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Appendix from R. Svanbäck and D. Schluter, "Niche Specialization Influences Adaptive Phenotypic Plasticity in the Threespine Stickleback"

(Am. Nat., vol. 180, no. 1, p. 50)

Analyses of the Marine-Freshwater Shape Axis

Phenotypic variation in the wild. Variation within freshwater populations along the marine-freshwater shape axis was smaller in the solitary, generalist populations than in the sympatric populations (fig. A3, available in a zip file; df = 10, $t = 2.48$, $P = .033$). Variation in shape along the marine-freshwater axis was greater in marines than in generalists (marine vs. solitary; df = 9, $t = 2.55$, $P = .031$) but did not differ from that in the specialist populations (marine vs. sympatric; df = 5, $t = 0.42$, $P = .69$).

Plasticity along the marine-freshwater shape axis. The reaction norms showed no consistent direction along the marine-freshwater shape axis (fig. A4, available in a zip file). There was a tendency toward differences in plasticity between generalist populations and specialist populations along the marine-freshwater shape axis (fig. A5, available in a zip file; df = 10, $t = 2.07$, $P = .065$). We did not find any relationship between plasticity and mean trait value for the marine-freshwater shape axis (fig. A6, available in a zip file).

There was a tendency for the marines to be more plastic than solitary populations along the marine-freshwater shape axis (fig. A5; df = 9, $t = 1.26$, $P = .84$). Similarly, marines were more plastic than the specialist benthics and limnetics along the marine-freshwater shape axis (fig. A5; df = 5, $t = 2.67$, $P = .045$), but the reaction norms were in different directions in the two groups of populations (figs. A4, A5).

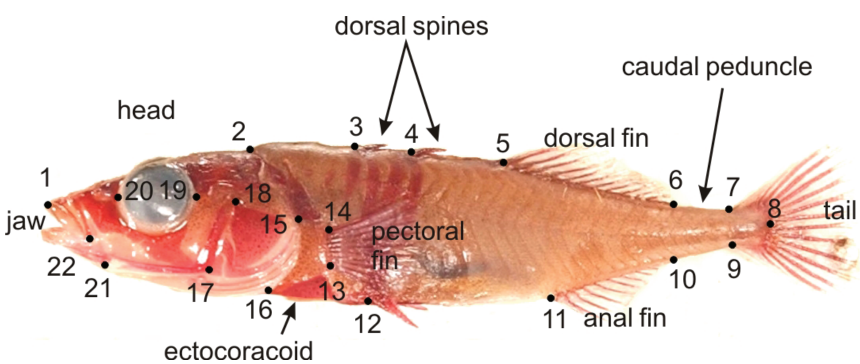

Figure A1: Locations of landmarks used in this study: 1, anterior extent of maxilla; 2, posterior extent of supraoccipital; 3, anterior insertion of first dorsal spine; 4, anterior insertion of second dorsal spine; 5, anterior insertion of third dorsal spine; 6, posterior insertion of dorsal fin; 7, dorsal insertion of caudal fin; 8, posterior extent of the caudal peduncle; 9, ventral insertion of caudal fin; 10, posterior insertion of anal fin; 11, anterior insertion of anal fin; 12, insertion point of pelvic spine into pelvic girdle; 13, ventral insertion of pectoral fin; 14, dorsal insertion of pectoral fin; 15, posterior extent of operculum; 16, anterior extent of ectocoracoid; 17, posterior extent of preopercular; 18, anterior extent of operculum; 19, posterior extent of orbit; 20, anterior extent of orbit; 21, anterioventral extent of preopercular; 22, posterior extent of maxilla. From Ingram et al. (2012).

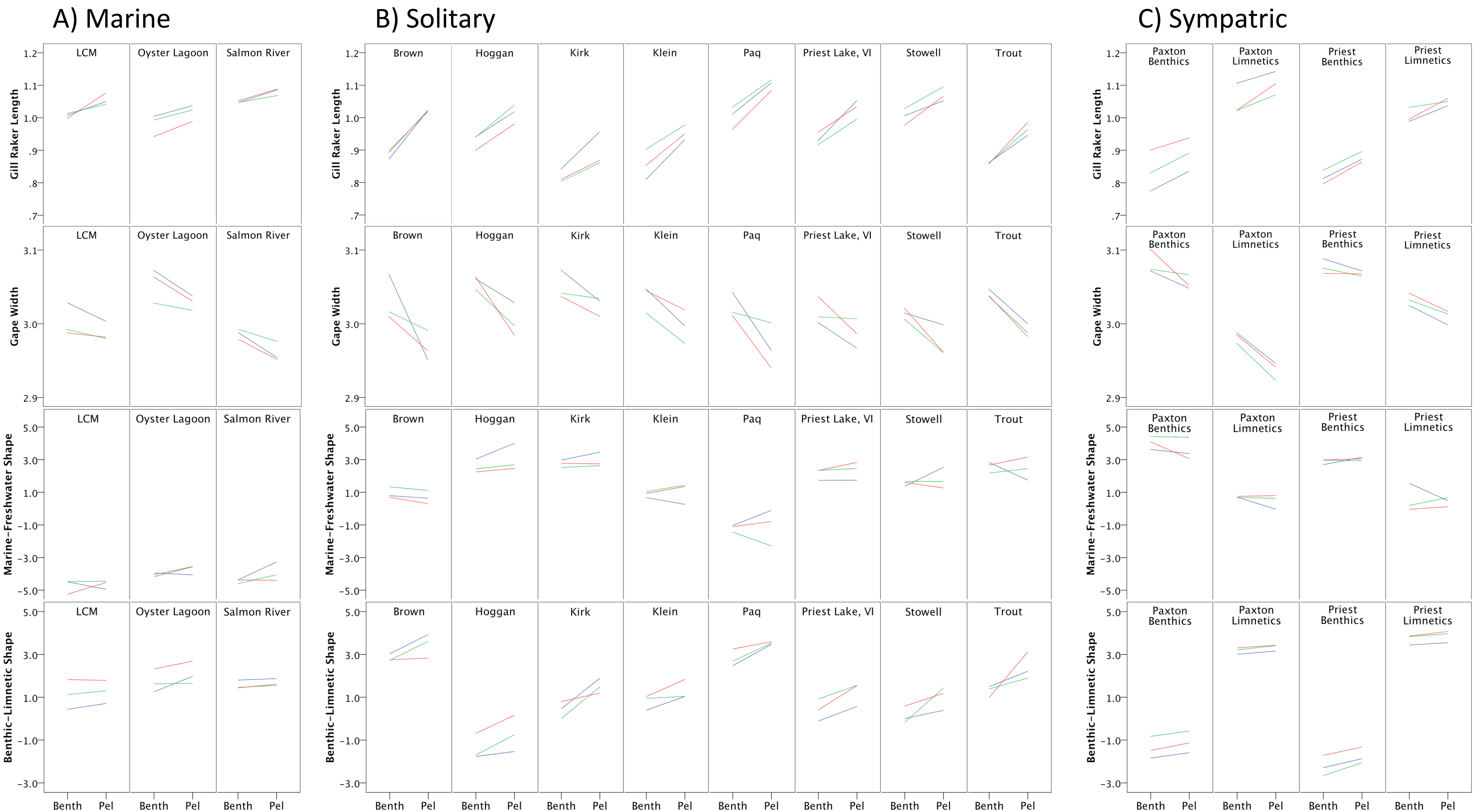

Figure A2. Shape of A) Marine, B) Solitary and C) Sympatric populations raised on benthic (Benth) and pelagic (Pel) diets depicting the reaction norms for each family in each population for Gill Raker Length, Gape Width, Marine-Freshwater Shape and Benthic-Limnetic Shape. Within a population, each family has the same color code for all the traits.

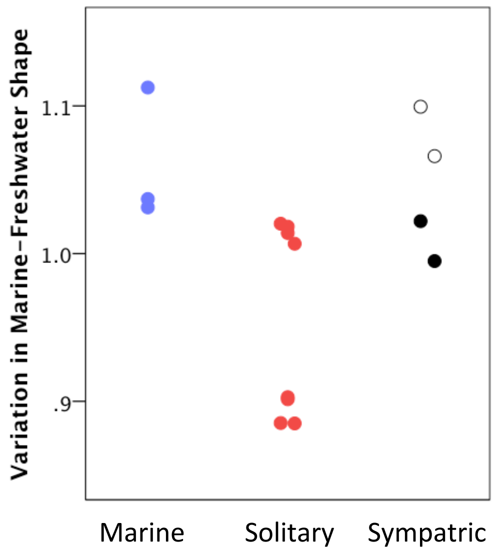

Figure A3. Phenotypic variation along the Marine-Freshwater shape axis estimated using wild-caught individuals sampled from natural populations for marine (blue circles), solitary (red circles) and sympatric populations (filled circles are benthic and open circles are limnetics).

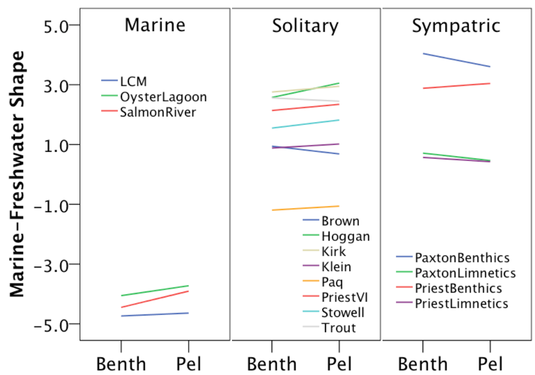

Figure A4. Shape of Marine, Solitaryand Sympatric populations raised on benthic and pelagic diets depicting the average reaction norms for each population for the Marine-Freshwater Shape axis.

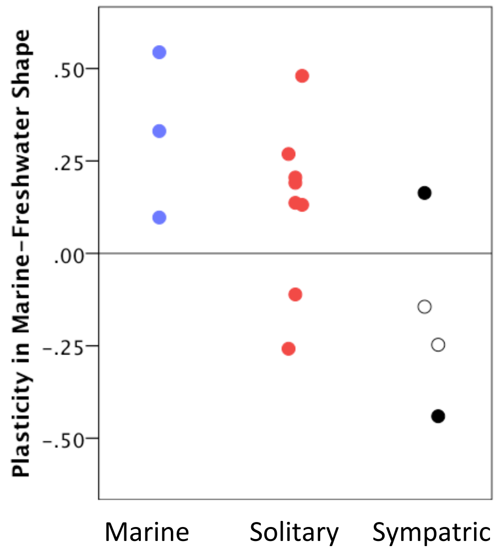

Figure A5. Plasticity in Marine-Freshwater Shape for marine (blue circles), solitary (red circles) and sympatric populations (filled circles are benthic and open circles are limnetics). Plasticity is measured as the average difference between sibs raised on contrasting diets in a laboratory common garden (see methods for more information).

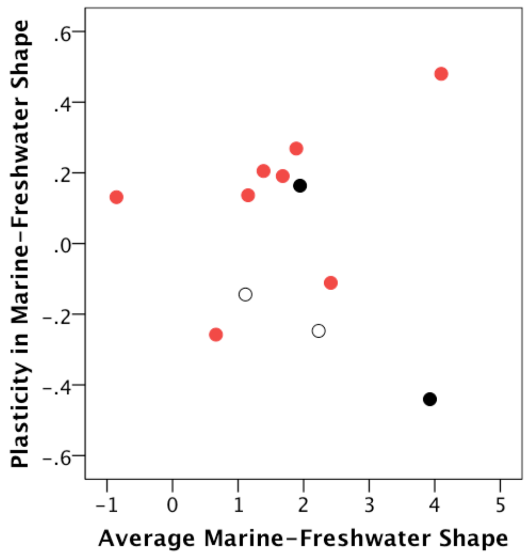

Figure A6. Relationship between plasticity in Marine-Freshwater Shape, and the population mean phenotype. Plasticity was measured in the common garden whereas mean phenotype was based on measurements of wild-caught individuals. Solitary stickleback populations are represented by red circles, benthics by black circles and limnetics by open circles.

Table S1. Types of stickleback populations and the physical characteristics of lakes they inhabit. Fish sample sizes for the measurements from the natural populations are placed in parentheses after the lake name.

Lake	Elevation (m)	Surface area (ha)	Mean depth (m)
Limnetic and benthic stickleback species			
Paxton (40;30)	88	17.0	6.2
Priest (Texada Island) (25;40)	75	44.3	5.4
Solitary populations			
Brown (40)	32	18.8	3.5
Hoggan (40)	60	19.7	3.0
Kirk (40)	121	8.3	8.3
Klein (40)	135	13.5	12.0
Paq (40)	21	12.1	2.2
Priest (Vancouver Island) (25)	15	2.3	4.8
Stowell (40)	77	5.6	4.6
Trout (40)	145	7.6	5.8
Marine populations			
Little Campbell River (35)	0		
Oyster Lagoon (40)	0		
Salmon River (40)	0		