

CHAPTER 3

ENERGY METABOLITE CHANGES IN THREE SPECIES OF FRESHWATER MUSSELS (BIVALVIA: UNIONIDAE) AFTER EXPOSURE TO LOW DISSOLVED OXYGEN AND AIR

by

Li-Yen Chen

Dr. Alan Heath, Chairman

Department of Biology

(ABSTRACT)

Energy metabolites in various tissues of three species of freshwater mussels were measured under different levels of dissolved oxygen (DO), anoxia, and air exposure. Lactic acid, succinic acid, glucose, and glycogen were measured in the posterior adductor muscle, anterior adductor muscle, foot, gill and mantle tissues. Results indicated that under hypoxic conditions, different biochemical mechanisms are used by these three species. *Villosa iris*, a riffle-dwelling species, had the lowest anaerobic capacity and least glycogen content of the three species. Specimens of *V. iris* sampled directly from the river had significant declines in glycogen of the gill and anterior adductor muscle under anoxia and air exposure. Lactic acid was the main anaerobic end product produced by *V. iris* under low DO. In *V. iris* held long-term in the laboratory with inadequate food, glycogen content was low, and no anaerobic metabolites accumulated under low DO or air exposure. *Elliptio complanata*, a pool and run species, accumulated lactic acid in gill and posterior adductor

muscle under low DO; under air exposure, it accumulated succinic acid in the gill and posterior and anterior adductor muscles. The higher glycogen content in different tissues of *E. complanata* showed that it has greater anaerobic capacity than *V. iris*. *Pyganodon grandis*, a lentic species in shallow or deep lakes, also had a higher glycogen content in the various tissues than did *V. iris*. The lactic acid and succinic acid concentrations in the posterior and anterior adductor muscles of *P. grandis* were reduced compared to control animals under anoxia and air exposure. Thus, the overall metabolism seems to be suppressed under low DO and air exposure in this species. The short-term stress used in the current study did not result in the depletion of glycogen in *E. complanata* and *P. grandis*. Mantle tissue had much higher glycogen content than the other tissues tested in this study, and it well suited for taking biopsies to assess the general condition of mussels.