Nutritional diversity in aquatic ecosystems

Joey Bernhardt and Mary O’Connor

University of British Columbia

While food provisioning is one of the most widely acknowledged ecosystem services provided by aquatic ecosystems, the role of seafood as a source of valuable micronutrients scarce in the human diet is often overlooked. The ecology of food security is not just about predicting yields, it is about understanding the ecological conditions that lead to a stable supply of nutritionally diverse foods. A primary challenge of linking ecological processes with human well-being is finding comparable metrics for ecological properties and human benefits. For nutritional value, a common currency that captures both ecological variation and human benefits is the nutrient content in an edible portion relative to dietary reference intake values (DRI). The nutrition benefits that humans derive from seafood are not directly related to the whole body stoichiometry of aquatic species because the edible portion ranges from the whole body (i.e. for shrimps) to highly restricted portions of muscle tissue (i.e. tuna fillets), and nutrients are not evenly distributed across all tissues. We analyzed the relationship between species’ traits and their nutritional value in terms of DRI using dietary food composition data, which is restricted to the edible portion, for 430 species of fish from all major oceanic and freshwater eco-regions. We find that there is a high degree of variability in nutrient profiles across taxa, and that increasing functional diversity in contributes to increased dietary nutritional diversity. For some, but not all, nutrients we analyzed (e.g. Ca, Hg, EPA, DHA), nutrient content varied predictably among species with latitude and body size, consistent with the physiological functional roles of micronutrients in fish. Our results suggest that the availability of micronutrients in fish assemblages may depend on geography and functional composition of the catch. Our approach integrates ecological variation and patterns in the human consumption of species to explicitly link ecological structure with one metric of human well-being to suggest that a diverse fish assemblage can support a more nutritious diet to local seafood consumers.