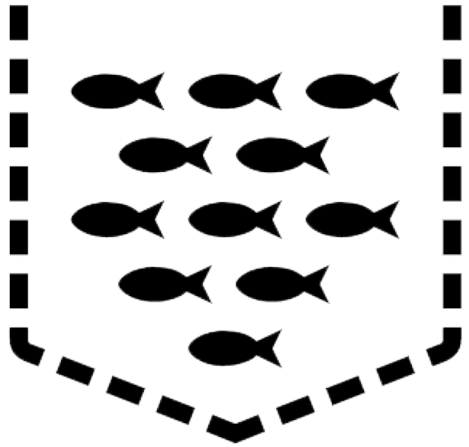
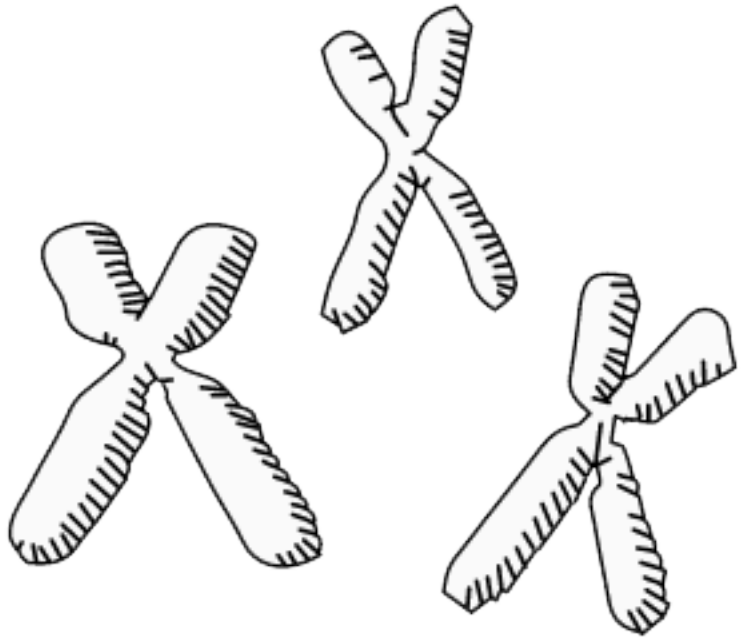
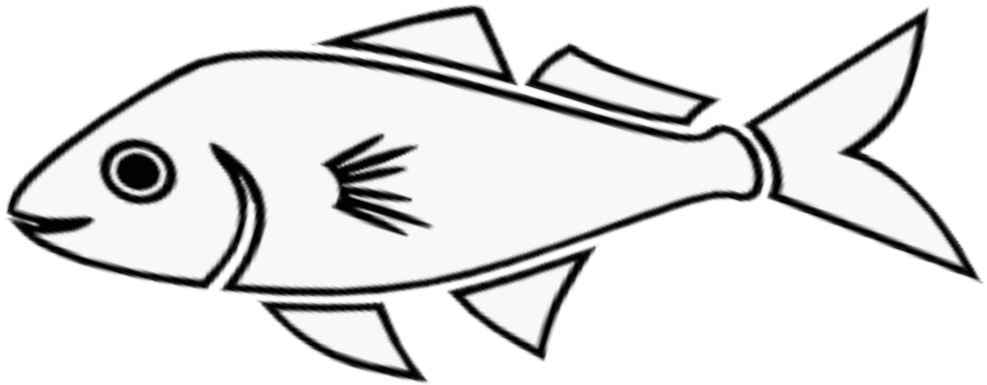


AQS 224 Fish Breeding

Dr. F. Sertel SEÇER





1. Week	**Domestication, Genetic Improvement Practices in Aquaculture**
2. Week	Selective breeding / production in seafood
3. Week	Theoretical Foundations of Cultivation and Selection
4. Week	Breeding Programs
5. Week	Strategies for Breeding
6. Week	Selection and Mating Design Methods
7. Week	Estimation of Breeding Values
8. Week	Genotype and Environment Interaction
9. Week	Calculating the Selection Response
10. Week	Side Effects in Fish Breeding Practices
11. Week	Biotechnology in Fish Farming
12. Week	Reproduction Techniques in Fish Breeding 1
13. Week	Reproduction Techniques in Fish Breeding 2
14. Week	Economic Evaluation of Fish Farming

1. Week

Domestication, Genetic Improvement Practices in Aquaculture

- Domestication of Animals
- Selective Breeding
- Quality Traits
- Better Utilization of Resources
- Genetic Improvement is Accumulative
- Genetic Improvement Produces Permanent Gains
- Initiating a Selective Breeding Program
- Selective Breeding Programs in Aquaculture
- Prerequisites for a Breeding Program

- “Price (1984) defines domestication as ‘that process by which a population of animals becomes adapted to man and to the captive environment by some combination of genetic changes occurring over generations and environmentally induced developmental events recurring during each generation’.”

- “Price (2002) concludes that ‘Domestication is about adaptation to man and the environment he provides. Phenotypic adaptations to the captive environment will occur based on the same evolutionary processes that enable free-living populations to adapt to changes in their environment. The major difference is that in captivity, man can accelerate phenotypic changes that would otherwise not appear or persist in nature, through artificial selection’.”

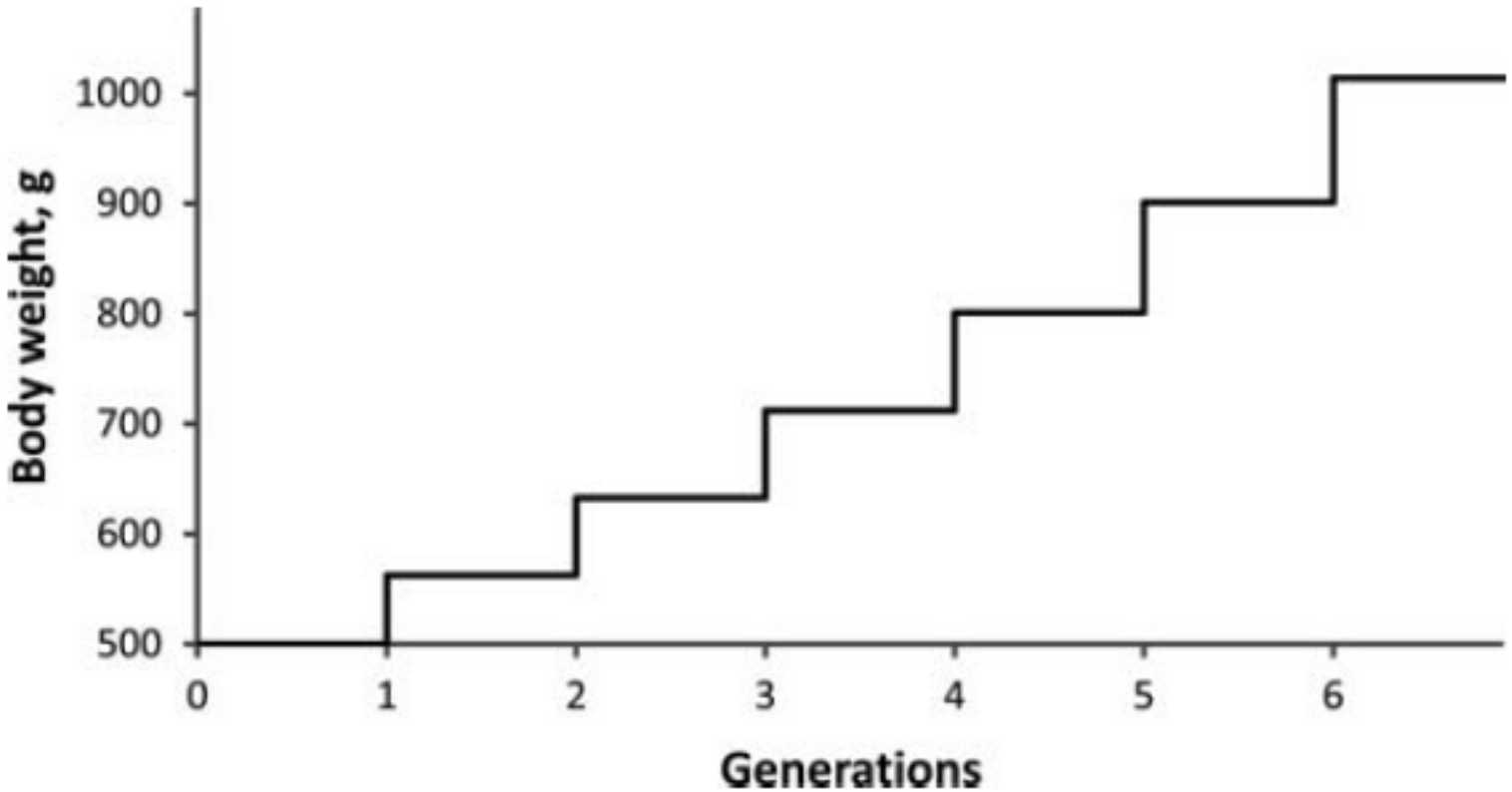

Body weight, g
1000
900
800
700
600
500
0
1
2
3
4
5
6
Generations

Table 2.1 Impact of selective breeding programs on the production of different aquaculture species

Species	No. programs[1]	No. families per program	World prod. in 2003 (1000 tons)	Prod. From improved stocks (%)
Chinese carps	4	76	15,332	?
Oysters	3	60	4,489	1
Indian carps	1	50	1,796	?
Shrimp	9	170	1,752	8
Tilapia	7	166	1,704	9
Mussel	1	60	1,410	?
Scallop	1	110	1,178	2
Atlantic salmon	12	211	1,129	97
Rainbow trout	7	160	483	27

[1]Number of programs using sib information in the selection decisions
Source: Gjerde et al. 2007a, modified from Gjedrem 2004.

Table 2.1 Impact of selective breeding programs on the production of different aquaculture species

Species	No. programs[1]	No. families per program	World prod. in 2003 (1000 tons)	Prod. From improved stocks (%)
Channel catfish	1		300	?
Sea bream	1	50	202	?
Pacific salmon	6	108	129	22
Sea bass	1	50	76	?
Crayfish	1	30	14	?
Turbot	1	50	5	?
Arctic charr	1	150	1	?
Atlantic cod	3	90	1	?
Total listed species	60	?	35,051	4.6
Total all species	––	––	42,304	3.8

[1]Number of programs using sib information in the selection decisions
Source: Gjerde et al. 2007a, modified from Gjedrem 2004.

Prerequisites for a Breeding Program

Some basic conditions must be met before a breeding program will be efficient:

- There must be variation between animals for the traits under prospect of selection since if all animals share identical phenotypes, there are no individuals with higher than average trait values to select
- A portion of this variation must be due to genetic differences since it is only the genetic variation that is transferred to the next generation through eggs and sperm

Prerequisites for a Breeding Program

- The lifecycle for the species in question must be known and able to be controlled since it must be possible to evaluate progeny for trait characters, subsequently select parents for the next generation and cross them in a controlled manner
- Individual animals must be identifiable (through various tagging methods) in order to keep track of their pedigree.

- T. Gjedrem, M. Baranski, Selective Breeding in Aquaculture: An Introduction, Reviews: Methods and Technologies in Fish Biology and Fisheries 10, DOI 10.1007/978-90-481-2773-3_2, C Springer Science+Business Media B.V. 2009