

## The level of knowledge and attitude to European bison from a local perspective – a preliminary study in north-eastern Poland

DANIEL KLICH<sup>1</sup>, WANDA OLECH<sup>1</sup>, MARTA ŻYGOWSKA<sup>2</sup>

<sup>1</sup>Faculty of Animal Sciences, Warsaw University of Life Sciences – SGGW,

<sup>2</sup>Faculty of Veterinary Medicine, Warsaw University of Life Sciences – SGGW

**Abstract:** *The level of knowledge and attitude to European bison from a local perspective a preliminary study in north-eastern Poland.* Among main reasons of lower acceptance of European bison (*Bison bonasus*) by local communities is the fear of the extent of the possible damage. The fear may be related to myths about the ecology of European bison. The aim of this study was to analyse the level of knowledge of local communities regarding the European bison, and its relation with the level of acceptance for the species. The survey was conducted in the area with already existing population of European bison (Bielsk Forest District), and the area where its reintroduction just have started (Augustów Forest District). The study was based on questionnaires filled out personally by workshop participants. The questionnaires contained a test on the level of knowledge on the European bison, the attitude towards this species, and basic information about the respondent. We found that the attitude to European bison was not driven by the level of knowledge. Respondents from Bielsk Forest District presented significantly lower level of acceptance than respondents from Augustów Forest District. The study confirms, that the level of acceptance towards protected species that may cause human-wildlife conflicts is related to the management methods in the area.

*Key words:* European bison, attitude, knowledge, Poland

## INTRODUCTION

In general, general public has a positive attitude to conservation efforts oriented towards the European bison in Europe (Balčiauskas et al. 2017, Bergsten 2014, Prior 2005). Nevertheless, the acceptance level may be lowered when the reintroduction of this species is seen from the local perspective (Balčiauskas and Kazlauskas 2014). Moreover, particular regions may differ regarding this phenomena, which generally depends on an importance of the natural environment in local economy (Decker et al. 2010). This is connected with differences in attitudes to European bison among various professional groups. The lowest acceptance is characteristic for farmers, especially those possessing larger farms (Bergsten 2014). The risk of losing an income because of damages, is the main reason of negative attitudes towards the European bison (Decker et al. 2010, Bergsten 2014, Balčiauskas et al. 2017). This relation plays an essential role in perceiving this species in areas where human-wildlife conflicts occur (Clark et al. 2016).

Differences in attitudes towards European bison were also found between

areas, where the species already occurs and areas where the reintroduction has been planned (Klich et al. 2018). In that study, respondents from the area where this species did not occur, presented lower level of acceptance, which could be a reason of negative myths about this species, mainly regarding an extent of possible damage to crops. Such myths are grounded upon a lack of knowledge of local inhabitants regarding the ecology of wild species and management of its population, which may in consequence rise a fear of such animal and induce a negative attitude (Lescureux et al. 2011, Røskoft et al. 2007). Such assumption lies at the base of best practices, which indicate workshops as an important tool facilitating the acceptance towards the European bison through an increase of the knowledge about this species (Olech and Perzanowski 2014). The aim of this study was an analysis of the level of knowledge of local communities regarding European bison, and its relation with the acceptance level for those animals. The survey was conducted for the area with already existing population of this species and an area where its reintroduction has just started.

## MATERIAL AND METHODS

The study was conducted between 17th and 20th November 2017, during workshops concerning European bison in two Forest Districts of north-eastern Poland: Augustów and Bielsk. The Augustów Forest District is managing a part of the Augustów forest complex, where a process of reintroduction of European bison just have started under the framework of

the project “A complex project for the conservation of European bison in Poland by State Forests” (Klich et al. 2017). The Bielsk Forest District is located to the west from the Białowieska Forest. Its area is already inhabited by a subpopulation of European bison, consisting of migrants from Białowieska Forest.

The study was based upon questionnaires filled out personally by workshop participants. The forms consisted of two pages of which the first was the test of the level of knowledge regarding the European bison, and the second page concerned the attitude towards this species and basic information about the participant. The knowledge about the European bison was tested with 48 questions separated into three categories: a) Biology (including genetics and veterinary); b) Ecology; c) Status (including the history and conservation). The attitude towards the European bison was assessed basing on 6 questions (Table 1). Each question was closed and five possibilities of an answer were offered; answers to each question were scored from 1 to 5 (questions 3–6) or from 5 to 1 (questions 1–2). The attitude to European bison was assessed as a mean score of the six questions which related to 5-point Likert scale, from 1 (negative attitude) to 5 (positive attitude). The sixth question concerning the attitude towards European bison differed slightly between Augustów and Bielsk Forest District (see Table 1).

An information about the participant included:

- sex: (man, woman);
- age (15–24, 25–44, 45–60, over 60 years);
- education (Primary school, Secondary school, Post-secondary); d) occu-

TABLE 1. Questions and possibilities of answers with their scores in the questionnaire concerning the attitude towards European bison

No	Question	Answers (scores)
1	Are there any threats to human health and life related to the presence of E. bison in the forest complex?	none (5), minor (4), medium (3), strong (2), very strong (1)
2	Are there any threats to incomes related to the presence of E. bison in the forest complex?	none (5), minor (4), medium (3), strong (2), very strong (1)
3	Are there any material benefits related to the presence of E. bison in the forest complex?	none (1), minor (2), medium (3), strong (4), very strong (5)
4	Can we expect an increase of attractiveness of this region due to the presence of E. bison in the forest complex?	none (1), minor (2), medium (3), strong (4), very strong (5)
5	Can we expect an increase of prestige of this region due to the presence of E. bison in the forest complex?	none (1), minor (2), medium (3), strong (4), very strong (5)
6*	If you could take part in referendum about re-introduction of E. bison to the forest complex, how would you vote?	firmly against (1), rather against (2), hard to say (3), rather for (4), firmly for (5)
6**	If you could take part in referendum about re-introduction of E. bison to the forest complex, how would you vote?	for the elimination of the E. bison population (1), a strong (over 50%) reduction of the E. bison population (2); hard to say (3) weak (less than 50%) reduction of the E. bison population (4); maintaining the existing state of the E. bison population (5)

\*question in Augustów Forest District, \*\* Bielsk Forest District

pation (agriculture, forestry, pension, other,  
 – area of the farm (0–0.5 ha, 0.5–5 ha, 5–20 ha, over 20 ha).

In total we received 51 correctly filled forms with the knowledge test and 49 forms related to the attitude towards the European bison.

All statistical tests were performed using the SPSS software (version 24.0, IBM Corporation, Armonk, NY). To examine the knowledge level we used an analysis of variance after check of normal distribution of the response variable (a percent of correct answers). In the analysis we set: location (Augustów or Bielsk Forest District) and category of knowledge (biology, ecology and status) as factors and an inter-

action between these two factors. We also used a general linear model to analyse the differences in attitude towards the European bison (as response variable). In the full model we were able to set the location (Augustów or Bielsk Forest District) and sex of participants as factors, and the knowledge level as covariate. The other variables (age, education, employment and farm area) were underrepresented in selected groups and thus were not included in the model.

## RESULTS AND DISCUSSION

An analysis of variance indicated a category of knowledge as the only variable that influenced the level of knowledge

TABLE 2. Statistical summary of analysis of variance of the level of knowledge about the E. bison and predictors: location (Augustów or Bielsk Forest District) and category of knowledge (biology, ecology and status) and interaction ( $R^2 = 0.11$ ;  $F = 3.698$ ;  $P = 0.004$ ); \* statistically significant

Source	<i>F</i>	<i>df</i>	<i>P</i>
Intercept	2910.62	1	0.000*
Location	0.44	1	0.507
Category	7.73	2	0.001*
Location * Category	0.52	2	0.595

level (Table 2). Respondents have given correct answers to ca. 75% of questions in the category “Biology”, 78% in category “Ecology”, and 65% in category “Status”. A percentage of correct answers in the category “Status” including history and conservation of the species was statistically lower comparing to both other categories (Fig.1). As there were no differences found between compared

Forest Districts, the data on the level of knowledge refer to all participants. A high level of knowledge in the categories “Biology” and “Ecology” suggests better understanding of the applied methods in E. bison conservation. Genetic and veterinary status included in the category “Biology”, are directly related to the problems with conservation of this species (e.g. Olech and Perzanowski 2002, Bielecki et al. 2013, Cabaj et al. 2013); “Ecology” is connected to the management practices applied in Poland (Olech and Perzanowski 2014). Lower level of knowledge in the “Status” category concerned mainly questions about the status and management of the European bison in other countries. This aspect seems to not play an important role in understanding the conservation efforts in local conditions of Augustów and Bielsk. Nevertheless it should be noted, that the study covered a specific group of the respond-

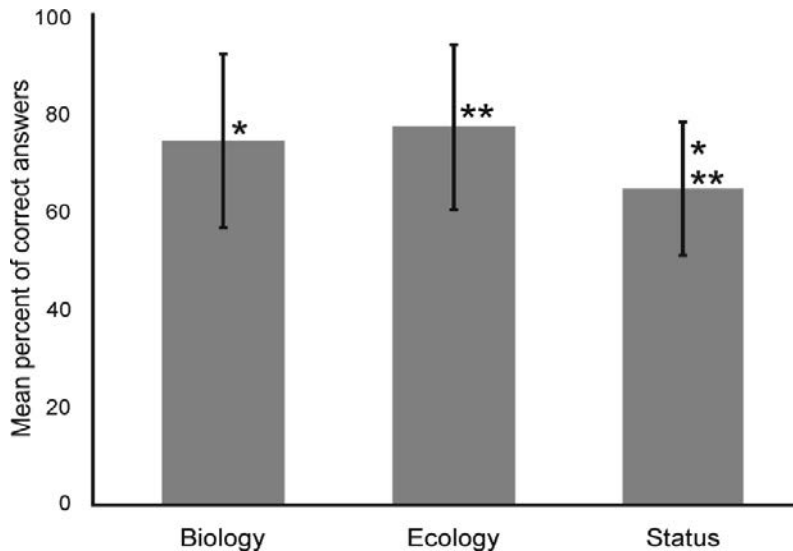


FIGURE 1. Mean level of knowledge ( $\pm$ SD) of workshop participants in relation to category of knowledge: Biology (including genetics and veterinary), Ecology, Status (including history and conservation), and post hoc Bonferroni test;  $N = 51$  in all cases; \*  $P = 0.009$ , \*\*  $P < 0.001$

ents that are more open for discussion and interested in participation in workshops than average local inhabitants. Besides, the dominating education level of our respondents was post-secondary. Assuming, that the level of knowledge is generally reflected by the education level (Røskaft et al. 2007), we should expect on average lower level of knowledge on this subject within local communities.

The attitude towards European bison was differentiated only by variable “Location” in the general linear model (Table 3). Other variables were not significantly different in the model. Respondents from Bielsk Forest District showed ambivalent attitude towards the European bison (3.04). Respondents from Augustów Forest District presented rather positive attitude (3.64), which was statistically different from Bielsk Forest District (Fig. 2).

The results are opposite to ones shown by Klich et al. (2018), where respondents in areas without the occurrence of European bison (Augustowska Forest and Rominka Forest) presented less favourable attitude comparing to the respondents from forest complexes

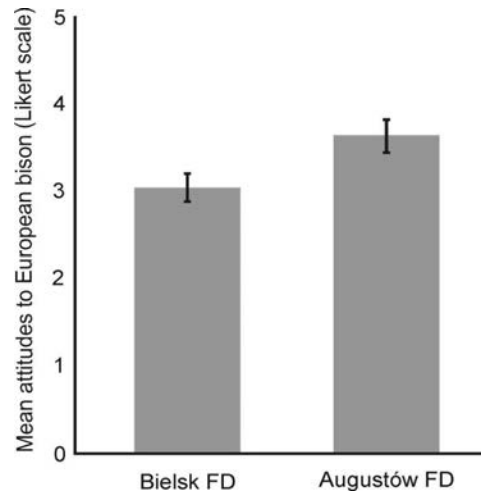


FIGURE 2. Mean attitudes towards European bison (±SE) of workshop participants in Bielsk Forest District and Augustów Forest District, and pairwise comparison with Bonferroni adjustment;  $N = 28$  and  $N = 21$  respectively;  $P = 0.018$

inhabited by this species (Borecka Forest and Knyszyńska Forest). Differences in the acceptance level found in this study were probably an effect of crop damages caused by European bison in the vicinity of Białowieska Forest (Hofman-Kamińska and Kowalczyk 2012), i.e. within Bielsk Forest District, where a part of core areas of European bison damage were located. In the region of Białowieska Forest, the number of damages as well as compensation level significantly increased from 14,000 Euros in 2010 to over 160,000 Euros by 2016 (Olech and Sobczuk 2018). The main crops damaged by European bison were cereals and hay, but in recent years rape was mainly damaged (Hofman-Kamińska and Kowalczyk 2012, Olech and Sobczuk 2018). This suggests that when the crop damage significantly exceeds the level of tolerance, it leads to even lower acceptance of the species in

TABLE 3. Statistical summary of general linear model of attitude towards E. bison and predictors: Location (Augustów or Bielsk Forest District) sex and knowledge level ( $R^2 = 0.27$ ;  $F = 4.067$ ;  $P = 0.007$ ); \* statistically significant

Source		<i>F</i>	<i>df</i>	<i>P</i>
Factors	Intercept	24.09	1	0.000*
	Location	6.08	1	0.018*
	Sex	2.22	1	0.144
	Location * Sex	1.08	1	0.305
Covariate	Knowledge level	0.84	1	0.364

areas inhabited by European bison comparing to areas without the presence of this species. In Bielsk Forest there was a lack of active management in the form of improvement of natural conditions for those animals, winter feeding etc. This could be a reason of human-wisent conflicts there and in a consequence a lower acceptance of European bison than in Augustów Forest District. Thus, the attitude towards European bison may be an outcome of the management methods (or their lack), used in the focal area, which is consistent with previous studies (Klich et al. 2018).

## CONCLUSIONS

The study did not confirm, that a knowledge level influenced the attitude towards the European bison, probably due to specific group of respondents participating in this survey. However, this topic should be more broadly studied in local communities, because it may provide suggestion regarding the strategy of information campaign before the establishment of a new population, and thus reduce the negative reception of conservation activities by local communities.

The study confirms, that the acceptance level of protected species that can cause human-wildlife conflicts is related to the management methods in the area. Thus the management of the European bison should be regarded as a main tool leading to mitigation of human-wisent conflicts. Including the Bielsk Forest District into conservation projects oriented towards mitigation of wisent related damages may contribute to changes in

the attitude of local community, but the positive long-term effect can probably only be achieved as a result of management measures that would lead to significant reduction of the damage level.

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- Streszczenie:** Poziom wiedzy i postawy wobec żubra z perspektywy lokalnej – badania wstępne w północno-wschodniej Polsce. Wśród głównych powodów niższej akceptacji żubra (*Bison bonasus*) przez społeczności lokalne jest obawa przed rozmiarem możliwych szkód. Strach ten może być związany z mitami dotyczącymi ekologii żubra. Celem badania była analiza poziomu wiedzy lokalnych społeczności na temat żubra i jego związku z poziomem akceptacji gatunku. Badanie przeprowadzono na obszarze istniejącej już populacji żubra (Nadleśnictwo Bielsk) i obszaru, na którym rozpoczęła się właśnie reintrodukcja tego gatunku (Nadleśnictwo Augustów). Badania oparte były na kwestionariuszach wypełnionych osobiście przez uczestników warsztatów. Zawierały one test poziomu wiedzy o żubrze, stosunek do tego gatunku i podstawowe informacje o respondencie. Stwierdziliśmy, że stosunek do żubra nie wynikał z poziomu wiedzy. Badani z Nadleśnictwa Bielsk prezentowali znacznie niższy poziom akceptacji niż respondenci Nadleśnictwa Augustów. Badania potwierdzają, że poziom akceptacji gatunków chronionych, które mogą powodować konflikty między ludźmi a dzikimi zwierzętami, jest związany z metodami gospodarowania populacjami tych gatunków na danym obszarze i ich skutecznością w ograniczaniu szkód.
- Słowa kluczowe:* żubr, postawy społeczne, wiedza, Polska
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**Authors' address:**

Daniel Klich  
Katedra Genetyki i Ogólnej Hodowli Zwierząt  
Wydział Nauk o Zwierzętach  
Szkoła Główna Gospodarstwa Wiejskiego  
w Warszawie  
ul. Ciszewskiego 8, 02-786 Warszawa  
Poland  
e-mail: daniel\_klich@sggw.pl