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Appendix 1

Modeling the growth rate of female North American porcupines

We replicated analyses from an earlier study (DeWitt et al 2017) using two model forms that reflect ontogenetic processes. We considered a non-asymptotic power model and an asymptotic Gompertz model recognizing that, although mammals do not grow indefinitely, captured individuals may not have achieved maximum body mass. Our analyses differ from DeWitt et al. (2017) in that here we use different model forms to measure predation risk effects on female growth rate and asymptotic mass. We evaluated four hypotheses assessing how female growth is influenced by predation risk (Table A1). Growth was modeled using the age-specific mass of captured female porcupines (n = 267). We included measures of predation risk, forage productivity, and phenology to account for interacting top–down and bottom–up effects. Further, we included an autoregressive process φ_1 for each individual to account for temporal autocorrelation in female growth. Statistical models were estimated for each hypothesis using generalized nonlinear least squares regression implemented in R 3.5.0 (<www.r-project.org>). We inspected model residuals and identified the most parsimonious hypothesis using Akaike's information criterion for small sample size (AICc; Akaike 1973).

Evidence supports our hypothesis that growth was influenced by both predation risk and summer forage productivity (w_3 = 0.62). Model selection indicates that non-consumptive predation effects were more influential on female growth rates than summer forage productivity. We found no evidence that predation risk suppressed growth more severely during periods of low summer forage production. The interaction between fisher and summer forage productivity was not different from zero (p = 0.64) and the support for this hypothesis (w_4 = 0.26) was less than the same hypothesis without an interaction term (w_3 = 0.62). Overall, predation risk and summer forage productivity influenced female growth independent of one another.

Table 1. A priori hypotheses describing female growth considering two model forms. Mean growth rate (Age), birth mass (M_0), and asymptotic mass (K) of female porcupines were estimated using covariates related to predation risk and summer forage productivity. Each model includes phenology (Date) to account for seasonal trends in female nutrition. The number of variables (k_i), AIC_c, difference between AIC_c values (ΔAIC_c) and AIC_c weights (w_i) are shown for each model.

Form	Hypothesis	Model formulation*	k_i	AIC_c	ΔAI	w_i
Power	Intrinsic	$M_0 \cdot \text{Age}^{(\text{Date})}$	4	724.	19.7	0.00
Power	Predation	$M_0 \cdot \text{Age}^{(\text{Date, Fisher})}$	5	707.9	3.3	0.12
Power	Predation + Forage	$M_0 \cdot \text{Age}^{(\text{Date, Fisher, sNAO})}$	6	704.6	0.0	0.62
Power	Predation : Forage	$M_0 \cdot \text{Age}^{(\text{Date, Fisher:sNAO})}$	7	706.3	1.7	0.26
Gompertz	Intrinsic	$K \cdot (M_0 / K)^{(\text{Age, Date})}$	5	750.3	45.7	0.00
Gompertz	Predation	$K \cdot{}_{\text{Fisher}} \cdot (M_0 / K)^{(\text{Age, Date, Fisher})}$	7	736.0	31.4	0.00
Gompertz	Predation + Forage	$K \cdot{}_{\text{Fisher}} \cdot (M_0 / K)^{(\text{Age, Date, Fisher, sNAO})}$	8	735.4	30.8	0.00
Gompertz	Predation : Forage	$K \cdot{}_{\text{Fisher}} \cdot (M_0 / K)^{(\text{Age, Date, Fisher:sNAO})}$	10	738.7	34.1	0.00

Notes: (*) Covariates are described in the main text