**Table S1**: Summary statistics for all linear and generalized linear mixed effects models. For all models, time (period or year) is the fixed factor and site is the random factor.

| Model/Response | p-value | Coefficient | Std Error | Marginal $R^2$ | Conditional $R^2$ | Relevant Figure |
|---|---|---|---|---|---|---|
| Seasonal density : time period | <0.0001 | 0.5618 | 0.1197 | 0.146 | 1.00 | 3 |
| Seasonal density : season | <0.0001 | 0.8160 | 0.0923 | | | |
| Percent change in density (pre die-off) | 0.001 | 0.0476 | 0.0141 | 0.0490 | 0.3366 | 4A |
| Percent change in density (die-off) | 0.181 | –0.1877 | 0.1331 | 0.0608 | 0.3565 | 4B |
| Spat (2018-2019) | 0.1 | 0.0319 | 0.0192 | 0.0148 | 0.0770 | 6A |
| Spat (2020-2021) | 0.006 | 0.1614 | 0.0588 | 0.0470 | 0.0578 | 6B |
| Proportion of adults with small annual growth rings | 0.01 | –0.2739 | 0.1048 | 0.1086 | 0.3520 | 7 |
| Seed (pre die-off) | <0.0001 | –0.1590 | 0.0254 | 0.0274 | 0.2956 | 8A |
| Seed (die-off) | 0.056 | 0.2757 | 0.1442 | 0.0069 | 0.7646 | 8B |
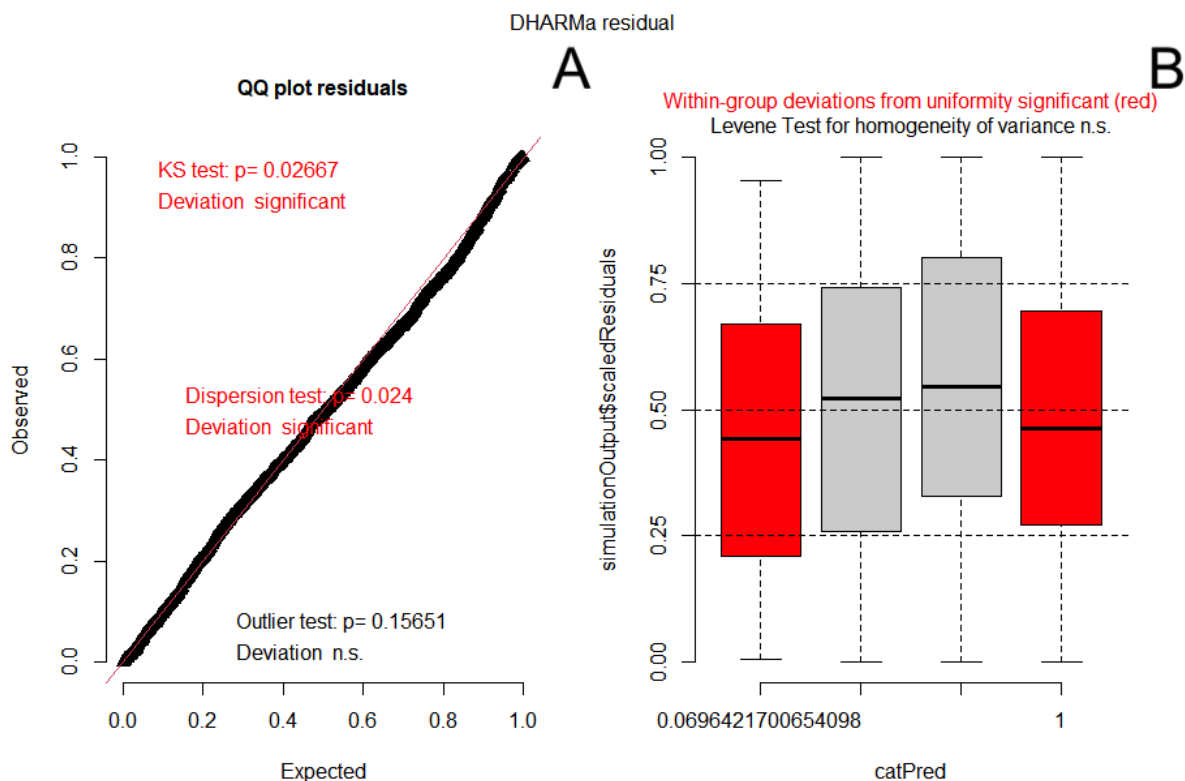


**Figure S1**: Diagnostic plots (**A**: QQ plot residuals, **B**: within-group deviations from uniformity) for the zero-inflated, mixed effect negative binomial GLMM for adult scallop counts from spring and fall population surveys by pre die-off (2008-2018) and die-off (2019-2021) time periods. This approach was chosen as the data contained moderately overdispersed, zero-inflated whole number values.
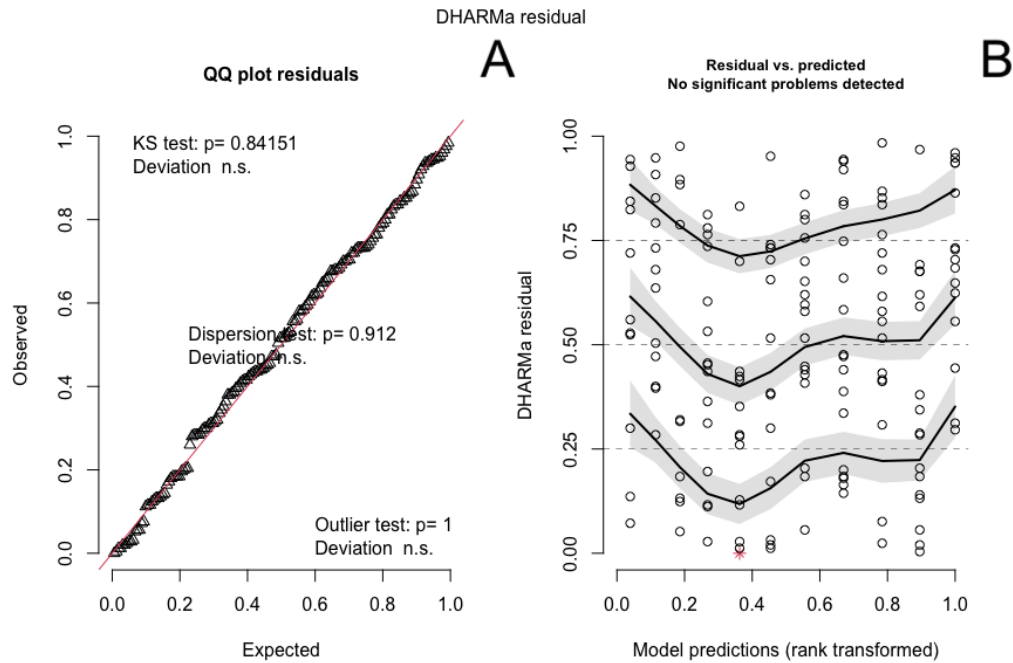
**Figure S2**: Diagnostic plots (**A**: QQ plot residuals, **B**: DHARMA residuals vs rank transformed model predictions) for the mixed effects linear model for percent change in adult scallop density (log+1 transformed) for the 2008-2018 time period (pre die-off). This approach was chosen as the data exhibited moderate over dispersion, but did not conform to GLM distribution options, in part due to negative continuous values and continuous values greater than one.
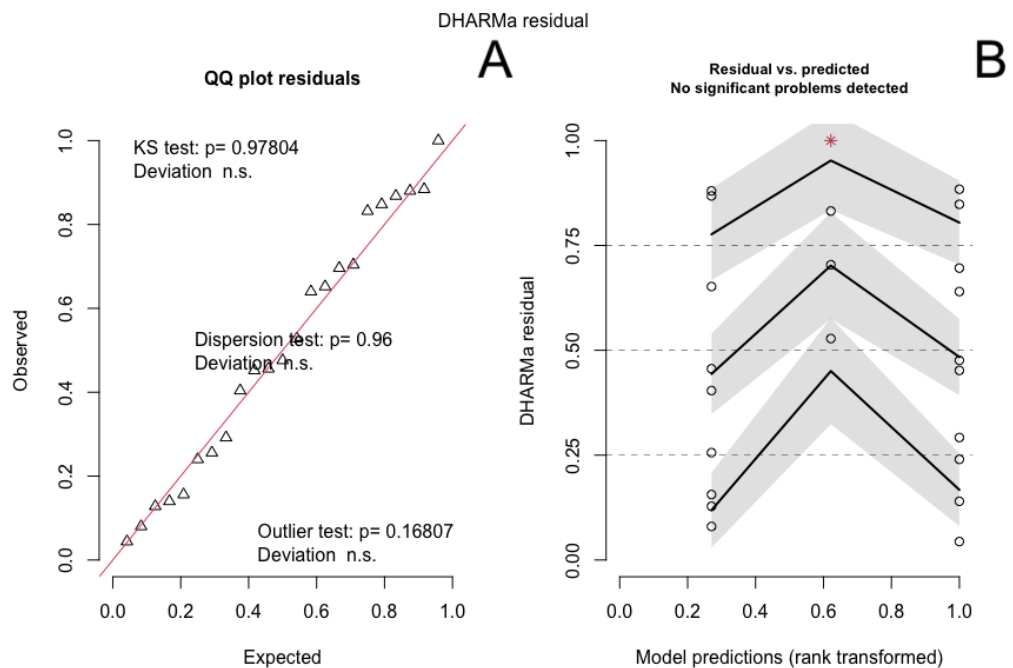


**Figure S3**: Diagnostic plots (**A**: QQ plot residuals, **B**: DHARMA residuals vs rank transformed model predictions) for the mixed effects linear model for percent change in adult scallop density (log+1 transformed) for the 2019-2021 time period (die-off). This approach was chosen as the data exhibited moderate over dispersion, but did not conform to GLM distribution options, in part due to negative continuous values and continuous values greater than one.
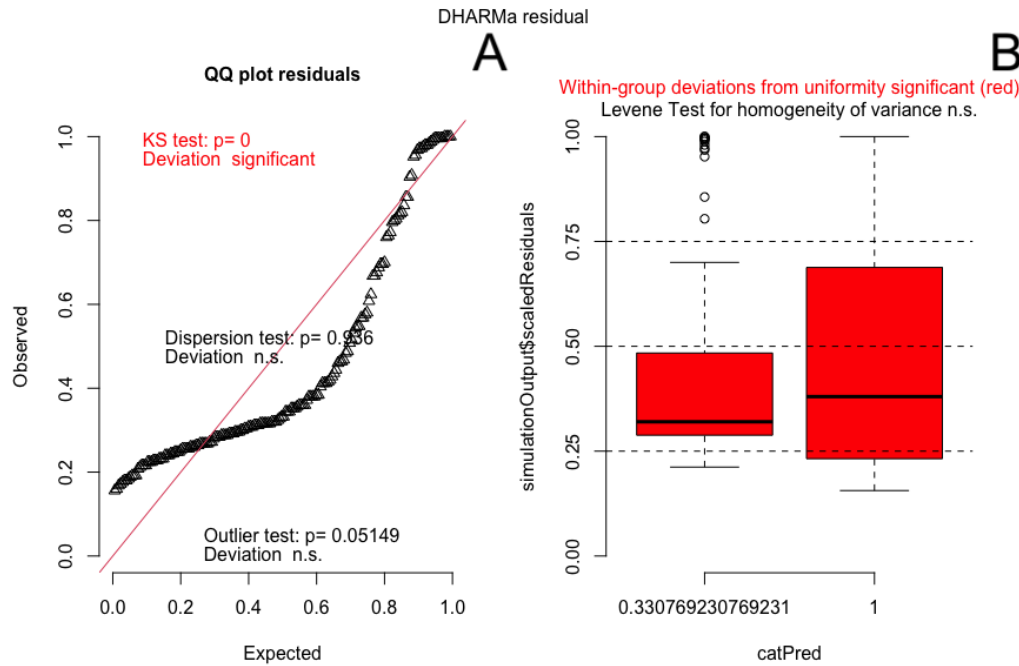
**Figure S4**: Diagnostic plots (**A**: QQ plot residuals, **B**: within-group deviations from uniformity) for the zero inflated, mixed effects linear model for spat density (log+1 transformed) for the 2018-2019 time period. This approach was chosen as the data exhibited moderate over dispersion and zero inflations, but did not conform to GLM distribution options, in part due to highly continuous values greater than one.
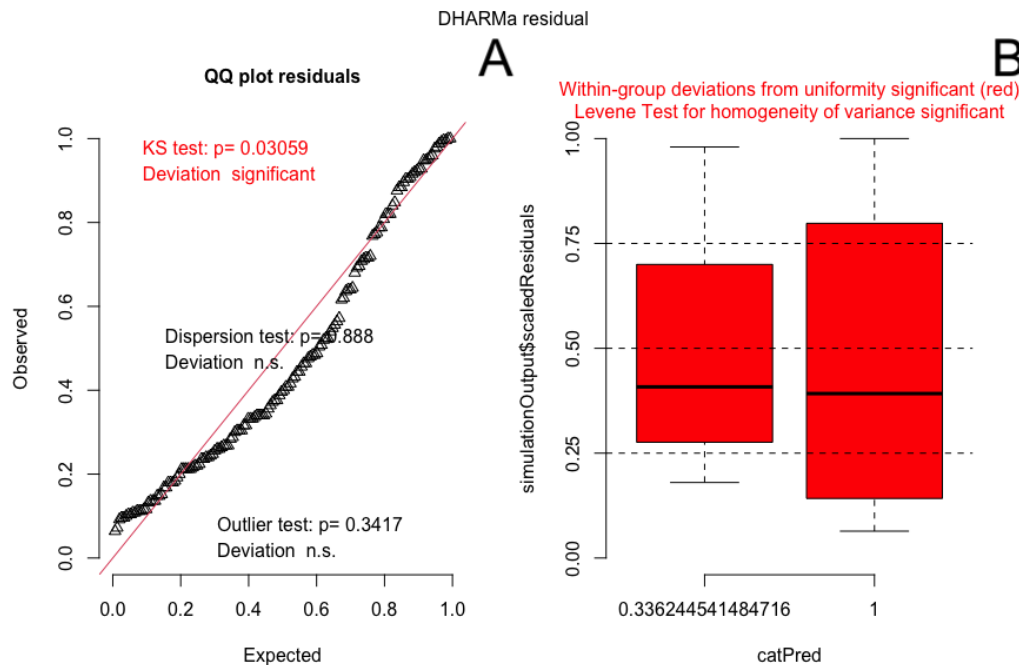


**Figure S5**: Diagnostic plots (**A**: QQ plot residuals, **B**: within-group deviations from uniformity) for the zero inflated, mixed effects linear model for spat density (log+1 transformed) for the 2020-2021 time period. This approach was chosen as the data exhibited moderate over dispersion and zero inflations, but did not conform to GLM distribution options, in part due to highly continuous values greater than one.
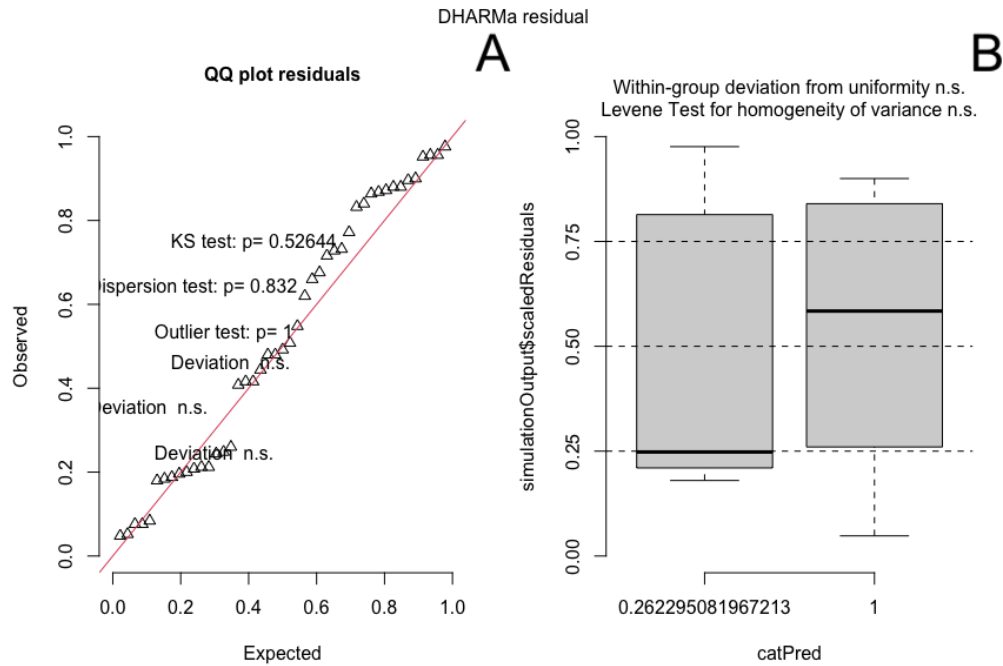
**Figure S6**: Diagnostic plots (**A**: QQ plot residuals, **B**: within-group deviations from uniformity) for the zero-inflated, Gaussian GLMM for percent of adult scallops with small ($\leq$20 mm) annual growth rings. This approach was chosen as the data contained a high quantity of zero values.
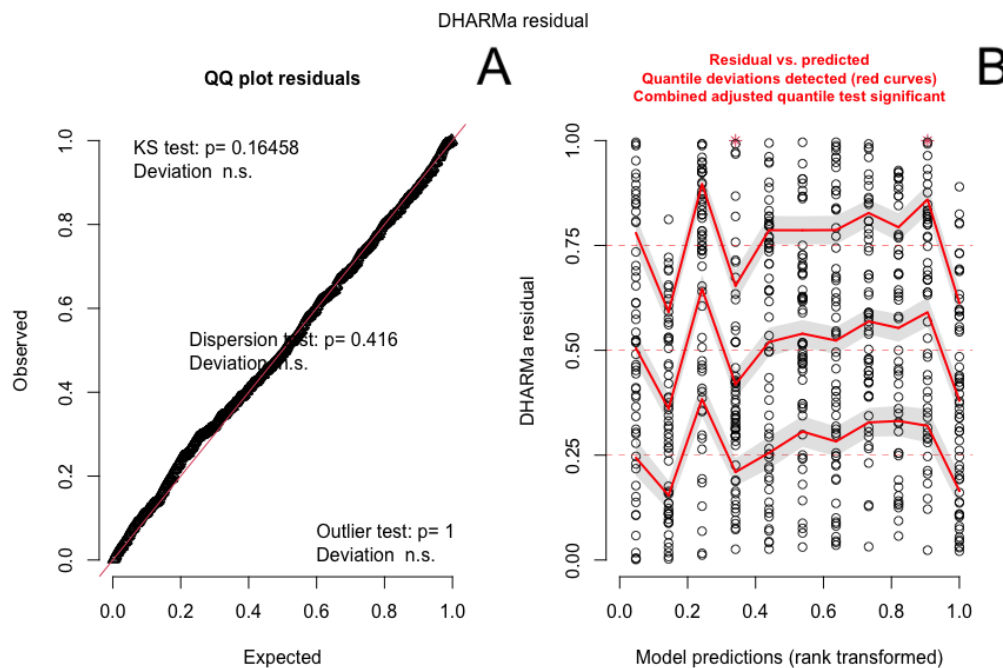


**Figure S7**: Diagnostic plots (**A**: QQ plot residuals, **B**: DHARMA residuals vs ranked transformed model predictions) for the zero-inflated, mixed effects GLMM (with a negative binomial distribution) for seed density for the 2008-2018 time period (pre die-off). This approach was chosen as the data contained moderately overdispersed, zero-inflated whole number values.
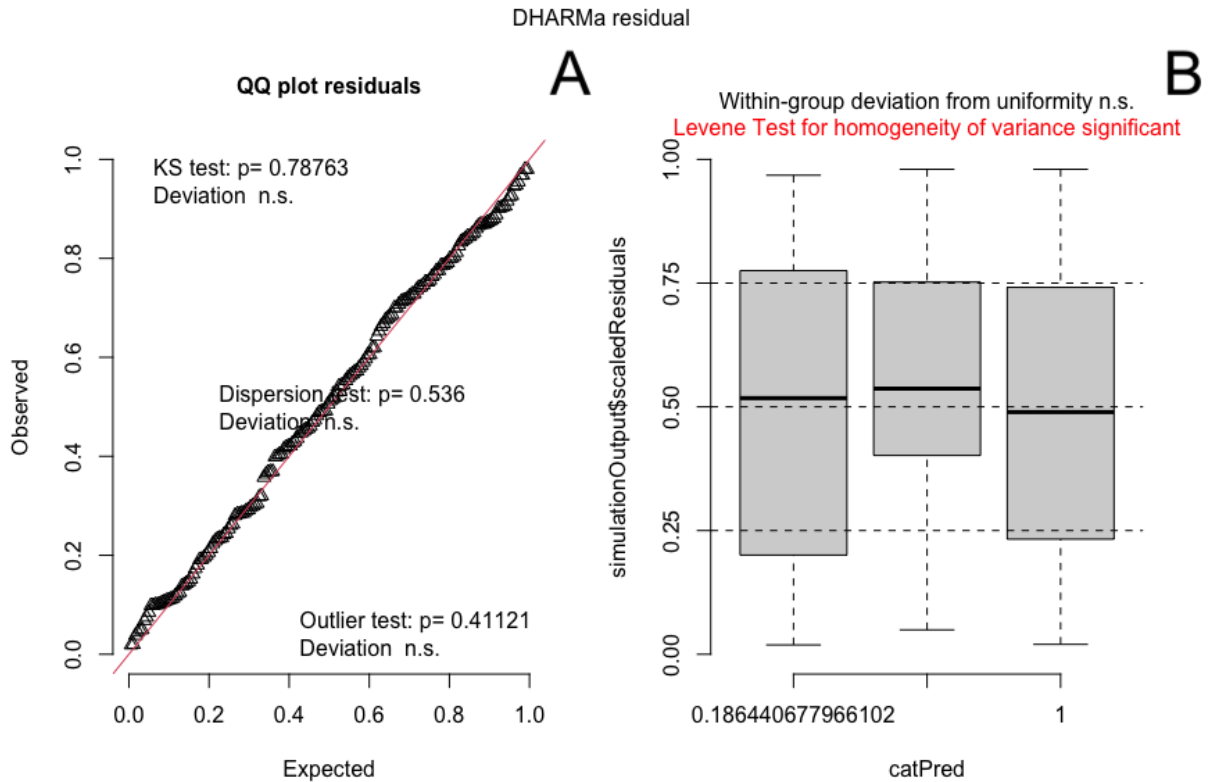
**Figure S8**: Diagnostic plots (**A**: QQ plot residuals, **B**: within-group deviations from uniformity) for the zero-inflated, mixed effects GLMM (with a negative binomial distribution) for seed density for the 2019-2021 time period (die-off). This approach was chosen as the data contained moderately overdispersed, zero-inflated whole number values.