

SELECTION METHODS AND BREEDING PLANS

Dr. Amrutha Gopan Assistant Professor School of Fisheries Centurion University of Technology and Management Odisha

P FOR GENETIC VARIATION

- Genetic variation provides the raw material for selection.
- Without additive genetic variance there can be no response to selection.
- Rare alleles in a population may not be of value to aquaculture today but may be tomorrow. For e.g. in conferring resistance to an outbreak of new disease.

<u>Centerios</u>e all UNIVERSITY Shaping Live and the Empowering Communities... material.

alleles are lost from a population, they t be recovered without addition of new al.

 Genetically variable populations are thought to have higher levels of developmental stability and fitness.

Inbreeding depression is prevented.

ESIGN OF BREEDING PROGRAMMES

VERSITY

Management or selective breeding.

SPECIES TRANSFORMER

Communities.
breeding between two individuals to develop new progeny.

This is based on a male, having high quality of quantitative characters and its proportion in the new hybrid become higher from generation to generation.

> Heterosis effect can be observed.

Effect of heterosis appears in the first hybrid generation and decrease gradually in the second and subsequent generations.

or quality seed production - healthy brood fish

1 Shaping Lives of origin.

2) Fish seeds produced from different strains are marked and reared to the size of fingerling.

3) Detail study is conducted on FCR, growth, quantitative and qualitative characters etc., before rearing as brood fish.

Cotule Field of Fast growing fishes. OF BROODFISH

- 2. Selecting young brood fish fed with nutritious diets
 - for spawning to ensure better quality of seeds.
- Avoiding breeding of small sized (both age and weight) brood fish.
- 4. Avoiding inbreeding and cross breeding.
- 5. Exchange of brood stock, ideas, technologies,
 - etc., between hatcheries.

1 <u>Certustatolishment</u> of a live gene bank at least for the UNIVERSITY Shaping Lives II and S. Major Carps to supply pure strains.

- Training the fish seed producers, hatchery operators on appropriate technologies concerning selective breeding, brood stock management, etc.
- Initiating participatory research with farmer, hatchery operators on induced breeding, selective breeding, line crossing, hybridization, nursery management, transportation, etc.



Variable levels of crossbreds showing heterosis for growth rate have been obtained in the channel catfish; rainbow trout; common carp and the Pacific oyster.

Heterosis was also found in survival, disease resistance and reproductive traits.

ROSSBREEDING IN COMMON CARP

Centerion NIVERSITYS breds exhibiting heterosis are the basis for Shaping Lives... Empowering Centre arp culture industries in Israel, Vietnam, China and Hungary.

The crossbreds' growth rate and other qualitative traits give 20% better performance than the parental lines and other control strains.

OSSBREEDING IN CATFISHES

Cultured in the southeastern states of the USA.

Produces an increase of 55 percent and 22 percent in growth rate.

Empowering Communities...

Cross-breeds of different strains of European catfish, Silurus glanis, have adaptability under warm water holding conditions and mixed diet feeding regimes. **TARGES** dual or mass selection ROGRAMMES

- II. Family selection
 - Between-family selection
 - -Within family selection
 - -Combined selection

INDIVIDUAL OR MASS SELECTION

The best individuals are selected from a population on the basis of their own 'phenotypic value' compared to the population means.

> The top 10 to 15% individual are selected.

After selection, the young brood fishes are kept under optimal conditions before choosing the most appropriate female and male individuals for hatchery operation. At least 50 pairs of fish should be selected in each generation and contribute to the next generation.

Centurion UNIVERSITY

rise energination and the 5-10% per generation.

Tilapia farmers conduct selection by culling smaller fish in the breeding stock and propagating only large individuals.

Mass selection is done when breeding space is limited.

Centurion UNIVERSITY Shapping Are policed only to traits that have relatively high h²' S.

- Selection of simply the largest individuals in a population
- Choose individuals from a few families which are larger than average for environmental rather than genetic reasons.
- In small hatchery populations this could result in rapid inbreeding.



selected

>When between-family selection is used relatively few families are saved.

This retroactively lowers N_e of the previous generation to a very small number.

family selection

vieual

is considered a sub-population and best from within family are selected or culled based on their relation to their family mean.

>Efficient method.

Selection is favoured for traits with lower heritabilities or were the trait cannot be measured on the live animal e.g. meat quality, fat content.

bined selection

Figure 1995 the best families can be bred together.

Advantage – exploition of additive genetic variation between and within the families to have a better selection response.

Used when the main differences are within rather than between families.

PROGENY TESTING

<u>Semilition</u> a breeding programme that deciphers a UNIVERSITY Shapping L Content's genotype by determining its offspring's phenotypes.

Once the genotypes of the dominant parents are deciphered, selection is used to save the homozygotes and cull the heterozygotes, which will eliminate all copies of the recessive allele, fix the dominant allele, and produce a true-breeding population.

This is the easiest, most efficient programme. For improving more than one phenotype; -tandem selection, -independent culling, -selection index.

TANDEM SELECTION

enturion

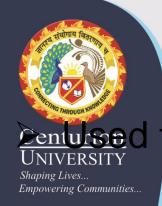
EXAMPLE 7 TWO-step selective breeding programme **designed** to first improve one phenotype, and **after** begin a second selective breeding **programme** to improve another phenotype.

It takes so long to try and improve two phenotypes using this back-to-back procedure.

Easiest selective breeding programme used to improve two or three phenotypes.

Selection is done simultaneously for two or more phenotypes by establishing cut-off values for each phenotype independent of the other(s), and each fish must reach or exceed all cut-off values in order to be saved.

A fish which fails one cut-off value is culled.



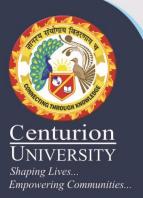
SELECTION INDEX

nulsed to improve two or more phenotypes.

More sophisticated and more expensive than independent culling.

Used by aquaculturists who work at research stations.

Needed only if three or more phenotypes will be mproved simultaneously.



DIALLEL CROSS

 All parents are crossed to make hybrids in all possible combinations.

Aims at establishing a foundation population for genetic improvement.



THANK YOU