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# Improving transportation of live hybrid striped bass

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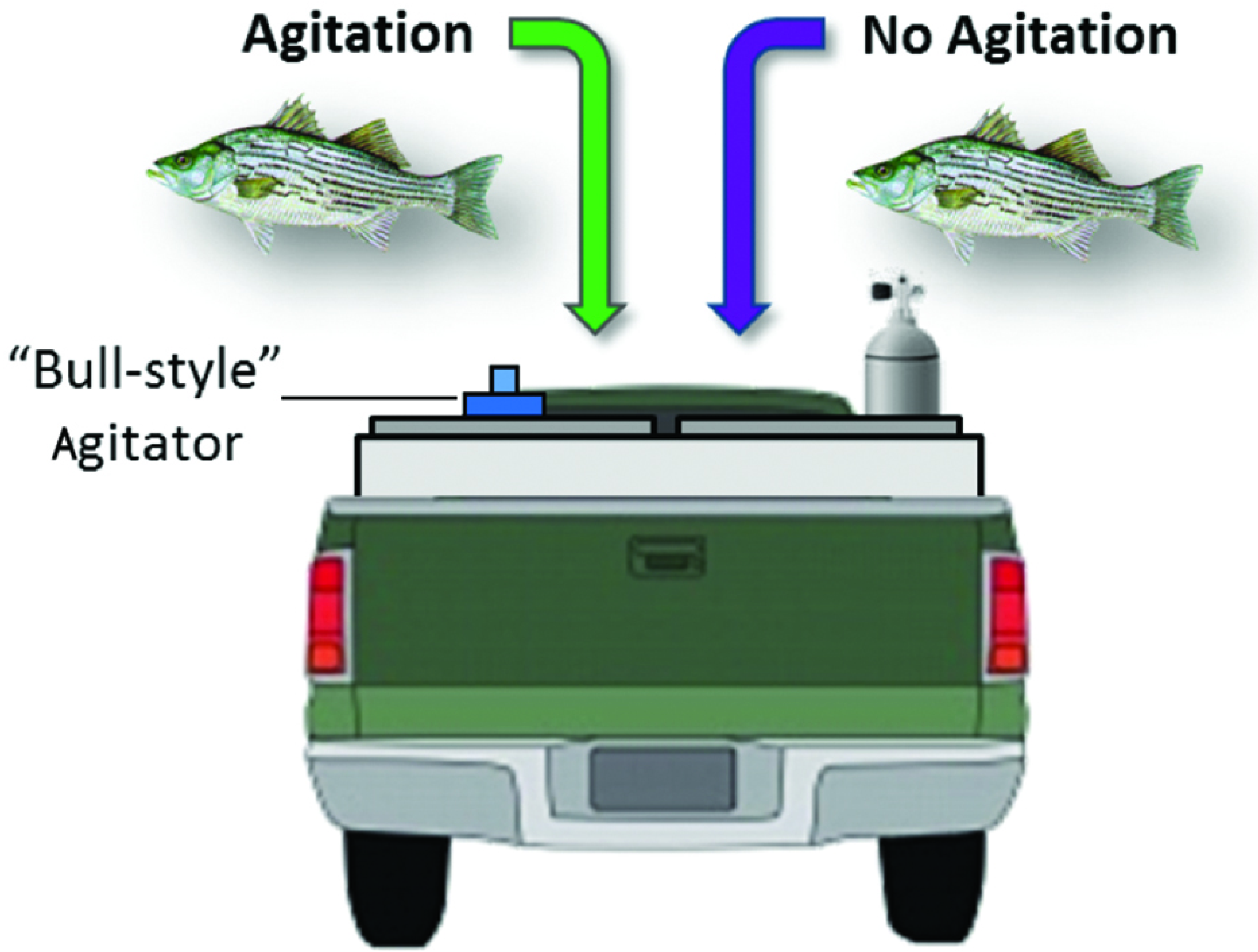
2 July 2015 Kelli Barry John Bowzer, Ph.D. Jesse T. Trushenski, Ph.D.

## Seining may contribute to poorer condition of pond-reared fish




Although continuous agitation improved some water quality parameters, its use did not substantially attenuate the stress responses of the fish.

A majority of the U.S. production of hybrid striped bass – a cross of female white bass, *Morone chrysops*, with male striped bass, *M. saxatilis* – is associated with farms located in the states of Texas, North Carolina and Florida. According to the U.S. Department of Agriculture, these farms were responsible for nearly 75 percent of the 5,634 mt of market-size fish produced in 2013. Although Illinois is a relatively minor contributor to domestic production, hybrid striped bass are the second most cultured fish in the state and represent a significant portion of its aquaculture industry.

Hybrid striped bass have been raised in a variety of culture systems in Illinois, including earthen ponds and floating cages. Most Illinois growers market their fish live, but these lucrative markets are typically in major metropolitan areas such as Chicago and New York City, which are located hundreds of kilometers from the majority of farms in southern Illinois. Transport times often range from six to 24 hours, so long and stressful live hauls are common. The results can include mortality, morbidity and fish in generally poor condition upon arrival.

Anecdotal information from Illinois growers has suggested that pond-reared hybrid striped bass are more vulnerable to transportation-related morbidity and mortality than cage-reared fish. To verify these reports and explore ameliorative strategies, the authors conducted two experiments to simulate live hauling of market-size hybrid striped bass.

## Live transport of pond-, cage-reared fish

In one experiment, market-size fish with individual weights of 650 ± 13 g were harvested by seining from earthen ponds and dip netting from floating cages, then stocked at a rate equivalent to 97 g fish/L in a two-compartment, insulated aluminum live hauler and held for eight hours to simulate transport. About 60 pond-raised and 65 cage-raised bass were stocked. The procedure was repeated on four replicate days.

Water chemistry was measured and blood samples were taken from three fish at zero, one, two, four and eight hours (Figure 1). Since blood samples from one trial were improperly stored, the blood chemistry results reflected only three of the four replicate trials.

Changes in plasma cortisol, glucose, lactate and osmolality indicated all fish underwent an acute stress response following harvest and transport, but subtle differences in performance and conditions experienced by the pond- versus cage-reared fish suggested greater accumulation of carbon dioxide during transport of pond-reared fish may be problematic (Fig. 1).

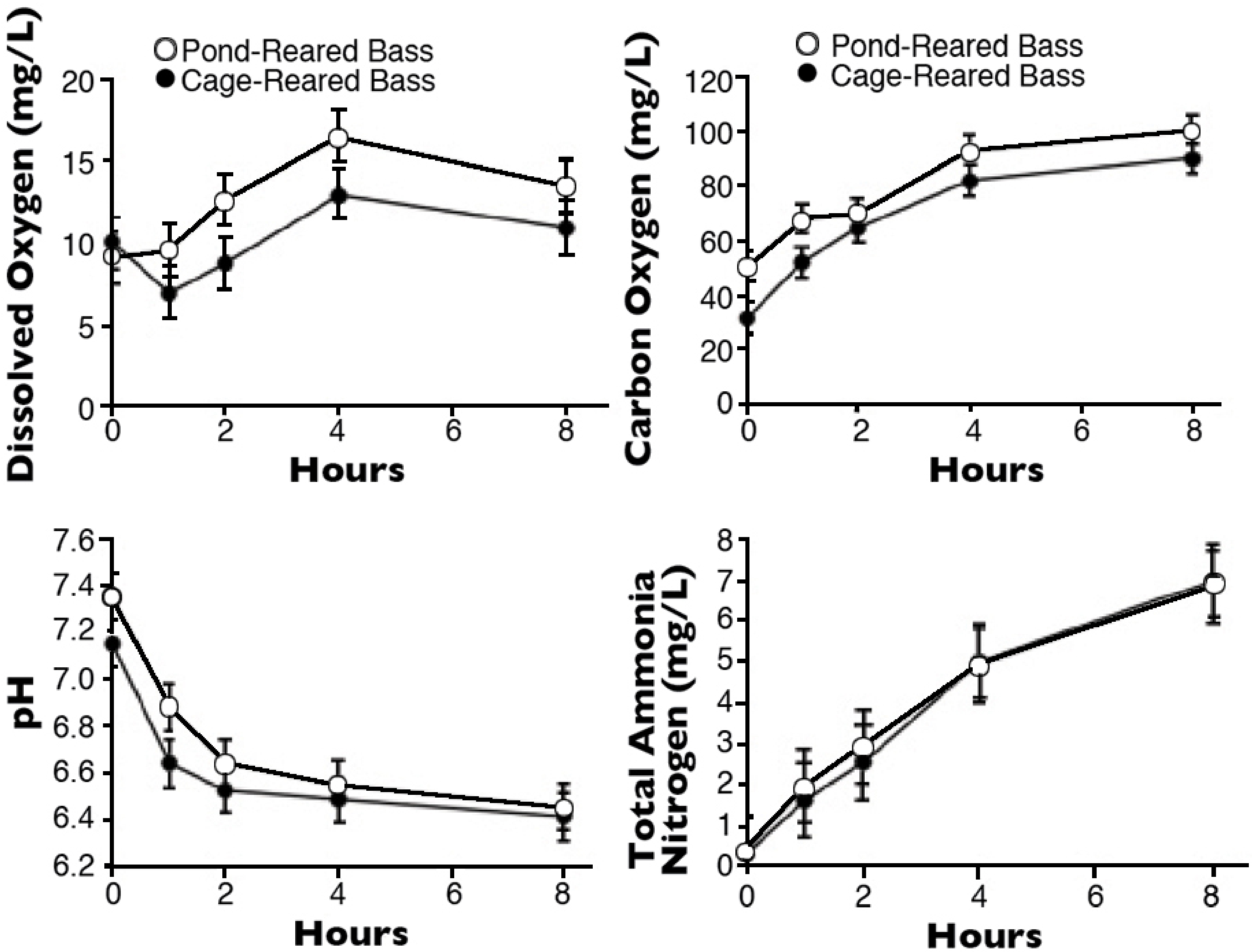



Fig. 1: Water chemistry during simulated transport of hybrid striped bass in the first experiment.

## Agitators manage water quality

In a second experiment with three replicate days, market-size fish with individual weights of 812 ± 12 g were seine harvested from earthen ponds and stocked in the same live hauler used in the first experiment. The bass were again held for eight hours of simulated transport. For this experiment, however, the live hauler was fitted with “bull-style” agitators powered by a 12-volt battery to provide continuous agitation during the simulated transport.

Although agitation mitigated the carbon dioxide accumulation and stabilized pH, the total ammonia nitrogen equilibrium shifted in favor of un-ionized ammonia nitrogen (Fig. 2). Minor differences in blood chemistry were noted, but the use of agitators did not substantially attenuate the stress response observed.

Fig. 2: Water chemistry during simulated transport of hybrid striped bass in the second experiment.

## Transport limitations

The authors' work suggested the anecdotal reports of pond-reared hybrid striped bass performing poorly during and after live transport were accurate. However, blood chemistry analyses failed to reveal significant differences between pond- and cage-reared fish. The only mortalities observed during the experiments were among the pond-reared fish, suggesting some distinction between these two "populations" of fish.

Increasing carbon dioxide and decreasing pH levels were identified as potential causal factors. The experiment with agitation to mitigate the carbon dioxide accumulation was successful in terms of these two aspects of water quality, but presented another challenge in terms of nitrogenous waste management. Such interactions among water quality parameters can complicate attempts to mitigate water quality-related stressors and achieve ideal transport conditions.

## Perspectives

Experimental results suggested harvest-related handling can be a greater stressor than others experienced during transport, and seining may contribute to poorer condition of pond-reared fish during and after transport.

The authors recommend further research to identify strategies – allowing fish to recover between primary harvest and transport or the use of water treatments to neutralize ammonia, for example – to reduce stress and improve live transport of hybrid striped bass, particularly those raised in ponds.

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