Stable Isotopes

In biological tissues, stable isotopes (i.e., isotopes of elements that do not decay, or decay on the order of several millions of years and therefore deemed 'stable') are most frequently used to determine both the source of energy and trophic position of fishes and aquatic invertebrates. They are also useful in helping understand the connections of taxa within a food web and range of resources each taxa uses. Common stable isotopes in food web and habitat use studies include ^{13}C, ^{15}N, ^{34}S, ^{18}O, and ^{2}H. The relative abundance of these stable isotopes to their more common forms (e.g., ^{12}C, ^{14}N, ^{32}S, ^{16}O, and ^{1}H) are compared to established standard reference materials (e.g., Peedee limestone for Carbon, Nitrogen in air, or the Canyon Diablo Troilite meteorite for Sulfur). Tissues (e.g., muscle, fin, scales, etc.) may fractionate isotopes at different rates; while sampling of some tissues may permit non-lethal collection, the stable isotope values from these other tissues are standardized to those of muscle using known correction factors. Certain tissue preservation methods can affect these ratios. Additionally, lipid extraction may also be required on fatty tissues (e.g., Carbon to Nitrogen ratios (C:N) > 3.5) to better differentiate diet sources from endogenous lipid signatures. Other isotopes derived from stable isotopes can also be used to determine natal streams (e.g. ^{86}Strontium, ^{87}Strontium).

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