

**Abstract:**

Invasive bighead (*Hypophthalmichthys nobilis*) and silver carp (*H. molitrix*) are reproductively isolated in their native range, but form a bimodal, multi-generational hybrid swarm within the Mississippi River Basin (MRB). Despite observed F1 hybrid superiority in experimental settings, effects of post-zygotic selection on bighead and silver carp hybrids have not been tested in a natural system. Individual parent and hybrid genotypes were resolved at 57 species-specific loci and used to evaluate post-zygotic selection for body condition ( $W_r$ ) and female reproductive potential (presence of spawning stage gonads and gonadosomatic index (GSI)) in the MRB during 2009-2011. Body condition in the Marseilles Reach, Illinois River declined with a decrease in species-specific allele frequency from 1.0 - 0.4 for each species and early generation hybrids (F1, F2, and first-generation backcross) had lower mean  $W_r$  than late generation hybrids (2nd+ generation backcrosses) and parentals. Proportions of stage IV and stage V (spawning stage) female gonads differed between bighead and silver carp, but not among parentals and their early and late generation hybrids within the MRB. Mean GSI values did not differ between parentals and hybrids. Because reproductive potential did not differ between hybrids and parentals, our results suggest that early generation hybrids occur in low frequency either as a factor of poor condition ( $W_r$ ) and post-reproductive survival, infrequent reproductive encounters by parental bighead and silver carp, or selection pressures acting on juvenile or immature life stages. Our results suggest that a combination of genetic and environmental factors may contribute to the post-zygotic success of bighead and silver carp hybrids in the Mississippi River Basin.

**DOI:** 10.1002/ece3.5423