SELECTIVE BREEDING OF STRIPED CATFISH (Pangasianodon hypophthalmus) IN INDONESIA: SELECTION RESPONSE OF THE FIFTH GENERATION OF GROWTH LINE

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INTRODUCTION

Striped catfish (Pangasianodon hypophthalmus) is an important commodity in Indonesia which was introduced in the past five decades, striped catfish has become one of the most important cultivation commodities in Indonesia. In 2022, striped catfish production volume will rank fourth among freshwater commodities. Striped catfish can take oxygen from the air, so they can live and grow relatively well in low-oxygen environments. With these advantages, millions of marginal lands such as swamps or peat swamps in Indonesia can be used for striped catfish cultivation. Apart from that, striped catfish can use artificial feed with relatively low protein content, so production costs are relatively cheap compared to other freshwater commodities. In this way, striped catfish can be used as a cheap source of animal protein for people, especially the lower middle class. The Sungai Gelam Freshwater Aquaculture Fisheries Center (BPBAT Sungai Gelam) in 2009 collected fingerling of striped catfish from various regions to form a base population used in the selection program (selective breeding). Selection activities began in 2013 with the aim of producing fast growing lines (growth lines) using the individual selection method, selected based on the best body weight.
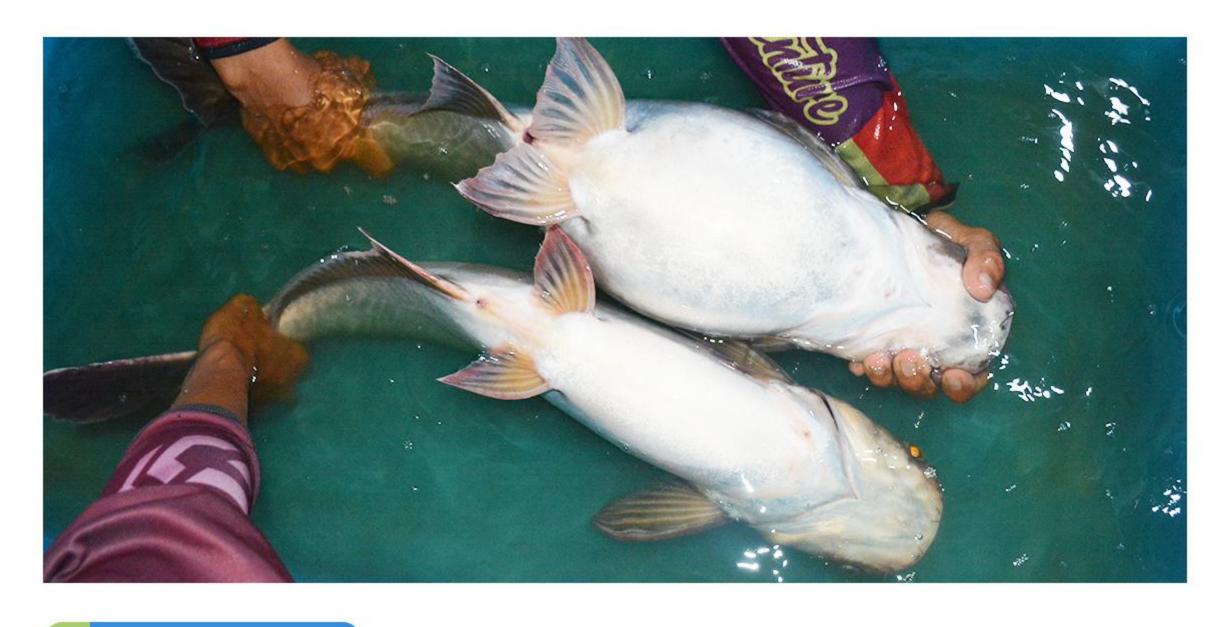

Material and methods

The selective breeding program was carried out at the Sungai Gelam Freshwater Aquaculture Fisheries Center (BPBAT Sungai Gelam). The selective breeding program for striped catfish at BPBAT Sungai Gelam is carried out in two stages. The first stage was the collection of genetic material and the formation of a base population which was carried out from February 2009 to May 2013. The second stage was the selection program for growth lines which started in 2013 and until 2022 the fifth generation (G5) growth lines had been obtained

BPBAT Sungai Gelam has brought in striped catfish seeds (1.5-2 inches) from seven regions in Indonesia (Riau, Jambi, Lampung, Bekasi, Subang, Bogor, Mandiangin) between January and February 2009 and in September 2009, it also brought in striped catfish seeds (1.5-2 inches) from Vietnam and Cambodia. This area was chosen because it is a center for striped catfish seed production. The striped catfish seeds originating from Vietnam are the result of the production of the catfish hatchery business unit, while the seeds from Cambodia are caught from nature. The striped catfish from seven regions in Indonesia, Cambodia and Vietnam are hereinafter referred to as the founder population. This founder population, which is still seed size, is raised to maturity.

The founder population matured in early 2011. After the founder population matured, spawning was carried out to form the base population. The number of females spawned from each founder sub-population was 3, which were fertilized by a combination of sperm from 27 males (3 males for each founder sub-population). Then the larvae from each founder sub-population are mixed proportionally and reared until adulthood, which is hereinafter referred to as the base population which is given the notation GiDs (Gi: generation i; Ds: basic population). This base population is used in the selective breeding program for striped catfish by BPBAT Sungai Gelam. The base population at the age of 16 months was sampled from 2,317 females and 1,362 males. Females have a mean weight of 1.010 ± 0.356 kg and a CV (coefficient of variation) of 35.25%. The average body weight of males was 0.867 ± 0.248 kg and the CV was 28.60%. Hereafter this population is referred to as the first (first) generation basic population with the notation G1Ds. This G1Ds is used as the base population that will be used in selective breeding program for striped catfish at BPBAT Sungai Gelam.

Production of growth lines of striped catfish in BPBAT Sungai Gelam uses the individual selection method with the character selected being body weight. The first generation (G1) was selected from the first generation of the base population based on body weight, proportional body shape and no defects. Selection (cutoff) is carried out in two steps, step I is carried out at the age of 1 year with a selection intensity of 50%, the second step of selection is carried out at the age of 20 months with a selection intensity of 20%.

Results

The results of the striped catfish selection program at BPBAT Sungai Gelam until 2022 have reached the fifth generation (G5). The selection response values for each generation are presented in Table 1. The comparison used in the seed quality test is the base population, but for the second generation (G2) seed quality test using parents with the average weight of filial (F1) G1. The G4 selection response value is not displayed due to technical problems during the comparison test. Based on the results of the seed quality test, the G5 growth line could reach a size of 961.71 g/head within 180 days, while the control (base population) only reached an average weight of 501.78 g/head within 180 days, so the G5 selection response was 91.66%. This selection response value is the accumulated selection response value for 5 generations because the comparison used is the base population so the selection response per generation is 18.33%. Based on the G1 selection response value, the real heritability value of body weight character is 0.287.

Table 1. Response to selection of growth lines resulting from selective breeding program at The Sungai Gelam Freshwater Aquaculture Fisheries Center

Generation	Year*	Character	Growth line		Base Populasi		Seletion Responses (%)
			Value	StDev	Value	StDev	
G1	2014	Bodyweight (g)	641	134	543	117	18.05
		Survival rate (%)	92.6	9.40	93	9.45	-0.43
		Feed efficiency (%)	94.05	15.2	91.54	13	2.74
G2	2016	Bodyweight (g)	619.65	39.09	536.15**	19.42	15.57
		Survival rate (%)	97.67	2.08	96.67	4.04	1.03
		Feed efficiency (%)	78.5	6.94	73.85	1.06	6.30
G3	2018	Bodyweight (g)	611.61	103	428.84	37.71	42.62
		Survival rate (%)	97.33	2.83	96.00	3.44	1.39
		Feed efficiency (%)	77.57	6.21	74.75	10.49	3.77
G4	2020	Bodyweight (g)	-	-	-	-	-
		Survival rate (%)	-	-	-	-	-
		Feed efficiency (%)	-	-	-	-	-
G5	2022	Bodyweight (g)	961.71	38.64	501.78	35.59	91.66
		Survival rate (%)	99.47	1.19	88.13	12.67	12.87
		Feed efficiency (%)	79.79	4.21	76.98	11.82	3.65

Note :
* The year in which the parents of each generation mature
** The comparison in the G2 seed quality test is the mean value of the G1 seedlings (F1), not the base population