THE CENTER FOR AQUACULTURE TECHNOLOGIES

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Maximize genetics gains: Choosing the right breeding program

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What is selective breeding?

Selective breeding is the process of improving one or more desirable traits of a cultured species through the selection of superior parents. A breeding program is how this idea is put into action, using specific tools and methods. It should be designed to maximize the economic return for a commercial producer. Selective breeding isn't just a buzzword; it's a practical strategy that helps aquaculture achieve critical goals.

Enhanced Productivity

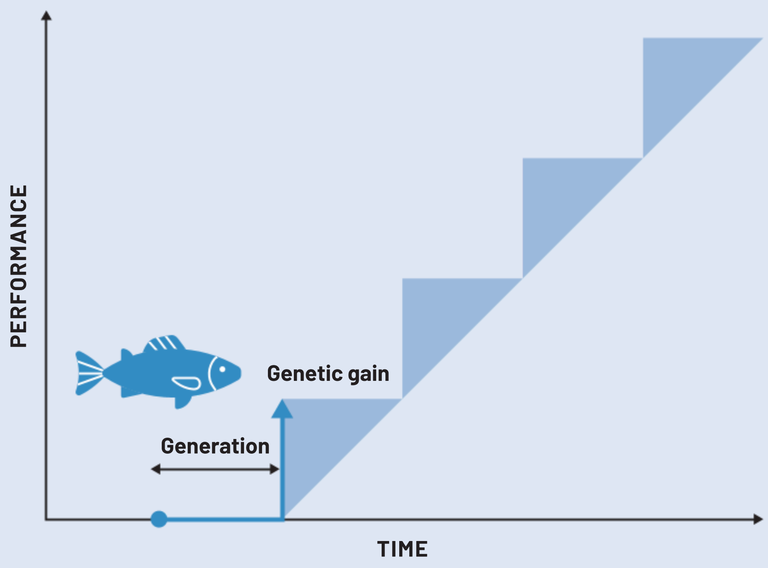
Productivity is the lifeblood of aquaculture. Selective breeding allows us to create strains of fish, crustaceans, or shellfish that grow faster and more efficiently through improved disease resistance and survival, leading to increased yields and reduced production costs.

Improved Quality

One of the primary motivations behind selective breeding is to enhance the quality of farmed aquatic species. By selectively breeding for desirable traits like color, fat or nutrient content, and fillet size and quality, we can produce fish and other aquatic organisms that meet consumer preferences and market demands.

Sustainability

Sustainable aquaculture practices are essential for safeguarding our aquatic ecosystems. By selectively breeding for traits that minimize environmental impact, such as reduced waste production and efficient feed utilization, we can create a more sustainable future for the industry.



Importance of genomic resources

Developing genomic resources for aquaculture species is essential for efficient breeding programs and selecting the right genotyping tool(s) is crucial to enable the genetic progress of a breeding program.

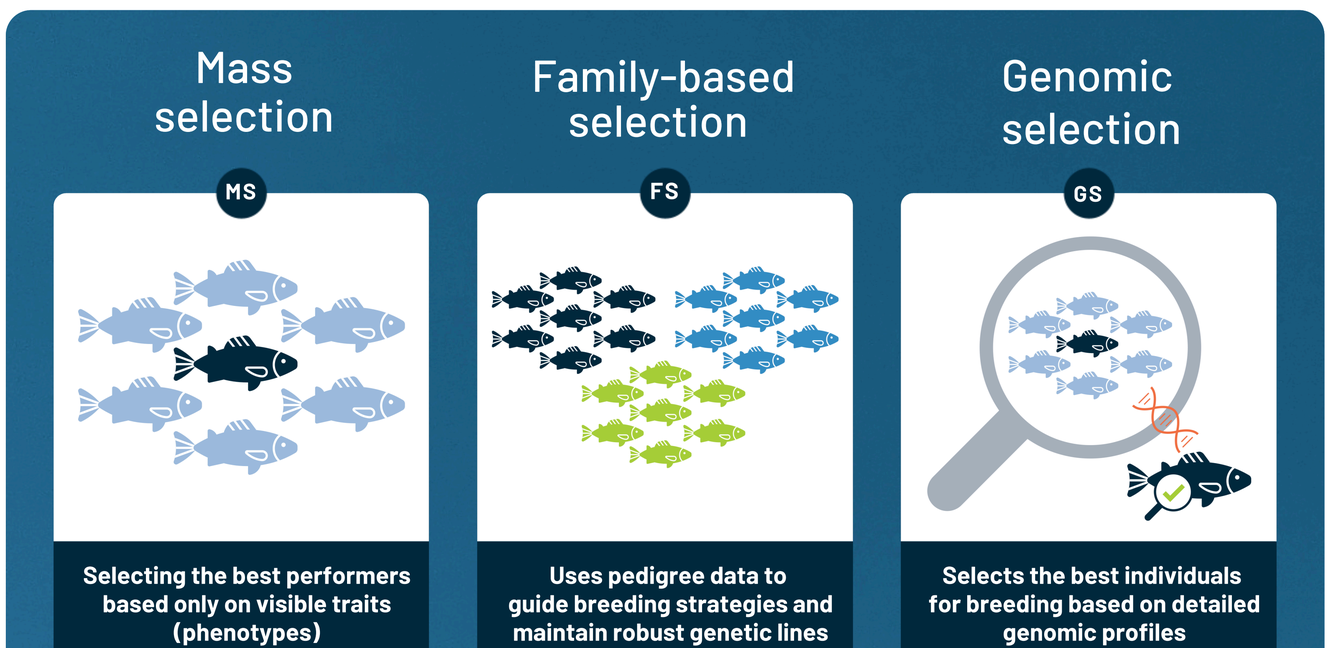
Genomic data enables producers to make informed decisions. This data is valuable for assessing inbreeding, relatedness, parentage, and breeding values, supporting more effective selection and higher genetic gains.

However, not all producers need large genomic datasets; requirements vary by production scale and program goals.

The future of genetic improvement

In the same way that selective breeding delivers improved genetic progress over time, genome editing precisely targets and delivers genetic changes that could naturally occur. However, instead of taking many years of careful selective breeding, this beneficial variation can now be introduced in a single generation.

By combining both approaches, we can rapidly accelerate progress for specific traits while maintaining the benefits of traditional selective breeding.



Providing critical insight to accelerate genetic improvement

Genotypingandsequencingtoolsuse markers atvarying densitiestosupportdifferentbreedingstrategies. Different breeding strategies require different densities of tools.

AQUA array® LD

Up to 1,000 markers

– Parentage assignment
– Genetic diversity assessment
– Broodstock population structure
– Inbreeding monitoring

AQUA array® MD

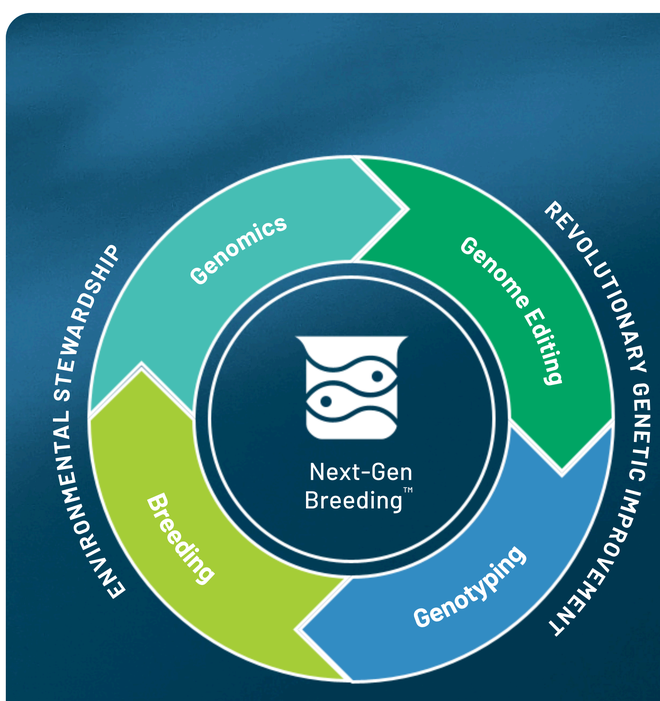
Between 1,000 and 10,000 markers

– Includes LD applications
– Traceability management
– Imputation to HD dataset

AQUA array® HD

Over 10,000 markers

– LD & MD applications
– Genomic selection
– Marker-assisted selection
– Marker discovery



Next-Gen Breeding

Next-Gen Breeding™ is a strategy that combines genotyping, breeding, genomics, and genome editing to enhance productivity, protect genetic assets, and support environmental stewardship.

Incorporatinggenome editing intoselective breeding programs is the next advancement in genetic improvement.

The Center for Aquaculture Technologies (CAT) specializes in designing and delivering customized breeding programs that align with each client's objectives, operational needs, and budget – from simple approaches to advanced, data-driven strategies. A successful genetic improvement plan requires careful consideration of the program's breeding goals, production capacity, and the selection of the most suitable tools to support effective implementation.

Leading genetic innovation

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