An experimental framework for quantifying the degree of intraguild predation in a three-species omnivorous food web in the field

Gen-Chang Hsu[a]

[a] Department of Life Science, National Taiwan University, Taipei, Taiwan

Abstract

Intraguild predation (IGP) is common in natural and human-managed systems and plays a critical role in food web dynamics. Although studies have documented the occurrence of IGP across a wide range of predator taxa, quantitative understanding regarding the degree/intensity of IGP remains lacking. Here, I propose an experimental framework combining controlled feeding trials and stable isotope analysis to quantify the degree of IGP in a three-species omnivorous food web (top predator + mesopredator + shared prey) in the field. The degree of IGP is defined as the proportion (in number) of mesopredator consumed in the total diet (shared prey + mesopredator) of the top predator. Feeding trials along with stable isotope analysis are used to construct a standard curve of the relationship between top predator's diet and shift in its nitrogen isotope signatures. The nitrogen isotope signatures of field-sampled top predator individuals are then analyzed and interpolated to the curve to estimate the degree of IGP in the field. The proposed framework leverages the strengths of different experimental approaches to studying trophic interactions, providing a practical tool for quantifying IGP in a more accurate (controlled feeding trials and standard IGP curve) and realistic (stable isotope analysis of field samples) fashion. The current framework can be further extended to food webs involving more complex interactions (e.g., cannibalism and multiple shared prey) and complemented with other approaches (e.g., molecular gut content analysis) to capture a more complete picture of IGP dynamics in the field.