Ch1\_models\_caribou

Erin Tattersall

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Based on model selection comparison of underlying distributions and zero-inflation, I chose an nbinom1 distribution for caribou data, with zero-inflation and ActiveDays in the ZI model (see Ch1\_caribou\_modelDistribution.Rmd)  
Here I will: 1. Double check random structure using all covariates 2. Build models with environmental covariates only  
3. Build hypothesis models with line covariates + environmental  
4. Perform model selection with AIC  
5. Calculate evidence ratios (AICwt of Best Model/ AICwt of other models)  
6. Checking residuals of Top Model 7. Model Averaging? 8. Standardize parameter estimates for easy interpretation  
Previous scale analysis showed lowland habitat and linear density measured at 1750m best explained caribou detections

### 1. Random structure

Random structure was previously assessed, but here I will confirm using all model covariates

## dLogLik dAIC df weight  
## r2 9.1 0.0 14 0.839   
## rSite 6.5 3.3 13 0.158   
## rMonth 2.1 12.0 13 0.002   
## r0 0.0 14.3 12 <0.001

## Environmental models

|  |  |
| --- | --- |
| Model Name | Covariates |
| E1 | None |
| E2 | low1750 + pSnow |
| E3 | low1750 |
| E4 | pSnow |

## dLogLik dAIC df weight  
## E2 21.1 0.0 8 0.979   
## E3 16.3 7.7 7 0.021   
## E4 5.3 29.6 7 <0.001  
## E1 0.0 38.2 6 <0.001

Continue modelling Line characteristics with both environmental variables

## Line characteristics

|  |  |
| --- | --- |
| Model Name | Covariates |
| L1 | Treatment + low1750 + pSnow |
| L2 | VegHt + low1750 + pSnow |
| L3 | LD1750 + low1750 + pSnow |
| L4 | LineWidth + low1750 + pSnow |
| L5 | Treatment + LineWidth + low1750 + pSnow |
| L6 | LineWidth + VegHt + low1750 + pSnow |
| L7 | Treatment + LD1750 + low1750 + pSnow |
| L8 | LD1750 + VegHt + low1750 + pSnow |
| L9 | Treatment + VegHt + low1750 + pSnow |
| L10 | Treatment + LineWidth + VegHt + low1750 + pSnow |
| L11 | Treatment + LineWidth + LD1750 + low1750 + pSnow |
| L12 | Treatment + VegHt + LD1750 + low1750 + pSnow |
| L13 | LineWidth + VegHt + LD1750 + low1750 + pSnow |
| L14 | Treatment + LineWidth + LD1750 + VegHt + low1750 + pSnow |

## dLogLik dAIC df weight  
## L8 43.0 0.0 10 0.205   
## L2 41.5 0.9 9 0.130   
## L12 45.4 1.1 13 0.116   
## L9 44.2 1.6 12 0.092   
## L13 43.1 1.8 11 0.084   
## L11 45.1 1.9 13 0.080   
## L14 45.9 2.3 14 0.066   
## L5 43.9 2.3 12 0.065   
## L4 40.7 2.5 9 0.058   
## L10 44.6 2.7 13 0.053   
## L6 41.6 2.8 10 0.052   
## L7 26.7 36.6 12 <0.001  
## L3 23.3 37.5 9 <0.001  
## L1 24.8 38.3 11 <0.001  
## E2 21.1 39.8 8 <0.001  
## E3 16.3 47.5 7 <0.001  
## E4 5.3 69.4 7 <0.001  
## E1 0.0 78.0 6 <0.001

Six models within 2 dAIC points of each other, with model weights between 0.08 - 20%  
VegHt is present in top 5 models.

## Evidence Ratios

Calculating evidence ratios (AIC wt of best model/AIC weight of others) gives:

## ModelNames dLogLikelihood dAIC Modelweight CumulativeWeight  
## 1 L8 43.002564 0.0000000 2.050385e-01 0.2050385  
## 2 L2 41.544490 0.9161474 1.296870e-01 0.3347255  
## 3 L12 45.429228 1.1466730 1.155682e-01 0.4502937  
## 4 L9 44.197219 1.6106899 9.163861e-02 0.5419323  
## 5 L13 43.110279 1.7845711 8.400801e-02 0.6259403  
## 6 L11 45.066625 1.8718789 8.041962e-02 0.7063600  
## 7 L14 45.875513 2.2541024 6.642985e-02 0.7727898  
## 8 L5 43.853233 2.2986618 6.496617e-02 0.8377560  
## 9 L4 40.737921 2.5292866 5.789056e-02 0.8956465  
## 10 L10 44.642599 2.7199294 5.262719e-02 0.9482737  
## 11 L6 41.625332 2.7544638 5.172627e-02 1.0000000  
## 12 L7 26.682080 36.6409687 2.266471e-09 1.0000000  
## 13 L3 23.262622 37.4798850 1.489984e-09 1.0000000  
## 14 L1 24.843795 38.3175374 9.801393e-10 1.0000000  
## 15 E2 21.106024 39.7930808 4.686813e-10 1.0000000  
## 16 E3 16.255186 47.4947565 9.965062e-12 1.0000000  
## 17 E4 5.286333 69.4324628 1.716989e-16 1.0000000  
## 18 E1 0.000000 78.0051282 2.361767e-18 1.0000000  
## EvidenceRatio  
## 1   
## 2 1.58102551028895  
## 3 1.77417673545795  
## 4 2.23746813197239  
## 5 2.44070157829935  
## 6 2.54960755055216  
## 7 3.08654144883331  
## 8 3.15608048307511  
## 9 3.54182917563461  
## 10 3.89605570762704  
## 11 3.96391384476862  
## 12 90465974.3062215  
## 13 137611150.654807  
## 14 209193185.123101  
## 15 437479503.736961  
## 16 20575733976.1682  
## 17 1194174346378019  
## 18 86815717791836624

## Family: nbinom1 ( log )  
## Formula:   
## Caribou ~ LD1750 + VegHt + low1750 + pSnow + (1 | Site) + (1 | Month)  
## Zero inflation: ~ActiveDays  
## Data: det  
##   
## AIC BIC logLik deviance df.resid   
## 622.1 672.4 -301.0 602.1 1118   
##   
## Random effects:  
##   
## Conditional model:  
## Groups Name Variance Std.Dev.  
## Site (Intercept) 1.0876 1.0429   
## Month (Intercept) 0.1715 0.4141   
## Number of obs: 1128, groups: Site, 59; Month, 12  
##   
## Overdispersion parameter for nbinom1 family (): 0.967   
##   
## Conditional model:  
## Estimate Std. Error z value Pr(>|z|)   
## (Intercept) -6.7578 1.7212 -3.926 8.63e-05 \*\*\*  
## LD1750 -0.9165 0.5590 -1.640 0.101   
## VegHt -0.4786 0.4189 -1.142 0.253   
## low1750 9.1998 1.9716 4.666 3.07e-06 \*\*\*  
## pSnow -1.6254 0.3867 -4.203 2.63e-05 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Zero-inflation model:  
## Estimate Std. Error z value Pr(>|z|)  
## (Intercept) 2.8454 2.3821 1.194 0.232  
## ActiveDays -0.2442 0.2557 -0.955 0.340

### Plotting residuals against fitted values and predicted values for all covariates

