Effects of intraspecific variation in reproductive traits, pectoral fin use and burst swimming on metabolic rates and swimming performance in the Trinidadian guppy (Poecilia reticulata) - DTU Orbit (03/01/2019)

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There is considerable intraspecific variation in metabolic rates and locomotor performance in aquatic ectothermic vertebrates; however, the mechanistic basis remains poorly understood. Using pregnant Trinidadian guppies (Poecilia reticulata), a livebearing teleost, we examined the effects of reproductive traits, pectoral fin use and burse-assisted swimming on swimming metabolic rate, standard metabolic rate (MO2std) and prolonged swimming performance (Ucrit). Reproductive traits included reproductive allocation and pregnancy stage, the former defined as the mass of the reproductive tissues divided by the total body mass. Results showed that the metabolic rate increased curvilinearly with swimming speed. The slope of the relationship was used as an index of swimming cost. There was no evidence that reproductive traits correlated with swimming cost, MO2std or Ucrit. In contrast, data revealed strong effects of pectoral fin use on swimming cost and Ucrit. Poecilia reticulata employed body-caudal fin (BCF) swimming at all tested swimming speeds; however, fish with a high simultaneous use of the pectoral fins exhibited increased swimming cost and decreased Ucrit. These data indicated that combining BCF swimming and pectoral fin movement over a wide speed range, presumably to support swimming stability and control, is an inefficient swimming behaviour. Finally, transition to burst-assisted swimming was associated with an increase in aerobic metabolic rate. Our study highlights factors other than swimming speed that affect swimming cost and suggests that intraspecific diversity in biomechanical performance, such as pectoral fin use, is an important source of variation in both locomotor cost and maximal performance.

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