**Brown bear damage: patterns and hotspots in Croatia**

Dário Hipólito, Slaven Reljić, Luís Miguel Rosalino, Seth M. Wilson, Carlos Fonseca and Đuro Huber

Supplementary Table 1 Brown bear damage to livestock/domestic animals in Croatia during 2004–2014 based on reports of the Croatian Ministry of Agriculture.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Mean value per animal (EUR) | No. of attacks | No. of animals injured/killed | Mean no. of animals per attack | Mean number of animals per attack without protection | Mean number of animals per attack with protection |
| Goats | 60.00 | 3 | 4 | 1.3 | 1.5 | 1.0 |
| Turkeys | 35.00 | 3 | 22 | 7.3 |  | 7.3 |
| Chickens | 7.50 | 18 | 169 | 9.4 |  | 9.4 |
| Sheep | 75.00 | 20 | 88 | 4.4 | 5.0 | 4.0 |
| Donkeys | 400.00 | 1 | 1 | 1.0 | 1.0 |  |
| Rabbits | 9.00 | 8 | 61 | 7.6 | 5.7 | 8.8 |
| Cows | 100.00 | 3 | 5 | 1.7 | 1.0 | 3.0 |
| Pigs | 107.50 | 2 | 2 | 1.0 |  | 1.0 |
| Horses | 200.00 | 1 | 1 | 1.0 | 1.0 |  |
| Deer | 200.00 | 1 | 1 | 1.0 |  | 1.0 |
| Dogs | 90.00 | 1 | 1 | 1.0 |  | 1.0 |
| Ostriches | 300.00 | 1 | 1 | 1.0 | 1.0 |  |

Supplementary Material 1 Details of generalized linear models for four hypotheses that could potentially explain differences in damage frequency between different areas.

Acronyms for variables: Per cent cover of forest (%For); per cent cover of scrub and/or herbaceous vegetation associations (%Shrub); per cent cover of artificial surfaces or houses (%Urb\_hou); per cent of arable land and permanent crops (%Agr); per cent of heterogeneous agriculture areas (%Het\_agr); per cent of wetland (%Wet); per cent of water bodies (%Wat); number of villages (Villag) within each hunting reserve; distance to protected areas (Dist\_PA); type of bear occurrence (Bear\_oc), according to the Croatian Bear Management Plan and LIFE DinAlp Bear project report (i.e. constant vs sporadic); number of bears ≥ 8 years old hunted in each hunting reserve (Hunt\_8).

Best models for each hypothesis (ΔAICc<2) and variables whose CI 95% did not include zero are marked in grey.

**Hypothesis 1: Land cover factors**

Produced models

Global model call: glm(formula = Damage\_100km2 ~ Villag + %Urb\_hou + %Agr +

 %Het\_agr + %For, family = “Gaussian”, data = z\_hotspot4)

Model selection table

 (Int) Villag %Agr %Urb\_hou %For %Het\_agr df logLik AICc delta weight

10 -2.1700 1.046 1.454 4 -636.699 1281.6 0.00 0.178

9 -1.0750 1.524 3 -638.256 1282.6 1.02 0.107

14 -1.8950 1.193 -0.6309 1.402 5 -636.209 1282.8 1.14 0.101

26 -1.3220 1.196 1.290 -0.46150 5 -636.436 1283.2 1.59 0.080

12 -3.2080 1.047 0.4464 1.686 5 -636.465 1283.3 1.65 0.078

30 -0.6544 1.435 -0.7792 1.162 -0.64080 6 -635.726 1283.9 2.31 0.056

11 -2.1070 0.4443 1.755 4 -638.028 1284.3 2.66 0.047

16 -3.0060 1.200 0.4822 -0.6560 1.650 6 -635.936 1284.4 2.73 0.045

13 -0.8538 -0.3258 1.503 4 -638.119 1284.5 2.84 0.043

25 -0.9429 1.504 -0.06069 4 -638.251 1284.7 3.10 0.038

28 -2.3900 1.211 0.4943 1.531 -0.50590 6 -636.151 1284.8 3.16 0.037

32 -1.8220 1.465 0.5575 -0.8220 1.427 -0.70070 7 -635.362 1285.4 3.75 0.027

22 2.8670 1.753 -1.0240 -1.19500 5 -637.739 1285.8 4.20 0.022

15 -1.9150 0.4631 -0.3483 1.742 5 -637.872 1286.1 4.46 0.019

18 2.4860 1.474 -1.03400 4 -638.978 1286.2 4.56 0.018

27 -1.9180 0.4534 1.728 -0.09675 5 -638.015 1286.4 4.75 0.017

29 -0.6185 -0.3398 1.467 -0.10390 5 -638.105 1286.6 4.93 0.015

2 1.5170 1.171 3 -640.492 1287.1 5.49 0.011

6 1.6980 1.352 -0.8020 4 -639.725 1287.7 6.05 0.009

24 2.9460 1.730 -0.1197 -1.0030 -1.15500 6 -637.718 1287.9 6.30 0.008

20 2.6730 1.439 -0.2594 -0.95480 5 -638.877 1288.1 6.47 0.007

31 -1.6190 0.4779 -0.3686 1.699 -0.14550 6 -637.844 1288.2 6.55 0.007

4 2.0390 1.147 -0.5164 4 -640.065 1288.4 6.73 0.006

1 2.9510 2 -642.368 1288.8 7.18 0.005

8 2.1430 1.319 -0.4522 -0.7501 5 -639.398 1289.1 7.51 0.004

17 3.7820 -0.64180 3 -641.752 1289.6 8.01 0.003

3 3.4870 -0.5622 3 -641.872 1289.9 8.25 0.003

5 3.1850 -0.4669 3 -642.099 1290.3 8.71 0.002

21 4.1110 -0.5375 -0.68740 4 -641.396 1291.0 9.39 0.002

19 4.0400 -0.4269 -0.52660 4 -641.484 1291.2 9.57 0.001

7 3.6650 -0.5305 -0.4154 4 -641.659 1291.6 9.92 0.001

23 4.3080 -0.3752 -0.4903 -0.58220 5 -641.191 1292.7 11.10 0.001

Models ranked by AICc(x)

Coefficients (Coef), Standard Error (SE), z-score and p-value and coefficients of CI 95% of variables included in the first ranked model.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variable | Coef | SE | z-value | Pr (> |z|) | CI 95% |
| Intercept | -2.169 | 1.655 | -1.311 | 0.192 | -5.414/1.075 |
| Villag  | 0.136 | 0.078 | 1.757 | 0.081 | -0.016/0.288 |
| %For | 0.070 | 0.025 | 2.760 | 0.006 | 0.020/0.120 |

**Hypothesis 2: Landscape protection status**

Produced models

Global model call: glm(formula = Damage\_100km2 ~ Dist\_PA, family = "gaussian", data = z\_hotspot5)

Model selection table

 (Int) Dist\_PA df logLik AICc delta weight

1 4.6502 -1.6181 3 -639.3042 1284.6 0.00 1.000

Coefficients (Coef), Standard Error (SE), z-score and p-value and coefficients of CI 95% of variables included in the first ranked model.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variable | Coef | SE | z-value | Pr (> |z|) | CI 95% |
| Intercept | 4.650 | 0.952 | 4.884 | <0.001 | 2.784/6.516 |
| Dist\_PA  | -1.648 | 0.664 | -2.483 | 0.014 | -2.949/-0.347 |

**Hypothesis 3: Bear population characteristics**

Produced models

Global model call: glm(formula = Damage\_100km2 ~ Hunt\_8 + Bear\_oc,

 family = "gaussian", data = z\_hotspot6)

Model selection table

 (Int) Ber\_oc Hunt\_8 df logLik AICc delta weight

4 -2.544 1.278 1.010 4 -638.497 1285.2 0.00 0.400

2 -3.056 1.512 3 -639.663 1285.5 0.24 0.355

3 2.410 1.306 3 -640.359 1286.9 1.63 0.177

1 2.951 2 -642.368 1288.8 3.58 0.067

Models ranked by AICc(x)

Coefficients (Coef), Standard Error (SE), z-score and p-value and coefficients of CI 95% of variables included in the first ranked model.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variable | Coef | SE | z-value | Pr (> |z|) | CI 95% |
| Intercept | -2.545 | 2.673 | -0.952 | 0.343 | -7.784/2.695 |
| Bear\_oc  | 1.978 | 1.028 | 1.923 | 0.056 | -0.038/3.993 |
| Hunt\_8 | 0.582 | 0.383 | 1.519 | 0.131 | -0.169/1.333 |

**Hypothesis 4: Hybrid hypothesis**

Produced models

Global model call: glm(formula = Damage\_100km2 ~ %For + Dist\_PA + Bear\_ocen +

 Villag, family = "gaussian", data = z\_hotspot7)

Model selection table

 (Int) Bear\_oc Dist\_PA Villag %For df logLik AICc delta weight

15 -0.3989 -0.03952 2.673 1.599 5 -633.292 1276.9 0.00 0.395

16 -1.7600 4.342 -0.03493 2.742 1.508 6 -633.213 1278.9 1.98 0.146

11 0.7029 -0.03605 1.703 4 -635.445 1279.1 2.19 0.132

14 -6.5910 16.620 2.728 1.306 5 -634.903 1280.2 3.22 0.079

12 0.3159 1.261 -0.03469 1.677 5 -635.438 1281.2 4.29 0.046

13 -2.1700 2.299 1.702 4 -636.699 1281.6 4.70 0.038

7 3.1670 -0.04211 2.955 4 -636.764 1281.8 4.83 0.035

6 -5.5990 22.400 3.065 4 -636.961 1282.2 5.22 0.029

8 -1.6890 13.470 -0.02740 3.117 5 -635.918 1282.2 5.25 0.029

10 -4.4930 13.470 1.476 4 -637.064 1282.4 5.43 0.026

9 -1.0750 1.784 3 -638.256 1282.6 5.72 0.023

3 4.6500 -0.03843 3 -639.304 1284.7 7.81 0.008

2 -3.0560 19.660 3 -639.663 1285.5 8.53 0.006

4 0.7164 11.100 -0.02615 4 -638.742 1285.7 8.78 0.005

5 1.5170 2.573 3 -640.492 1287.1 10.19 0.002

1 2.9510 2 -642.368 1288.8 11.87 0.001

Models ranked by AICc(x)

Coefficients (Coef), Standard Error (SE), z-score and p-value and coefficients of CI 95% of variables included in the first ranked model.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variable | Coef | SE | z-value | Pr (> |z|) | CI 95% |
| Intercept | -0.399 | 1.764 | -0.226 | 0.821 | -3.858/3.060 |
| Dist\_PA | -0.080 | 0.031 | -2.606 | 0.010 | -0.140/-0.020 |
| Villag | 0.158 | 0.077 | 2.064 | 0.041 | 0.008/0.309 |
| %For | 0.066 | 0.025 | 2.631 | 0.009 | 0.017/0.115 |