Abstract 22:

Optimizing phenotypic and genomic selection schemes for integrated aquaculture genetic improvement programs

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Centralized breeding programs are not available for most farmed fish species. One solution to this issue is to integrate breeding programs with production.
The objective of this study was to optimize an integrated breeding program for aquaculture species, where animals produced within production environment are the selection candidates. This research investigated two alternatives to select for a difficult to measure trait (DIF). One alternative was phenotypic selection on an indicator trait (IND). The other was genomic selection for DIF. Two-stage selection scheme was used where the first stage imposed phenotypic selection on harvest weight (HW). The second stage consisted of either phenotypic selection on IND or genomic selection for DIF. We investigated the genetic gains in DIF from selecting on IND or DIF by varying accuracies of GEBVs and the selected proportion in the first stage.
Given the population parameters used in our study, selecting on an IND that is very strongly correlated (0.9) to DIF yielded a similar response with genomic selection with an accuracy of 0.5. Selecting on GEBVs with accuracy above 0.5 always outperformed indirect selection. Selecting on GEBVs with an accuracy of 0.3 outperformed selecting on a moderately correlated (0.5) IND. With GEBV accuracies below 0.9, the maximum response in DIF is obtained by first applying phenotypic selection on HW.
Genotyping only the fraction of candidates that are selected in the first stage of selection significantly reduces genotyping costs and genomic selection with low accuracy will still outperform phenotypic selection on a moderately correlated indicator trait.