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GENOTYPE BY ENVIRONMENT INTERACTIONS, HERITABILITIES AND GENETIC CORRELATIONS FOR PRODUCTIVE TRAITS OF *Haliotis rufescens*

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Abstract

A critical aspect of a selective breeding program is whether responses of traits of interest are similar in different environments. The magnitude of the genotype by environment interaction (GEI) together with heritability (h^2) accounts for this aspect. Despite the economic significance of abalones and the interest in genetic improvement programs for their cultivation, only one previous study has reported GEI estimations for this group of mollusks. The objective of the present study was to estimate h^2 and the existence of GEI for growth traits of *Haliotis rufescens* cultivated in Chilean farms with different environmental and management conditions. A total of 2 cohorts (2007 and 2009) of 50 and 42 families of full sibs (FS), respectively, were used. Replicates of each FS family of the 2007 cohort were distributed in two farms in the northern region of the country and were evaluated after 1 and 2 years of cultivation. For the 2009 cohort, replicates of each family were distributed in a farm in the northern region and a farm in the southern region of the country. The estimated h^2 values were significant for all traits, with the length and width of the shell and total weight varying primarily by cohort between 0.22-0.62, 0.16-0.58 and 0.40-0.53, respectively. The genetic correlations (r_G) between traits were all higher than 0.82. The expected correlated responses for improving the total weight using the shell length as a selection criterion predict a selection gain (14-51%) similar to what would be obtained by selecting directly for weight (16-51%) in all environments examined. Thus, indirect selection by shell length and the direct use of total weight as a selection criterion would yield similar effects in terms of the increase in weight. High r_G, not significantly different from 1, were observed for the analyzed traits between replicates of the families in any of the farms compared, both within the northern region and between the northern and southern regions of the country. These high r_G were indicative of non-significant GEI for the analyzed traits. Therefore, results suggest that one selective breeding program could provide improved red abalone for the industry in Chile with consistent results between farms located in different environments.