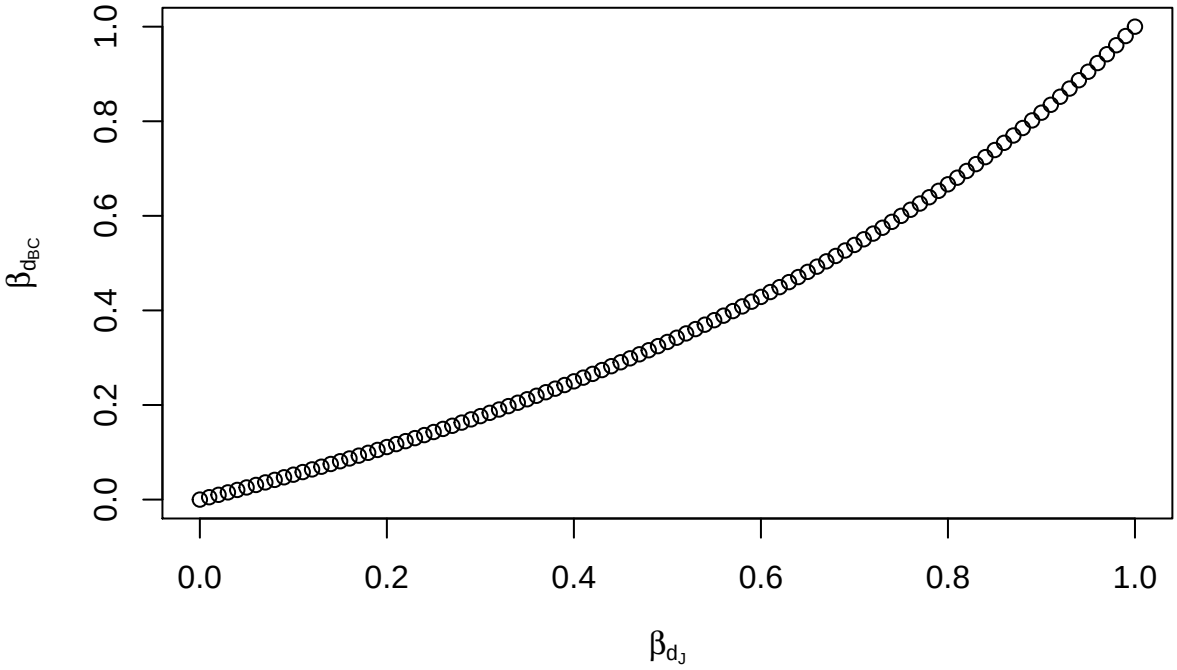
Thus,

$$
\beta_{d_{BC}} = \frac{-\beta_{d_J}}{\beta_{d_J}-2}
$$

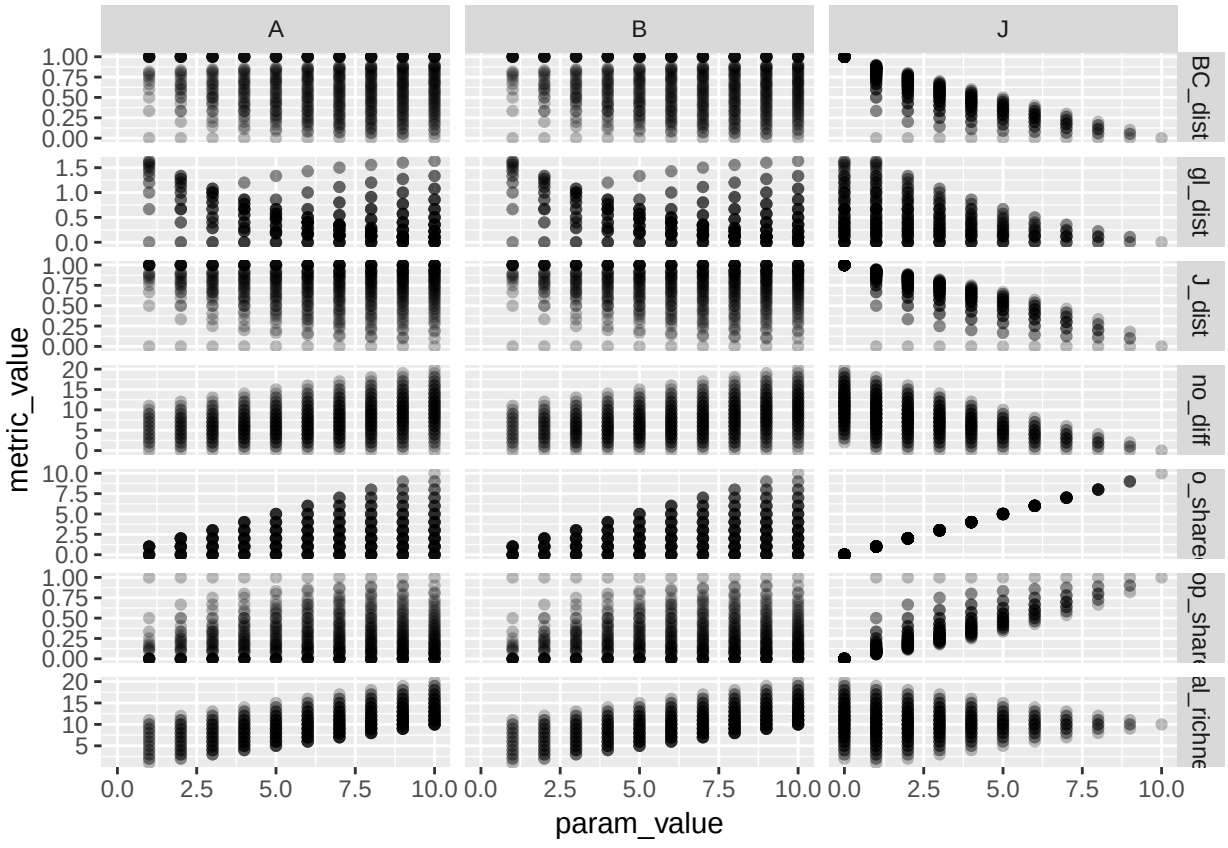
Also, as in Table 1, let $b = |A-J|$ and $c = |B-J|$. Thus,

$$
|A \cup B| = a+b+c \qquad\qquad = J + |A-J| + |B-J| = A+B-J
$$

....


$\beta_{d_{BC}}$
β_{d_J}
0.0
0.2
0.4
0.6
0.8
1.0

...


A
B
J
BC_dist
gl_dist
J_dist
no_diff
o_share
op_shar
al_richne
metric_value
param_value
0.0
2.5
5.0
7.5
10.0