

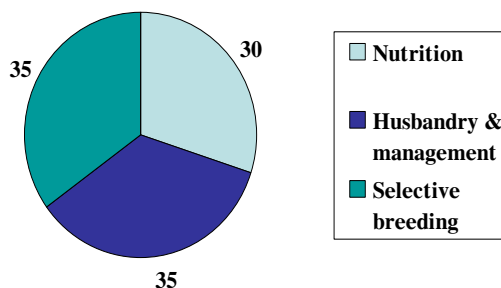
GENETIC PARAMETERS, GENOTYPE BY ENVIRONMENT INTERACTION AND REALISED SELECTION RESPONSE OF SOME IMPORTANT TRAITS IN RIVER CATFISH (*Pangasianodon hypophthalmus*) IN VIETNAM

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Introduction

- Three approaches to improve production efficiency:



Introduction

- Selective breeding program:
 - Improve production efficiency
 - Faster growth
 - Lower FCR
 - Against early sexual maturity
 - Resistance to disease
 - Higher quality: fillet yield, fillet fat, fillet colour
 - World breeding program: successful in various species: salmon, tilapia, carp, shrimp, catfish.
 - Cost: benefit =
 - 1:15 in Atlantic salmon in Norway (Gjedrem, 2000)
 - 1:8.5-60 in tilapia in the Philipinnes (Ponzoni, 2007)

Introduction

- What have to be done in a breeding program:
 - Traits recorded: measure in an economic way
 - Genetic parameters:
 - Heritability
 - Genetic correlation
 - Genotype by environment interaction
 - Genetic response
 - Dissemination

Introduction

- Breeding program in striped catfish in Vietnam at RIA2:
 - Characteristics of fish species: high selection intensity vs. inbreeding
 - 2001-2005: SUFA-DANIDA-MoFI
 - Growth & fillet yield
 - 3 selective populations: 2001, 2002 (growth, individual selection) and 2003 (fillet yield, family selection)
 - 2006-2008: MoFI – MARD
 - Fillet yield
 - Body weight
 - Other traits: measure; fillet fat and fillet colour

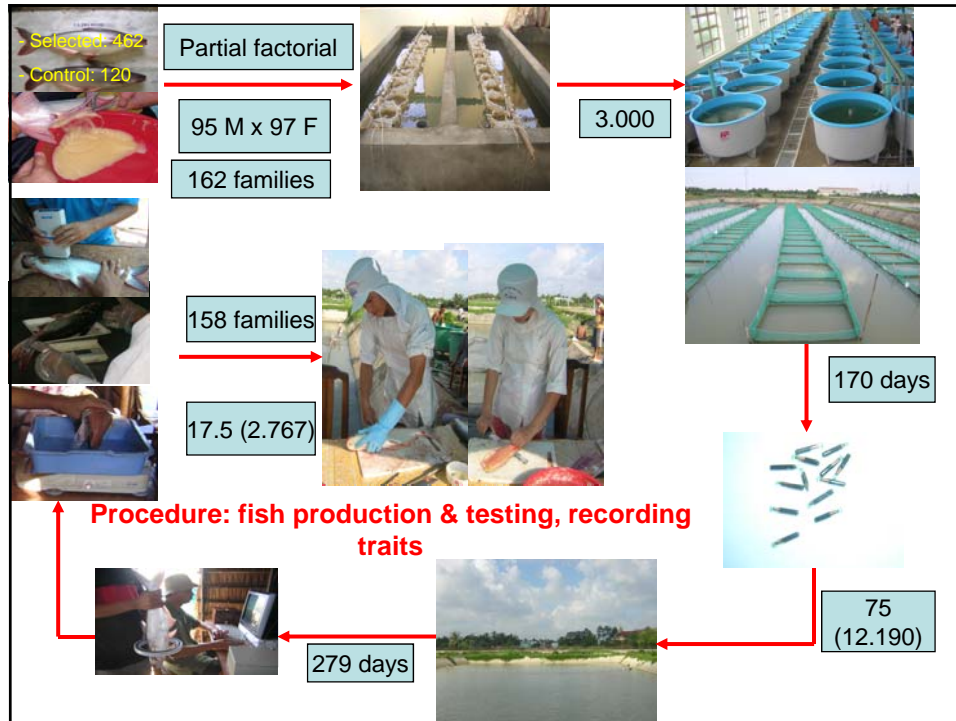
Materials and methods

- Populations
 - 3 year classes, 2001, 2002 & 2003;
 - Each formed from 3-4 hatcheries which collected fish from the wild
- Family production & selection
 - Parent generation
 - 75 & 79 families res. for year class 2001 & 2002; 1 male x 1 female; individual selection for body weight; selection proportion: $p=18\%$ and 25% ; selected and control lines.
 - 101 families for year class 2003; 1 male x 1 female; family selection for fillet yield; selected and control lines;

Materials and methods

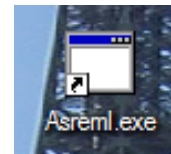
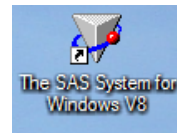
	F1-2001	F1-2002
No. Of families	162 (31)	208 (33)
No. of test fish/family	75	14, 14 and 65 for each test environments: pen, open river pond and research station pond
No. Individuals recorded/family	17.5	10, 11 and 13
Traits recorded	Body weight, fillet weight, yield, fat and colour	Body weight, fillet weight, yield, fat and colour
Genetic parameters	Heritability, genetic correlation, genetic response	Heritability, genotype by environment interaction, genetic response





Data analysis and selection

- Animal model
- Genetic parameters
 - + Heritability
 - + Genetic correlation
 - + Selection response
- Softwares
- Selection: index selection



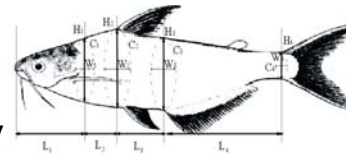
Results & Discussion

Heritability & genetic correlation

	BW	FW	FY	IFI	FF	FC
BW	0.44 (0.09)	0.59 (0.02)	-0.45 (0.03)	0.53 (0.02)	0.21 (0.03)	-0.13 (0.03)
FW	0.96 (0.02)	0.34 (0.08)	-0.45 (0.01)	0.43 (0.02)	0.26 (0.02)	-0.08 (0.03)
FY	0.38 (0.18)	0.89 (0.17)	0.06 (0.06)	0.06 (0.03)	0.10 (0.02)	0.01 (0.03)
IFI	0.69 (0.08)	0.70 (0.07)	0.23 (0.21)	0.08 (0.12)	0.26 (0.02)	0.07 (0.03)
FF	0.93 (0.09)	0.74 (0.12)	-0.03 (0.27)	0.83 (0.08)	0.15 (0.07)	-0.09 (0.03)
FC	-0.34 (0.15)	0.08 (0.15)	0.44 (0.23)	-0.48 (0.38)	-0.17 (0.21)	0.16 (0.05)

Genotype by environment interaction

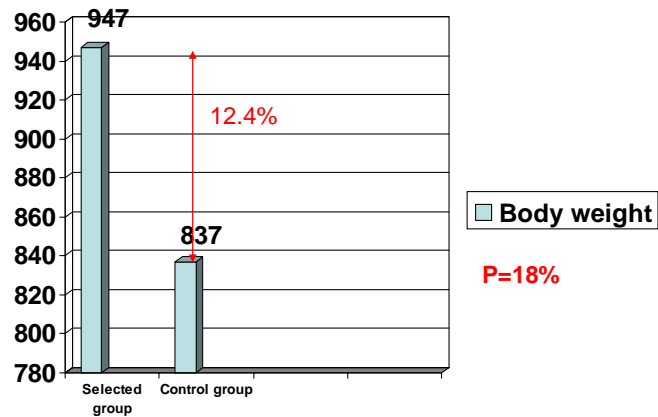
	Pen & Open river pond	Pen & research station pond	Open river pond & research station pond
BW (g)	0.94 (0.29)	0.67 (0.25)	0.66 (0.11)
FW (g)	0.89 (0.22)	0.78 (0.24)	0.67 (0.11)
FY (%)	0.57 (0.29)	0.54 (0.22)	0.78 (0.18)
PFF (%)	0.73 (0.26)	0.63 (0.17)	0.48 (0.23)
FC (1-3)	0.76 (0.15)	0.60 (0.15)	0.65 (0.18)



- Heritability can be improved by
 - Better recording method
 - More family and number of tested and recorded individuals each family

- Selection accuracy can be improved by:
 - Non-invasive method: select on the same candidate
 - Family/index selection based on EBV
 - More accurate estimate of heritability.
 - Test in the representative environment: open river pond

Realized response: F1-2001



Realized response (%):

	Direct	Correlated response	
	Body weight	Fillet weight	Fillet yield
F1-2002	12.4	12.0	0.39
F1-2002: Pen	4.7	5.9	0.59
F1-2002: Open river pond	6.1	6.1	-0.6
F1-2002: research station pond	5.4	4.8	-0.6

Predicted response

	i ($p=15\%$)	h^2	STD	R	R(%)
BW	1.6	0.39	370.54	231.22	25.0
FY	1.6	0.06	7.00	0.67	1.87

- Response can be maximized:
 - By improving accuracy of selection
 - By increase of selection intensity (selection proportion: 10%):
 - But the restriction on inbreeding has to be taken into account.
 - The optimal contribution selection program can be used to improve selection response while restricted inbreeding at predefined value.

Dissemination

- More than 7.000 pre-broodstock were disseminated to hatcheries in Mekong Delta, mainly in Dong Thap and An Giang provinces
- Advantage:
 - Can be traced their pedigree.
 - Production efficiency: growth & fillet yield
 - Hatcheries: acquire higher or equal spawning parameters
 - Rearing & grow-out farms: faster growth, higher survival, less frequency of disease outbreak

Dissemination

- Target:
 - Expand dissemination network through multipliers.
 - Certain regulation has to be followed.
 - 80% of broodstock for the whole production: 35.000 in the next 3 years.

Brand name

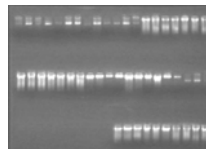


Conclusion

- Heritability for body weight and fillet weight are high: high response can be expected
- Positive genetic correlation between body weight and fillet weight/yield: correlated response can be acquired
- Have to monitor fillet fat and intestinal fat index
- Encouraging selection response for body weight by individual selection.
- Need to establish dissemination network quickly to meet the demand

Future research

- Include more traits: disease resistance to *Adwardsiella ictaluri*, FCR, fillet fat and color,
- Maximizing genetic response while keeping at certain level of inbreeding:
Optimal contribution of selection.
- DNA markers to assist selection.



**Thank you very much for your
attention!**

