Appendix to "unusually paced life history strategies of marine megafauna drive atypical sensitivities to environmental variability"

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Appendix: the effect of increasing and decreasing cheloniid length at puberty by 10% on links between life history traits and shifts in environmental stochasticity.

Several conspecific sea turtle populations differ in length at puberty (see main text). To investigate how the interaction between the benefits and costs of maturing at a smaller size affects population growth rates, we re-ran all our analyses for a scenario in which length at puberty, L_p, of all cheloniid species is increased by 10% or decreased by 10%.

The relationships between life history traits and populations responses to shifts in environmental stochasticity that we found using the default parameter values (Table 1, main text), and which are presented in Figure 3 in the main text, were still significant, irrespective of whether we increased (Fig. A1) or decreased (Fig. A2) length at puberty, L_p. Thus, we infer that our results on how different life history traits are linked to population responses to shifts in environmental stochasticity are robust against perturbation of length at puberty.

The non-significant, positive trend between increasing scaled, maximum reproduction rate R_m and the difference in log stochastic population growth rate, $\log(\lambda_s)$, between good environment frequency values of $f = 1$ and $f = 0$ (Fig. 3H), does now longer exist (Figs. A1H, A2H). Instead, a non-significant, negative trend between increasing juvenile mortality rate, μ_j, and the difference in $\log(\lambda_s)$ between environmental autocorrelation $\rho = 1$ and $\rho = -1$ when good environment frequency $f = 0.75$ emerged when we decreased length at puberty, L_p, with 10% (Fig. A2G).

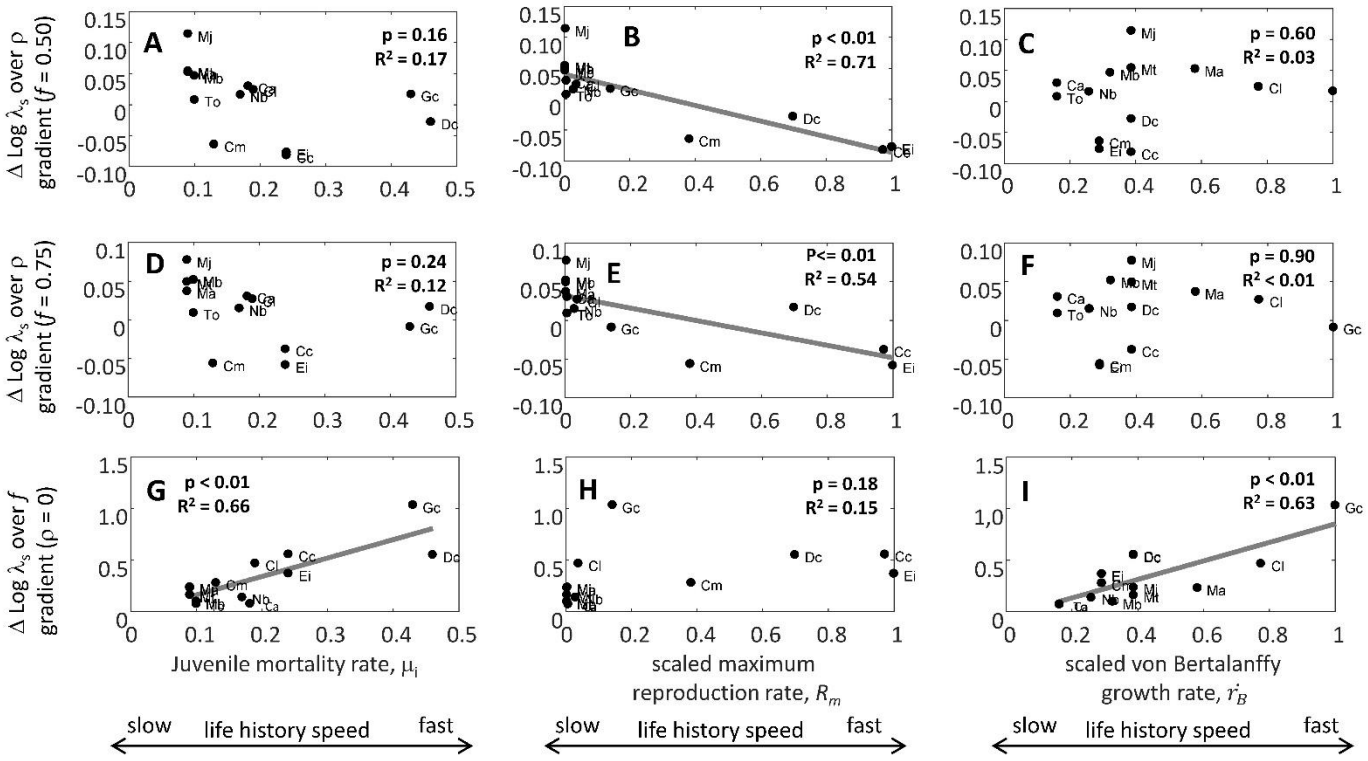

Figure A1. Relationship between juvenile mortality rate, μ_i (yr^{-1}) (**A**, **D**, **G**), scaled maximum reproduction rate R_m (# yr^{-1}), (**B**, **E**, **H**), scaled von Bertalanffy growth rate, $\dot{r}_B$ (yr^{-1}), (**C**, **F**, **I**) and the difference between the log stochastic population growth rate, log(λ_s), at the end and beginning of the environmental autocorrelation ρ gradient with good environment frequency f = 0.50 (**A-C**), the difference between log(λ_s) at the end and beginning of the environmental autocorrelation ρ gradient with f = 0.75, (**D-F**), and the difference between log(λ_s) at the end and beginning of the good environment frequency f gradient (with ρ = 0) (**G-I**). Parameter values are as in Table 2 of the main text, except for values of Lp for the cheloniids, which have been increased by 10%. P-values and R^2 values are indicated for each relationship in each panel, with significant relationships plotted (note: panel H indicates a non-significant trend). Abbreviations are mobulid species *M. alfredi* (Ma), *M. birostris* (Mb), *M. japonica* (Mj) and *M. thurstoni* (Mj); carcharhinid species *C. limbatus* (Cl), *T. obesus* (To), *C. amblyrhynchos* (Ca), *N. brevirostris* (Nb), and *G. cuvier* (Gc); and cheloniid species *D. cariacea* (Dc), *C. mydas* (Cm), *C. caretta* (Cc), and *E. imbricate* (Ei). The relationship between μ_i, R_m and $\dot{r}_B$ and the fast-slow life history speed continuum is indicated.

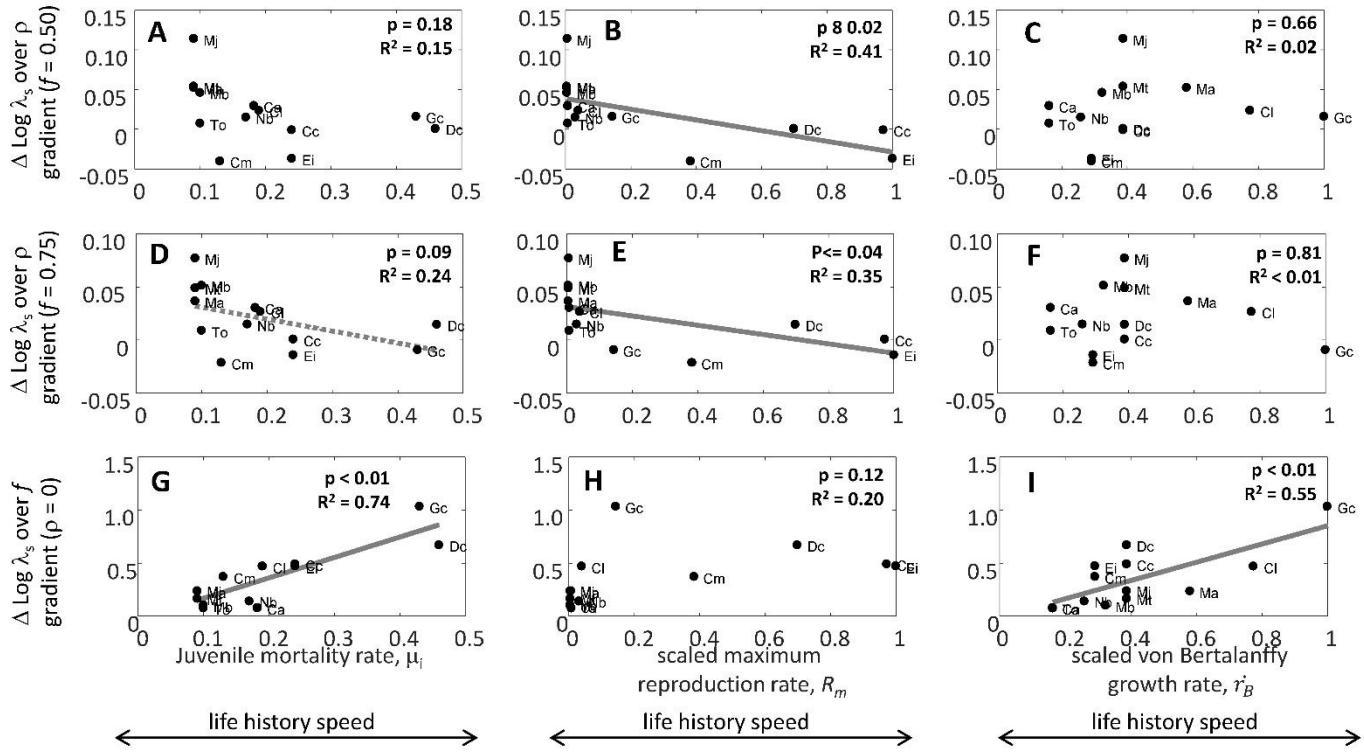

Figure A2. Relationship between juvenile mortality rate, μ_i (yr^{-1}) (**A**, **D**, **G**), scaled maximum reproduction rate R_m (# yr^{-1}), (**B**, **E**, **H**), scaled von Bertalanffy growth rate, $\dot{r}_B$ (yr^{-1}), (**C**, **F**, **I**) and the difference between the log stochastic population growth rate, log(λ_s), at the end and beginning of the environmental autocorrelation ρ gradient with good environment frequency f = 0.50 (**A-C**), the difference between log(λ_s) at the end and beginning of the environmental autocorrelation ρ gradient with f = 0.75, (**D-F**), and the difference between log(λ_s) at the end and beginning of the good environment frequency f gradient (with ρ = 0) (**G-I**). Parameter values are as in Table 2 of the main text, except for values of Lp for the cheloniids, which have been decreased by 10%. P-values and R^2 values are indicated for each relationship in each panel, with significant relationships plotted (note: panel H indicates a non-significant trend). Abbreviations are mobulid species *M. alfredi* (Ma), *M. birostris* (Mb), *M. japonica* (Mj) and *M. thurstoni* (Mj); carcharhinid species *C. limbatus* (Cl), *T. obesus* (To), *C. amblyrhynchos* (Ca), *N. brevirostris* (Nb), and *G. cuvier* (Gc); and cheloniid species *D. cariacea* (Dc), *C. mydas* (Cm), *C. caretta* (Cc), and *E. imbricate* (Ei). The relationship between μ_i, R_m and $\dot{r}_B$ and the fast-slow life history speed continuum is indicated.