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Genetic variation for growth rate, feed conversion efficiency, and disease resistance exists within a farmed population of rainbow trout - DTU Orbit (08/11/2017)

Genetic variation for growth rate, feed conversion efficiency, and disease resistance exists within a farmed population of rainbow trout

The objective of this study was to test that additive genetic (co)variation for survival, growth rate, feed conversion efficiency, and resistance to viral haemorrhagic septicaemia (VHS) exists within a farmed population of rainbow trout. Thirty sires and 30 dams were mated by a partly factorial mating design. Each sire was mated to two dams, and each dam was mated to two sires, producing 50 viable full-sib families (29 sires, 25 dams). The fish from these families were reared for a 215-day growout period, and were assessed for survival between days 52 and 215, growth rate (i.e., body weight on days 52, 76, 96, 123, 157, 185, and 215, and body length on days 52 and 215); feed conversion efficiency between days 52-215, 52-76, 77-96, 97-123, 124-157, 158-185, and 186-215, and VHS resistance. REML estimates of additive genetic variation for the body weights, body lengths, and feed conversion efficiencies were obtained by fitting univariate linear (reduced) animal models. Additive genetic variation for VHS resistance was estimated by fitting a Weibull, sire-dam frailty model to time until death of fish challenged with VHS. Genetic correlations were estimated among the body weights, body length, and feed conversion efficiencies that expressed additive genetic variation, while genetic correlations between VHS resistance and the body weights, body length, and feed conversion efficiencies were approximated as product-moment correlations among predicted breeding values of the sires and dams. Additive genetic variation was found to be very low for survival, body weight on days 52 and 76, body length on day 52, and feed conversion efficiency between days 185 and 215. However, additive genetic variation was detected for body weight on days 96, 123, 157, 185, and 215 (coefficient of additive genetic variation (CV)=8.4-28.4%, heritability (h2)=0.35 for body weight on day 215), body length on day 215 (CV=6.9%, h2=0.53), feed conversion efficiency between days 52-215, 52-76, 77-96, 97-123, 124-157, and 158-185 (CV=4.0-13.9%), and VHS resistance (additive genetic variance for log-frailty=0.24, h2 on the logarithmic-time scale=0.13). Genetic correlations among the body weights, body length, and feed conversion efficiencies that expressed additive genetic variation were generally favourable and moderate-to-very strong (0.55-0.99), though there were unfavourable correlations (-0.01 to -0.33) between the predicted breeding values for VHS resistance and the predicted breeding values for the body weights, body length, and feed conversion efficiencies. These results demonstrate that additive genetic (co)variation for growth rate, feed conversion efficiency, and VHS resistance does exist within the farmed population of rainbow trout, and indicates that selective breeding for these traits can be successful.

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