

Host Sweet Host: Symbiotic Cnidarians as a Habitat for Algal Endosymbionts

Abstract: In biology, the study of endosymbiotic associations offers key insights into the ecological and evolutionary processes that structure biological interactions. Symbiotic cnidarians, ranging from reef-building corals to pelagic jellyfish, rely on single-celled algal endosymbionts to meet most of their nutritional demands. Although prior work demonstrates that specificity is common in coral-algal mutualisms, the extent to which these associations vary across ecological and evolutionary contexts is unclear. Using genetic approaches, I characterized host-symbiont associations across geographic, phylogenetic, and life history axes, revealing both broad and highly specific patterns in these critical marine symbioses. Because hosts differ in morphology, ecology, and evolutionary history, different hosts may impose distinct selective pressures on their symbionts. To test this, I examined baseline gene expression in specialist and generalist symbionts across a range of compatible hosts and found strong evidence of host-specific transcriptional responses, indicating different host corals function as different habitats for these symbionts. Now at Texas State University, my ongoing work aims to identify conserved molecular signatures important for host-symbiont communication and sorting. Together, this research supports a framework in which hosts function as dynamic habitats that shape symbiont specificity through ecological filtering and molecular interactions.