Using stable isotopes to investigate ecology of sharks and turtles: what can evidence from multiple tissues tell us?

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Ecologists are getting better at analysing environmental samples to estimate natural abundances of stable isotopes in ways that yield more robust and relevant inferences within and across taxa. For marine wildlife, it is critical that samples have the ability to reveal spatial and temporal information about habitat use that improve population models and directly influence management. Mixing models now incorporate error and we understand that the data reflect processes that occur over varying lengths of time. However, we are yet to take full advantage of the fact that different tissues of animals can yield different kinds of information, because they have different biochemical composition and different rates of turnover. We use data from different tissues with different turnover rates to test hypotheses about the ecology of large sharks and turtles at Ningaloo, Australia. $\delta^{15}N$ of blood components (plasma, red blood cells) are highly correlated, but deviate from simple predictions about the slope and intercept. $\delta^{15}N$ of blood components are also correlated with tissues that turn over more slowly (skin, cartilage), but $\delta^{13}C$ of all tissues are poorly correlated. The data predict that sharks and turtles are largely resident at Ningaloo, and we test these predictions with known patterns from acoustic and satellite tagged individuals.