The Use of Growth and Dissolved Oxygen Consumption per Mass of Fish to Determine the Impact of Gender, Transgenes (Wild-type vs. Florescence), and Zygosity (Hemizygous vs. Homozygous) on the Fitness and Impact in the Wild of Transgenic Fluorescent Zebrafish

Slater, Frances

Zebrafish (Danio rerio) are tropical fish that are often used for genetic research. Transgenic zebrafish contain a mutant strain that makes them glow when muscles fluoresce. The question was: What effect does gender, transgenes (wild-type vs. florescence), and zygosity (hemizygous vs. homozygous) have on zebrafish fitness (oxygen consumption and growth)? Using 36 transgenic fluorescent zebrafish, the oxygen consumption was measured using a dissolved oxygen (DO) probe in a sealed Erlenmeyer flask, recording the oxygen consumed (milligrams per liter) per second for 30 minutes. The concentration of oxygen per mass of fish was calculated and the mass (grams) was measured using a balance. Length (centimeters) was measured after sedating the fish using a tricane solution (Bagatto, 2009). The original hypothesis was: If gender, transgenes (wild-type vs. florescence), and the zygosity (hemizygous vs. homozygous) of Danio rerio are compared, then fitness (oxygen consumption and growth) will be affected. The hypothesis was partially supported. Grey Wild-type zebrafish (homozygous) were significantly more massive and used significantly less oxygen per mass of fish, using an ANOVA, $p<.030$. Also, when oxygen consumption per mass of fish and overall mass of each fish were compared, there was not a significant difference by transgenic zygosity. Nespolo et al. (2003) reports that in animals, oxygen consumption can be used to determine metabolic rate. Also, in ectotherms, metabolic rate affects energy usage and expenditure and can be related to Darwinian fitness. Thus, it appears that the insertion of the transgene in zebrafish has a negative effect on fitness.