PHYSIOLOGICAL STRESS IN CULTURED STRIPED BASS: QUANTIFYING EFFECTS OF ROUTINE HANDLING AND STOCKING PROCEDURES

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Introduction

This study was undertaken to examine the physiological stress levels in cultured phase II striped bass, *Morone saxatilis,* due to routine handling procedures. Juveniles are raised at hatcheries and stocked into rivers, reservoirs, and other waters to supplement existing populations (Harrell 1990), or create new fisheries. These stocking programs require handling of the fish that can result in physiological stress. Handling and stocking stress can have detrimental effects on the overall health of the fish stocked (Weirich and Tomasso 1992; Davis and Parker 1990), and result in decreased survival of the fish. It is essential that high-quality, healthy fish be stocked to ensure the success of stocking programs.

Field and laboratory studies have examined brood stock capture methods, harvest methods, and hauling methods used for striped bass culture (Grizzle et al. 1985; Mazik et al. 1991; Harrell and Moline 1992). Wallin and Van Den Avyle (1995) used plasma cortisol determinations, in conjunction with survival experiments at stocking sites, for determining handling stress levels in stocked juvenile striped bass. They concluded that survival of fingerlings stocked in fresh water was significantly related to stress levels induced during pre-stocking harvest and handling procedures.

The current study was undertaken to examine the physiological stress levels of cultured phase II striped bass due to handling associated with harvest from culture ponds, transfer to holding facilities, tagging and transport to stocking sites. Objectives of this study were to quantify stress levels in routinely handled phase II striped bass at the time of stocking, describe the pattern of stress response during repeated handling prior to stocking, and to compare stress levels and survival rates of fish stocked on the day of harvest with those stocked after being held for at least 24-hr after harvest.

Methods

In the fall of 1994 and 1995, phase II striped bass were sampled at Richmond Hill Hatchery (Georgia Department of Natural Resources), Richmond Hill, Georgia, and Bo Ginn National Fish Hatchery (U.S. Fish and Wildlife Service), Millen, Georgia. Blood samples were taken from fish in the culture ponds 10 days prior to harvest, and at various sampling points during the harvest and stocking procedures. Plasma cortisol, glucose, and osmolality levels were determined at one hour post-harvest, at the time of loading onto the hauling trucks, at the time of stocking, and 48-h after stocking. Fish were anaesthetized in MS-222 before being bled.

In 1994, the fish received coded-wire micro magnetic tags after harvest prior to being stocked. No tagging was done in 1995. During both years, groups of fish were placed in experimental cages at the stocking site in order to determine percent survival after 48-h.

Results

Plasma cortisol, glucose, and osmolality levels, measured after harvest, changed from pre-harvest levels in all pond groups sampled. The levels of plasma cortisol measured after harvest varied by pond, ranging from 125 to 430 ng/mL. Figure 1 shows cortisol, glucose, and osmolality values at various sampling points for a typical pond sampled. Cortisol, glucose, and osmolality levels did not return to pre-harvest levels, even at 48-h after stocking.

Some groups of fish were stocked within 9-h after harvest, while others were held overnight and stocked 26-27 h after harvest. Cortisol levels at the time of stocking were not significantly different between these groups. Glucose and osmolality levels were also not significantly different in held fish and unheld fish.

Although cortisol levels measured at the time of stocking were not significantly lower in the fish held overnight, there were differences in survival rates. Survival rates varied with holding time before stocking. There was 0% survival for fish from any pond stocked on the day of harvest. Survival rates are shown in Figure 2.

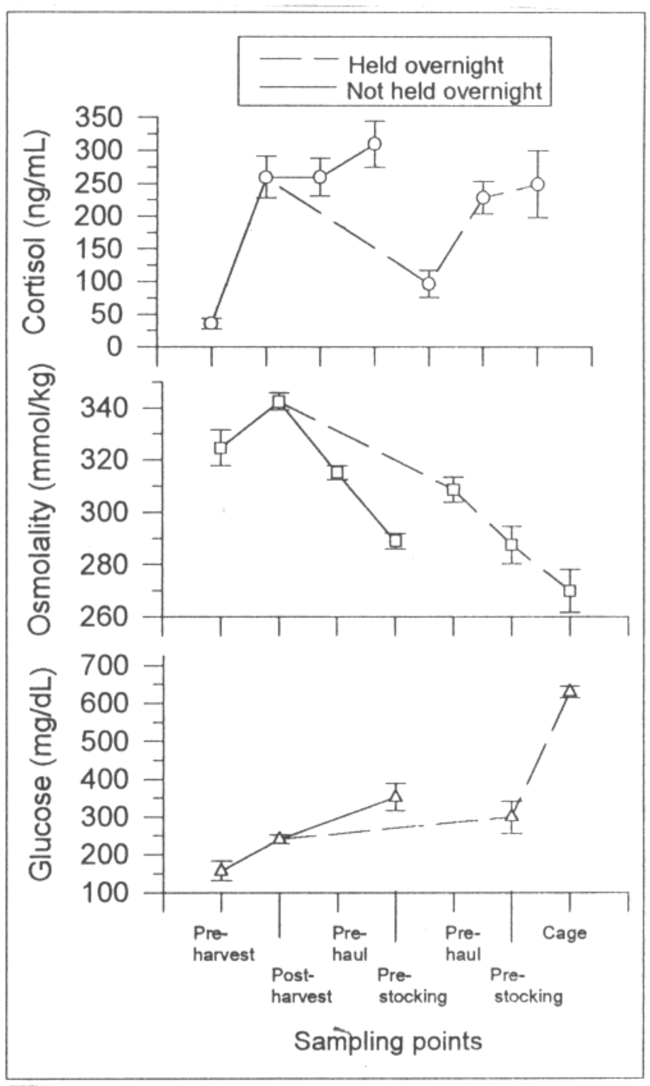

Figure 1. Cortisol, glucose and osmolality response (mean ±SE) at various sampling times before and after harvest. Stocking occurred at 8-h post-harvest and 26-h post-harvest. Values at cage are for the 48-h post-stocking sampling point. Pre-haul corresponds to sampling points before fish are loaded on hauling truck (6-h and 24-h post-harvest, respectively).

Discussion

There appears to be a benefit in holding fish overnight prior to stocking. Based on survival rates a 16-24-h holding period after a series of successive handling events resulted in increased survival. The type of handling involved in harvesting, tagging and stocking phase II striped bass juveniles causes acute physiological stress. The benefits of holding fish in isosmotic environments to allow a decline in stress levels has been shown (Nikinmaa et al. 1983; Mazik et al. 1991). Handled fish should be allowed to recover from one stressful situation before exposing them to another (Parker et al. 1990).

The increase in survival rates after a holding period was observed in both years. Even in the absence of micro-tagging, the stress of harvest, crowding and transfer to a holding facility was sufficient to show the benefits of a recovery period. Tagging, weighing, counting and disease treatments necessitate that fish be brought into a holding area before stocking. These necessary procedures often cannot be eliminated from hatchery routines. Allowing for a recovery period before the additional stress of hauling has the potential to increase the health and survival of stocked fish.

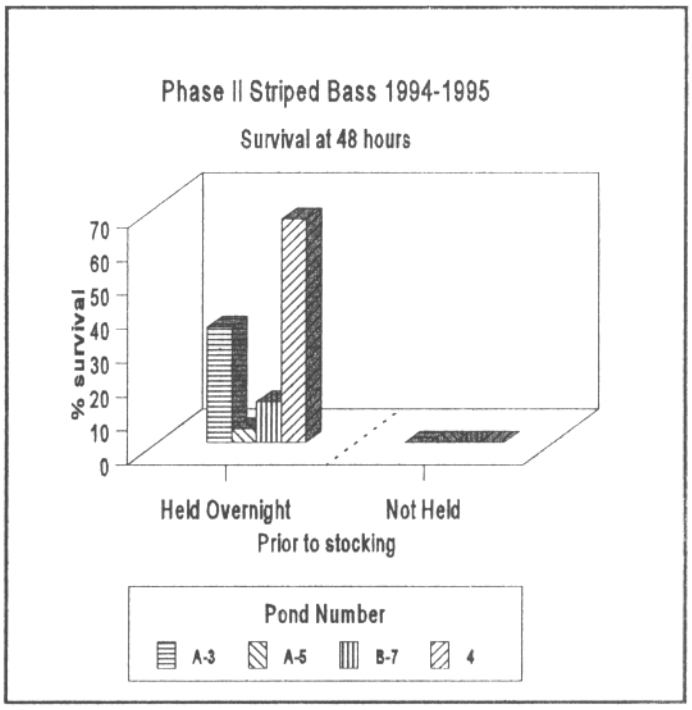

Figure 2. Percent survival for fish held overnight and fish not held overnight prior to stocking.

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