

TESTING THE USE OF COMPOUND SPECIFIC ISOTOPIC ANALYSIS OF AMINO ACIDS
IN TROPHIC ECOSYSTEM STUDIES

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Abstract

The use of stable isotopes in studying ecological systems has a wide range of applications, from comparing food web interactions to tracing nutrient flow through an organism or an environment. Compound specific isotopic analysis of amino acids (AA-CSIA) has recently emerged as a technique which resolves some of the shortcomings of bulk tissue stable isotope analysis, yielding information for estimating trophic position and tracing the ^{15}N values of baseline nutrients from a single sample. However, the application of AA-CSIA to food web studies requires a more in-depth understanding of amino acid isotopic incorporation and fractionation. This dissertation focuses on the preliminary steps toward global application of AA-CSIA in ecosystem studies. The research presented here provides measurements of some of the first incorporation rates of individual amino acid nitrogen isotopes (Chapter 2) and the largest known dataset of AA-CSIA in marine teleosts for determining fractionation patterns across trophic positions (Chapter 3). The latter portion of the dissertation describes an understudied ecosystem in Hawaii, the mesophotic reefs, and uses AA-CSIA to compare the trophic ecology of the resident fish population to those in a shallow water coral reef environment (Chapters 4 & 5). The results of this dissertation provide critical first steps toward further developing AA-CSIA as a tool within ecosystem studies and in the process reveal that the biochemical processes controlling isotopic fractionation may be more elusive than previously believed.