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## ORNAMENTAL TRAITS IN *HYALELLA AZTECA* AS INDICATORS OF WATER QUALITY: IMPLICATIONS FOR BIOLOGICAL MONITORING

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Ornamental traits are sexually selected traits that an organism uses to attract a mate or defend against a rival. Studies have shown that ornamental traits are more sensitive to environmental changes during development relative to naturally selected traits and tend to develop smaller in size or more asymmetrical in response to disturbance. *Hyaella azteca* is a freshwater benthic macroinvertebrate that has been used in numerous studies to establish water quality criteria in freshwater ecosystems. Male *H. azteca* use their antennae and gnathopods (claws) during precopulatory struggles. Hence, these traits are considered "armaments". Thus, ornamental traits in *H. azteca* provide a unique opportunity to examine the response of these traits to common disturbances affecting aquatic ecosystems such as nutrient enrichment. The objectives of the current study were to 1) experimentally assess population level responses of *H. azteca* to nitrogen enrichment, 2) experimentally assess the ornamental trait response signature of *H. azteca* to nitrogen enrichment and 3) characterize the ornamental trait response signature of natural populations of *H. azteca* in mesotrophic, eutrophic and hypereutrophic basins.

Amphipods were reared in 9 aquaria over a 7 week experimental period and were randomly dosed with ammonium nitrate ( $\text{NH}_4\text{NO}_3$ ). Three control tanks received blank doses (0 mg/L  $\text{NH}_4\text{NO}_3$ ) three aquaria received low level doses (10 mg/L  $\text{NH}_4\text{NO}_3$ ) and three tanks received high level doses (50mg/L  $\text{NH}_4\text{NO}_3$ ): Morphological characters of test organisms were measured with a computer imaging system and morphometry program. Morphological characters were also measured on amphipods collected from 9 randomly selected lakes in the Northern Glaciated Plain ecoregion.

Survival of amphipods was significantly different in all three treatments with highest survival in control amphipods. Male morphological traits (total body, mean 2nd antenna and mean gnathopod length) and 2nd antenna asymmetry seemed to respond to a subsidy-stress condition in that largest response signatures were observed in low treatment tanks and smallest response signatures were observed in high treatment tanks. Male 2nd antennae length was significantly smaller in high treatment tanks relative to controls. Female morphological traits (total length and mean 2nd antenna length) were progressively smaller in the treatment tanks relative to the control tanks and the only females with eggs present in the brood pouch were from control tanks. Smallest ornamental trait

responses (mean 2nd antenna and mean gnathopod length) in male amphipods sampled from lakes were observed in hypereutrophic basins while largest responses were observed in mesotrophic basins. However, total body length was greatest in hypereutrophic basins. Mean second antenna length was again the only trait which varied significantly among lake classes. Total body length, mean 2nd antenna length and brood size in female amphipods sampled from lakes were progressively smaller in more enriched lakes.

Results from this study indicate that 2nd antenna of *H. azteca* may be the most sensitive to ammonia stress and nutrient enrichment. In addition, overall growth and fecundity of *H. azteca* may be reliable indicators of stress in the aquatic environment.