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Creation of a base population for a breeding program in fish aquaculture

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Abstract

Selective breeding programs have great potential to increase the profitability of aquaculture. The first and one of the most important, steps to be taken when establishing a breeding program is the creation of a population with a broad genetic diversity. This will ensure that rapid inbreeding can be avoided and maximized the likelihood of long-term genetic response. The first step in forming a base population should be to compare productivity in available populations. A base population should combine characteristics of the subpopulations and the best individuals across different populations should be selected as base population. Traditionally, base populations were created from a number of wild strains by sampling equal numbers from each strain. However, for some aquaculture species improved strains are already available and, therefore, mean phenotypic values for economically important traits can be used as a criterion to optimize the sampling when creating base populations. Also, the increasing availability of genome-wide genotype information in aquaculture species could help to refine the estimation of relationships within and between candidate strains and, thus, to optimize the percentage of individuals to be sampled from each strain. In conclusion, marker-based strategies could be used to attempt maximizing variation for disease and meat quality traits, while phenotypic information could be used for traits like growth.

Keywords: Aquaculture, Genetic diversity, Inbreeding, Selection