

# A FACTORIAL STUDY TO INVESTIGATE THE EFFECTS OF SWIMMING SPEED AND DISSOLVED OXYGEN CONCENTRATION ON RAINBOW TROUT PERFORMANCE, HEALTH, AND WELFARE

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Inappropriate swimming speed and reduced dissolved oxygen concentrations are putatively associated with reduced health and welfare in salmonid aquaculture; however, these relationships need to be further quantified. Both parameters are related to variable costs (water pumping, liquid oxygen) in operating aquaculture systems, and more research into balancing these costs with fish health outcomes is needed at present. The objectives of this study are to determine the impacts, both alone and in combination, of swimming speed and dissolved oxygen concentration on rainbow trout performance (growth, feed conversion, and survival), health (tissue histopathology and blood gas and chemistry changes), and welfare (fin condition, spinal deformities). The study described is ongoing at the time of abstract submission, and therefore results will be available for presentation at the conference in 2010.

Juvenile rainbow trout (10g) were stocked into twelve small circular tanks (500 fish per tank) and raised for six months, with a maximum rearing density of 80 kg/m<sup>3</sup>. A 2X2 factorial study design was employed, with treatment groups consisting of the following: three tanks with high swimming speed (2 body lengths per second) and high dissolved oxygen (100% saturation), three tanks with low swimming speed (<0.5 body lengths per second) and low dissolved oxygen (70% saturation), three tanks with high swimming speed and low dissolved oxygen, and three tanks with low swimming speed and high dissolved oxygen. With this design, the effects of the two parameters investigated will be assessed for their associations with the various outcomes examined. Fish performance will be evaluated with daily mortality and monthly length and weight data; growth and survival rates will be calculated and compared statistically. Fish health will be assessed through terminal caudal venipuncture samplings for blood gas (e.g. pO<sub>2</sub>, pCO<sub>2</sub>, sO<sub>2</sub>, etc.) and blood chemistry (e.g. sodium, potassium, chloride, glucose, lactate, urea nitrogen, and creatinine) analyses using an i-Stat 1 portable analyzer, with sampling being carried out at the end of the study period. Tissue health will be evaluated through histopathological examination of various organs (e.g. heart, liver, spleen, kidney, gill, skin, muscle) harvested from fish at study's end. Fin indices (the length of rayed fins standardized by fork length) will be measured and compared statistically. Finally, fish will be sampled at 60g and evaluated radiographically to determine the associations between spinal deformities and swimming speed and/or dissolved oxygen concentration. It is hoped that by study's end, new insights will be gained into these performance, health, and welfare outcomes and their associations with dissolved oxygen and swimming speed.