

# Measuring Distance Between the Compositional Diet Estimates Produced by Quantitative Fatty Acid Signature Analysis

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## Abstract:

In ecological applications involving compositional data, zeros can be problematic and may preclude the use of standard statistical techniques. This is especially true in applications requiring a valid measure of distance. In quantitative fatty acid signature analysis (QFASA), compositional diet estimates containing the proportion of each species of prey potentially in the predator's diet are produced and zeros often arise corresponding to species estimated to be absent from the diet. QFASA diet estimates may then be used to test whether differences in diet exist, for instance, between male and female predators or across different seasons and years, provided an appropriate measure of distance has been established. Traditional distance measures such as Aitchison's distance, however, either cannot be applied directly when zeros are present or do not satisfy fundamental properties of compositional data analysis. In this talk we compare three distance measures that are capable of handling zeros but do not satisfy one of the fundamental properties, namely the principle of subcompositional coherence. Following the ideas of Greenacre (2011), we attempt to measure the subcompositional incoherence of the distance measures in order to determine if the measures may, from a practical point of view, satisfy the principle. Based on the results of a simulation study, we recommend a distance measure that may be useful in compositional data applications involving zeros. We subsequently apply this distance measure to test for differences in the diet of real-life grey seals inhabiting the eastern coast of Canada.

## References

Greenacre, M. (2011) Measuring subcompositional incoherence. *Mathematical Geosciences*, 43:681-693.