Energy Reserves in Native Freshwater Mussels (Bivalvia:Unionidae) With and Without Attached Zebra Mussels: Effects of Food Deprivation.

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(ABSTRACT)

This project evaluated the feasibility of salvaging zebra mussel-infested freshwater mussels from their native habitat by determining 1) how zebra mussel infestation affects unionid feeding and body condition, 2) how starvation in quarantine affects body condition of unionids, and 3) what feeding regime maintain unionid condition in quarantine.

The effects of zebra mussel infestation on two mussel species were evaluated through glycogen analyses of mantle tissue and gut content analysis. Specimens of *Amblema p. plicata* (Say, 1817) and *Quadrula p. pustulosa* (I. Lea, 1831), collected from a heavily infested reach of the Ohio River in 1996, had significantly lower ($p<0.05$) glycogen levels than specimens collected from a low-infestation reach upstream. In 1996 and 1997, heavily infested *Amblema p. plicata* and *Quadrula p. pustulosa* had significantly less ($p<0.01$) organic matter and fewer algal cells in their guts than lightly infested specimens. In addition, gut contents of individual *A. p. plicata* contained significantly less ($p<0.05$) organic matter and fewer algal cells than the combined gut contents of all zebra mussels (18-33 mm in length) attached to their shells. Gut analyses also revealed significant diet overlap between native unionids and infesting zebra mussels. Thus, competitive interactions or interference by zebra mussels likely reduced unionid ingestion and consequently reduced glycogen stores.

During quarantine, unionids salvaged from a lightly infested area and starved for 30 days had glycogen levels that declined dramatically. After 30 days without supplemental feeding, mean glycogen levels of *A. p. plicata* declined 85%, and mean glycogen levels of *Q. p. pustulosa* declined 70%. Thus, feeding of unionids is necessary to maintain their condition during lengthy quarantine.

To determine the best feeding regime for unionids in quarantine, assimilation efficiencies and carbon budgets were established for the rainbow mussel, *Villosa iris* (Lea, 1829), using radio-labelled cultures of *Neochloris oleoabundans* (Chantanachat and Bold 1962) at three cell concentrations. Assimilation efficiencies for *Villosa iris* at 1×10^5 cells$\cdot$ml^{-1}, 1×10^4 cells$\cdot$ml^{-1}, and 1×10^3 cells$\cdot$ml^{-1} were similar (45-56%); however, regardless of these similarities, assimilation efficiencies from this study indicate that *Neochloris oleoabundans* is readily assimilated (~50% AE) by *Villosa iris*. In addition,

total assimilation was maximized at 1 x 10^5 cells·ml $^{-1}$, which indicates that *Villosa iris* has the greatest amount of energy available for growth, reproduction, and maintenance of condition in captivity at this cell concentration.

During a second quarantine experiment, specimens were provided with 1 x 10^5 cells·ml^{-1} of *N. oleoabundans* twice per day. Initial mean glycogen levels for *Amblema p. plicata* (9.4 $\pm$ 2.4 mg/g) and *Quadrula p. pustulosa* collected from ORM 175.5 in July 1997 were not significantly different ($p>0.3$) than the mean glycogen levels of *A. p. plicata* and *Q. p. pustulosa* collected from the same site in July 1996. Glycogen stores of unionids entering quarantine, therefore, were similar in both the starvation and controlled feeding experiments. After 7, 14, and 30 days of controlled feeding in quarantine, mean glycogen levels of *A. p. plicata* and *Q. p. pustulosa* did not change significantly ($p>0.1$). Thus, quarantine protocol for salvaged native mussels should include the feeding of algae to captive specimens to sustain glycogen levels prior to relocation.