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ABSTRACT

The southern flounder (*Paralichthys lethostigma*) is a commercially important marine flatfish that ranges from Albemarle Sound, NC to Corpus Christi Pass, TX but is absent in southern Florida. Juveniles and adults are mainly found in estuaries and can tolerate a wide range of salinities, making it an attractive species for aquaculture. Spawning methods are relatively well developed for southern flounder, however one limitation to commercial-scale production of fingerlings is that optimum environmental conditions for culturing the larval stage are not completely known.

The optimum turbulence and salinity conditions for culture of southern flounder from hatching to day 16 post-hatching (d16ph), were determined by stocking embryos into black 15-L cylindrical tanks under four turbulence levels (20, 90, 170, and 250 mL/min of diffused aeration) and two salinities (24 and 35 ppt) in a 4 x 2 factorial design. Larvae were provided with enriched s-type rotifers from d2ph at a density of 10 ind./mL. Temperature was 19°C, light intensity was 390 lux, and photoperiod was 18L: 6D.

Significant ($p < 0.05$) effects of turbulence on growth (Notochord length NL, wet wt., and dry wt.) were observed. On d16ph growth (NL) increased with decreasing turbulence level and was significantly greater at 20 (64.2 μm) and 90 mL/min (58.2 μm) than at 170 (56.3 μm) and 250 mL/min (57.2 μm). Survival declined primarily during the pre-feeding and first-feeding stages through d8ph, then stabilized through the end of the study on d16ph. In contrast to growth trends, survival (%) on d16ph increased with increasing turbulence levels and was significantly greater at 170 (57.9 %) and 250 mL/min (54.0 %) than at 20 and 90 mL/min (21.4 and 26.2%, respectively). Mean rotifer concentrations (24 hours after feeding) were significantly higher ($P < 0.05$) in the low turbulence treatments of 20 (4.48 rotifers/mL) and 90 mL/min (4.23 rotifers/mL)

than in the high turbulence treatments of 170 and 250 mL/min (2.28 and 2.45 rotifers/mL, respectively). Under both salinities, larval whole body osmolality (mOsm/kg) increased with increasing turbulence levels and was significantly higher at 250 mL/min (427) than at 20 mL/min (381). On d14ph, larvae in all treatments were positively buoyant in 35 ppt and negatively buoyant in 24 ppt.

Results showed that growth of southern flounder larvae in 15-L tanks was maximized under low turbulence levels of 20 and 90 mL/min, while survival was maximized at high turbulence levels of 170 and 250 mL/min. Higher turbulence levels probably helped pre-feeding and early feeding stage larvae, which lack a swim bladder and have weak swimming ability, to maintain position in the water column and survival. The data suggested that, in feeding stage larvae, high turbulence levels increased prey encounters and capture, but caused excessive swimming and, hence, less energy available for growth. At high turbulence levels, stress of increased swimming and lower prey availability (i.e., prey/larval ratios) due to higher larval survival contributed to osmotic stress and slower growth. In contrast, larvae surviving in the lower turbulence treatments benefited from higher prey availability and prey consumption and showed better growth.

Based on the results of this study, turbulence levels should be maintained relatively high during pre-feeding and early feeding stages and then decreased for mid to late feeding and pre-metamorphic stage larvae.

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DEDICATION

I would like to dedicate this thesis to my mother, Julia Mangino, whose love of science and dedication to teaching inspired me to follow my dreams.

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