

MIXED-FAMILY ESTIMATION OF GENETIC PARAMETERS OF GROWTH, MORPHOLOGIC, IMMUNE AND BEHAVIORAL TRAITS IN THE EUROPEAN ABALONE *Haliotis tuberculata*

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In response to a declining supply from abalone fisheries, aquaculture production has greatly increased in recent decades. Selective breeding has been proposed to improve growth, the main trait constraining the increase of aquaculture production. Among abalone species, *Haliotis tuberculata* is in an early stage of domestication and no estimates of heritability or genetic correlations were yet available for growth-related traits. In this context, weight, length morphology, immunity and behaviour traits were recorded on 945 offspring from a cohort generated by the full factorial mating of 24 sires and 16 dams reared under standard conditions. SNPs were used to assign parentage of this cohort (Harney et al., Aquaculture 491 (2018): 105-113). BLUP was used to estimate additive genetic components and genetic correlations. Shell length exhibited moderate to high heritability estimates, from 0.13 at 14 months old to 0.49 at 42 months old (figure 1). Variation of foot colour and bled meat yield were also proven to be significantly heritable, unlike behaviour and immunity traits. Novel phenotyping methods such as ultrasound to estimate meat yield were developed and evaluated as potential tools for selection. A strong positive genetic correlation was observed between live weight and gonad yields, suggesting a trade-off between reproductive effort and meat yield. Sex ratio variation was measured between paternal half-sib families. Females were heavier at 32 months old but not at 42 months old, suggesting earlier reproductive allocation in males. As a result, a low but significant heritability of sex ratio (0.25 ± 0.11) was observed and moderate positive genetic correlations were estimated between sex ratio of families and weight at 32 and 42 months old. These observations raise the questions about sex determinism in *H. tuberculata* and the potential interest of selecting for high female-to-male ratios high sex ratios. Overall, our results provide essential information to initiate selective breeding to improve growth-related traits in the European abalone. More precise heritability estimates would however be needed to better predict the expected genetic gains.

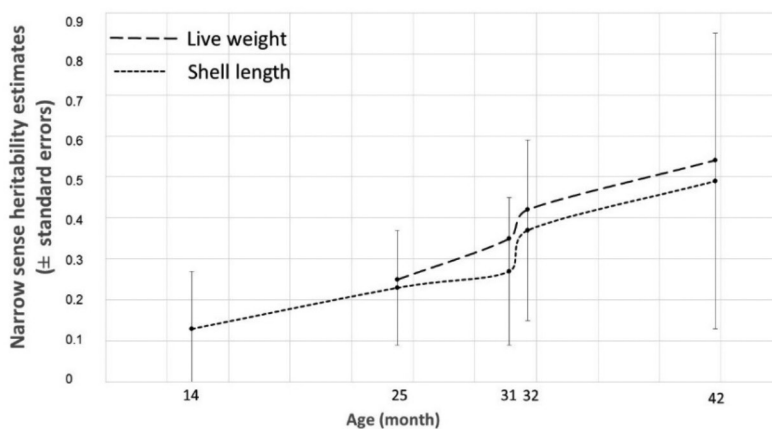


Figure 1. Narrow sense heritability estimates of live weight and shell length in 14- to 42-month-old European abalone (*Haliotis tuberculata*).

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