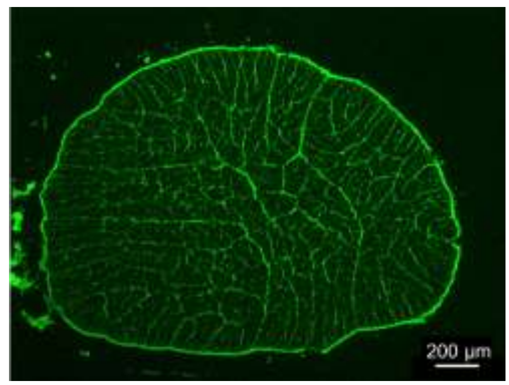
California State University, Fresno, Department of Biology Friday Seminar Series
Presents Dr. Kristin Hardy

Metabolic and Structural Consequences of 'Extreme' Fiber Size in Crustacean Muscle Cells



Crustacean muscle fibers are some of the largest cells in the animal kingdom, with fiber diameters in the blue crab (*Callinectes sapidus*) exceeding 600 µm and in the giant acorn barnacle (*Balanus nubilus*) exceeding 3 mm! At these sizes, metabolically active muscle cells are at risk for insufficient oxygen delivery owing to low SA:V ratios and excessive intracellular diffusion distances. We have used the giant swimming muscles of the Portunid swimming crabs to investigate the extent to which aerobic metabolism and contractile functionality may be limited by diffusion constraints in fibers of these 'giant' sizes. Further, we have explored the degree to which diffusion limitations have influenced the evolution of skeletal muscle cellular structure (e.g., organelle distribution) in these same fibers. Over time we have also begun to explore metabolism and fiber design in even larger muscle cells from the giant acorn barnacle (*Balanus nubilus*), a sessile organism that occupies a position in the subtidal to low intertidal zone where environmental hypoxia is a common occurrence. Our work has revealed that in most cases excessive diffusion distances do not limit maximal ATP turnover rates in giant crustacean fibers, but these rates appear to be maintained during hypertrophic fiber growth by the substantial reorganization of cellular organelles (mitochondria and nuclei) and sometimes dramatic changes in the hemolymph perfusion patterns and 'effective' fiber diameter. The additive challenge of acute or chronic environmental hypoxia (as either air emersion or anoxic immersion), does not appear to elicit significant alterations in the metabolism (e.g., reliance on anaerobic metabolism, activity of aerobic enzymes) or muscle structure (e.g., fiber size) in the giant barnacle fibers. The lack of muscle plasticity in response to hypoxia may result from changes that occur to other higher-level processes (e.g., respiratory behaviors or whole-animal metabolic rates), which effectively serve to match oxygen supply and demand during low environmental oxygen and obviate the need for changes at the level of the muscle fibers.

Kristin Hardy, Ph.D.
California Polytechnic State University, SLO
Friday, April 26, 2019
3:00 – 4:00 PM
Science 2, room 109
For further information: fresnostate.edu/csm/biology

Bio: Dr. Hardy earned her B.S in Neuroscience from Tulane University and her Ph.D. in Marine Biology from University of North Carolina, Wilmington. Her research is focused on the physiological acclimations and evolutionary adaptations of marine invertebrates (particularly crustaceans) to changing environmental conditions. In particular, her efforts are focused on the consequences of low dissolved oxygen (hypoxia) and elevated carbon dioxide (hypercapnia) on muscle physiology, metabolism, growth and behavior.

If you need a disability-related accommodation or wheelchair access, please contact Lindasue Garner at the Department of Biology at 278-2001 or e-mail lgarner@csufresno.edu (at least one week prior to event).