Thermal Performance of an Undescribed Sea Anemone, *Urticina* sp.

Tanya Martinez, Class of 2027

Initiatives towards the growing discovery of new species within the Bay of Fundy and Gulf of Maine have been carried out and continue to add to the breadth of scientific knowledge and collaboration. This summer, I carried out research to understand how an undescribed species of sea anemone, under the genus *Urticina,* thrives in an intertidal habitat. This species has been documented through natural observations from midcoastal Maine to beyond Newfoundland, Canada, with its known southernmost distribution along the shores of Vinalhaven, Maine.

My project investigated the physiological responses of this species to temperatures ranging from 1°C to 30°C. At intervals of five degrees, anemones were placed in sealed chambers submerged in a temperature-controlled seawater tank, regulated by chillers and heaters. Control chambers without anemones were also used to ensure the ruling out of confounding variables. Following an acclimation period, initial oxygen levels were measured before sealing the chambers for an incubation period determined by past consumption rates. After incubation, final oxygen readings were taken, and the dry mass of each anemone was recorded to standardize oxygen consumption rates to account for different body sizes ($\mu LO_2/g/h$). A general observation of the anemones was also collected during their incubation periods; a scale of how they were expanded (open) or contracted (closed) indicates a feature that significantly influenced oxygen use.

Oxygen consumption can be directly tied to metabolic performance, as it indicates how much energy is being used for essential biological functions like growth, reproduction, and body maintenance. Since metabolic processes are temperature dependent, approaching or exceeding thermal tolerance limits increases energy demands and stress and leads to death. In warmer temperatures, oxygen consumption rates increase due to the need to work harder to maintain physiological function, while colder temperatures may show lower rates, aligning with their known range among northern waters. My results indicated a thermal curve which demonstrates a period of peak metabolism around 22ºC, after which their bodily functions, also seen by their observed contraction, declined sharply (Figure 1). Because these anemones rely on attachment to rocky substrates and prey capture with their tentacles, their contraction under elevated temperatures is a mechanism to conserve energy.

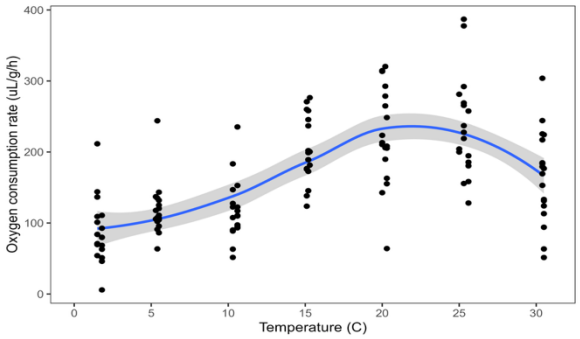

Figure 1. Oxygen consumption rate ($\mu L\ O_2/g/h$) of *Urticina* sp. across a temperature gradient of 1–30°C. Each black point represents an individual measurement, while the blue line shows the fitted thermal performance curve with 95% confidence intervals.

The breakdown of cellular processes and enzyme activity after 22ºC raises attention to the occurring rise in global ocean temperatures. This research highlights the vulnerability of intertidal organisms to thermal stress and provides new insight into the biology of an undescribed sea anemone species. Identifying its temperature tolerance not only establishes its optimal metabolic range but also underscores its inability to maintain basic functions at higher temperatures. This study affirms the broader ecological consequences of warming oceans on species survival and ecosystem stability.

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