

# Calculating association indices

## Formulas

$$HWI = \frac{x}{x + Y_{ab} + \frac{1}{2}(Y_a * Y_b)}$$

$$TWI = \frac{x}{x + 2Y_{ab} + Y_a * Y_b}$$

## Variables

$x$  = number of instances where individuals a and b were observed, associating

$Y_{ab}$  = number of instances where individuals a and b were observed, not associating

$Y_a$  = number of instances where individual a was observed, and individual b was not observed

$Y_b$  = number of instances where individual b was observed, and individual a was not observed

## Assumptions

In the case of GPS data with regular fix rates, all individuals are (usually) located at each “observation” and therefore,  $Y_a$  and  $Y_b$  are 0 or nearly 0.

In the case of focal observations, if we assume a single observer can only observe one group at a time, and all groups are temporally distinct, then  $Y_{ab}$  is 0. If groups are not temporally distinct (e.g.: more than one observer observing different groups at the same time), then the temporal component must be provided to calculate  $Y_a$ ,  $Y_b$  and  $Y_{ab}$ .