

The assessment of a wisent population structure in Bieszczady Mountains

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Abstract: Sex and age structure of a wisent population was assessed in Bieszczady Mountains on the basis of routine year-round observations conducted between 2001 – 2012, and compared with a structure estimation based upon analysis of wisent photographs. There were differences found between the western and eastern population of the region as well as among seasons of the year. In western subpopulation there was, according to applied method, a distinct dominance of bulls in both seasons (63.7% in the growing season and 58.5% in winter), while the percentage of calves was at a low level (below 10%), while in the eastern subpopulation, the estimated percentage of cows was generally higher (respectively 38.6 and 48.6%), however its proportion vs. bulls differed between seasons. The percentage of calves was much higher there – at the level exceeding 15% on average. Estimates based on the analysis of photographs gave much lower estimates for bulls: 32.1 and 35.5% respectively in summer and winter for western subpopulation, and 12.2 and 13.8% for the eastern subpopulation. The percentage of calves however, was assessed at much higher level there: 19.5 and 12.5% respectively. Discussed are reasons for differences in results obtained with both methods.

Key words: wisent, *Bison bonasus*, population structure, Bieszczady

Introduction

Methods for the assessment of a structure of large mammals' populations depend on the species, its behaviour, a habitat dominating within its home range, season of the year etc. Often, sex and age structures are estimated on the basis of direct observations, providing there are distinct differences between males and females or adult and young, allowing for making an assessment from a distance (e.g. aerial counts of moose). In some cases it is possible to distinguish tracks of males and females (e.g. red deer) or because of the size, separate tracks of young, but apart from genetic methods, so far nobody has proposed a reliable method for the determination of population structure based just on signs of animals' presence. The other problem is, that the most common is the case, that observed is only a portion of a population, which results in a bias of an estimate (e.g. underestimation of lone males). The task is easier, when the species of concern has a gregarious spatial distribution, i.e. when at certain conditions (e.g. foraging in winter) it forms large groups that may be considered as representative for the population (Bobek *et al.* 1984; Okarma & Tomek 2008; Perzanowski 2010).

The wisent belongs to such species, and especially when animals are provided with a supplementary food in winter, whole groups are fairly well visible from the distance. Because of a different curvature of horns, cows and bulls can be fairly easily distinguished, and calves from the last year are easy to tell from adults (Kraśńska & Kraśński 2007). However in a group, animals often make movements in various directions so it is also easy to count some individuals twice – therefore overestimate the size of the group and wrongly assess its structure. Hence, in this paper we attempted to compare results of population structure assessment based on counts done during field surveys with results of analysing the population structure using photos of wisent groups.

Material, methods, study area

The assessment is based on data derived from observation cards, collected during the routine monitoring of both subpopulations of Bieszczady wisents, between 2001 and 2012 (Perzanowski 2001–2012). Considered were only cards where the observer indicated the sex and age of animals. In total, for the analysis used were 627 of such cards.

For the comparison, good quality photographs of groups of wisents taken during the same period at Bieszczady (75) were used, both done during a routine monitoring and those which were taken accidentally by staff



Figure 1. An example of a photograph of a wisent herd from Bieszczady, used for the estimation of sex and age structure

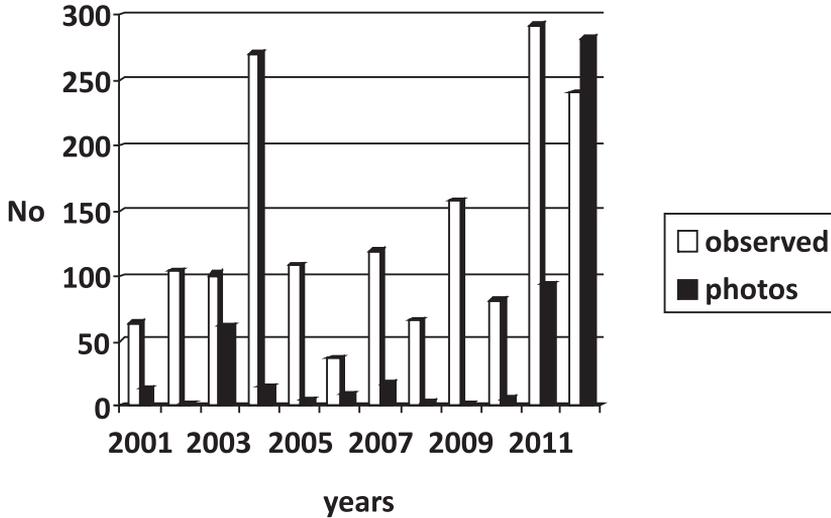


Figure 2. Numbers of identified animals in every year on the basis of observations and from photographs

members of Carpathian Wildlife Research Station of Polish Academy of Sciences, and local foresters. Only those photos where all visible animals could be identified to the sex and age class were used.

A differentiation between cows and bulls was done mostly on the basis of the horn shape, and calves were identified by the body size (Fig. 1).

Numbers of animals that were identified to the sex or age class in every year, either through observations or at photographs were very variable and in some years a number of record was insufficient to be considered as statistically significant (Fig. 2). Therefore, to base the calculations of population structure on a reliable set of data, records from years between 2001–2012 were pooled together.

Results and Discussion

There were differences observed in the proportion among bulls, cows and calves, between both subpopulations of Bieszczady, as well as between winter and growing seasons.

According to the estimate based on data from observation cards, in western subpopulation there was a distinct dominance of bulls in both seasons, while the percentage of calves was at a low level (below 10%), while in the eastern subpopulation, the percentage of cows was generally higher, however its proportion vs. bulls differed between seasons. The percentage of calves was much higher there – at the level exceeding 15% on average (Tabl. 1).

The estimate based on photos, shows a different picture. Cows dominated distinctly in both subpopulations regardless of the season, however much

Table 1. A comparison of the percentage of bulls, cows and calves in western and eastern wisent subpopulations of Bieszczady in growing and winter seasons, estimated on the basis of observation cards and photos (in parenthesis).

Sex/age class	Western subpopulation		Eastern subpopulation	
	Growing season	Winter season	Growing season	Winter season
Bulls	63.7 (32.1)	58.5 (35.5)	45.2 (12.2)	35.7 (13.8)
Cows	27.6 (60.2)	32.2 (52.1)	38.6 (68.3)	48.6 (73.7)
Calves	8.7 (7.7)	9.3 (12.4)	15.3 (19.5)	15.7 (12.5)

stronger in the eastern part. Percentage of calves is almost identical in winter season but differs significantly in summer (Table 1).

Definitely, the estimate based on available photos usually underestimates the number of males in the population, since photos of large groups, that are of mixed character i.e. dominated by cows with young, are much more frequent, while lone males being more human shy and only occasionally visible at the open, are rarely observed and even less often photographed. Therefore a distinct domination of cows over bulls visible at photos of eastern subpopulation can be relatively easily explained, since a large part of this subpopulation forms sizeable herds at Tworylne valley, consisting mostly of cows and young, and being fairly easy to photograph. On the other hand, herds from the western subpopulation are much less frequently visible at the open.

More difficult to explain is a result showing a dominance of bulls over cows in the western subpopulation, according to the estimate based on data from observation cards. To some extent it can be considered as artefact. For this subpopulation, among about 304 observed groups counting up to 3 individuals, only about 10% were mixed groups i.e. containing also cows. In many cases, information on observations of mixed groups (10 – 20 individuals) contained only the number of animals, without specification of sex structure. Also among some 176 observations of groups counting over 4 individuals, there are only 5 observations of groups larger than 25 animals, i.e. those large groups where females prevail. Therefore, a number of observations which identified the bulls, was there disproportionally high. This also has an influence upon the estimate of the percentage of calves, for which the accuracy of an estimate is dependent on the ability of detection and proper identification of animals in large mixed groups.

For the eastern subpopulation however, sex of observed animals was identified in 21 cases (out of the total number of observations – 222) of mixed groups counting 30–40 animals (where is a strong domination of females).

Perhaps also, quite high number of direct and indirect observations of bulls recorded at cards, was connected with a number of bulls that were released there as a part of an improvement of population's genetic structure. Those animals originated from breeding centres and zoos, were much less human shy than the free-ranging herd, and their presence could be much easier to be found.

The higher proportion of calves in the eastern part of Bieszczady population is in accordance with earlier observations, however extremely high result of 19.5% found on the basis of photographs for eastern population during the growing season should be regarded with a caution.

A comparison of data obtained from Bieszczady, with very reliable – long term observations from Białowieża according to Krasińska and Krasiński (2007), where on average the population consisted of 25% adult bulls, 37 adult cows, 23% adolescents and 15% calves shows, that in such large, stable population, the percentage of cows exceeds that of bulls for about 1/2. However, also at Białowieża recorded were considerable variations in the sex structure ranging from 14.7 – 30.5% for bulls and from 29.4 – 44.1% for cows. Also the percentage of calves varied between 10 – 21%. Nevertheless, values obtained at Bieszczady are in most cases outside of this range.

Additional source of discrepancies between the true and observed male/female ratio may be of behavioural origin, since males of that species have much stronger tendencies for migration which may contribute to their lower presence in records on population numbers (Krasińska & Krasiński 2007).

Since both used methods have their benefits and drawbacks calculated were average values for the numbers of bulls, cows and calves in the whole wisent population of Bieszczady based on all available data (Tabl. 2). Significant differences with t-test, at the confidence level of 0.05 were found between numbers in both seasons of cows and calves in the eastern population, for numbers of bulls and calves in both subpopulations in both seasons, and between cows from both subpopulations in the winter season.

Table 2. Numbers of bulls, cows and calves observed in both wisent subpopulations of Bieszczady (in bold), in growing and winter seasons (the average for all years of the survey). Separately calculated was their percentage (in parenthesis) derived from data obtained with all available methods.

Sex/age class	Western subpopulation		Eastern subpopulation	
	Growing season	Winter season	Growing season	Winter season
Bulls	50.08 (56.4)	48.00 (52.9)	26.75 (40.4)	28.58 (31.4)
Cows	31.16 (35.1)	33.58 (37.0)	28.83 (43.5)	48.66 (53.6)
Calves	7.5 (8.5)	9.16 (10.1)	10.66 (16.1)	13.66 (15.0)

Those values can be assumed as the best approximation of sex and age structure of this wisent population so far.

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Ocena struktury populacji żubrów bieszczadzkich

Streszczenie: Płciowa i wiekowa struktura populacji żubra w Bieszczadach była oceniana na podstawie całorocznych obserwacji prowadzonych pomiędzy 2001 – 2012 oraz porównana z wynikami oceny struktury populacji opartej na analizach fotografii stad żubrów. Wykazano różnice pomiędzy zachodnią i wschodnią populacją żubra w tym regionie oraz pomiędzy zimą a sezonem wegetacyjnym. W subpopulacji zachodniej wyraźnie dominowały byki w obu sezonach (63,7% w sezonie wegetacyjnym i 58,5% w zimie, a udział cieląt był niski (poniżej 10%). W subpopulacji wschodniej, udział krów był wyraźnie wyższy (odpowiednio 38,6 i 48,6%), jakkolwiek ich proporcja w stosunku do byków zmieniała się sezonowo. Dużo wyższa była tu też proporcja cieląt w populacji (odpowiednio 19,5 i 12,5%). Przeprowadzono dyskusję na temat przyczyn różnic w wynikach otrzymanych oboma metodami.
