Appendix 1

The E index of diet variation and the Cws index of clustering

The E index of interindividual diet variation

The index E, derived from complex-network theory, is based on the individual niche overlap network, in which nodes represent individuals and edges connect individuals that overlap in their diets. Weights (wij) measuring pairwise niche overlap are assigned to edges connecting individuals i and j and measure the degree of diet overlap between individual i's and j's diets, varying from near zero (little overlap) to 1 (total overlap). A wij = 0 indicates no diet overlap and therefore no connection between nodes. If all individuals' diets are identical (no diet variation), all individuals are connected and wij = 1 for all pairs of individuals. The summation of all wij,

\[ \sum w_{ij} = \frac{n(n-1)}{2} \]  

which is the number of edges of a completely connected network with n individuals. As diet variation increases,

\[ \sum w_{ij} \ll \frac{n(n-1)}{2} \]  

and the ratio

\[ \frac{\sum w_{ij}}{\frac{n(n-1)}{2}} \]  

can be interpreted as a measure of the degree of interindividual diet variation, which will range from 1 when there is no diet variation, towards 0 as variation increases. To make the interpretation of the index more intuitive, a measure of diet variation

\[ E = 1 - \frac{\sum w_{ij}}{\frac{n(n-1)}{2}} \]  

is defined, in which E ranges from 0 when individual diets are identical and there is no diet variation, towards 1 as diet variation increases.

The Cws index of diet clustering

In an individual niche overlap network, for a given level of diet variation (E), links may be arranged in different ways. For example, links may be randomly distributed among nodes or may be organized into highly connected subgroups (clusters). These different patterns of organization, in turn, can be captured with the recently proposed index of clustering Cws, which compares the density of connections in the neighborhood of nodes to the overall density of connections in the network and varies from \(-1\) to \(+1\). Cws will be positive and tend towards \(+1\) when the local density of connections is higher than the overall density of connections in the network, and it will be negative and will tend to \(-1\) when the local density of connections is lower than the overall density of connections.

Appendix 2

Results of the rarefaction analyses testing the effect of sampling effort on the estimates of E, Cws and NODF

E, Cws and NODF may be affected by limited information about the diets of individuals. Limited information stems from few captures/recaptures per individual, which result in few recorded prey items and therefore in underestimates of individual diets. This, in turn, may overestimate the degree of specialization, because individuals will appear more specialized than they really are, inflating E. Moreover, poor sampling may potentially affect Cws and NODF. We therefore performed a rarefaction analysis to assess the reliability of our samples by testing the effects of reducing sampling effort on E, Cws and NODF. We randomly reduced the number of prey items recorded for individuals in the population until a given fraction of the total sampling effort. We generated rarefied samples of 95%, 85%, 75%,…, 25% of total sampling effort and we used 1000 replicates for each fraction. We found that all indices showed either no variation with sampling effort or approached asymptotic values at sampling efforts higher than 75%, indicating that our estimates were not affected by sampling artifacts (Fig. A1–A3).
Figure A1. Rarefaction of sampling effort and its effects on $E$. (a) males (dry season), (b) males (wet season), (c) females (dry season), and (d) females (wet season). Note that $E$-values recorded for total sampling effort are within the confidence interval of $E$-values for rarefied matrices even after reducing the sampling effort to 25% (dry season datasets, a and c) or 75% (wet season datasets, b and d).
Figure A2. Rarefaction of sampling effort and its effects on $C_{ws}$, (a) males (dry season), (b) males (wet season), (c) females (dry season), and (d) females (wet season). Note that $C_{ws}$-values recorded for total sampling effort are within the confidence interval of $C_{ws}$-values for rarefied matrices even after reducing the sampling effort to 25%.
Figure A3. Rarefaction of sampling effort and its effects on NODF (a) males (dry season), (b) males (wet season), (c) females (dry season), and (d) females (wet season). Note that NODF-values recorded for total sampling effort are within the confidence interval of NODF-values for rarefied matrices even after reducing the sampling effort to 50%.