

# Group stability – a pilot study of a wisent herd of Bieszczady Mountains

Kajetan Perzanowski\*, Maciej Januszczak, Aleksandra Wołoszyn-Gałęza

Museum and Institute of Zoology, Polish Academy of Sciences, Carpathian Wildlife Research Station at Ustrzyki Dolne, Poland

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**Abstract:** To assess a multiannual dynamics of group structure/composition in a wisent herd inhabiting Bieszczady Mountains, compared were records of presence of characteristic individuals with deformed/malformed/broken horns. Selected were 14 observations of possibly large groups (over 10 individuals), representing in total 388 individual records, obtained between 2008 – 2015, within the range of an eastern subpopulation of wisents in this region (so called “Tworylne” herd). Estimated was the total number of individuals in a group, proportion of bulls, cows and young up to 1 year. Among bulls identified were three age classes: 2 years, 3–5 years, 6+ years. Among cows distinguished were young females in their second year of life and older (3+). The most variable was the presence of bulls. The presence of cows was more stable, however even in case of a cow observed every year between 2008 – 2014, there were several gaps in her presence in the herd. High irregularity of group structure and composition, excludes purposefulness of performing the population census for wisent herds living in fairly natural conditions just once a year. Population census should take place in late winter/early spring, during the period of highest stability of mixed groups, and be repeated during the rut when adult bulls temporarily join the herd.

**Key words:** European bison, Carpathians, group dynamics, deformed horns, population census

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## Introduction

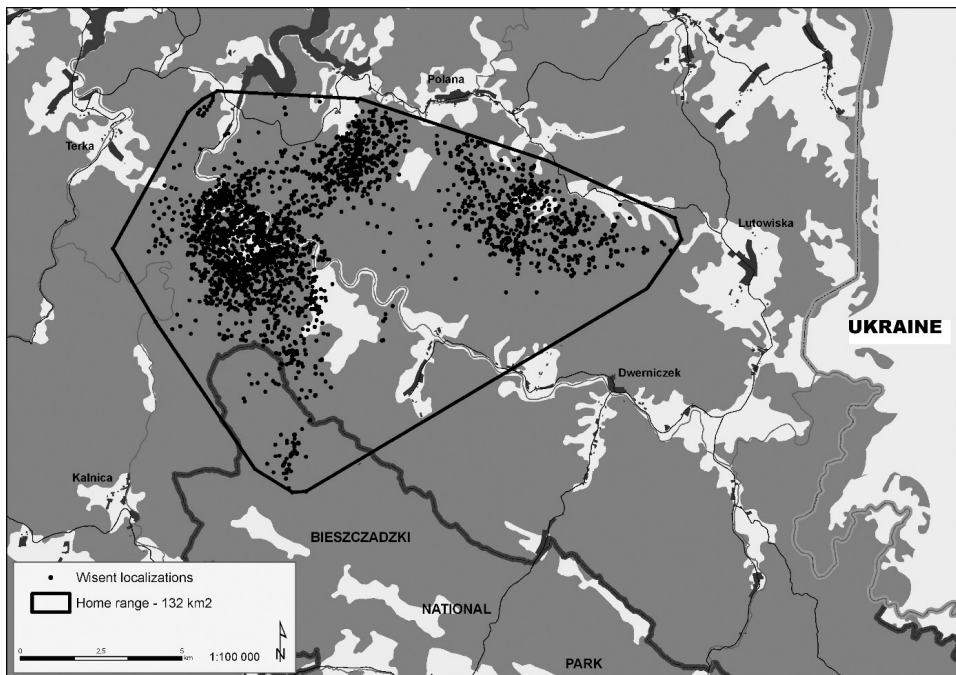
There are several patterns of socio-spatial structure of animal populations. Basically there are: solitary, usually territorial species (e.g. lynx), territorial family groups (e.g. wolf packs), and non-territorial, usually not-closely related formations (e.g. deer or wisent herds). Size and composition of such groups, as well as their spatial distribution, are affected by many factors, both internal – like age and sex structure of the group and animals’ density, and external – like climate (season), availability of food, predation, anthropoppression etc. Temporal variation can be observed in all types of animal groups, however the lower degree of kinship, the more variable is the size and structure of the group. Additionally, there are sex related differences regarding the association with the group. Generally females, especially those with young, tend to be more resident while males exhibit stronger tendency towards migration (Berger 1978; Owen-Smith 2010; Latombe *et al.* 2014).

Understanding of spatio-temporal patterns of a group size and structure is crucial for exact estimates of population numbers/density, and therefore for implementing proper measures in conservation and management of a population. Such knowledge is particularly crucial for highly endangered species, surviving in relatively small populations, and like in the case of wisents reintroduced to the Carpathians, requiring a careful course of action towards their maintenance or introduction into new ranges (Perzanowski and Olech 2014).

So far, long term studies on the social structure and stability of wisent groups were conducted in both parts of Białowieża Forest (Kraśiński 1978; Kraśiński *et al.* 1994; Kraśińska *et al.* 1987; Kraśińska and Kraśiński 1995; Kraśiński *et al.* 1997; Kozło and Bunevich 2009). The aim of this study was to assess multiannual range of changes in numbers and sex/age structure reflecting stability of a wisent herd inhabiting eastern part of Bieszczady Mountains.

## Study area, Materials, Methods

For this analysis used were records (photos and video) of wisent groups of Lowland-Caucasian line, belonging to so called “Tworylne herd”, being a part of eastern subpopulation of this species at Bieszczady Mountains. Its numbers during the



**Fig. 1.** Multiannual (2008 – 2015) home range of “Tworylne herd” at Bieszczady Mountains.

reported period fluctuated between 91 – 117 individuals. Those records were taken within the multiannual annual home range of this herd, during years 2008 – 2015. Its total area is estimated for 132 km<sup>2</sup> (Fig. 1) (Perzanowski 2008 – 2014).

Obtained data allowed only for the analysis of the structure of mixed groups. For the purpose of this study, in order to eliminate observations that could be accidental or concerning situations when the herd disturbed by the presence of people or predators would be temporarily broken into random units, considered were only records of groups containing at least 10 individuals.

Estimated was the total number of individuals in a group, proportion of bulls, cows and young up to 1 year. Among bulls identified were three age classes: 2 years, 3–5 years, 6+ years. Among cows determined were young females in their second year of life and older (3+). Observations were taken in two locations (Tworylne and Olchowiec), situated about 5 km from each other, where animals were well visible at the open ground. This area in vegetative season provides good quality pasture, and in winter there are sites where game animals are supplied with hay silage, which is also available for wisents.

In all surveyed groups recorded was the appearance of individuals with characteristic (e.g. deformed, malformed, undeveloped, broken etc) traits/forms of horns (Fig. 2 A, B).



Fig. 2. Examples of recorded wisents with deformed/malformed horns (A – bull, B – cow).

## Results

For the purpose of this study analysed were records of 14 groups. Cumulative number of individuals recorded within those groups equaled to 388. The size of observed groups ranged between 14 – 43 animals (27.7 on average) (Fig. 3).

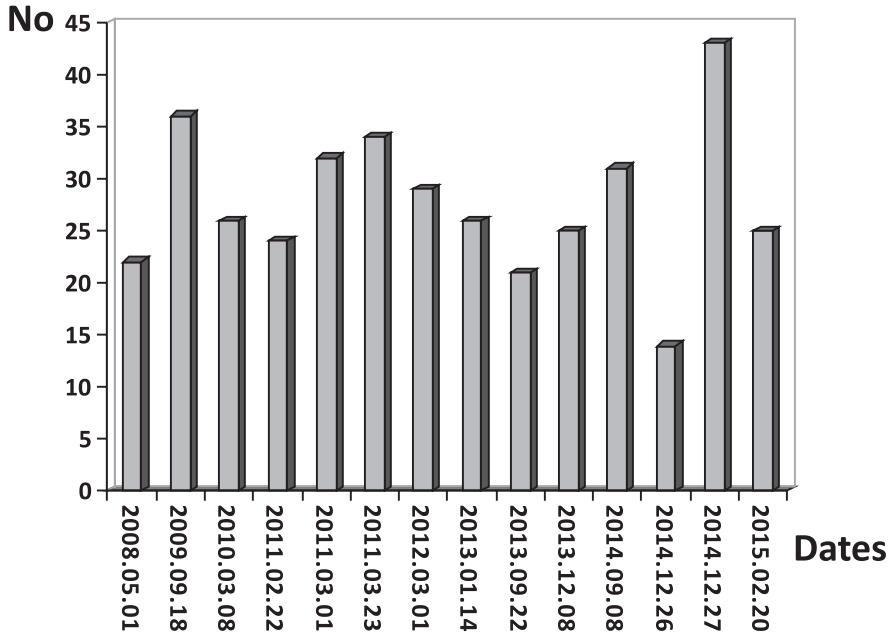


Fig. 3. Numbers of recorded individuals in observed wisent groups between 2008–2015.

Considerable changes in group size were recorded even in two consecutive days e.g. 26 – 27 of December 2014, when the group counted 14 and 43 animals respectively. The proportion of bulls in observed groups ranged between 4.6 and 34.9% (average  $19.4 \pm 9.6$ ). The percentage of calves was between 0.0 and 26.9% (average  $12.2 \pm 7.4$ ). The multiannual recruitment rate was estimated there for 12.6%, however it also ranged considerably from 0% in December 2014, when none of 12 observed cows was with a young, up to 26.9% in March 2010, when 13 cows were accompanied by 7 calves.

Quite surprising was very low incidence of older bulls (6+), which in 5 cases were not visible at all, and only in 3 observations recorded was the presence of 2 such individuals which represented then 13 – 25% of all males, and 4.6 – 7.7% of the whole group.

The proportion of cows varied to a lesser degree, and on average young females constituted 13.5% of the herd, while adult cows 54.0%. The highest percentage of young cows (almost 29%) was observed in December 2014, while the lowest (8.3%) in March 2011. The proportion of old cows ranged between 35–77% (May 2008 and December 2014 respectively).

Specific for this herd is quite high number of individuals (mostly cows) with damaged or characteristically malformed horns which allowed for identification of particular individuals (Tabl. 1, 2).

**Table 1.** Dates, numbers and sites of appearance of identified individuals with characteristic/deformed horns.

Date	Herd numbers	Characteristic		Identification No	Surveyed sites
		Cows	Bulls		
01-05-2008	22	1	–	C1	Tworylne
18-01-2009	36	1	–	C1	Tworylne
08-03-2010	26	2	–	C1, C3	Tworylne
22-02-2011	24	4	–	C3, C4, C5, C6	Olchowiec
01-03-2011	32	3	–	C4, C5, C8	Olchowiec
23-03-2011	34	5	–	C1, C3, C4, C7, C8	Olchowiec
01-02-2012	29	6	–	C1, C2, C3, C5, C8, C10	Olchowiec
14-01-2013	26	6	2	B1, B2, C1, C2, C3, C5, C6, C7	Tworylne
22-09-2013	21	4	1	B3, C2, C5, C7, C9	Tworylne
08-12-2013	25	–	2	B1, B2	Tworylne
08-09-2014	31	6	2	B1, B4, C2, C3, C5, C7, C8, C9	Tworylne
26-12-2014	14	3	1	B1, C1, C5, C7	Tworylne
27-12-2014	43	4	1	B1, C1, C2, C5, C7	Tworylne
20-02-2015	25	3	–	C2, C5, C9	Olchowiec

**Table 2.** Description of characteristic traits (anomaly of horns – malformed or deformed) of identified individuals in observed groups.

Identification No	Description
C1	Cow with deformed, pointless left horn; properly developed right horn
C2	Cow with deformed, conical left horn; properly developed right horn
C3	Old, saddle-backed cow with visible only damaged remnants of both horns
C4	Cow with asymmetrical horns; lack of the left horn; right horn of helical shape turned out frontward
C5	Cow with properly developed left horn; right deformed, short and strongly thickened
C6	Adult cow with remnants of horns
C7	Cow with remains of horns, left blunt, right with a point
C8	Cow with deformed left horn ended up with ball shape knot
C9	Cow with deformed left horn – curved and blunt; right horn properly developed
C10	Young cow with remnants of left horn, right deformed, growing upwards
B1	Bull with telemetric collar
B2	Bull 6+ years old with asymmetric horns; left turned up backwards
B3	Over 10 years old bull without horns. Observed only during the rut of 2013
B4	Over 10 years old bull with broken right horn. Observed only during the rut of 2014

Certain individuals appeared in the herd “Tworylne” for a number of years, e.g. cow C1, observed in 2008, 2009, 2010, 2011, 2012, 2013, and 2014, however not being visible in meantime in two observations of 2011, two of 2013 and one of 2014. Similarly the cow C2 that appeared for the first time in February of 2012, was observed also twice in 2013, and 2014, and once in 2015, but was not recorded once in 2013 and 2014. On the other hand the cow C6 observed first in February 2011 appeared once more only in January 2013.

Even more erratic were appearances of bulls, e.g. B3 that was seen only in September 2013 and B4 observed once in September 2014. Only B1 was recorded twice in 2013, and three times in 2014. The same individuals were periodically observed in both sites surveyed in this study (Tworylne and Olchowiec) (Tabl. 1).

## Discussion

Social structure of wisent herds was the most particularly studied at Białowieża (Kraśńska and Kraśński 2007; Kraśńska *et al.* 2014). According to those data, the group composition in this species is very changeable, especially in late spring during calving period. At that time observed were 39% of all annual changes in group structure. Nevertheless, quite considerable variability was observed in group composition also during the rut i.e. in early autumn. Those wisent herds were the most stable in early spring. The most variable components of wisent groups are bulls and young individuals, while the most stable – adult cows.

Similar seasonal fluctuations in the age/sex group structure were observed in a number of gregarious, herbivorous species like American bison, bighorn sheep, red deer, caribou etc. so this phenomenon seem to be quite common among large herbivores (Berger 1978; Clutton-Brock *et al.* 1982; Lott and Minta 1983; Latombe *et al.* 2014).

There are numerous reasons and mechanisms affecting variability in age/sex structure of animal populations, including domination (driving away young and subdominated individuals), search for optimal foraging patches (often different for both sexes), maternal care, anti-predator behaviour, human related factors etc. (Lott and Minta 1983; Fortin and Fortin 2009; Owen-Smith 2010; Courant and Fortin 2012,).

Nevertheless, such high irregularity of group structure and composition, excludes purposefulness of performing the population census for wisent herds just once a year, since there is a high chance for obtaining completely random results. This concerns especially wisent populations dwelling in mountain habitats. Except of some herds, that are intensively fed with supplemental forage during winter, and therefore an absolute majority of such population simultaneously gather around feeders, an inventory of wisents living in fairly natural conditions should be performed at least twice a year.

Such census should take place in late winter/early spring, during the period of highest stability of mixed groups, and repeated during the rut when bulls, that remain solitary or stay in small bachelor groups during vegetative season, join the main herd in search for susceptible cows.

Detailed data on group dynamics can be obtained with help of telemetry, however even simple, easy to observe traits, allowing for individual identification of animals in the group, may be sufficient to assess the rate of changes in age/sex composition of a given social unit.

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### Stabilność grupy – pilotowe studium stada żubrów w Bieszczadach

**Streszczenie:** Badaniami objęto tzw. stado „Tworylne” stanowiące główną część wschodniej subpopulacji żubrów linii LC w Bieszczadach, którego wieloletni areal został oceniony na 132km<sup>2</sup> (Ryc. 1). Liczebność tego ugrupowania fluktuowała w okresie objętym niniejszym opracowaniem między 91 – 117 osobników. Dane zebrano w dwóch miejscach koncentracji żubrów z tej subpopulacji, znajdujących się na obszarze administrowanym przez Nadleśnictwo Lutowiska. Na podstawie bezpośrednich obserwacji, udokumentowanych zdjęciami wykonanymi w latach 2008 – 2015, analizowana była dynamika struktury bytujących tam stad. Analiza ta objęła 14 ugrupowań żubrów o liczebności powyżej 10 osobników (od 14 do 43) (Ryc. 3). Skumulowana liczebność osobników zaobserwowanych w obrębie tych grup wyniosła 388. Spośród nich 14 można było zidentyfikować indywidualnie na podstawie charakterystycznych cech indywidualnych związanych z anomaliami rogów takimi jak ubytki czy deformacje (Ryc. 2 A, B, Tabl. 1, 2). W obserwowanych ugrupowaniach analizowane były także: ich bieżąca liczebność, udział byków, krów oraz cieląt. Ze względu na wiek byki zaliczono do 3 klas: 2 lata, 3–5 oraz 6 lub więcej lat, podczas gdy krowy do dwóch klas: samice 2 letnie oraz 3 letnie i starsze.

Obecność charakterystycznych, dorosłych byków (4 osobniki) w poszczególnych ugrupowaniach okazała się najbardziej niestabilną zmienną. Obecność zidentyfikowanych na podstawie charakterystycznych cech rogów u krów (10 osobników) była bardziej stabilna, jakkolwiek nawet krowy obserwowane tam poprzez 6 lat (2008–2014) okresowo nie były wykazywane w tych grupach. Zmienna była również frekwencja byków i krów w kolejnych obserwacjach. Wykazano także przemieszczanie się poszczególnych osobników pomiędzy dwoma miejscami koncentracji zidentyfikowanymi dla tej populacji. Dlatego też, z uwagi na dużą nieregularność w strukturze ugrupowań, w przypadku populacji żubrów bytujących w warunkach zbliżonych do naturalnych – ich inwentaryzacja nie może być oparta na obserwacjach przeprowadzanych raz do roku. Dotyczy to zwłaszcza populacji bytujących w środowisku górskim. Obserwacje takie powinny być optymalnie przeprowadzane późną zimą/wczesną wiosną tj. podczas okresu dużej stabilności grup mieszanych oraz powtórzone w okresie rui, gdy dorosłe byki okresowo przyłączają się do stad składających się z krów i młodych osobników.

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