LIVER AND MUSCLE TISSUE HALF-LIVES IN JUVENILE YELLOWFIN TUNA

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Abstract: The stable nitrogen isotope composition of an organism can be used to identify migration patterns and the relative trophic position of an organism. If an organism has a $\delta^{15}N$ composition similar to that of the local prey, after taking in account trophic level enrichment in ^{15}N, then the organism could be considered a resident. On the other hand, if the $\delta^{15}N$ value is not similar, the organism is either a new arrival to the area or has recently switched its diet. The residence time of an organism in the new area can be estimated if one knows the turnover rate of the tissue sampled. This turnover rate is also described as a half-life and can be estimated from the change in isotope values during a diet switch. This study determined turnover rates of the liver and muscle tissues of juvenile yellowfin tuna. The diet switch experiment was conducted using an outdoor tank at Hawaii Institute of Marine Biology on Coconut Island in Kaneohe Bay, Oahu. Juvenile tuna were collected from waters around Oahu. Some of the tuna were sacrificed initially and tissues sampled, which would represent baseline isotope values before a diet switch. The other tunas captured were placed in the tank and fed a diet that had a distinct $\delta^{15}N$ value from the tuna's natural diet or baseline values. Fish were sacrificed at measured time intervals, and tissues were sampled for stable isotope analysis. The data revealed a trend of increasing $\delta^{15}N$ with time until the tunas equilibrated with the captive diet $\delta^{15}N$ value. The data were fitted with an exponential curve and decay rate extracted from the equation to obtain tissue half-life. Calculated half-lives were 16.1 days, 27.6 days, and 36.9 days for the liver, red, and white muscle tissue respectively. The tissues' half-lives determined in this study are essential in determining the number of days since a switch in a tuna's diet. Results from this study provide important information on tissues sampled in tuna migration studies.