



European Bison Conservation Newsletter Vol 10 (2017) pp: 71–78

Daily movements of wisents released to the wild in the Bieszczady Mountains

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Abstract: We measured the distances covered daily by 7 adult wisents (5M, 2F), released to the wild at Bieszczady Mountains. Those individuals were fitted with GPS collars, and their locations were recorded every hour between 27.01.2015 and 02.03.2017. Average distances of their daily movements ranged between about 1200 up to almost 1650m. The maximal recorded length of a daily covered distance was about 10 km. In winter, average spans of movements within 24 hrs were almost identical for cows and bulls, while, distances covered by cows in summer were greater by about 30%. In both seasons, movements of both bulls and cows within open areas were by about 40% shorter than those in the forest. On average, the greatest distances moved were recorded in the vegetative season for bulls within the forest (almost 2400m). However, comparing both sexes, cows moved for greater distances within open areas while bulls moved further in the forest. Generally, bulls moved at higher elevations than did females.

Key words: European bison, animal movements, daily distance, energy expenditure,

Introduction

A distance covered daily by an animal depends on many factors. The first obvious relationship relates to its body size and the area of home range or territory – typical for the species. Movements are essential for the search for food, water or cover, and during pursuit of a mate. Rapid sudden movements are a sign of flight e.g. from a predator or are caused by a human related disturbance. Systematic movements that follow a particular spatial pattern, occur usually during migrations e.g. when animals are changing their seasonal range. Last but not least, the distance travelled by an animal during the day depends also on environmental conditions i.e. terrain, density of vegetation, weather, and presence of natural barriers such as water-courses, wetlands, cliffs etc. (Perzanowski 1995; Barraquand and Benhamou 2008; Hansson and Akesson 2014; Wasiak and Perzanowski 2014).

Any movement requires an expenditure of energy, and while successful search for food may quickly compensate such cost, an effective escape from a predator or chasing a mate and fighting with competitors during the rut necessitate earlier



accumulation of energetic resources e.g. in the form of body fat (Parker *et al.* 1984, Bobek *et al.* 1990a; 1990b).

Animals that undertake seasonal migrations should reach an adequate body condition prior to migration but on the other hand not migrating, e.g. staying for winter within a summer range would inevitably end with their death. Therefore, it is very important to know beforehand the factors driving changes in locations when estimating and comparing of animals' daily movement distances.

The aim of this paper was the assessment of daily distances covered by wisents that were released to the wild in apparently optimal set of habitats, but in fairly short time were searching for their own preferred home range.

Study area, materials, methods

We estimated the distances moved daily by 7 adult wisents (5M, 2F) (Table 1) introduced to the Bieszczady Mountains under the framework of the project aiming to improve the genetic structure of the local free ranging population established with 18 animals in the early 1980s.

Table 1. Data on wisents studied in this project.

Sex	Name	Year of birth	Place of birth
F	ENTRE	2010	Eriksberg
F	ENDORA	2010	Eriksberg
M	XADIO	2010	Karlsruhe
M	JONAS	2011	Bielefeld
M	PUKOM	2012	Wola Michowa
M	PULECH	2012	Muczne
M	DZIKI*	2009/10	?

* this bull was among those introduced to the Bieszczady in 2011/12, and recaptured in January 2015, but since he lost his ear tag, its exact identification was impossible.

The animals were fitted with ML 931 XL GPS collars, and their locations were recorded every hour. Telemetric data were collected between 27.01.2015 and 02.03.2017. In total 99556 telemetric points were used for this analysis.

The wisents were released from an acclimatisation enclosure (49.2450435N, 22.1653503E), situated at forestry Wola Michowa of Komańcza Forest District in the Bieszczady Mountains, south-eastern Poland. After the release, the animals explored the vicinity of the enclosure, then moved a few km east prior to turning south to cross the international border between Poland and Slovakia, where they established their home range in the neighbourhood of the settlements of Osadne, Papin, Hostovice and Pcoline (Fig. 1).

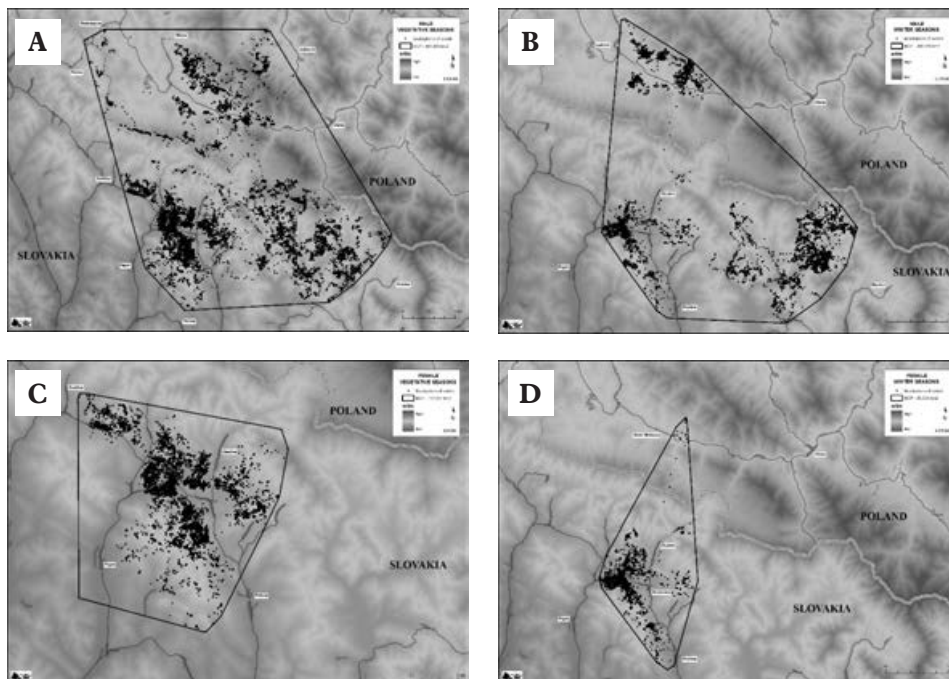


Fig. 1. Home ranges of wisents released at Forestry Wola Michowa: A – bulls in vegetative seasons, B – bulls in winter seasons, C – cows in vegetative seasons, D – cows in winter seasons.

Results

The home ranges of bulls were significantly larger than those of cows, ranging from about 308 km² in winter up to over 580 km² in vegetative season, while respective values for cows were only 88 and 113 km² (Fig. 1 ABCD).

Distances covered daily averaged between about 1200 up to almost 1650m, however maximal recorded length of a movement during 24 hrs was about 10 km. In winter season, average values of daily movements were almost identical for cows and bulls, while in growing season cows were more mobile by about 30%. Minimal recorded movements were associated with time periods wisents remained stationary while feeding at hay stacks and beets available at local collective farms (Table 2).

We also estimated distances covered by wisents within open and forested areas. The longest movements on average, were those of bulls during vegetative season in the forest (almost 2400m). In both seasons movements of both bulls and cows were considerably (even by about 40%) shorter within open areas. Generally, cows were more mobile in open areas while bulls covered greater distances in forest areas (Table 3).

Table 2. A comparison of distances covered daily by wisents (bulls and cows separately) during the vegetative and winter seasons.

Sex	Distances of daily movements (m)			
	min	max	average	SD
Vegetative seasons				
bulls	1	10383	1192	1839
cows	1	9248	1648	1875
Winter seasons				
bulls	1	9739	1251	1708
cows	1	9980	1259	1579

Table 3. A comparison of the length of daily movements of wisents (bulls and cows separately) within open and forested area as well as elevational ranges where animals were recorded during the vegetative and winter seasons.

A – Vegetative seasons – forest								
Sex	Distance covered (m)				Elevation above sea level (m)			
	min	max	average	SD	min	max	average	SD
bulls	1	9861	2375	1502	314	1148	616	149
cows	3	8460	1938	1330	308	780	472	84

B – Vegetative seasons – open area								
Sex	Distance covered (m)				Elevation above sea level (m)			
	min	max	average	SD	min	max	average	SD
bulls	3	7411	1441	1269	313	804	468	88
cows	1	7098	1647	1206	308	780	451	77

C – Winter seasons – forest								
Sex	Distance covered (m)				Elevation above sea level (m)			
	min	max	average	SD	min	max	average	SD
bulls	1	8931	1852	1351	308	793	546	103
cows	33	7243	1666	943	308	709	437	77

D – Winter seasons – open area								
Sex	Distance covered (m)				Elevation above sea level (m)			
	min	max	average	SD	min	max	average	SD
bulls	4	5919	1175	1100	306	709	485	95
cows	1	5443	1199	1128	294	647	407	70

Elevations where animals were recorded varied from the maximum obtained for bulls in the forest during summer (1148m) to minimal value of 294 m for cows in open areas during winter. Generally, bulls were present at higher elevations than females. The largest difference (144 m) was recorded during the vegetative season within the forest, while the lowest (17 m) was for open areas during the same season (Table 3).

Discussion

Wisents released at Bieszczady originated from captive breeding centres. Only one animal had a few years' experience living in the wild herd. Their release from the acclimatisation enclosure took place in winter, therefore they initially preferred to stay close to the feeders. Nevertheless, with an onset of spring they gradually moved southward towards higher elevations along the main ridge of the Carpathians, finally crossing the state border with Slovakia. Compared to their former range in Polish Bieszczady, which is almost 90% forested, they found there a mixture of forest patches with a number of well maintained pastures for beef cattle. Such a habitat structure secured both cover and good grazing grounds (Perzanowski *et al.* 2008). Additionally, in the central part of their new range there is former collective farm, now oriented for cattle breeding, with easily available hay stacks and open storage pits for beets. Therefore, the greatest daily distances covered by the wisents were recorded when animals were moving through the forest towards the international border. After establishing the new range, they become less mobile, especially in winter when they spent most of the time feeding on hay and beets.

The average and maximum values for the length of their daily movements were lower than those reported for wisents at Białowieska Forest (5 and 12 km respectively). However similar behaviour, connected with strong affiliation to feeding points during winter is very close to that for Białowieża wisents (Kraśńska and Kraśński 2007).

Also data on American plain bison show on average slightly larger distance of their daily movements (up to 3.2 km) (McHugh 1958).

The food base of wisents living in the Bieszczady Mountains is good in both quantity and quality, and especially in winter is much better than that available in lowland forests (Wołoszyn-Gałęza *et al.* 2016). This may explain relatively short distances covered daily.

Wisents in general are rather sedentary animals if they have easy access to satisfactory food resources. The annual rate of a linear expansion of the home range of the wisent herd established within the Komańcza and Baligród Forest Districts remained during first 20 years at the level of 0.7 km and later grew up to 2.6 km (Perzanowski *et al.* 2011; 2012). However occasionally, some solitary males may undertake long range migrations of up to several hundred kilometres (Kraśńska *et al.* 2014).

It is difficult to explain a difference in the length of daily distances covered by bulls and cows. Perhaps longer movements of bulls in vegetative seasons could be related to searching for cows during the rut, while cows, being in this part of the year pregnant or accompanying a calf, have a weaker tendency to move.

The relatively short daily distances covered by wisents after the establishment of the new range may indicate the high suitability of such habitat for those animals. Such quick and satisfactory adaptation to an environment considerably altered by man, may be also a good information for plans foreseeing an extension of the range of this species in Europe involving introduction of wisents into new sites.

Acknowledgements

Authors thank the Regional Directorate of State Forests at Krosno for the financial support of the project, and the Bieszczadzki National Park for sharing telemetric data.

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Dobowe przemieszczenia żubrów wypuszczonych na wolność w Bieszczadach

Streszczenie: Oceniane były dystanse przemierzane dziennie przez 7 dorosłych żubrów (5M, 2F), wypuszczonych na wolność w Bieszczadach, w ramach projektu mającego na celu poprawę struktury genetycznej, żyjącej tam wolnościowej populacji. Osobniki te zaopatrzone w obroże telemetryczne z nadajnikami GPS, ich pozycja była ustalana co godzinę, w ciągu dwóch lat (27.01.2015 i 02.03.2017). Średni dystans pokonywany w ciągu doby wahał się pomiędzy 1200 i niemal 1650 m. Maksymalne zarejestrowane przemieszczenie wyniosło ok. 10 km. W zimie, krowy i byki przemieszczały się na bardzo podobne odległości, natomiast w sezonie wegetacyjnym dystanse pokonywane dziennie przez krowy były o ok. 30% dłuższe. Średnio, najdłuższe były dystanse pokonywane dziennie przez byki w obszarze zalesionym (prawie 2400 m). W obu sezonach, przemieszczenia krów i byków w terenach otwartych były o ok. 40% krótsze niż te w obrębie lasu. Niemniej, porównując osobniki obu płci na terenach otwartych, dalej przemieszczały się krowy, podczas gdy byki wędrowały dalej w obszarach zalesionych. Generalnie, byki przemieszczały się na wyższych wysokościach n.p.m. niż samice.

