**Supporting Information for “Territory acquisition mediates the influence of predators and climate on juvenile red squirrel survival”** – Hendrix et al.

**Table S1: Interactions of juvenile traits and environmental factors**

Our primary analysis of overwinter survival considered how the timing of territory acquisition mediated the effects of predators and climate. Other work in this system suggests that birth date and growth rate are associated with territory acquisition. We therefore also tested whether these juvenile traits had interactive effects themselves with predators or climate on the overwinter survival of juvenile red squirrels.

We did not fit these interactions in the initial model, which already contained several interaction terms and would subsequently have been overfit. We present the results of the new model including interactions between each of birth date and growth rate and the effects of predators and climate in Table S1. We did not include interactions between the variable for “current owner of territory” and the effects of predators and climate. We found no evidence that growth rate or birth date had interactive effects with predator abundance or temperature overwinter on survival of juvenile red squirrels.

**Table S2: Correlations among fixed effects**

A correlation matrix for the predictor variables in our models of overwinter survival is provided in Table S2. Note we have not estimated correlations involving the interaction terms

Table S1. Mixed effects binomial model of juveniles red squirrel over winter survival (*n* = 1305), testing whether juvenile growth rate or birth date mediate effects of predators and temperature on over winter survival, including random effects of litter ID and year (conditional R2 = 0.47).

|  |  |  |  |
| --- | --- | --- | --- |
| Term | Estimate ± SE | *z* | *P* |
| Std. density | -0.67 ± 0.16 | -4.17 | < 0.001 |
| Std. cones | 0.39 ± 0.13 | 3.00 | 0.002 |
| Std. growth rate | 0.29 ± 0.11 | 2.61 | 0.009 |
| Std. birth date | 0.01 ± 0.09 | 0.10 | 0.924 |
| Grid (SU) | 0.22 ± 0.18 | 1.20 | 0.229 |
| Sex (male) | -0.53 ± 0.15 | -3.4 | < 0.001 |
| Autumn owner (yes) | 2.67 ± 0.21 | 12.60 | < 0.001 |
| Std. lynx | 0.17 ± 0.22 | 0.78 | 0.433 |
| Std. hares | 0.13 ± 0.21 | 0.61 | 0.542 |
| Std. mustelid | -0.21 ± 0.13 | -1.65 | 0.099 |
| Std. voles | -0.51 ± 0.14 | -3.53 | < 0.001 |
| Std. temperature | 0.46 ± 0.13 | 3.52 | < 0.001 |
| Std. lynx : Std. hares | 0.12 ± 0.10 | 1.22 | 0.223 |
| Std. mustelid : Std. voles | 0.12 ± 0.13 | 0.92 | 0.357 |
| Std. growth rate : Std. lynx | -0.02 ± 0.13 | -0.15 | 0.882 |
| Std. growth rate : Std. mustelid | -0.12 ± 0.09 | -1.31 | 0.191 |
| Std. growth rate : Std. temperature | -0.09 ± 0.11 | -0.81 | 0.420 |
| Std. birth date : Std. lynx | -0.05 ± 0.10 | -0.49 | 0.627 |
| Std. birth date : Std. mustelid | 0.04 ± 0.08 | 0.49 | 0.626 |
| Std. birth date : Std. temperature | -0.03 ± 0.08 | -0.31 | 0.759 |
| Random effects | Variance | | |
| Litter ID | 0.544 | | |
| Year | 0.080 | | |

Table S2. Correlation matrix of fixed effect predictor variables for the overwinter survival of juvenile red squirrels (n = 1305). Correlations with sex, territory ownership, study grid, growth rate, and birth date were calculated using the complete dataset; correlations including only annual measures (within dashed lines) were calculated using a summary annual dataset to avoid pseudoreplication (n = 27). We standardized all continuous predictors as z-scores prior to analysis, and the correlations shown here were calculated using these standardized values.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Territory ownership (not settled) | Study grid (SU) | Growth rate | Birth date | Density | Cones | Lynx abundance | Hare abundance | Mustelid abundance | Vole abundance | Temperature |
| Sex (M) | -0.112 | 0.012 | -0.005 | 0.008 | -0.049 | 0.005 | -0.017 | -0.012 | 0.004 | -0.002 | 0.077 |
| erritory ownership (not settled) |  | -0.005 | 0.018 | -0.351 | 0.121 | -0.139 | 0.083 | 0.107 | -0.074 | -0.023 | -0.062 |
| Study grid (SU) |  |  | -0.024 | -0.030 | 0.062 | -0.301 | -0.148 | -0.140 | -0.210 | -0.037 | -0.102 |
| Growth rate |  |  |  | 0.026 | 0.054 | -0.025 | 0.003 | -0.023 | -0.055 | 0.061 | 0.008 |
| Birth date |  |  |  |  | -0.059 | 0.069 | -0.064 | -0.05 | 0.01 | 0.02 | 0.069 |
| Density |  |  |  |  |  | -0.243 | 0.338 | 0.118 | -0.388 | -0.130 | 0.153 |
| Cones |  |  |  |  |  |  | 0.248 | 0.290 | 0.177 | 0.024 | -0.199 |
| Lynx abundance |  |  |  |  |  |  |  | 0.727 | -0.179 | -0.040 | -0.161 |
| Hare abundance |  |  |  |  |  |  |  |  | -0.348 | -0.088 | -0.277 |
| Mustelid abundance |  |  |  |  |  |  |  |  |  | 0.270 | 0.142 |
| Vole abundance |  |  |  |  |  |  |  |  |  |  | 0.323 |