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Dynamic Energy Budget theory predicts smaller energy reserves in clams that harbour symbionts

Dynamic energy budget (DEB) theory describes the uptake and use of energy by individuals, and distinguishes between the biomass of an organism that function as an energy reserve and as a structure. Two related species of small-sized clams inhabit the same seasonal environment and have similar diets. However, one species harbours bacteria that are digested as an additional resource, and how this nutritional symbiosis affects the energy budget of the clam is unknown. We parameterized a DEB model for each species and we found that the symbiotic clam has a smaller fraction of its biomass as an energy reserve relative to the asymbiotic species. A smaller energy reserve, in turn, implies reduced energy assimilation and mobilization fluxes, lower structural maintenance costs and growth rate, and larger energy allocation to maturity and reproduction in the symbiotic clam. Together, these features may comprise an evolutionary strategy where the symbionts function as a partial energy reserve for the host, and are an adaptation to fluctuating food availability. Our results highlight how a nutritional symbiosis may alter the energy budget of a host clam.

This work is joint with Starlight Augustine, Suzanne C. Dufour and Amy Hurford.