DEPARTMENT OF BIOLOGY | UNIVERSITY of WASHINGTON

Biology Seminar

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A Crustacean's guide to surviving the Anthropocene: fiddler crab behavioral thermoregulation strategies in lethally hot environments

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Behavioral thermoregulation is an important defense against the negative impacts of climate change for many ectotherms. One such example is the fiddler crab *Minuca pugnax*, a species that occupies thermally unstable mudflat habitats, where it uses behavioral thermoregulation, including burrow retreats, to manage body temperature (Tb). To understand how body temperatures respond to changes in the surface temperature and explore how efficiently crabs exploit the cooling potential of burrows to thermoregulate, we measured body, surface, and burrow temperatures during low tide on Sapelo Island, GA, USA, in 2019. We found that both sexes resisted increases in Tb as surface temperatures increased, and the Tb at which crabs began to use burrows to thermoregulate was far below the critical body temperatures that could lead to death. In 2022, we explored the relationship between the frequency of burrow use and environmental conditions in male *M. pugnax* in breeding areas around Flax Pond, New York, USA. We found a highly significant positive correlation between burrow use and surface temperature. Laboratory data on cooling times were compared to field observations of burrow retreat durations. Because crab bodies in burrows experience exponential declines in Tb due to Newton's law of cooling, there are diminishing returns to remaining in a burrow, and we show that many crabs probably leave before coming to equilibrium. For *M. pugnax*, burrow retreats reduce time spent feeding and courting, activities that only occur on the surface. Current concerns about the impacts of climate change on animals include whether compensatory mechanisms, like the more frequent and longer burrow retreats seen in *M. pugnax*, will come at the cost of other behaviors necessary for survival and reproduction. Finally, by shielding organisms from the selective pressure of higher temperatures, it has been posited that behavioral thermoregulation could limit the evolution of physiological tolerance (the Bogert effect).

Seminar Speaker Host: Jon Herron