

Estimation of Genetic Parameters and Optimum Breeding Programme Design in Korean Flatfish Breeding Population

Phuong Thanh N. Dinh^{1,†}, Jong-Won Park^{2,†}, Waruni Ekanayake³, Yeong Kuk Kim¹, Doo Ho Lee³, Dain Lee², Hyo Sun Jung², Julian Kim², Hye-Rim Yang², Heegun Lee^{1,2}, Sangwon Yoon^{1,2}, Jeong-Ho Lee^{2,*}, and Seung Hwan Lee^{3,*}

¹ Department of Bio-AI Convergence, Chungnam National University, Daejeon, 34134, Republic of Korea

² Fish Genetics and Breeding Research Center, National Institute of Fisheries Science, Geoje, 53334, Republic of Korea

³ Division of Animal & Dairy Science, Chungnam National University, Daejeon, 34134, Republic of Korea

[†] These authors contributed equally to the work

* Correspondence: Jeong-Ho Lee: jhlee7124@korea.kr, Seung Hwan Lee: slee46@cnu.ac.kr

Table S1. Average measurements and fixed effects of BW, TL, and CF in 3 periods of time

gen	batch	sex	n	BW_11	TL_11	CF_11	BW_18	TL_18	CF_18	BW_22	TL_22	CF_22
1	D1	F	457	415.51	32.32	12.20	1342.18	48.65	11.57	2222.53	53.18	14.59
		M	330	342.11	30.37	12.11	843.18	42.16	11.14	1205.74	44.76	13.31
	R1	F	111	294.19	28.23	12.83	802.84	40.70	11.69	1304.79	46.12	13.05
		M	97	207.21	25.84	11.90	541.09	36.91	10.59	772.55	39.97	11.91
	W1	F	1312	311.13	29.18	12.18	1281.27	47.78	11.63	2104.26	52.12	14.71
		M	1018	293.50	28.58	12.35	833.12	41.88	11.19	1218.95	44.58	13.54
	W2	F	1742	280.98	28.42	12.00	1092.47	45.74	11.27	1809.29	49.86	14.38
		M	2414	259.65	27.64	12.13	704.50	39.84	10.97	1042.74	42.61	13.29
2	X1	F	2915	497.75	34.51	11.94	1431.41	49.98	11.32	2343.00	54.90	14.07
		M	1694	426.90	32.79	11.98	846.36	42.49	10.80	1292.08	46.31	12.84
	X2	F	1446	513.27	34.57	12.32	1477.73	50.23	11.54	2380.65	54.89	14.30
		M	951	443.24	32.89	12.39	833.93	42.30	10.84	1308.20	46.13	13.14
	X3	F	362	462.10	33.13	12.59	1479.57	50.22	11.58	2407.19	54.62	14.64
		M	335	407.64	31.83	12.54	874.60	42.95	10.83	1271.15	45.53	13.33
3	Y1	F	4421	408.67	34.38	9.90	1367.18	48.36	11.98	1917.45	51.95	13.58
		M	3799	360.48	32.87	10.03	749.46	40.49	11.13	984.09	42.65	12.49
	Y2	F	4055	389.74	33.24	10.47	1316.89	47.78	11.95	1813.71	51.24	13.38
		M	3298	350.34	31.88	10.70	790.85	41.17	11.16	1039.63	43.43	12.51
4	Z1	F	693	NA	NA	NA	886.88	41.75	12.08	2607.65	57.73	13.43
		M	1668	NA	NA	NA	656.06	37.79	12.05	1490.99	49.35	12.26
	Z2	F	953	NA	NA	NA	1149.82	46.93	11.02	1562.29	51.05	11.65
		M	290	NA	NA	NA	881.53	42.92	11.05	1084.37	46.24	10.89
5	A1	F	2456	299.22	28.75	12.40	1083.46	44.92	11.83	1626.76	50.57	12.37
		M	1670	274.76	27.97	12.32	788.09	40.35	11.79	1186.88	45.59	12.25
	A2	F	2373	680.10	38.01	12.36	1671.69	51.86	11.87	2635.21	56.97	14.08
		M	934	605.70	36.52	12.38	1028.36	44.16	11.77	1450.97	48.02	12.94
6	B1	F	2962	542.67	35.57	11.97	1231.13	47.51	11.40	2143.34	54.12	13.44
		M	2051	501.05	34.47	12.16	859.95	42.09	11.45	1352.71	47.32	12.66
7	C1	F	2763	567.13	35.98	12.07	1511.73	50.08	11.96	2489.10	56.07	14.03

C2	M	2021	505.13	34.53	12.16	1044.33	44.24	11.94	1559.43	49.45	12.73
	F	1223	518.20	34.56	12.45	1405.80	48.56	12.20	2401.52	54.66	14.61
	M	1345	466.18	33.34	12.50	998.45	43.27	12.23	1526.08	48.40	13.33

Table S2. ANOVA summary of fixed effects.

	Df	F-value	p-value
BW_11	Bacth	13310	< 2e-16 ***
	Sex	4221	< 2e-16 ***
BW_18	Bacth	514.8	< 2e-16 ***
	Sex	2780.6	< 2e-16 ***
BW_22	Bacth	365	< 2e-16 ***
	Sex	1937	< 2e-16 ***
TL_11	Bacth	63101	< 2e-16 ***
	Sex	4436	< 2e-16 ***
TL_18	Bacth	787.7	< 2e-16 ***
	Sex	1045.3	< 2e-16 ***
TL_22	Bacth	513.5	< 2e-16 ***
	Sex	699	< 2e-16 ***
CF_11	Bacth	46999.6	< 2e-16 ***
	Sex	161.3	< 2e-16 ***
CF_18	Bacth	951.1	< 2e-16 ***
	Sex	531	< 2e-16 ***
CF_22	Bacth	411.8	< 2e-16 ***
	Sex	493.1	< 2e-16 ***

***: significant under the threshold of 0.001

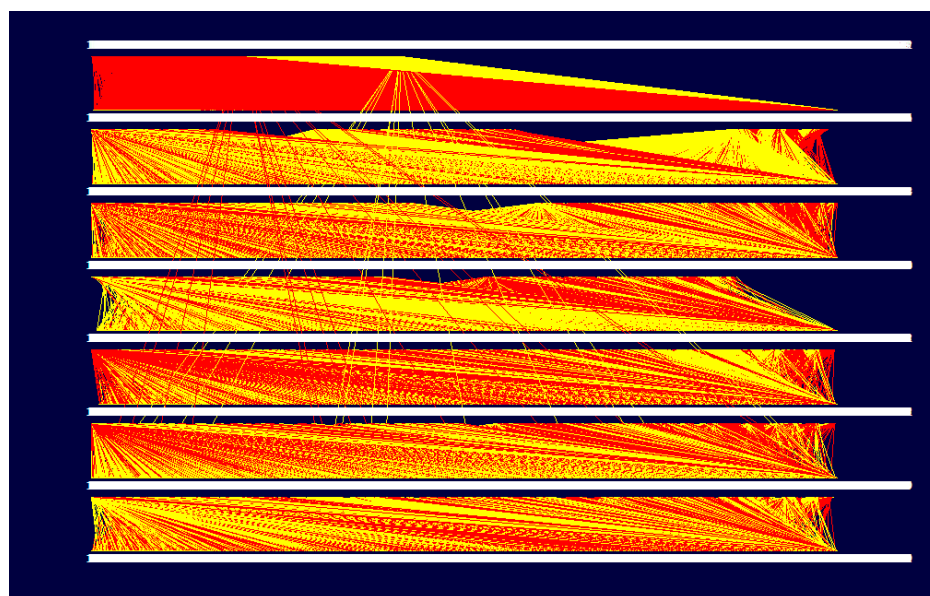


Figure S1. Diagram of pedigree information of 54,159 flatfish in 7 generations. Red lines indicate sires-offspring relationship and yellow lines indicate dam-offspring relationship.

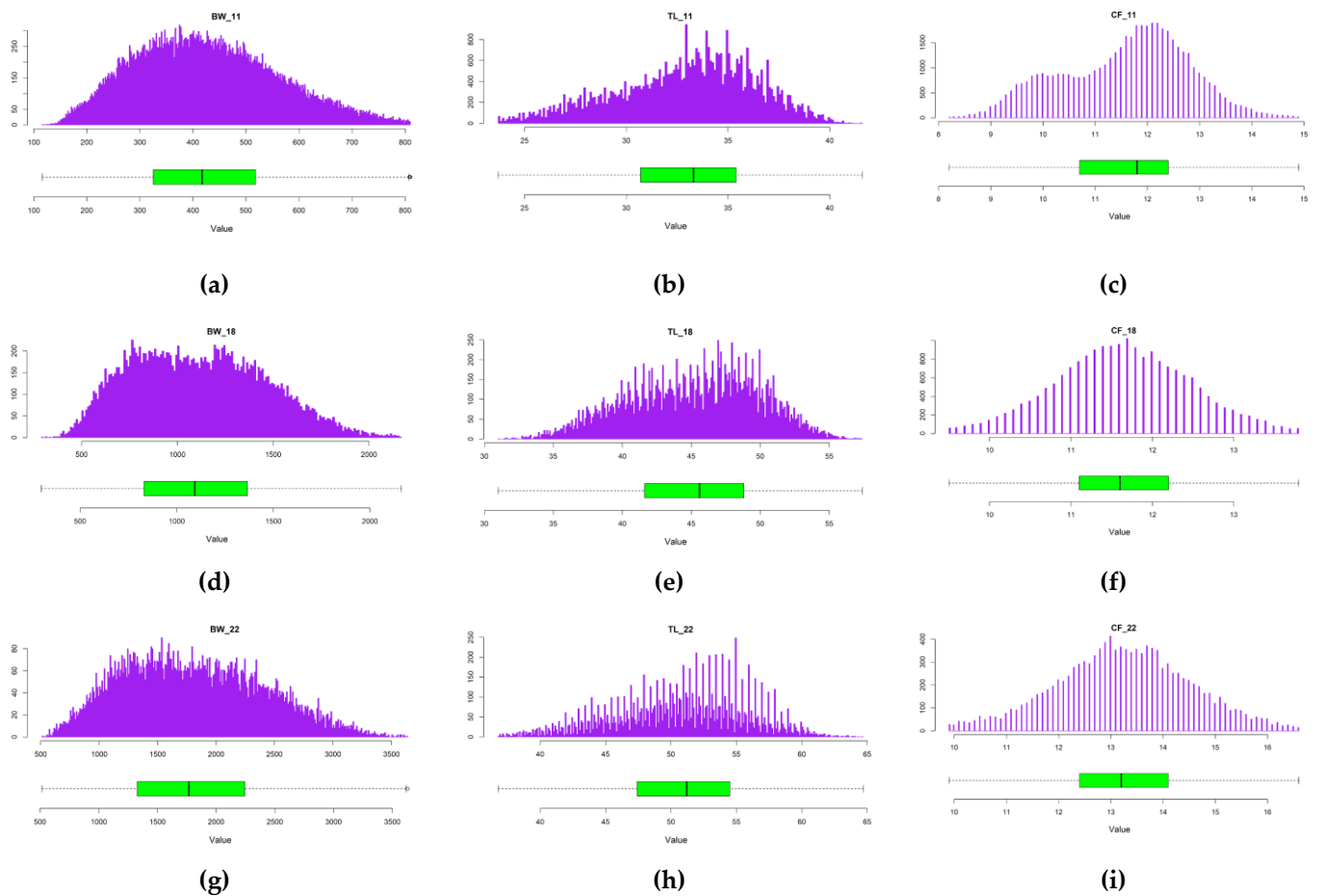


Figure S2. Distribution of 9 trait measurements: **(a)** Distribution of body weight at 11th month; **(b)** Distribution of body weight at 18th month; **(c)** Distribution of body weight at 22nd month; **(d)** Distribution of total length at 11th month; **(e)** Distribution of total length at 18th month; **(f)** Distribution of total length at 22nd month; **(g)** Distribution of condition factor at 11th month; **(h)** Distribution of condition factor at 18th month; **(i)** Distribution of condition factor at 22nd month.