

Kavčič, I., Adamič, M., Kaczensky, P., Krofel, M., Kobal, M. and Jerina, K. 2014. Fast food bears: brown bear diet in a human-dominated landscape with intensive supplemental feeding. – *Wildlife Biology* 000: 000–000.

Appendix 1

Resampling method to test differences in EDEC values between food categories

Method

The differences in the EDEC of food categories over all seasons for all regions were tested using bootstrapping (Efron and Tibshirani 1993). We considered each scat as one unit and calculated differences between EDEC values for all possible pairs of food items (e.g. EDEC of food category 1 minus EDEC of food category 2; in total 21 pairs) for each scat. With the weighted selection with replacement of scat samples we created 10 000 resamplings, and then calculated the average difference in EDEC values for each resample and for all 21 pairs of food items. When selecting units (scats) for each resampling, we used such weights 1) that all seasons were equally represented in each resample and 2) that samples in each resample were distributed among the three regions in the proportions according to the relative number of bears present in each region (data from Jerina et al. 2013). We created a distribution function of EDEC differences from 10 000 resamples (for each pair of food items; in total 21 pairs). For each difference in EDEC we estimated the probability that it is different from zero (= 1 - relative rank of the first resample in the distribution function of differences, for which the sign was changed from positive to negative or vice versa). Calculated probabilities were then corrected due to multiple comparisons (21 comparisons for six independent samples in seven food categories in the sample). The results of the analyses are presented in the table below.

Table A1. Differences in EDEC values between food categories for the whole study area on an annual basis, analysed by the resampling method (bootstrapping). Values above diagonal are test probabilities, below diagonal the symbol *** indicates pairs of EDEC food items that are different with $p < 0.001$, ** pairs that are different with $p < 0.01$, * pairs that are different with $p < 0.05$, and ns the pairs that are not significantly different ($p > 0.05$).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Maize (1)		<0.001	<0.001	0.302	0.002	0.043	<0.001
Livestock carrion (2)	***		0.011	0.001	0.101	0.025	<0.001
Wild ungulates (3)	***	*		<0.001	<0.001	<0.001	0.003
Insects (4)	ns	**	***		0.005	0.103	<0.001
Fruits (5)	***	ns	***	**		0.165	<0.001
Hard mast (6)	*	*	***	ns	ns		<0.001
Other plant material (7)	***	***	**	***	***	***	

References

- Efron, B. and Tibshirani, R. 1993. An introduction to the bootstrap. – Chapman and Hall/CRC.
- Jerina, K. et al. 2013. Range and local population densities of brown bear *Ursus arctos* in Slovenia. – Eur. J. Wildl. Res. 59: 459–467.

Appendix 2

Table A2. Percent frequency of occurrence (FO%) of food items found in 363 brown bear scats in two different parts of the study area (Kočevska and Snežnik) in Slovenia during spring, summer and autumn 1993–1998.

Food item	Spring (n = 75)	Summer (n = 119)	Autumn (n = 169)	Annual (n = 363)
Anthropogenic foods				
<u>Animal food</u>				
Livestock carrion	16.0	3.4	8.9	9.4
<u>Plant food</u>				
Maize	40.0	23.5	15.4	26.3
Crops	0.0	3.4	1.2	1.5
Natural foods				
<u>Animal food</u>				
Wild ungulates	12.0	5.9	7.1	8.3
<u>Insects</u>				
Formicidae	8.0	59.7	6.5	24.7
Apidae	0.0	5.9	13.0	6.3
Coleoptera	0.0	0.8	1.8	0.9
<u>Plant food</u>				
<u>Hard mast</u>				
<i>Fagus sylvatica</i>	18.7	0.0	27.2	15.3
<i>Quercus</i> sp.	4.0	0.0	17.8	7.3
<i>Corylus avellana</i>	0.0	1.7	1.8	1.2
<u>Soft mast</u>				
<i>Sorbus</i> sp.	4.0	0.0	12.4	5.5
<i>Amelanchier ovalis</i>	2.7	0.8	0.6	1.4
<i>Crataegus</i> sp.	0.0	0.0	1.2	0.4
<i>Rosa</i> sp.	4.0	1.7	5.9	3.9
<i>Cornus mas</i>	0.0	0.0	0.6	0.2
<i>Prunus avium</i>	0.0	5.9	0.0	2.0
Domestic fruits (<i>Malus domestica</i> , <i>Pyrus communi</i> , <i>Prunus domestica</i>)	0.0	2.5	45.6	16.0
<i>Rubus</i> sp.	0.0	6.7	3.6	3.4
<i>Fragaria</i> sp.	0.0	1.7	0.0	0.6
<i>Lonicera xylosteum</i>	0.0	0.8	0.0	0.3
Graminoides	82.7	70.6	24.9	59.4
Mushrooms	0.0	0.0	0.6	0.2
Tree buds, undetermined sp.	2.7	1.7	0.0	1.4
<u>Other</u>				
Bear hair	1.3	0.8	0.0	0.7
Unidentified	0.0	1.7	1.2	1.0

Appendix 3

Table A3.1. Per cent frequency of occurrence (FO%) of food categories found in 714 brown bear scats in Slovenia for three different seasons in three different regions (Kočevska, Menišija, Snežnik) of the study area, 1993–1998.

Food category	<u>Kočevska (n = 220)</u>				<u>Menišija (n =260)</u>				<u>Snežnik (n = 234)</u>				<u>Study area (n = 714)</u>			
	spring	summer	autumn	annual	spring	summer	autumn	annual	spring	Summer	autumn	annual	spring	summer	autumn	annual
Maize	64.3	38.3	16.1	39.6	32.3	56.6	60.9	49.9	10.2	15.9	11.7	12.6	41.4	33.1	20.6	31.7
Carrion	19.0	6.7	8.5	11.4	10.0	6.8	8.4	8.4	11.4	0.0	6.3	5.9	15.2	4.4	7.7	9.1
Ungulate	19.0	0.0	5.9	8.3	6.1	4.5	6.8	5.8	2.9	11.0	6.3	6.7	11.7	4.4	6.2	7.4
Insects	9.5	71.7	16.9	32.7	37.1	70.8	18.5	42.1	8.2	65.9	18.4	30.8	12.8	69.5	17.7	33.3
Fruits	0.0	23.3	65.3	29.5	0.0	27.4	38.0	21.8	8.2	18.3	67.0	31.1	2.8	22.1	62.2	29.0
Hard mast	14.3	1.7	35.6	17.2	3.2	2.8	4.3	3.5	20.4	6.1	30.1	18.9	14.9	3.3	29.5	15.9
Other plant material	85.7	70.0	22.0	59.2	83.9	54.7	34.8	57.8	83.7	78.0	49.5	70.4	84.8	70.7	33.2	62.9
Other	0.0	6.7	0.8	2.5	8.1	25.5	5.4	13.0	2.0	8.5	1.9	4.2	1.8	9.8	1.8	4.5

Table A3.2. Per cent faecal volume (FV%) of food categories found in 714 brown bear scats in Slovenia for three different seasons in three different regions (Kočevska, Menišija, Snežnik) of the study area, 1993–1998.

Food category	<u>Kočevska (n = 220)</u>				<u>Menišija (n =260)</u>				<u>Snežnik (n = 234)</u>				<u>Study area (n = 714)</u>			
	spring	summer	autumn	annual	spring	summer	autumn	annual	spring	Summer	autumn	annual	spring	summer	autumn	annual
Maize	22.6	12.3	7.5	14.1	21.3	35.7	47.8	34.9	3.3	7.4	5.4	5.3	15.8	13.8	12.2	13.9
Carrion	9.3	1.9	2.9	4.7	6.4	1.4	4.3	4.0	5.9	0.0	3.0	3.0	7.7	1.2	3.1	4.0
Ungulate	11.0	0.0	1.8	4.2	3.8	0.8	2.1	2.2	0.5	4.4	1.0	1.9	6.4	1.6	1.5	3.2
Insects	3.2	39.9	5.0	16.1	6.5	21.8	3.4	10.6	2.4	26.6	5.9	11.6	3.4	32.9	5.1	13.8
Fruits	0.0	15.1	45.5	20.2	0.0	11.1	25.6	12.2	3.8	7.6	40.7	17.4	1.3	12.0	41.1	18.1
Hard mast	8.0	1.5	30.5	13.3	1.6	2.3	2.3	2.1	15.4	2.7	20.2	12.8	9.7	2.0	23.2	11.6
Other plant material	46.0	27.3	6.4	26.6	59.3	22.8	12.8	31.6	68.6	51.0	23.8	47.8	55.6	34.8	13.3	34.6
Other	0.0	2.0	0.4	0.8	1.1	4.1	1.6	2.3	0.1	0.2	0.1	0.1	0.2	1.6	0.5	0.8

Appendix 4

Table A4. Logistic models with region, season and the interaction region×season as an explanatory variable for the occurrence of major food items in the brown bear diet in Slovenia, 1993–1998. The models were produced by the backward removal procedure and show probabilities that a given food category was present in a given sample. One level of each categorical variable served as a contrast (estimate = 0.00) for the other levels of that variable.

Model	Explanatory variables	Estimate	SE	Wald	p	
Maize	Region			60.30	<0.001	
		Kočevsko	0.00			
		Menišija	0.83	0.13	41.69	<0.001
		Snežnik	-1.18	0.17	50.30	<0.001
	Season*			4.07	0.131	
		autumn	0.00			
		spring	0.01	0.16	0.00	0.978
		summer	0.21	0.13	2.48	0.115
	Region × Season			39.79	<0.001	
		Kočevje-autumn	0.00			
		Menišija-spring	-0.71	0.20	12.22	<0.001
		Menišija-summer	0.02	0.17	0.01	0.927
		Snežnik-spring	-0.39	0.27	2.01	0.157
	Snežnik-summer	0.16	0.21	0.56	0.456	
Livestock carrion and wild ungulates	Season			13.15	0.001	
		autumn	0.00			
		spring	0.54	0.16	11.11	0.001
		summer	-0.55	0.17	10.08	0.001
Insects	Region*			3.56	0.169	
		Kočevsko	0.00			
		Menišija	0.23	0.15	2.37	0.124
		Snežnik	-0.30	0.18	2.80	0.094
	Season			146.90	<0.001	
		autumn	0.00			
		spring	-0.84	0.20	17.90	<0.001
		summer	1.58	0.14	123.57	<0.001
	Region × Season			18.19	0.001	
		Kočevje-autumn	0.00			
		Menišija-spring	0.99	0.24	17.32	<0.001
	Menišija-summer	-0.42	0.18	5.50	0.019	
	Snežnik-spring	-0.55	0.31	3.12	0.077	
	Snežnik-summer	0.10	0.21	0.24	0.621	

Fruits	Region*				3.22	0.200
		Kočevsko	0.00			
		Menišija	-0.03	0.02	2.37	0.124
		Snežnik	0.03	0.02	1.91	0.167
	Season				102.41	<0.001
		autumn	0.00			
		spring	-1.96	0.32	38.24	<0.001
		summer	0.18	0.20	0.81	0.369
	Region × Season				17.23	0.002
		Kočevje-autumn	0.00			
		Menišija-spring	0.42	0.25	2.85	0.091
		Menišija-summer	0.28	0.20	1.99	0.158
		Snežnik-spring	0.12	0.27	0.18	0.672
	Snežnik-summer	-0.43	0.23	3.49	0.062	
Hard mast	Region				27.95	<0.001
		Kočevsko	0.00			
		Menišija	-1.34	0.25	27.94	<0.001
		Snežnik	0.66	0.18	14.17	<0.001
	Season				33.26	<0.001
		autumn	0.00			
		spring	0.17	0.21	0.06	0.426
	summer	-1.10	0.25	19.76	<0.001	
Other plant material	Region				29.69	<0.001
		Kočevsko	0.00			
		Menišija	-0.14	0.12	1.25	0.264
		Snežnik	0.65	0.12	28.58	<0.001
	Season				82.96	<0.001
		autumn	0.00			
		spring	1.03	0.13	59.64	<0.001
	summer	0.05	0.12	0.15	0.699	

* main effect of variable is not significant