

Population characteristics of bighead carp *Hypophthalmichthys nobilis* larvae and adults in the Missouri River and interspecific dynamics with paddlefish *Polyodon spathula*

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ABSTRACT

Basic biological data on bighead carp *Hypophthalmichthys nobilis* in the Missouri River are needed to predict potential ecological problems and provide a foundation for manipulative studies. The objectives of this study were to document spatial and temporal variability of larval bighead carp in the Missouri River, to assess age, growth and gonadal characteristics of bighead carp in the Missouri River, and to experimentally test for competitive interactions between bighead carp and paddlefish *Polyodon spathula*. Larval bighead carp were collected on June 25, 1997 and July 2 and 9, 1998 (3 of 19 sampling periods during May-July 1997 and 1998). Density was highest (24.4 larvae/m³) at the most downstream site (Lexington, MO) and lowest (0.1 larvae/m³) at the most upstream site (White Cloud, KS) in 1997. Spawning of bighead carp occurred in three distinct periods (June 16-19, 1997; June 23-26, 1998; July 3, 1998), in conjunction with a rise in discharge (> 2,700 m³/s) after water temperatures stabilized above 22°C. Adult bighead carp in our sample varied from age-3 to age-7 and length varied from 475 mm to 1,050 mm. There was variation in length at age and overall, bighead carp exhibited fast growth. For example, mean back-calculated length at age-3 was 556 mm. The sample was dominated by bighead carp from the 1994 year class. There was no difference in gonad development (gonadal somatic index, egg diameter) between winter and spring samples. Egg diameter frequencies exhibited a bimodal distribution, indicating protracted spawning. Mean fecundity was 226,213 eggs per female, with a maximum fecundity of 769,964. In a mesocosm experiment, age-0 paddlefish exhibited a decrease in relative growth in enclosures with bighead carp, while bighead carp exhibited a decrease in relative growth in enclosures without paddlefish. Bighead carp negatively affected growth of paddlefish through competition for food, and an increase in intraspecific competition negatively affected growth of bighead carp. These results suggest that bighead carp have become well established in the Missouri River, and may negatively influence paddlefish. It is likely that increased dispersal and population density of this exotic species will negatively affect native planktivores in the Missouri River.