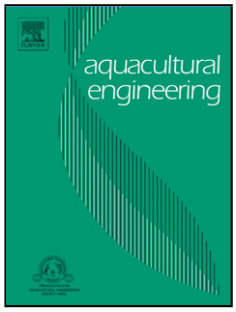

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Experimental investigation on the transport of different fish species in a jet fish pump

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Highlights

- The transport of different fish species in a jet fish pump is experimentally studied.
- The tissue injury, stress and metabolism of different fish species are analyzed after they pass through the jet fish pump.
- Injury rate and energy consumption per unit mass of different fish species are collected for optimizing the jet fish pump.
- The study has implication for the application of the jet fish pump.

Abstract

A jet fish pump with a throat of ø60 mm was designed to study its performance in the transport of different fish species and the physiological changes in fish thereafter. Experiments were conducted to investigate the fish transport rate and energy required to transport each ton of fish when transporting *Carassius auratus*, commonly known as the Chinese goldfish, *Megalobrama amblycephala*, or Wuchang bream, and *Ctenopharyngodon idella*, the grass carp. Fish were examined for external injuries as well as for several important enzymes and hormones which are indicators of tissue injury and stress. The results showed that the transport rate for all three species of fish rose dramatically with an increase in the primary stream rate. In this experiment, the transport rates of *C. auratus*, *M. amblycephala* and *C. idella* reached 2357±37.2 kg·h^{-1}, 2888±41.6 kg·h^{-1}, and 2060±40.2 kg·h^{-1}, respectively. However, both injury rate and energy required to transport each ton of fish increased no matter whether the primary stream rate was too low or too high. Considering both transport rate and injury rate, the mean primary stream rate of 80 m^3·h^{-1} was determined to be the optimal operating condition in this experiment. Fish were stressed and most likely some of their organs were damaged. However, most physiological indexes almost fully recovered after several hours.

Key words: jet fish pump; fish transport; fish species; aquaculture.

Nomenclature

A_t	throat cross sectional area	A_j	annular nozzle cross sectional area
ALT	alanine aminotransferase	AST	aspartate aminotransferase
Cor	cortisol	Cr	creatinine
D_t	throat diameter	E_p	energy required to transport each ton of fish
Glu	blood glucose	H	lift