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Seasonal patterns of food use of wild boar (*Sus scrofa L.*) in a Central European floodplain forest

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Abstract

Wild boar populations are rising all over the world. This also counts for the Donau-Auen National Park (DANP). The aim of this study was to analyze seasonal and spatial changes in wild boars' diet in the DANP, the largest remaining floodplain forest in Central Europe. We analyzed the stomach contents of 242 wild boars shot in the DANP for regulation reasons. Plant matter (e.g. crops) proved being the most important food, while animal diet was negligible. Diet composition most likely was affected by management measures and/or human disturbance. A more natural feeding behavior of wild boars could only be achieved when reducing baiting. However, this may reduce regulation success, resulting in a population increase with potential negative impacts (e.g. on floodplain forest vegetation, increased crop raiding).

Key words

Diet, Donau-Auen National Park, Protected Areas, Wetlands, Austria

Introduction

Wild boars are omnivorous generalists, opportunistic and very flexible in their food selection. Hence, the food found in wild boars' stomachs often reflects the availability of food items. Consequently, there are seasonal differences in food use. Wild boars can also have a strong impact on animal species of high conservation relevance.

The aim of this study was to quantify seasonal changes in wild boars body condition and spatio-temporal differences in diet use in the DANP. Therefore, we analyzed stomach contents from 242 wild boars shot in the Donau-Auen National Park (DANP) between February 2015 and February 2016.

Our hypotheses are:

(H1) Adult wild boars show seasonal changes in body condition due to seasonally changing food availability.
(H2) Diet composition and diet breadth of wild boars varies between the seasons.
(H3) Wild boars' food composition and diet breadth are affected by management measures differing between study sites.
(H4) The high density of wild boars in the DANP might represent a potential conversation problem due to negative effects on the native herpetofauna.

Methods

The study was conducted in the DANP east of Vienna, Austria. We defined six study sites with almost the same size, two in the Viennese part (Lobau) and four in the Lower Austrian part of the national park. In total 242 wild boars' stomach contents have been analyzed (Lobau: n = 144; Lower Austria: n = 98). As no wild boars were shot in the Lower Austrian part between February and October, comparisons between stomach contents of wild boars between the Lobau and the Lower Austrian part of the DANP only consider the period November 2015-January 2016.
The fullness of the stomachs and the percentage volume of food items were estimated in percentage. Body condition was quantified for all adults by regressing body mass on body length. The residuals from this regression were used as an index of body condition.

Results

Seasonal changes in stomach fullness and body condition

Fullness of stomachs differed between months but was not related to body weight. Body condition proved being significantly affected by seasons. A distinct peak of higher body condition was found in October and November.

Seasonal Changes in diet composition and diet breadth

Food composition differed between all seasons. In winter Levin's Index of diet breath was highest followed by autumn. Plant material (94% mean relative volume) represented the most important food matter of wild boars' diet (Tab. 1).

Food category	Spring	Summer	Autumn	Winter	Total	Frequency
Plant matter	**94.2±12.1**	**93.3±9.4**	**94.6±9.2**	**93.3±13.8**	**94.0±11.5**	**100.0**
Maize/Crop	36.1±33.8	40.9±33.9	38.3±33.9	27.4±31.8	36.8±34.1	81.1
Grass/ Herbaceous Pl.	38.3±34.1	31.8±31.2	25.8±28.8	29.9±31.0	33.3±31.3	88.8
Fruits/Nuts/Beechnut	6.7±18.0	9.2±21.2	12.0±20.8	14.3±26.6	10.7±21.6	37.8
Root Tuber	11.0±24.9	8.0±22.7	12.2±26.4	19.7±31.5	9.0±21.9	23.1
Acorn	0.6±4.1	2.1±7.2	3.8±10.5	–	2.3±8.4	11.2
Mistletoe	0.4±1.8	0.3±1.9	0.5±2.2	0.4±1.4	0.5±2.0	6.3
Root	1.0±4.1	0.9±4.0	2.1±5.9	1.6±3.0	1.5±4.7	16.8
Animal matter	**4.7±11.0**	**5.6±8.0**	**3.5±6.9**	**2.7±5.4**	**4.4±9.3**	**44.1**
Vertebrate	1.3±5.4	0.7±2.8	0.8±3.0	1.3±3.3	1.1±4.3	18.2
Bird	–	–	–	0.5±2.7	0.1±1.3	1.4
Amphibian	–	–	–	0.3±1.8	0.1±0.8	0.7
Carrion	1.3±5.4	0.7±2.8	0.8±3.0	0.6±1.5	0.9±4.1	16.1
Invertebrate	3.4±7.3	4.8±7.8	2.7±6.5	1.3±4.0	3.3±7.0	32.2
Snail	2.9±6.3	3.6±6.4	1.7±4.5	0.4±1.8	2.4±5.5	25.9
Earthworm	0.2±1.0	0.8±2.6	0.7±2.5	0.5±2.0	0.6±2.1	10.5
Terr. arthropod	0.3±1.1	0.4±1.9	0.3±1.8	0.3±1.8	0.3±1.7	8.4
Other matter	**0.8±4.4**	**0.8±4.4**	**1.6±5.7**	**4.0±10.9**	**1.5±6.1**	**8.4**
Soil	0.6±3.7	0.6±3.7	1.3±5.3	3.4±10.5	1.3±5.9	7.7
Other	0.3±2.4	0.3±2.4	0.3±2.3	0.6±3.5	0.1±1.7	0.7

Table 1: Mean relative volume (%) of food types in different seasons in stomach contents of Viennese wild boars.

Regional differences in food use and food composition

Animals shot in the Lobau in November 2015 until January 2016 had slightly different stomach contents than wild boars shot in the Lower Austrian part during the same period. Further, the Levin's Index of wild boar diet breadth was higher in Lower Austria than in Vienna.

Discussion

Our study shows a great seasonal variation in fullness of stomachs and body condition of wild boars, indicating better food availability in the autumn and winter months, hence perhaps reflecting the mild winter during the study year. In other studies the mean stomach content was greatest in summer (e.g. Poland: GENOV 1981). No relation between stomach fullness and body weight and body condition respectively could neither be found by our nor by other studies (ASAHI 1995; CELLINA 2008). Wild boars' body condition differed significantly between seasons with a distinct peak in October and November. That wild boars were capable of maintaining a relatively high body condition in our study area even during the winter months may have been also caused by the warm and mild winter 2015/2016.

In our study seasonal changes in food use were visible especially in the consumption of fruits, acorns and root tubers and in the use of animal food. Crops including maize were the most important food types found, occurring in 81 % of the analyzed wild boar stomachs in the Lobau with the highest amount in summer. For wild boars maize is a very attractive food source (GENOV 1981), hence it is used often for supplementary feeding. To control the wild boar population, maize and other crops are also used in the DANP as bait by hunters. In our study we had a very low standardized Levin's Index value year around (Ba about 0.2), indicating a small diet breadth all over the year (MASSEI et al. 1996).

Food compositions during late autumn and winter differed between the two federal states was identified. In Vienna crop, including maize and wheat, are used for baiting and hence represented the most important food items. In Lower Austria grass and herbaceous plants are most important, while maize and other crops played only a subordinate role in wild boars' diet. A possible explanation could be that in Lower Austria, contrary to Vienna, more than the half of the shot wild boars were not hunted with baiting. Additionally, the results of the standardized Levins Index of the study sites in Vienna was under 0.2, while the study sites in Lower Austria reached a value of Ba>0.2.

Wild boars can have negative effects on the native herpetofauna (JOLLEY et al. 2010; KRULL & EGETER 2016) and can represent important predators of bird nestlings and nests (CARPIO et al. 2016; OJA et al. 2015; SENSERINI & SANTILLI 2016). In contradiction to results of other studies these food types did not contribute substantially to the diet of wild boars in the DANP. In 242 analyzed stomachs only one frog and two times remains of birds were found.

Our data indicates that a more natural feeding behavior of wild boars in DANP could only be achieved when reducing baiting. However, this may reduce regulation success and subsequently may result in an increase of the wild boar population. Considering the potential negative impact of higher wild boar densities in the DANP (e.g. on the vegetation of the floodplain forest) and an increase of crop raiding individuals in agricultural areas adjacent to the park border, further studies evaluating different scenarios are urgently required before modifying the current management measures to control the park's wild boar population.

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