

Exercise Conditioning Effects on the
Morphology and Physiology of Young-of-the-year
Striped Bass, *Morone saxatilis* (Walbaum)

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by

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DISSERTATION

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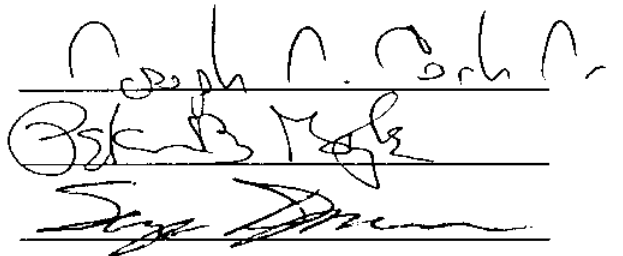
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ABSTRACT

This study was conducted to determine if exercise conditioning can improve the condition of young-of-the-year (YOY) striped bass before they are released for mitigation purposes.

Effects of serial sampling and net confinement were first determined to assess the degree of stress caused by these two unavoidable handling practices. Serial sampling at 5 min intervals resulted in progressive increases in plasma cortisol and lactate of remaining fish; acclimation to 1.0% NaCl 15-17 hr before sampling did not alleviate the stress responses. Capture, net confinement and crowding for 90 s (collectively, "handling"), resulted in plasma cortisol increase, hyperlacticemia and osmotic imbalance. Addition of 1.0% NaCl in the recovery environment resulted in faster return to pre-stress levels of cortisol and lactate, and stabilization of osmolality and hematocrit.

Exercise conditioning at 1.2-2.4 body lengths $\cdot s^{-1}$ for 60 d significantly improved final weights, specific growth rates (SGR), 2-min critical swimming velocities, red muscles at 80% standard length (SL), and red:white muscle ratio at 80% SL in both cultured and wild fish. Moreover, wild fish had final weights and SGR

greater than cultured fish in both exercise and control groups. The white muscles at all sections (50, 65 and 80%) also increased in the cultured, but not in the wild fish, although white muscles of conditioned wild fish were significantly greater than in the control cultured fish. Conditioned fish also showed improved physiological responses to and decreased recovery time from handling stress in cultured and wild fish. Osmotic imbalance due to handling stress was less severe, and plasma cortisol and lactate clearance rates were faster, in conditioned cultured and wild fish compared to the controls.

Optimum exercise conditioning velocities for growth and swimming were the moderate (1.5-2.4) and fast (2.4-3.6 $\text{bl} \cdot \text{s}^{-1}$) velocities, respectively, with both effects persisting 56 d post-conditioning. Red and white muscles also increased in both velocities at 0 and 14 d post-conditioning, respectively. Exercise conditioning at the moderate-fast velocity range increased body lipids and decreased a post-swimming stress acidosis.

Results indicate that exercise-conditioned YOY striped bass used for stocking purposes would have size, swimming, energy reserve, and stress response advantages consistent with higher survival than unexercised fish.

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