S1 Statistical comparison of stomach- and intestine samples

To test for possible differences in mean biomass of prey (herring, cod, saithe, wolfish, flatfish and other fish) in stomachs and intestines and to avoid violating the sphericity and normality assumptions (e.g Gotelli and Ellison 2004) we used a non-parametric multivariate test, in lieu of Hotelling's T^2 test. By generating *k* bootstrap replicates of the diet-data we generated *k* Hotellings T^2 values (T^2_{boot}). The The P-value was calculated by simply counting number of T^2_{boot} values larger than T^2_{obs}. The simulation procedure can be summerised as follows:

I. Calculate the difference in biomass of prey j, j=1,..,m, between stomachs and intestines and zero-adjust the matrix (D_{ST})

II. Generate *k* bootstrap replicates of D_{ST}

III. Calculate *k* Hotelling T^2 values (T^2_{boot})

IV. Calculate the observed T^2 value (T^2_{obs})

V. Calculate the P-value: $P = \frac{1}{k}\left(\#T^2_{boot} \geq T^2_{obs}\right)$

$$D_S = D_T = \{d_{ij}\} = \begin{bmatrix} d_{11} & . & d_{1m} \\ . & . & . \\ d_{n1} & . & d_{nm} \end{bmatrix},\ i = 1,...,n,\ j = 1,...,m$$

$$D_{ST} = D_S - D_T - \overline{(D_S - D_T)}$$

$$T^2 = n\overline{D_{ST}}^T \operatorname{cov}(D_{ST})^{-1}\overline{D_{ST}}$$

Where D_S and D_T is the prey biomass matrix of the stomach and intestine, *n* is number of stomach and intestine samples, *m* is number of prey groups, D_{ST} is a matrix of zero-adjusted prey biomasses (difference between prey biomass in stomachs and intestines), $\overline{D_{ST}}$ is a vector of mean prey biomasses, $\operatorname{cov}(D_{ST})$ is the covariance of D_{ST}, ^{T} and $^{-1}$ is the transpose and inverse, respectively. The results indicate that there are no significant dietary differences between stomachs and intestines (Hotelling's T^2 test: $\overline{T^2_{boot}} = 9.68, P_{boot} = 0.41$). Thus, stomach and intestine samples were pooled and treated as one sample.

References

Gotelli, N.J., Ellison, A.M. 2004. A Primer of Ecological Statistics, 2nd edition. Sinauer Associates, Oxford University Press. 614 pages.