Global-scale analysis of trophic interactions in co-occurring tropical tuna using stable isotope analyses

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Tropical tuna fisheries are of vital importance to many developing countries as they heavily depend on these industries for food security and national income. Knowledge on trophic interactions among species present in these fisheries is essential to understanding food-web dynamics supporting tuna populations and how these may alter with climate-driven changes and intensive fishing activities. Using stable isotope analyses, we investigated the trophic interactions of four co-occurring tuna species including the yellowfin tuna Thunnus albacares, the bigeye tuna Thunnus obesus, the albacore tuna Thunnus alalunga and the skipjack tuna Katsuwonus pelamis. We used Bayesian mixing analyses of isotopic niche metrics to examine the spatial variation of dietary overlap among these species across 4 regions in tropical oceans. We also explored temporal variation in trophic niches for two species in the western Pacific Ocean. We showed that trophic relationships among species within a same area can vary depending on individual size class. Similar interactions among co-occuring species were found in two geographically distinct oceanic regions (Pacific and Atlantic) which may be linked to similar oceanographic characteristics (e.g. diazotrophy). We also showed that interactions among these same species can differ between biogeochemical provinces of a same ocean (Pacific regions). Trophic niche metrics vary across different time periods within a region and may be linked to oceanic phenomenon such as El Niño. Our findings suggest that resource partitioning and foraging behavior of tropical tuna species may be linked to intrinsic conditions of oceanic regions which vary across time.