Heritability of Age/Size at Maturity

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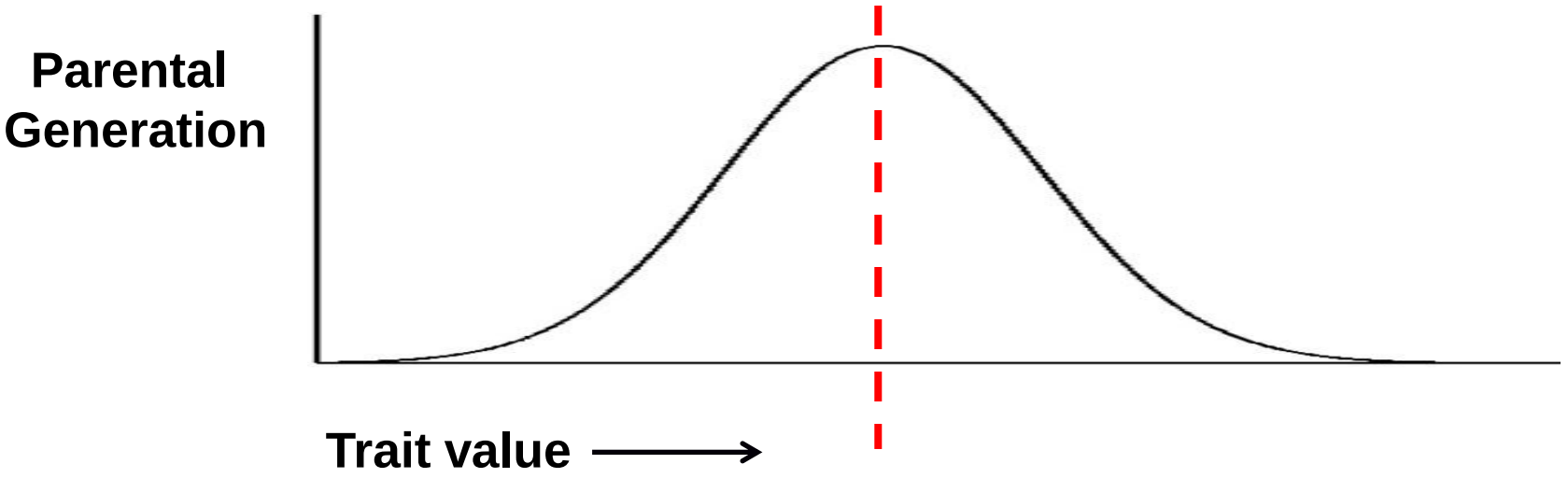
Outline of presentation

- Genetics 101: Principles of selection response
- Heritability of age and size at maturity
- Coho jack study at Cowlitz Hatchery

Response to selection: $R = h^2 \cdot SD$



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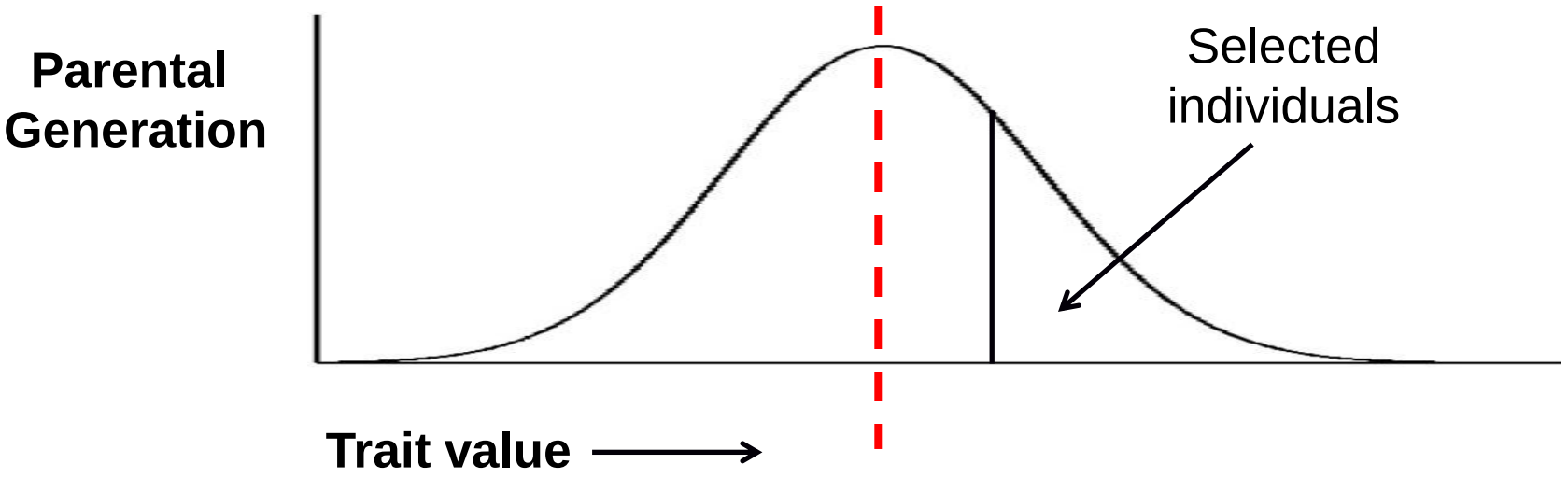

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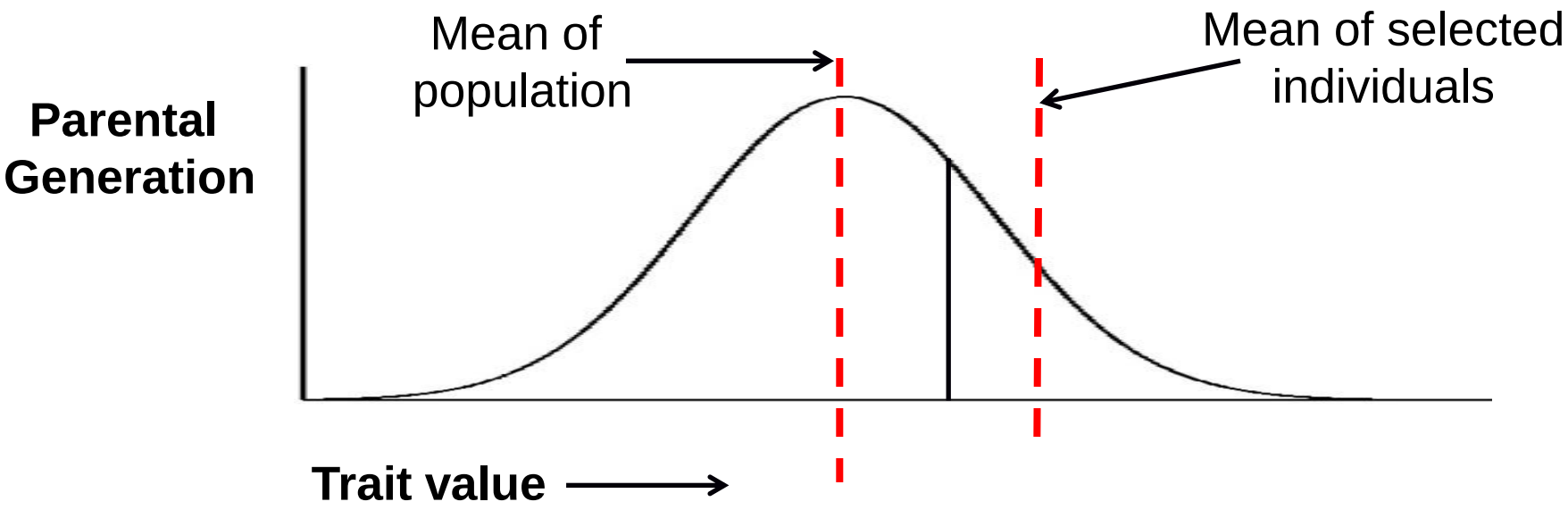

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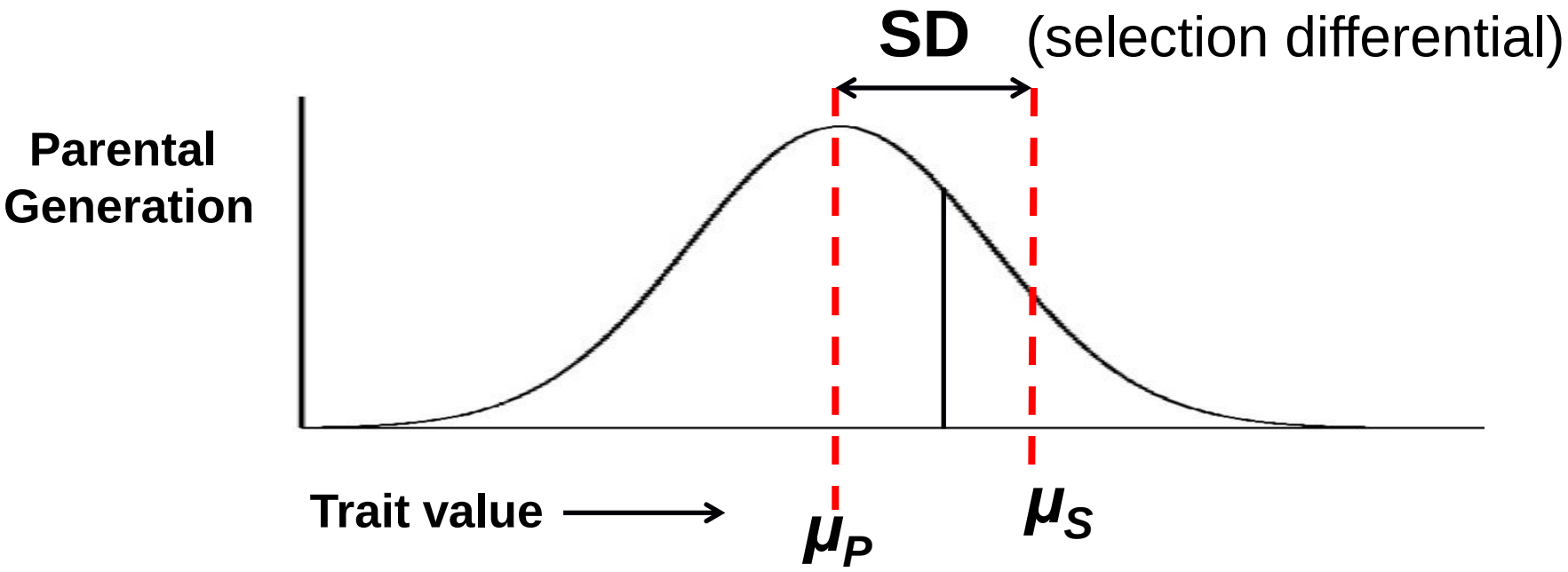
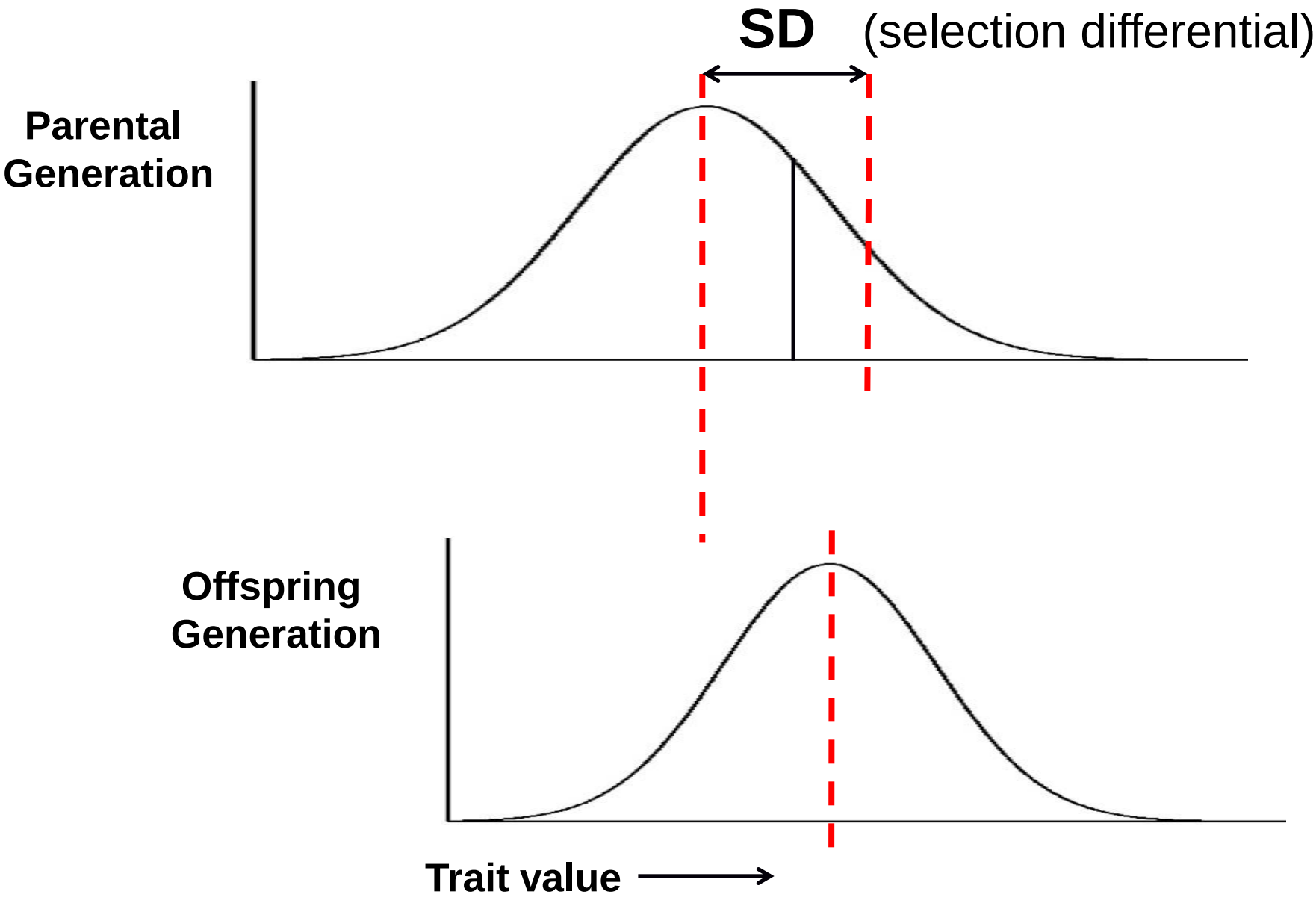


$$SD = \mu_S - \mu_P$$

Response to selection: $R = h^2 \cdot SD$



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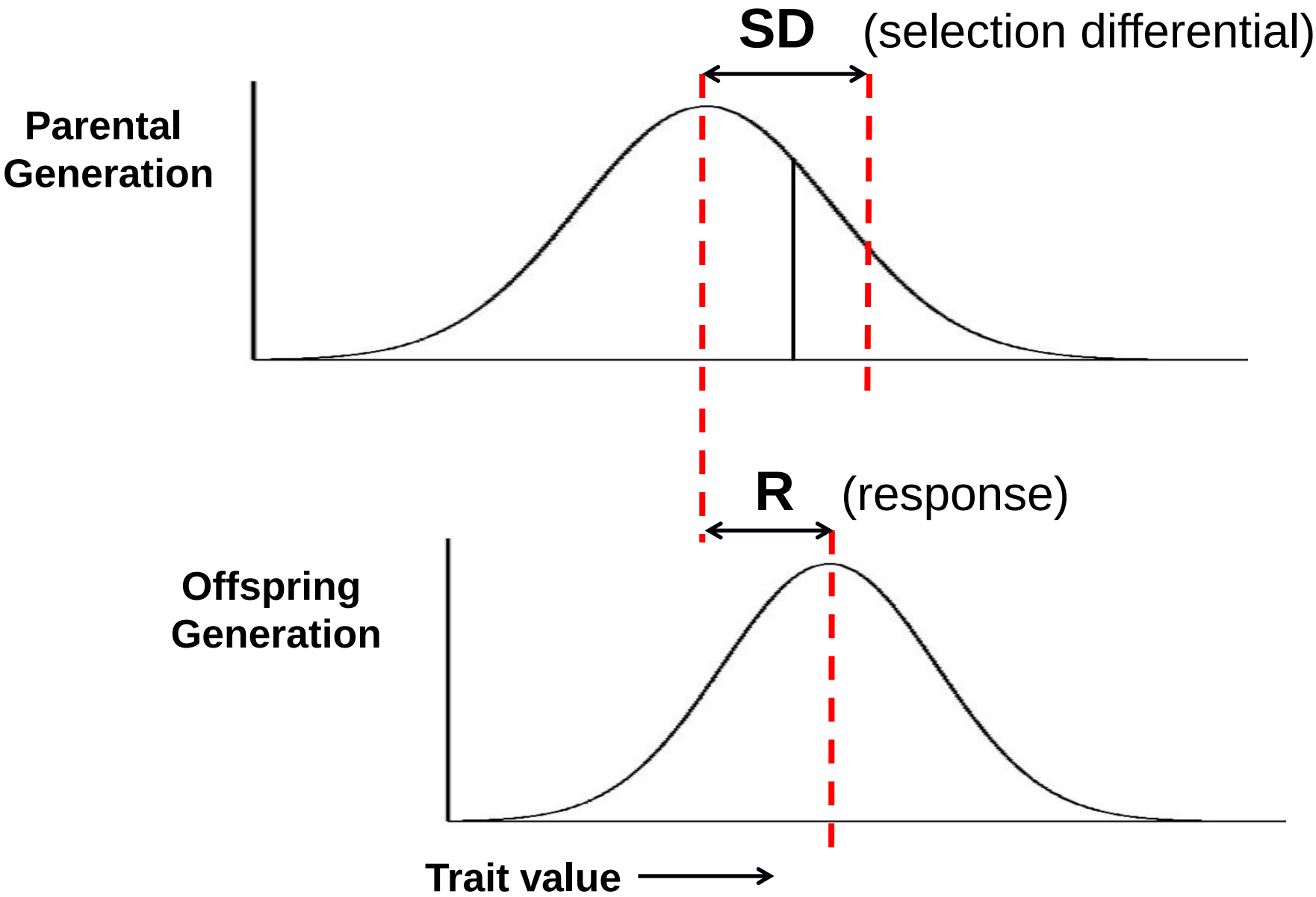


$$R = h^2 \cdot SD$$

Heritability = h^2 = $Var(G) / Var(P)$

$$Var(P) = Var(G) + Var(E)$$

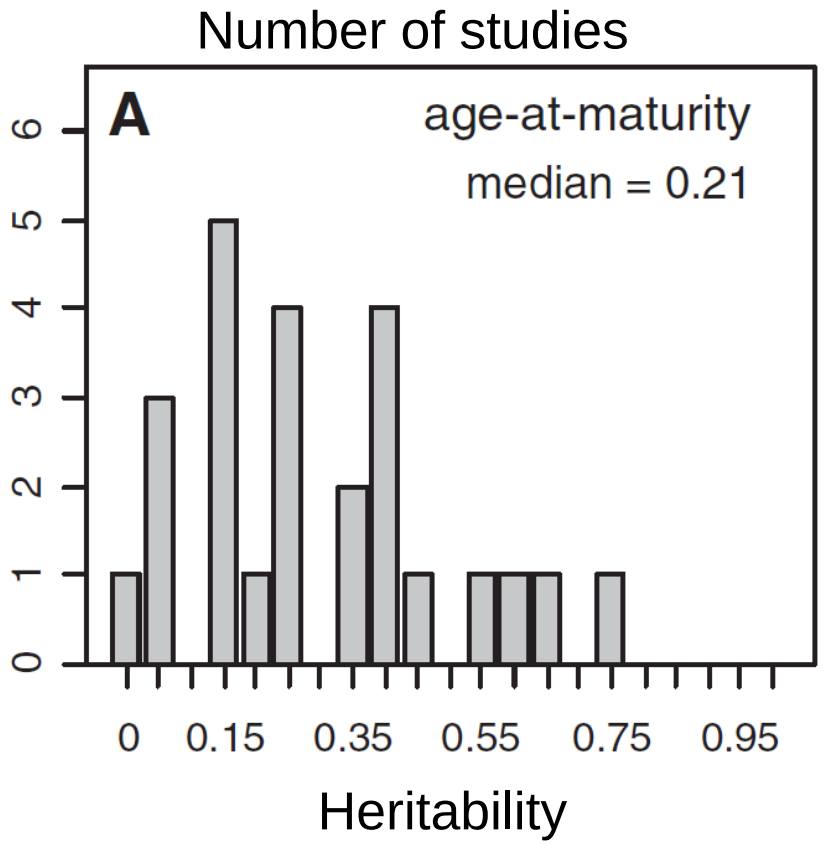
$$0 \leq h^2 \leq 1.0$$

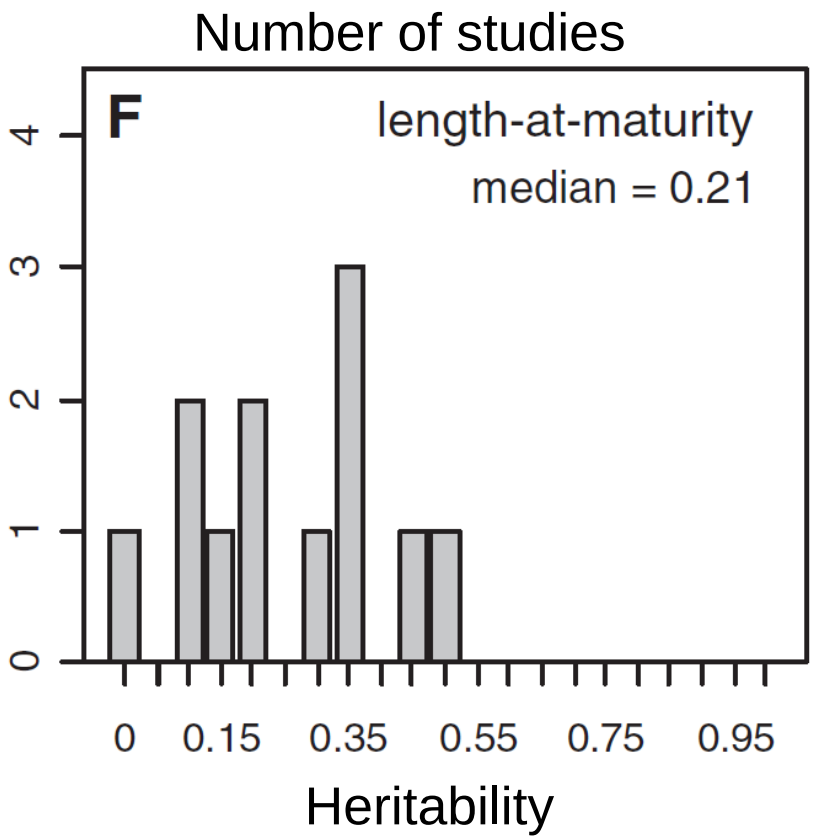
SYNTHESIS

A review of quantitative genetic components of fitness in salmonids: implications for adaptation to future change

Stephanie M. Carlson[1] and Todd R. Seamons[2]

1 Department of Applied Mathematics and Statistics, University of California, Santa Cruz, CA, USA
2 School of Aquatic and Fishery Sciences, University of Washington, Seattle, WA, USA





Evolutionary Applications 1: 222-238 (2008)

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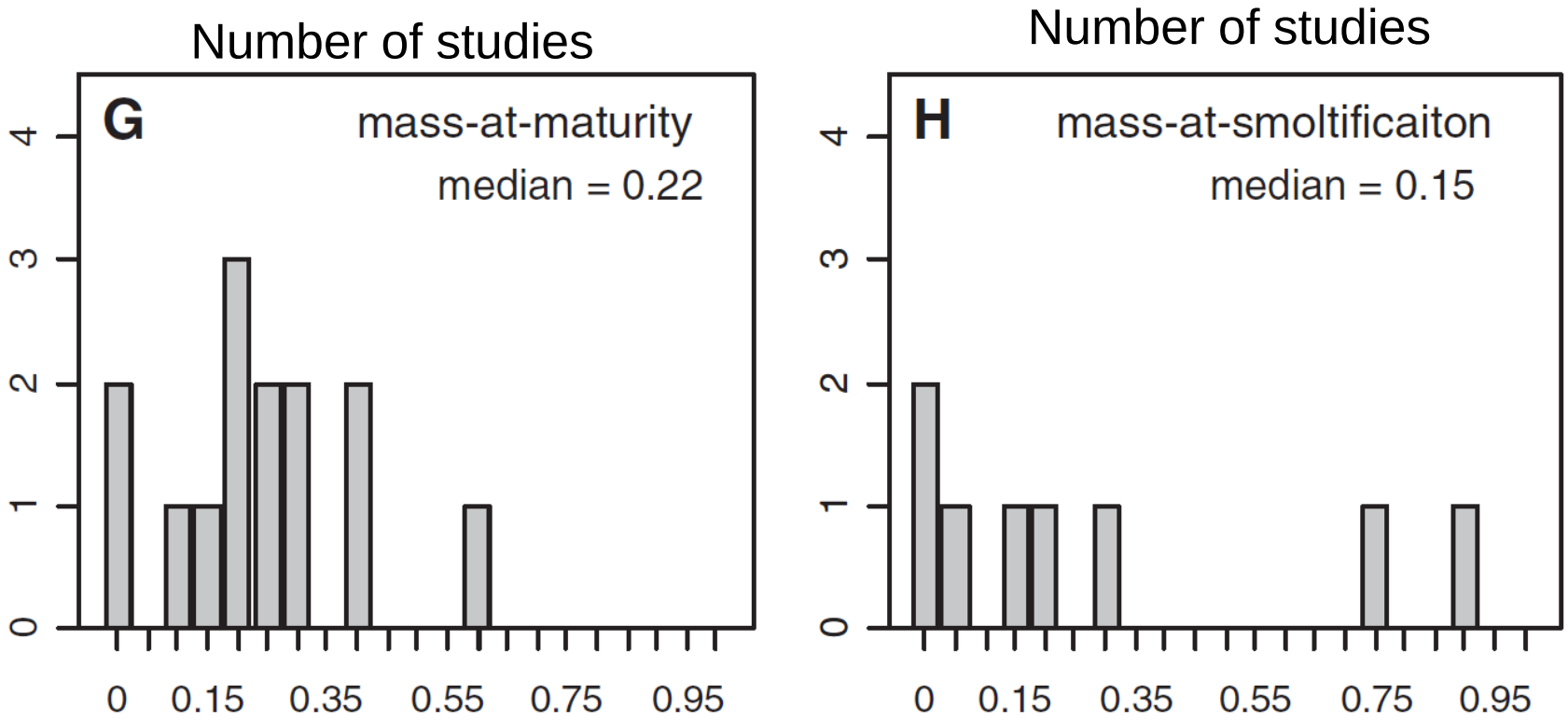

Evolutionary Applications 1: 222-238 (2008)

The Effect of Using Two-Year-Old Male Coho Salmon in Hatchery Broodstock on Adult Returns

ANDREW E. APPLEBY,* JACK M. TIPPING, AND PAUL R. SEIDEL

Parental cross	Release size (g)	Returning fish	
		Jacks (%)	Adults (%)
2% jacks	Normal	241 (0.16)	3,320 (2.16)
100% jacks	Normal	227 (0.37)	1,247 (2.02)
2% jacks	Large	369 (0.61)	2,172 (3.62)
100% jacks	Large	839 (1.37)	2,064 (3.37)

Conclusion: Size at release ≈ 2-3x greater effect at producing jacks than 100% vs. 2% jacks for male broodstock.

North American Journal of Aquaculture 65:60–62, 2003

Conclusion

- Age and size at maturity are heritable traits
- Heritabilities vary among populations
- Heritabilities can vary temporally within populations (due to variable environmental effects)
- On average, ≈80% of the phenotypic variation for age/size at maturity is due to non-inherited (environmental) factors (median $h^2 \approx 20\%$).

Sperm competition between alternative reproductive tactics of the Atlantic salmon *in vitro*

Tomislav Vladić [a,*], Lars A. Forsberg [b], Torbjörn Järvi [a,c]

Aquaculture 302 (2010) 265–269

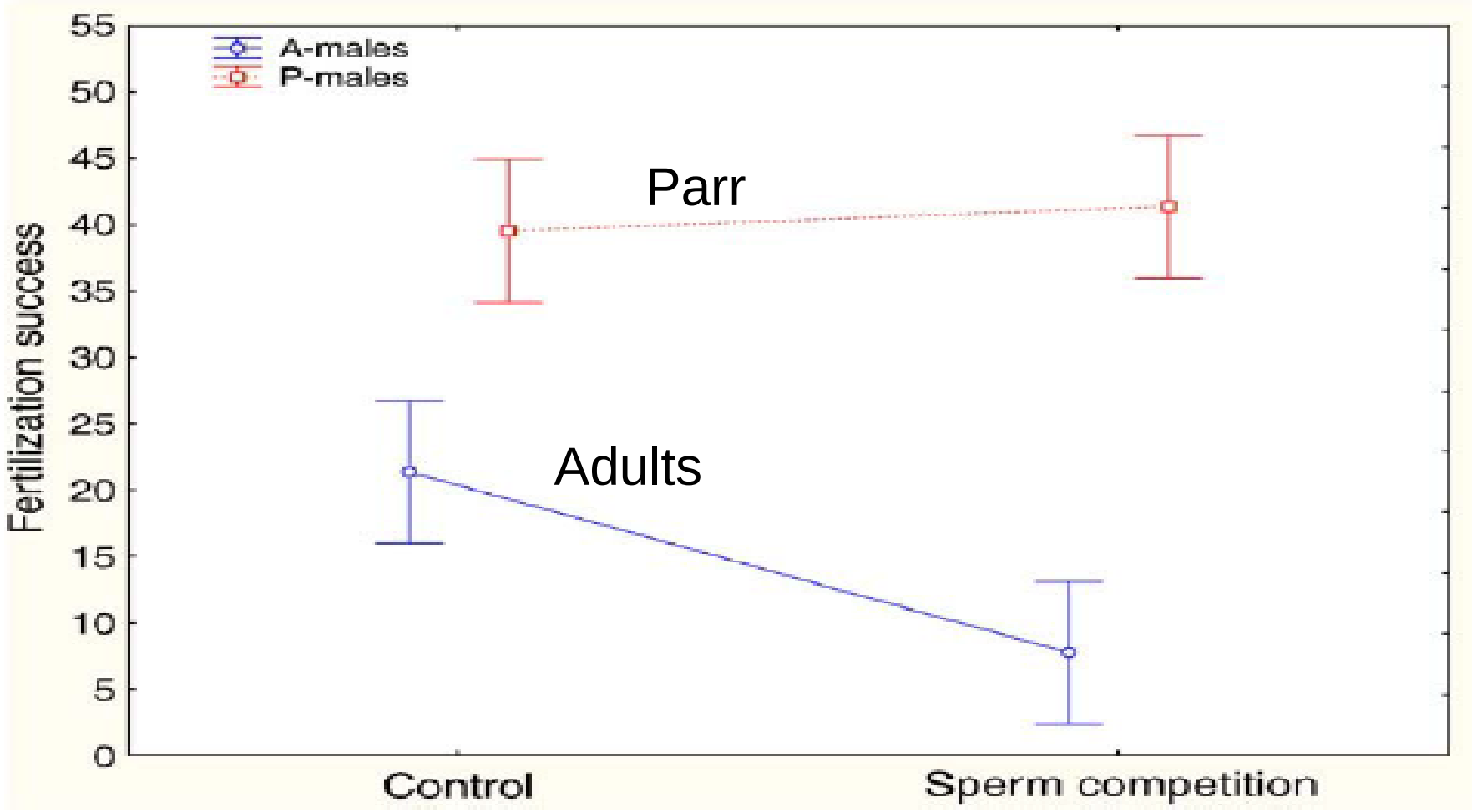

Fig. 3. Observed decrease in fertilization success of salmon anadromous males in competition with parr males. Vertical bars denote confidence intervals. ANOVA, interaction, $F_{1,40} = 8.437$, $p<0.01$.