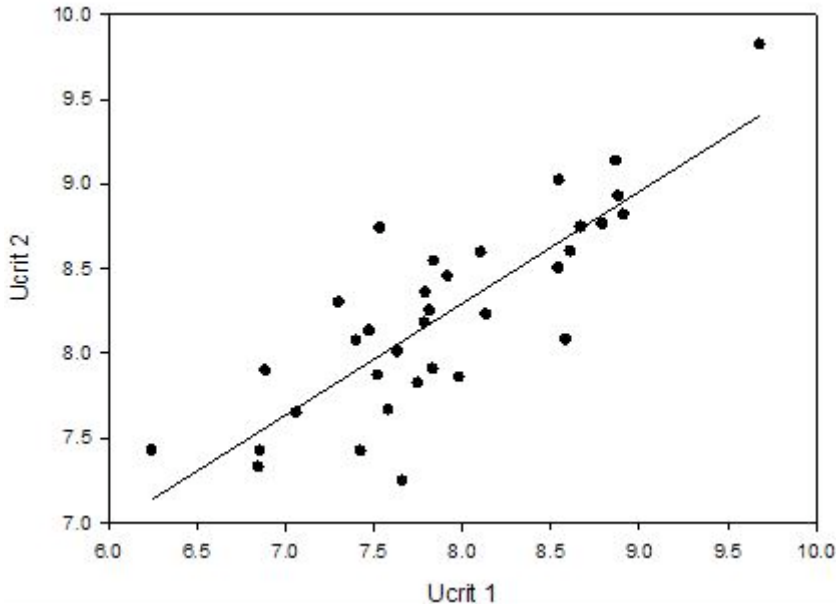

Fig. S1. Repeatability of U_{crit} in Bonsall Creek F2 hybrid sticklebacks. U_{crit} 2 was measured 2 weeks after U_{crit} 1 [$U_{crit}2=0.660\times(U_{crit}1)+3.015$, d.f.=33, $t=8.27$, $P<0.001$, $r^2=0.671$].

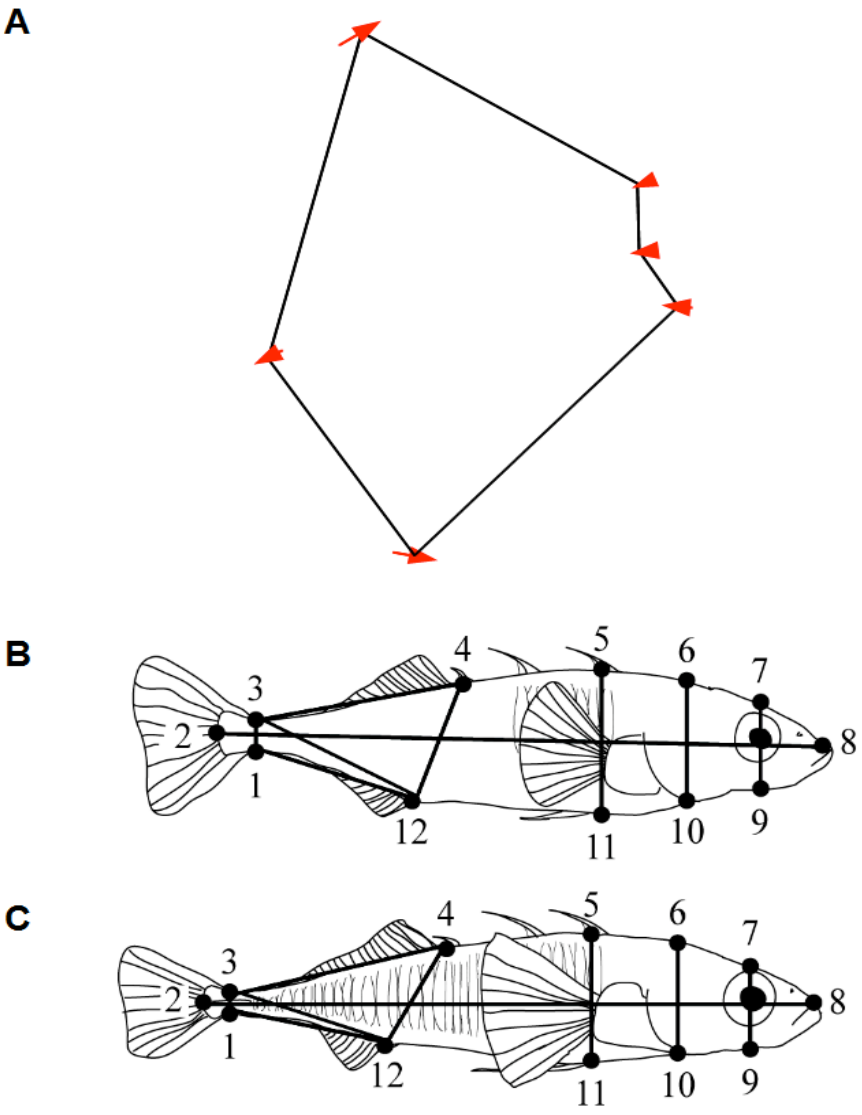

Fig. S2. (A) Landmarks used to measure pectoral fin shape are located at the center of the nearest arrow. Arrows multiply by four the changes in landmark position that occur among cross-types for pectoral fin shape linear discriminant 1 (ld1), and generally summarize changes in fin shape from a marine to a stream-resident fish. Representative stream-resident (B) and anadromous (C) sticklebacks showing landmarks (numbered circles) used to measure the five body shape variables used in this paper (from black lines connecting landmarks).

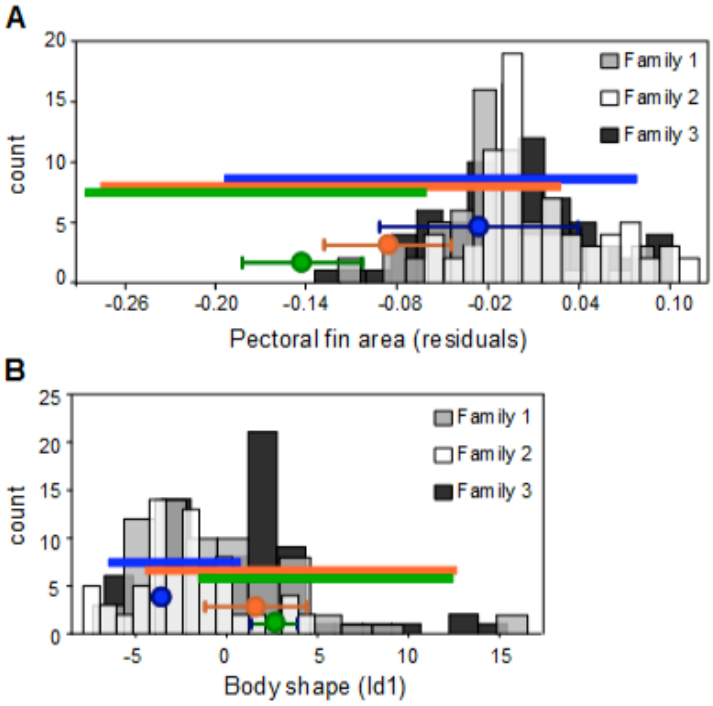

Fig. S3. Histograms of residual (A) pectoral fin area and (B) body shape ld1 values in F2 fish. The full range of values measured for all F1 individuals of a given cross type (green, pure stream-resident crosses; orange, F1 hybrid crosses; blue, pure marine crosses) are represented by thick colored bars, and the mean values ± s.d. for F1 line crosses are denoted with circles and thin lines (data from Dalziel et al. 2012a).

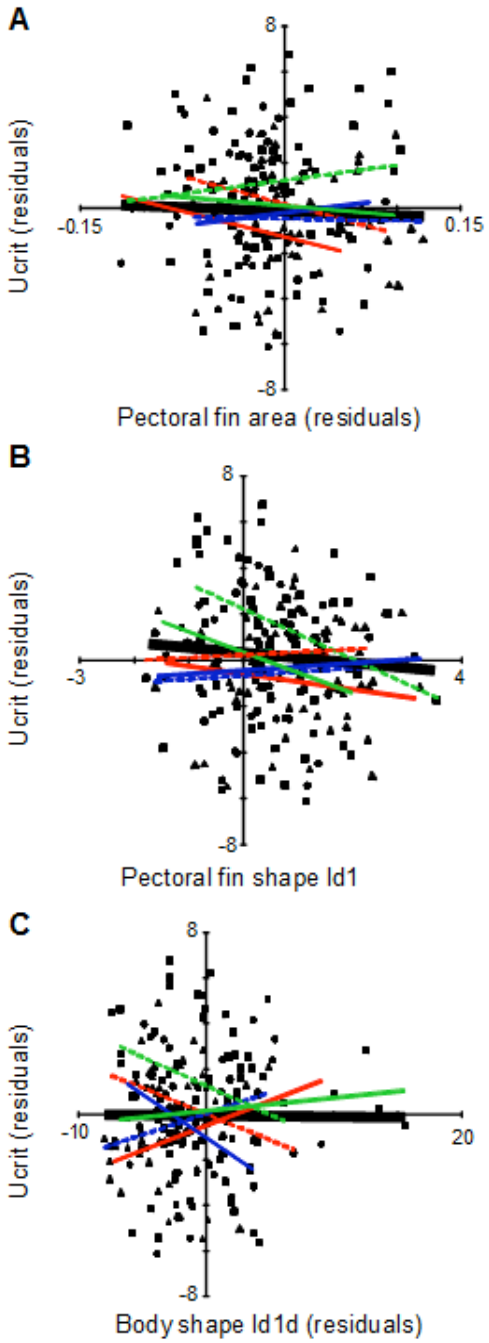

Fig. S4. The relationship between U_{crit} and (A) residual pectoral fin area, (B) pectoral fin shape ld1 (low values indicate marine shaped fins and high values indicate stream-resident shaped fins; see Fig. S2) and (C) body shape ld1 in F2 fish. The thick black line represents the fitted values for the whole population (with family and sex as nested random effects) for residual pectoral fin area ($F_{1,179}$=0.485, P=0.487), pectoral fin shape ld1 ($F_{1,182}$=1.471, P=0.2267) and body shape ld1($F_{1,175}$=0.005, P=0.941) (Table 2). The colored lines represent the fitted values for each family and sex (red dashed line, family 1 females; solid red line, family 1 males; blue dashed line, family 2 females; solid blue line, family 2 males; green dashed line, family 3 females; solid green line, family 3 males). Circles symbolize values for family 1 fish, triangles symbolize family 2 fish, and squares symbolize family 3 fish.

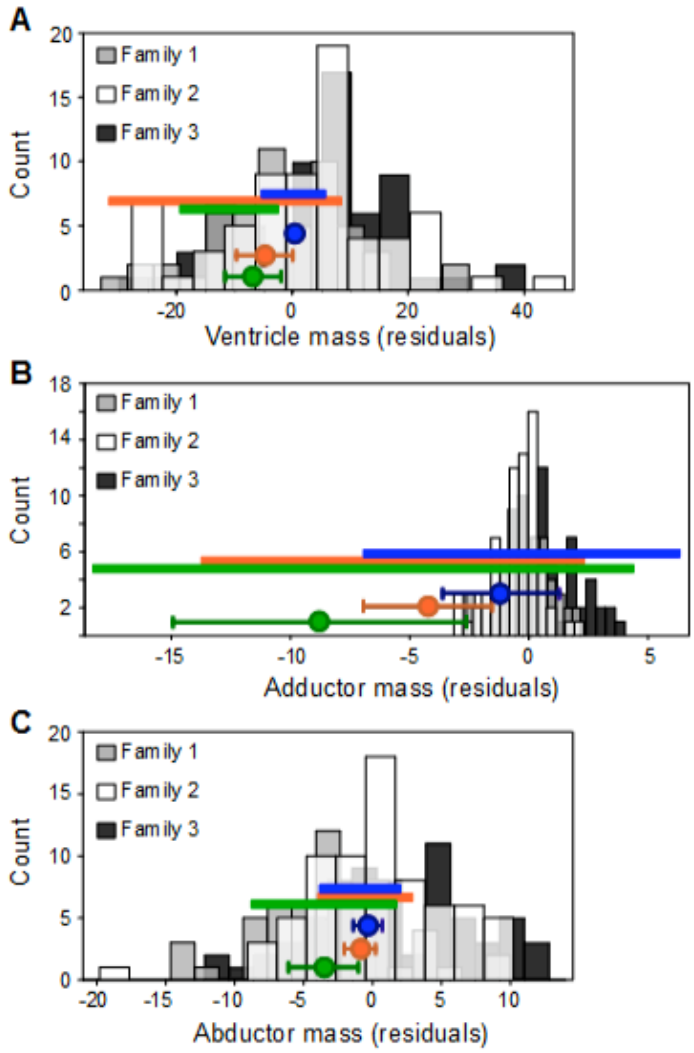

Fig. S5. Histograms of residual (A) ventricle mass, (B) residual pectoral adductor mass and (C) residual pectoral abductor mass of F2 fish. The full range of values measured for all F1 individuals of a given cross type (green, pure stream-resident crosses; orange, F1 hybrid crosses; blue, pure marine crosses) are represented by thick colored bars, and the mean values ± s.d. for F1 line crosses are denoted with circles and thin lines (data from Dalziel et al. 2012a).

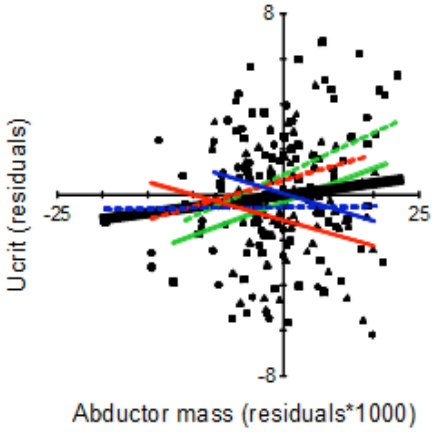

Fig. S6. The relationship between U_{crit} and residual abductor mass in F2 fish, with data presented as in Fig. S4. Thick black lines represent the fitted values for residual abductor mass ($F_{1,183}$=2.385, P=0.124) for all data (Table 2). Data for ventricle and adductor mass are presented in Fig. 2.

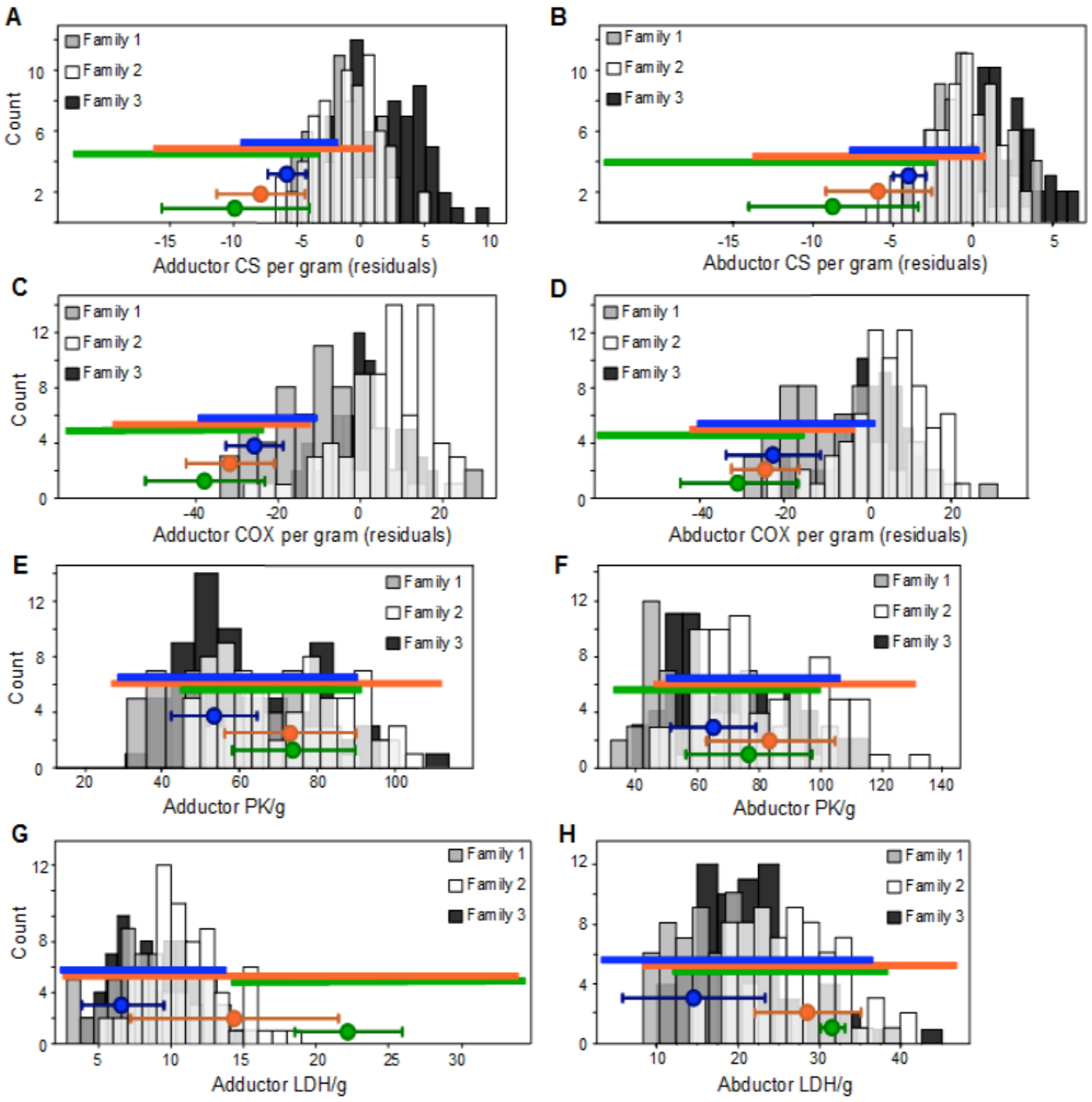

Fig. S7. Histograms of residual citrate synthase (CS) activity per gram adductor (A) and abductor (B) muscle, residual cytochrome *c* oxidase (COX) activity per gram adductor (C) and abductor (D) muscle, pyruvate kinase per gram adductor (E) and abductor (F) muscle, and lactate dehydrogenase (LDH) activity per gram adductor (G) and abductor (H) muscle in F2 fish. There is a strong effect of sex on PK activities (E,F), resulting in a bimodal distribution. The full range of values measured for all F1 individuals of a given cross type (green, pure stream-resident crosses; orange, F1 hybrid crosses; blue, pure marine crosses) are represented by thick colored bars, and the mean values ± s.d. for F1 line crosses are denoted with circles and thin lines (data from Dalziel et al. 2012b).

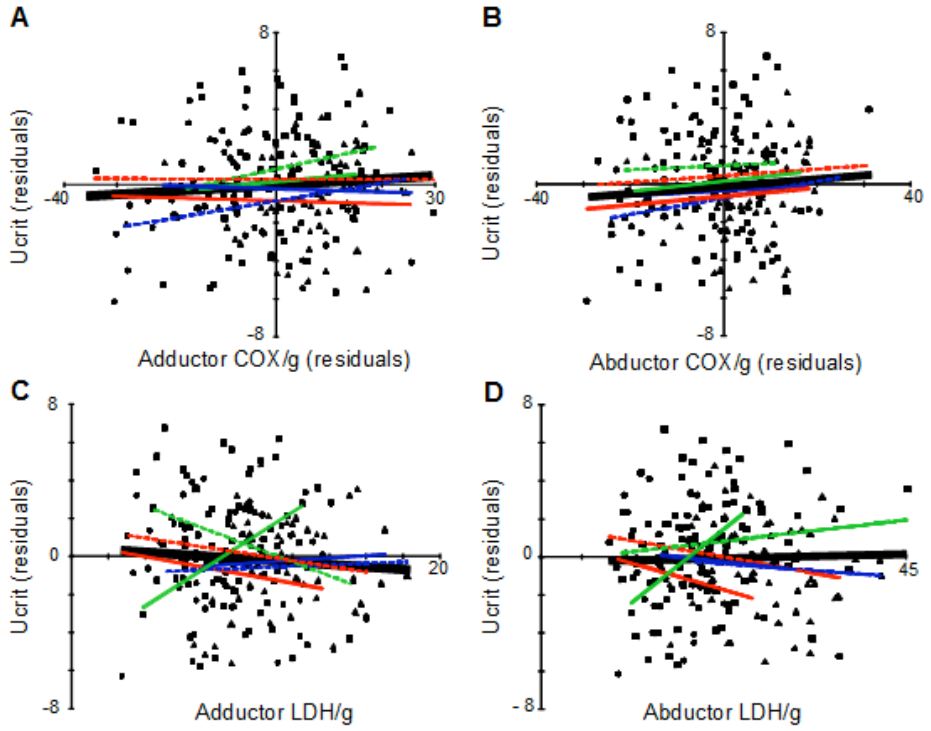

Fig. S8. The relationship between U_{crit} and (A) residual COX and (C) LDH activity per gram adductor muscle in F2 fish, and (B) residual COX and (D) LDH activity per gram abductor muscle in F2 fish. Data are presented as in Fig. S4. Thick black lines represent the fitted values for residual COX per gram adductor ($F_{1,184}$=1.023, P=0.313), LDH per gram adductor ($F_{1,184}$=0.948, P=0.332), residual COX per gram abductor ($F_{1,183}$=1.450, P=0.230) and LDH per gram abductor ($F_{1,183}$=0.112, P=0.738) for all data (Table 2). Data for CS are presented in Fig. 2.

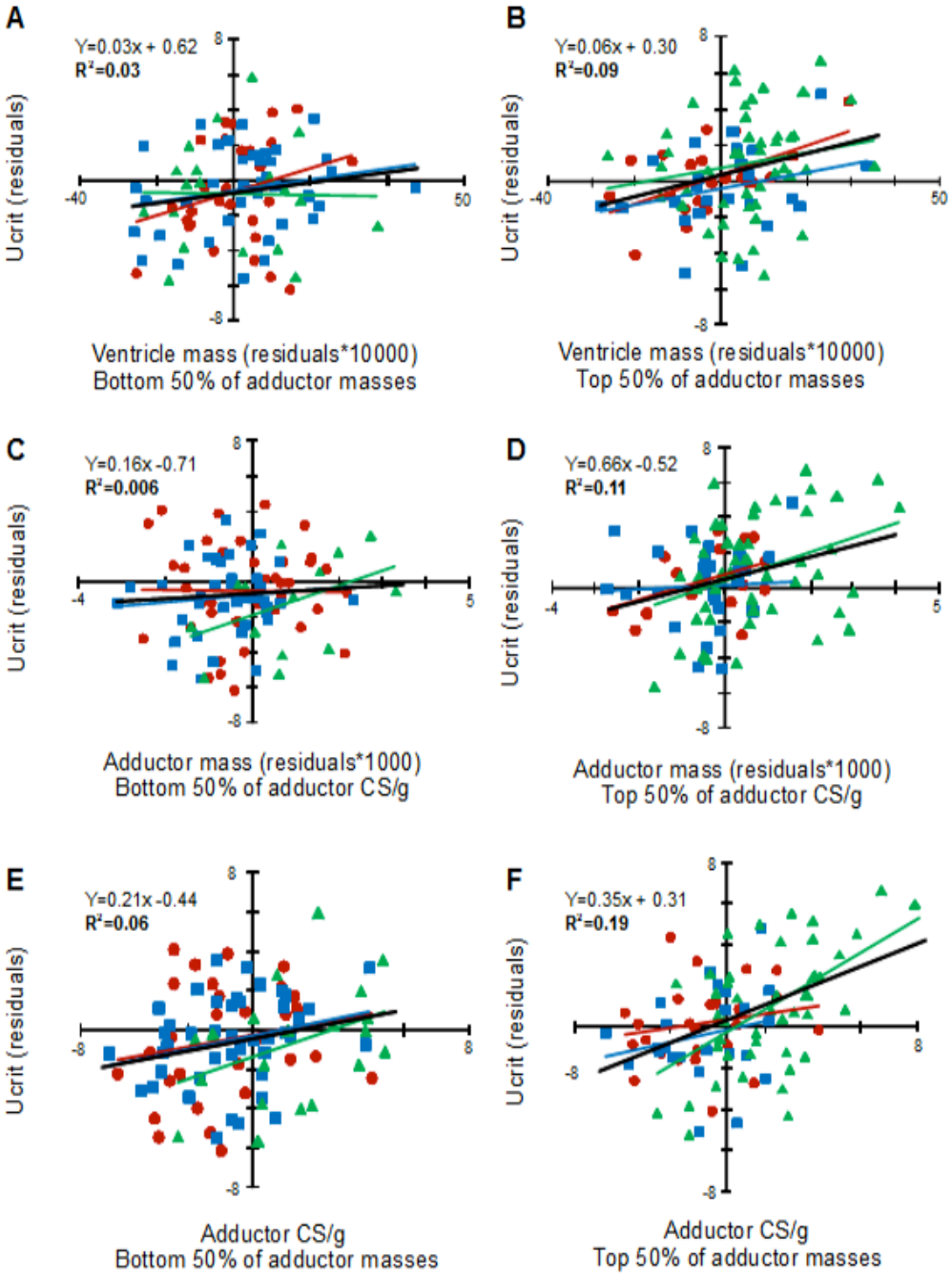

Fig. S9. The relationship between U_{crit} and (A,B) residual ventricle mass, (C,D) residual adductor mass and (E,F) residual adductor CS per gram for the highest 50% of values (B,D,F) and lowest 50% of values (A,C,E) of a second 'background' trait listed on the *x*-axis. The thick black line represents the fitted curve for all values, and colored lines represent the fitted curves for each individual F2 family (red, family 1; blue, family 2; green, family 3).

Table S1. Correlations among explanatory variables (fixed-effects only)

	U_{crit}*	Fineness	Caudal peduncle depth	Caudal area	Posterior depth	Head depth
U_{crit}*	–	r=–0.117 P=0.094	r=–0.058 P=0.409	r=–0.117 P=0.096	r=0.074 P=0.292	r=–0.021 P=0.769
Fineness	–	–	**r=–0.277** **P=0.00006**	r=0.082 P=0.242	**r=–0.269** **P=0.000094**	r=–0.035 P=0.617
Caudal peduncle depth	–	–	–	**r=0.350** **P<0.000001**	**r=0.333** **P<0.000001**	r=0.117 P=0.094
Caudal area	–	–	–	–	**r=0.522** **P<0.000001**	r=–0.029 P=0.682
Posterior depth	–	–	–	–	–	r=0.083 P=0.234
Head depth	–	–	–	–	–	–

When corrected for multiple comparisons, the cut-off for significant P-values is 0.000094. Significantly correlations are bolded.