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ORIGINAL ARTICLE

The wolves are coming: understanding human controversies on the return of the wolf through the use of socio-cultural values

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Abstract

Wildlife comebacks are often subject to public debate. Recurring controversies dominate the discussion, while the frequent use of stereotypes to describe concerned actors reinforces polarizations. This is not any different for the return of the wolf. In order to assist in the interpretation of the human dimensions of the wolf debate, we propose the use of the socio-cultural (SC) value concept. This concept distinguishes between the performance and importance of ecosystem services and allows to give meaning to indicators without blindfolding on caricaturized profiles. The methodology is applied to the case study of the Ardennes (southern Belgium), where the wolf has recently made its comeback. An online survey, based on main points of controversy in human–wildlife debates, was presented to a large sample ($N = 1461$) of local residents and (potential) visitors, representative for age classes and gender. The answer options were modeled as a function of socio-demographic and profile variables, as well as SC value variables. Overall, a positive positioning was observed. The example of the hunter profile is used to demonstrate how SC values address heterogeneity within and overlap of profiles between groups. Our results show that the use of SC values, complementary to the sole use of standard profile variables, is an interesting tool to overcome preconceptions and to understand underlying reasons behind peoples stated position on points of controversy. These insights can, among others, lead to question the legitimacy of existing discourses and to transparency in terms of which values are accounted for by an actual or proposed management.

Keywords Socio-cultural values · Human–wildlife conflict · Carnivore re-establishment · Public debate · Conservation conflict

Introduction

Across Europe, the wolf's range is expanding, and it is reclaiming its original territory (Chapron et al. 2014). This comeback does not occur without controversy (Boitani and Linnell 2015; Linnell and Cretois 2018; Salvatori et al. 2020). The return of this predator could potentially benefit the restoration and maintenance of ecosystem functioning (Ripple et al. 2014), but it also challenges the current uses of a certain territory, as well as the current discourses and actor positioning in relation to the management of this same space (Drenthen 2015). Hence, the return of the wolf is as much an ecological question as a socio-political one (Benhammou 2019; Enck et al. 2006; Geerts 2018). When human concerns, perceptions, and attitudes are not properly taken into account through management policies, this potentially gives rise to human–wildlife conflicts, which often prove difficult to solve. Van Herzele et al. (2015) describe three recurrent points of controversy in public debates concerning wildlife comebacks. These are (i) whether the species in question belongs to the reclaimed territory or not; (ii) whether the animals represent an opportunity or a threat; and (iii) whether it is preferable to keep population sizes under control through human interventions or through natural processes. The way the question is brought to public

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debate through various forums (such as media channels, parliament, specialist magazines) by as well the general public as adherents of particular groups, such as hunters, conservationists, or farmers, often reinforces polarizations instead of contributing to solutions (Van Herzele and Aarts 2019). One dynamic that was identified as contributing to this polarization is the frequent use of stereotypes and the stigmatization of those particular groups. In order to obtain a more constructive way of establishing relationships between the concerned actors, it is essential to avoid this kind of conflict-reinforcing dynamic (see also Van Herzele and Aarts 2019). Therefore, a key element is to understand the support base of and the meaning behind those controversial positions within the general public, as well as within the actor groups that are subject of the aforementioned stereotyping.

Surveys and interviews are commonly employed methodologies to study the human dimension of wildlife debates or conflicts, either at a specific point in time (Ericsson et al. 2008; Hermann and Menzel 2013; Majić and Bath 2010) or over a larger time span (Dressel et al. 2015; Killion et al. 2019; Treves et al. 2013). This human dimension may concern values, beliefs, attitudes, or (intentional) behavior towards (the management of) a wildlife species (Enck et al. 2006). Drivers to explain or interpret the human dimension mainly include socio-demographic variables (such as age, gender, education, distance from wolf populations) (Arbieu et al. 2019; Frank and Sjöström 2007; Glikman et al. 2011), as well as other profile variables such as place of residency or profession/activity (being a hunter, a farmer, a tourist, etc.) (Bath et al. 2008; Heel et al. 2017; Naughton-Treves et al. 2003; Røskaft et al. 2007). In addition to those socio-demographic and economic variables, several studies corroborate the interest of adopting a more value-oriented approach for studying human–wildlife aspects (Dietsch et al. 2016; Grilli et al. 2018; Kaltenborn and Bjerke 2002; Teel et al. 2010; Vaske and Donnelly 1999). The cognitive hierarchy model (Fulton et al. 1996) is one often used conceptual framework that addresses the values–attitudes–behavior chain in human–wildlife interactions (Johansson et al. 2016). Within this framework, values are understood as fundamental values, which are few in numbers, slow to change, central to beliefs, and transcend to situations; they are accompanied by value orientations, which are less abstract basic beliefs towards a specific domain of interest (Grilli et al. 2018; Kaltenborn and Bjerke 2002; Manfredo and Dayer 2004; Vaske and Donnelly 1999). There are however multiple ways to address the value concept (Kenter et al. 2019; Spangenberg and Settele 2016). Contrary to previous studies that address values or value orientations towards wildlife specifically in order to explain or predict attitudes or behavior on wildlife and its management, this study focuses on contextual values for ecosystem services of a specific landscape to which wildlife is returning in order to interpret the positing of both the general public and particular actor groups on the aforementioned points of controversy concerning wildlife comebacks.

The ecosystem services' (ES) concept is a popular framework to oversee the study and management of nature and nature policies (Costanza et al. 2017; Díaz et al. 2015). It has nevertheless been criticized for its strong anthropogenic focus and its frequent orientation towards economic evaluations, excluding other interpretations and methodologies (Robertson 2006). Researchers have therefore called for a more integrated approach that takes multiple sets of values and the interactions between them into account (Jacobs et al. 2016; Martín-López et al. 2014). However, a mere integration does not account for the current confusion regarding the interpretation of the value concept within the ES framework (Felipe-Lucia et al. 2015; Fish et al. 2016). Kenter et al. (2019) identify three main concepts of values: (1) transcendental values, which correspond to the aforementioned fundamental values from the cognitive hierarchy model; (2) contextual values, which give meaning to the broader transcendental values; and (3) quantitative or qualitative value indicators as outcomes of an evaluation process. Breyne et al. (2021)[1] further propose to clarify the distinction between ES value indicators (whether social, economic, or biophysical) and socio-cultural (SC) values, where the former describe the performance of a service and the latter reflect the relative importance that an actor attributes to the service. As such, SC values offer a way to interpret and give meaning to the outcomes delivered by indicator-based ES assessments. SC values are contextual and place-based (Tadaki et al. 2017) and can withhold intrinsic and instrumental, as well as relational values (Arias-Arévalo et al. 2017; Small et al. 2017). The set of SC values used for a given study is flexible depending on the context and research settings.

By adopting the SC value concept, our aim is to contribute to the interpretation of the heterogeneity within certain subgroups (Sponarski et al. 2013) that are commonly used for classifying and explaining the attitudes of concerned actors (for example, residents vs. non-residents, farmers vs. non-farmers). First, we assess the positioning of people on the three aforementioned points of controversy formulated by Van Herzele et al. (2015), after which we evaluate the relationship between this positioning and standard socio-demographic and profile variables. We then evaluate the interest of using the SC value concept for a deeper understanding of people's position depending on which view they have of the territory and what they consider to be its

[1] A conceptual development is detailed in the paper "How the integration of 'socio-cultural values' can improve ecosystem service evaluations. Giving meaning to value indicators." On the time of writing, this paper has been accepted for publication by the journal Ecosystem Services. We will refer to this work by Breyne et al. (2021) hereafter.

functions or roles. In this sense, SC values offer a way to operationalize the "sense of place" concept, as described by Cheng et al. (2003) and Masterson et al. (2017, 2019). This approach is all the more important given that people's concerns, beliefs, attitudes, or behavior towards wolves do not necessarily represent an actor's opinion about the species per se but are instead a reaction to how this species impacts (or is thought to impact) the territory it claims. The return of the wolf to a certain territory challenges the actual use of this same space by humans and may reinforce existing competing interests between actors (Redpath et al. 2013). By providing insight into people's positioning on some main points of controversy concerning the return of the wolf, the aim of this paper is to contribute to the construction of a positive dialogue in the public debate by visualizing and understanding (1) the positioning of the general public on the outlined points of controversy and (2) the heterogeneity of the positing of the adherents of particular stakeholder groups on those same points. To illustrate the latter aim, the example of hunters as a particular group has been used. The insights based on why a landscape is important to whom, can assist policy makers in taking legitimate and transparent decisions concerning existing and potential human–wildlife conflicts (Everaert et al. 2018).

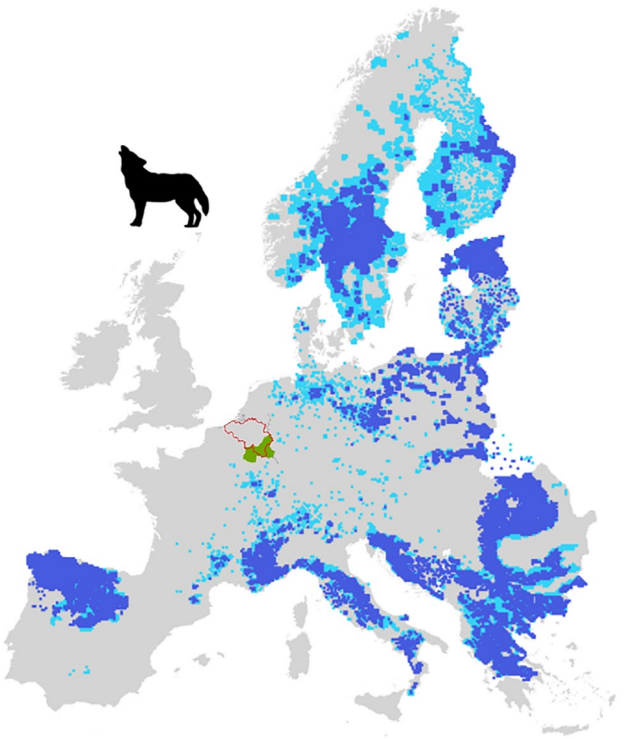

Fig. 1 The distribution of wolf populations in Europe. Trans-border Ardennes forests are indicated in green; Belgian contours are highlighted in red. Adapted from Icie (2020)

Methodology

Case study

The case study concerns the Belgian (cf. Walloon) Ardennes. The Ardennes is a highly forested region that represents a geographical unit of 11,200 km^2 that extends beyond Belgium, into Luxembourg, Germany, and France. The structural characteristics of these forests have been highly shaped by wood production and hunting activities. Its specific location, however, with six million people living within a buffer radius of 100 km, gives the Ardennes a peri-urban character, implying a high existing and potential demand for tourism and recreational activities (Colson et al. 2010). The revised forestry code from 2008 promotes a multifunctional landscape and aims to ease tensions between different users of the same space (Code Forestier 2008). These users include not only residents, farmers, hunters, forest owners, and loggers, but also tourist operators and tourists themselves. Tensions between different user profiles exist around a range of topics (Filot 2005), among which the presence and management of wildlife species. Recently, these tensions also concern the wolf species (Denayer and Bréda 2020).

The wolf had disappeared from Belgian territory during the nineteenth century due to hunting activities (Everaert et al. 2018). During the twentieth century, there were occasional stories about killed livestock or spottings (Everaert et al. 2018), but its presence remained unconfirmed. In 2018, a female wolf, descended from East German populations, was reported in Flanders (HLN 2018) (see Fig. 1). Shortly after, another male was photographed in the Hautes Fagnes, signaling the first official comeback of wolves in the Ardennes. At the time of this writing, five male wolves have been identified on Ardennes territory, of which at least one is sedentary (Le Soir 2019). The Ardennes are a major corridor for reconnecting wolf populations from southern Europe with those from Eastern Europe (De Standaard 2020).

The wolf has been legally protected since 1992 by the European Union Habitats Directive (92/43/EEC). To anticipate the wolf's arrival and manage its comeback, both Flemish and Walloon "wolf-networks," including diverse stakeholders, have been established[2] (Denayer and Bréda 2020; Everaert et al. 2018). These stakeholders include representatives from the public administration, from the hunting sector, from naturalist associations, from the livestock sector, from the academic sector, and from non-profit associations ("Réseau Loup" n.d.). As a result, a Walloon wolf management plan was released by the ministry at the

[2] In Belgium, due to the decentralization of official authorities concerned with nature protection and conservation, the regions of Wallonia and Flanders each have their own "wolf-regulation plan.".

start of this year (Schockert et al. 2020). The return of the wolf is a heavily mediatized topic, with frequent reporting on the number and the behavior of every wolf present on the territory. Nevertheless, this event is not completely without conflict. A major event was the illegal killing of a female wolf with cubs in Flanders in the spring of 2019. Hunters are suspected to be responsible for this act (Mariotti 2019), which was framed as "murder" in several media communications (Buitenlandredactie 2019; Somers 2019). Because of their conflicting position regarding wolves and their management (Denayer and Bréda 2020; Filot 2005), hunters are one of the main profiles addressed through this study. Even though this was not specifically asked in the survey, it is known that hunters in the Ardennes region mainly concern big game hunters (Goethals 2017). Also the position of farmers, forest owners, forest loggers, and tourist operators was evaluated. Since the survey did not allow for a profound profiling, we did not expect any influence from a broad farming profile. Being a forest owner or a forest logger could potentially have an influence on the respondents' positioning, due to the overpopulation of ungulates and wild boar in the region (Delvaux 2015), on which the presence of wolves could have a regulating effect. However, the overlap with a hunting profile is recurrent for these two categories. Tour operators finally could think of the wolves in the Ardennes in terms of either an opportunity or a threat for their business, depending on how they estimate the reaction of the visitors to the region. Since the return of the wolf is inevitable and public policy leans towards cohabitation, it will be of major importance for policy makers to oversee and ensure an inclusive implementation of the wolf management plan in order to avoid conflicts (Van Winckel 2019).

Survey

An extensive web-based survey targeting residents and (potential) visitors to the Ardennes was drawn up using Limesurvey software, with the objective to assess people's preferences, expectations, concerns, behavior etc. of, for, and in the Ardennes' natural environment. The survey could be filled out either in Dutch, French, or German. The survey sampling was carried out by Kantar ("Global Data Insights" n.d.), based on their double-opt-in panel[3] representing the general public. The sampling group consisted of (i) residents, (ii) visitors, and (iii) potential visitors, the latter two being inhabitants of the neighboring regions of the Ardennes. This targeting was due to the focus of the overall survey on nature-based tourism in the Ardennes region. Therefore, in France, only inhabitants of the Grand Est and Haut-de-France regions (northern France) were sampled, and in Germany, only the Länder Nordrhein-Westfalen, Rheinland-Pfalz, and Saarland (eastern Germany) were sampled. In all of these specific regions, the wolf has recently made or is making its return. It must be noted, however, that the wolf has been present for a longer time in other regions of both Germany and France. Kantar was responsible for guaranteeing the representativeness of the sample according to age class (only adults were allowed to participate) and gender. Nevertheless, the representativeness of the sample in terms of age, gender, and education level was verified for each country with Eurostat data (Eurostat 2020a, b). The survey was conducted in April 2019 and took an average of 17 min. A total of 1667 questionnaires were received. After deleting 151 questionnaires to which respondents replied too quickly (identified as speedsters[4]), as well as 55 others for which not all of the wolf questions had been answered, the final sample included 1461 useable records (Flanders-Brussels, 297; Wallonia,[5] 372; France, 276; Germany, 244; the Netherlands, 272),[6] to which we will henceforth refer to as the wider public. In respect to the current legislation on privacy regulations, respondents agreed on a consent to participate, and all data was treated anonymously.

Questions on the return of the wolf

The survey included four questions focusing on the return of the wolf (Table 1). Questions 1 to 3 each address one of the controversies concerning wildlife returnees, as described by Van Herzele et al. (2015). More specifically, Question 1 deals with people's belief on the question of belonging; Question 2 (wolf regarded as an opportunity or a threat) refers to people's behavioral intention regarding recreational services; and Question 3 assesses people's opinion on the financing of management strategies. Questions 4a and 4b serve to complement Question 3 and assess people's opinions on tax contributions since the Walloon wolf plan proposes certain measures that will have to be paid for, such as the implementation of electric fences to protect livestock from wolf attacks. The relationship between taxation and wolf tolerance is therefore of specific interest for decision-makers on wolf management (Linnell and Cretois 2018).

[3] In double-opt-in panels, the panelists, after having voluntary opted to be part of the panel, confirm their contact email, authorize receiving invitations to surveys, and provide background data.

[4] Respondents replying faster than 40% of the median interview time.

[5] The Belgian regions, Flanders, Brussels, and Wallonia, were based on the ZIP codes of respondents' residencies. Flanders and Brussels were combined for the analysis since neither is concerned by the Walloon regulations on wolf management.

[6] Due to confidentiality issues, it was not possible to include respondents from Luxembourg, who are also frequent visitors to the Ardennes.

Table 1 Questions on the return of the wolf in the Ardennes as presented to the survey respondents

Questions	**Answer options**
1. To what extent do you agree with the following statement: "An animal such as the wolf belongs to the Ardennes' natural environment"?	5-point Likert items: strongly disagree, disagree, neutral, agree, strongly agree
2. Has the return of the wolf had or will have an influence on your forest visiting behavior?	a) I would go less often into the forests b) I would not change the frequency of my visits, but I would feel less at ease c) No influence d) I would not change the frequency of my visits, but it would render my forest visits more exciting e) I would go more often into the forests
3. Since the wolf is back in the Ardennes, what measures should be financed in order to manage its expansion and interactions with human activities?	a) Measures to eradicate the wolf populations in order to obtain zero interaction with human activities b) Limit the effects of the wolves and constrain their territory so that wolf–human interactions remain rare c) Indifferent d) Promote cohabitation between wolves and human activities without restraining them (knowing that on some occasions, these interactions can cause damages)
4. a)To what extent do you agree with the following statement: "It is normal for a small part of the taxes to be earmarked to manage the expansion of the wolf and its interactions with human activities?"	5-point Likert items: strongly disagree, disagree, neutral, agree, strongly agree
b)(Only asked when disagreeing with Question 4) For what reason did you disagree with the statement that "It is normal for a small part of the taxes to be earmarked to manage the expansion of the wolf and its interactions with human activities?" Chose the most pertinent response	a) I am not in favor of the return of the wolf, so I don't wish that a part of my taxes be earmarked to manage its expansion b) I don't think all citizens should pay for this, only those who are in favor of the wolf's return c) I think this topic is too specific for it to be included in our taxes d) I don't live in a country where the wolf has returned/will return

The scoring of SC values

Respondents were asked to score SC values by distributing a total of 100 votes over 13 SC values, thereby enforcing an indication of their relative importance. It was not mandatory to include all the listed SC values in the scoring; an automatic counter was used to avoid miscalculations.

Respondents were only able to see the explicative phrase (second column). In addition, the order of the SC values was randomized for the survey to avoid the introduction of a bias related to a fixed order of SC values.

For a more detailed description concerning the concept of SC values, the objectives of the overall survey, and the choice of the SC values listed in Table 2, interested readers can refer to Breyne et al. (2021).

Modeling people's positioning on points of controversy regarding the comeback of wolves in the Ardennes

Answer options were modeled as a function of all three sets of variables (see Date overview section), applying an ordered logit model (Greene and Hensher 2010). All SC values underwent an ln (SC value + 1) transformation, commonly used to minimize the effect of outliners (Garson 2012). Interaction terms were defined between the variable country/region — with Wallonia (WL) as the reference[7] — and each socio-demographic variable. The answer options to the four questions were either 5-point Likert items (Questions 1 and 4) or represented a natural ordering (Questions 2 and 3). Question 3 had only four 4 answer possibilities while the other questions had five. While this could potentially have influenced the respondent's way of answering, the number of response possibilities does not change the ordered logit estimation conceptually as long as each question is analyzed separately. Assuming a latent variable regression model where y_n^* is a latent continuous measure

$$y_n^* = \sum_{i=1}^{I} \alpha_i x_{in} + \sum_{j=1}^{J} \beta_j z_{jn} + \sum_{l=1}^{L} \gamma_l v_{ln} + \sum_{c}^{C} \sum_{i=1}^{I} \delta_{ic} x_{in} D_c + \varepsilon_n, n = 1, \ldots, N \quad (1)$$

In this function, x_{in} are socio-demographic variables, z_{jn} are profile variables, and v_{ln} are SC value variables describing the respondent n. D_c=1 if the respondent is from region c and 0 otherwise (c = {Flanders, France, Germany, Netherlands}).α_i, β_j,γ_l, and δ_{ic} are the parameters to be estimated. ε_n

[7] The Walloon region is taken as a reference since this region is the administrative unit responsible for wolf management in the Belgian Ardennes.

Table 2 The socio-cultural (SC) values presented to the respondents

Socio-cultural value	Explicative phrase showed to the respondent
	The Ardennes forests are important to me because …
Esthetic value	… I can enjoy the views, sounds, smells, etc
Biodiversity value	… they provide a habitat for wild animals, plants and microorganisms
Direct economic value	… they provide economic products such as timber, mushrooms, game, etc
Indirect economic value	… they create jobs because of their touristic attractiveness, of which I can make use of as a user or operator from the touristic sector
Extensive recreational value	… they provide a space for my outdoor activities such as hiking, biking, observation of fauna and flora, etc
Intensive recreational value	… they provide a space for my outdoor activities such as quad, 4×4, MTB circuits, mass events, etc
Future value	… they allow future generations to know and experience these forests
Patrimonial value	… they are part of the cultural patrimony in the same way as villages, abbeys and castles, and they are part of the history of the region
Relational value	… they provide a place to create or reinforce social relationships (outings with family or friends, working environment, etc.)
Mistrust value	… one could feel ill at ease in those forests because they create fears (of getting lost, they are dark and gloomy, etc.)
Life support value	… in the battle against climate change and the maintenance of a healthy living environment through the renewal of soil, air, water, etc
Mystical/therapeutic value	… they are inspiring places and make one feel better, physically as well as mentally
Disservice value	… they can also have a negative impact on daily life (less room for urbanization or agriculture, pests or damage by wildlife, etc.)

is an error term distributed randomly according to a logistic distribution. The latent variable y_n^* is not observed but is assumed to be linked to the stated ordinal answer options with discrete values 1,…,H by the censoring mechanism in Eq. (2) where τ_h are the observed thresholds defining the boundaries between the different answer options, which are estimated freely, together with the parameters in Eq. (1), by maximization of the log likelihood function in Eq. (3):

$$y_n = \begin{cases} 1 if -\infty < y_n^* \le \tau_1 \\ \cdots \\ h if \tau_{h-1} < y_n^* \le \tau_h \\ \cdots \\ H if \tau_h < y_n^* < \infty \end{cases} \quad (2)$$

$$\mathrm{Ln}L = \sum_{n=1}^{N} \sum_{h=1}^{H} I_{nh} \log[F(\tau_h - V_n) - F(\tau_{h-1} - V_n)] \quad (3)$$

In Eq. (3), the index variable $I_{nh} = 1$ if $y_n = h$, and 0 otherwise, $F(\bullet)$ is the cumulative probability function for the logistic distribution, and $V_n = \sum_{i=1}^{I} \alpha_i x_{in} + \sum_{j=1}^{J} \beta_j z_{jn} + \sum_{l=1}^{L} \gamma_l v_{ln} + \sum_{c}^{C} \sum_{i=1}^{I} \delta_{ic} x_{in} D_c$ is the deterministic part of Eq. (1). The likelihood function is maximized by applying an ologit procedure in Stata 2015 (StataCorp 2017). We estimated the model using inverse sample probability weights with respect to gender, age, and level of education. A particular reason for this was the necessity to account for the sample, displaying both higher levels of education and a lower representation of the youngest and oldest age classes than those prevailing in the overall population (see below).

We have also carried out the estimation assuming a normal distribution of the error term (ordered probit model); the results were fairly robust to the assumptions of the distribution of the error term. A stepwise selection procedure was used to select significant explanatory variables in the final model for each of the four questions. The procedure operated from general to specific and the cut-off significance level was set at 0.1%. However, before applying this procedure, we tested the general model (*unrestricted model*) to see if the SC values as a group had a significant effect on the responses, applying a likelihood ratio test:

$$LR = -2LnL(restrictedmodel) - LnL(unrestrictedmodel)$$

where the *restricted model* is the model without the SC values and LR is X^2 distributed with the degrees of freedom corresponding to the difference in number of the estimated parameters in the two models. Finally, in order to assess the significance of observed differences in SC value scoring for certain subgroups within the standard profession/activity groups, based on their divergent answers to the wolf questions, we used independent sample t tests. Again, since the answers to the wolf questions were ordered, a Spearman rank correlation test was used to verify the coherence between the four questions.

Table 3 Distribution (in percentages) of the sample and the population for the following variables: gender, age, and education class, for each of the four countries

Representativeness of the sample in comparison to the general population								
	Belgium		France[a]		Germany[b]		The Netherlands	
	Population	Sample	Population	Sample	Population	Sample	Population	Sample
18–24 yr	10.2	9.4	10.8	7.2	9.6	7.8	10.8	5.1
25–34 yr	16.2	16.7	15.4	18.1	15.0	15.6	15.7	16.2
35–44 yr	16.3	19.1	16.0	19.6	14.0	14.3	15.0	18.8
45–54 yr	17.6	22.6	17.3	22.8	18.9	32.8	18.5	23.2
55–70 yr	24.3	28.6	25.2	29.7	25.1	26.6	25.4	30.5
> 70 yr	15.4	3.6	15.3	2.5	17.4	2.9	14.7	6.3
χ^2 test	$\chi^2(5)=79.00^{***}$	$P=0.000$	$\chi^2(5)=43.12^{***}$	$P=0.000$	$\chi^2(5)=55.47^{***}$	$P=0.000$	$\chi^2(5)=30.03^{***}$	$P=0.000$
Education, low[c]	21.7	13.5	23.4	13.0	17.1	26.6	21.0	14.7
Education, medium	37.7	40.5	46.3	35.9	56.8	35.2	40.7	49.6
Education, high	40.6	46.0	30.4	51.1	26.1	38.1	38.3	35.7
	$\chi^2(2)=27.34^{***}$	$P=0.000$	$\chi^2(2)=57.93^{***}$	$P=0.000$	$\chi^2(2)=46.55^{***}$	$P=0.000$	$\chi^2(2)=10.96^{***}$	$P=0.000$
Women	51.2	49.6	52.1	54.0	51.4	44.3	50.8	50.7
	$\chi^2(1)=0.69$	$P=0.41$	$\chi^2(1)=0.39$	$P=0.53$	$\chi^2(1)=4.93^{**}$	$P=0.026$	$\chi^2(1)=0{,}00$	$P=0.995$

[a]France: Grand Est region (Alsace, Champagne-Ardennes and Lorraine) and Hauts-de-France region

[b]Germany: Länder Nordrhein-Westfalen, Rheinland-Pfalz and Saarland

[c]Education, low — less than primary, primary, and lower secondary education, International Standard Classification of Education 2011 (ISCED11) = 0–2, education, medium — upper secondary and post-secondary non-tertiary education, ISCED11 3–4, education, high — tertiary education, ISCED11 5–8

Results

Sample representativeness

It appears that the youngest and oldest age classes of the sampling group are slightly underrepresented (see Table 3), even though the survey company targeted a representative sample with respect to age classes. However, chi-squared independence tests were rejected for each country using conventional significance levels. The level of education is significantly higher (except for the German regions) in the sample relative to the population. This

Table 4 An overview of the socio-demographic variables used for the modeling exercise

Variables	Definition of the variable	Mean	Std. Dev	Min	Max
Age	Categorical, treated as numeric Age classes and the averages used: 18–24, 21.5; 25–34, 30; 35–44, 40; 45–54, 50; 55–70, 62.5; > 70, 75	47.11	14.49	22	75
Education	Categorical, treated as numeric Education classes: primary education, 1; lower secondary education, 2; upper secondary education, 3; post-secondary non-tertiary education, 4; short-cycle tertiary education or bachelor, 5; master or doctoral education, 6	3.93	1.39	1	6
Income	Categorical, treated as numeric Income classes and the averages used for each class: < 1500, 750; 1501–2000, 1750; 2001–3000, 2500; 3001–4500, 3750; 4501–6000, 5250; > 6000, 7000; for NA, the overall average was used, 2489	2475.49	1308.04	750	7000
Gender	Equal to 1 if female; 0 otherwise	0.50	0.50	0	1
City size	The size of the city or village of residence Categorical, treated as numeric City size classes used: rural or village < 500 inhabitants, 1; 500–20,000 inhabitants, 2; 20,000–100,000 inhabitants, 3; > 100,000 inhabitants, 4	2.48	1.00	1	4
Country/region	Creation of binary dummy variables for each country/region Included independently and in interaction with the other socio-demographic variables Included Wallonia (WALL), Flanders-Brussels (FL-BXL), France (FR), Germany (GR), and the Netherlands (NL)	/			

Table 5 An overview of the profile variables used for the modeling exercise

Variables	Definition of the variable	Share of the sample
Resident	Equal to 1 if a resident of the Ardennes region and if farmer and hunter and forest owner and forest logger and tour operator; equal to 0 otherwise	12%
Farmer	Equal to 1 if a farmer in the Ardennes region; 0 otherwise	4%
Hunter	Equal to 1 if a hunter in the Ardennes region; 0 otherwise	4%
Forest owner	Equal to 1 if a forest owner in the Ardennes region; 0 otherwise	5%
Forest logger	Equal to 1 if a forest logger in the Ardennes region; 0 otherwise	4%
Tour operator	Equal to 1 if a tour operator in the Ardennes region; 0 otherwise	6%
Non-nature visitor	Equal to 1 for residents not having visited the Ardennes natural environment AND for tourists having visited the Ardennes, but not its natural environment; 0 otherwise	17%
Ardennes visitor	Equal to 1 for non-residents having visited the Ardennes; 0 otherwise (residents also equal to 0)	76%

bias for the variable education is a recurrent issue when employing internet-based surveys (Olsen 2009).

Data overview

This section contains three overview tables (Tables 4, 5 and 6) presenting all of the variables used for the modeling. Note that the number of respondents for each country/region was defined by the survey design (Table 4), and that in Table 6, gross values are given, whereas for the analysis, logged values were used.

Overall positioning on points of controversy regarding the comeback of wolves in the Ardennes

Concerning the wider public, a large majority of people agree that the wolf belongs to the Ardennes' natural environment (Q1, Fig. 2). The presence of wolves appears to potentially have a positive impact on the frequency of forest visits in the Ardennes (Q2), with 17% reporting an intentional increase (Fig. 2). For 43% of the respondents, the frequency of visits would remain unchanged, with 28% for whom it would increase the level of excitement of their visit and 15% for whom the presence of wolves would make them feel less at ease. Regarding the management of wolves (Q3), 45% of the respondents favor the financing of a cohabitation strategy, while 36% would like to see measures to limit the possibility of human–wolf interactions, and 6% would want to see measures to have the wolves eradicated (Fig. 2). Note that for reason of simplification, the strategy promoted by the Walloon ministry is the only option visualized on the positive side. About taxes (Q4a), 15% opposed the idea that a small part is earmarked for the management of wolf populations, while 55% agreed and 30% remained indifferent (Fig. 2). Of the 15% who were opposed to a taxation (Q4b), those who expressed being against the return of the wolf in response to Q1 gave this as the main reason. Other explanations mainly indicate that the subject is too specific to be included in a general tax and that not all people should pay, only those favoring the return of the wolf.

Table 7 provides the Spearman rank correlations, which are all positive and highly statistically significant.

Table 6 An overview of the socio-cultural value variables used for the modeling exercise

Variables	Mean	Std. Dev	Min	Max
Esthetic value	15.37	17.68	0	100
Biodiversity value	12.96	14.02	0	100
Life support value	10.65	13.92	0	100
Mystical/therapeutic value	10.35	13.93	0	100
Extensive recreational value	10.19	14.50	0	100
Patrimonial value	9.51	11.27	0	100
Future value	7.98	10.85	0	100
Direct economic value	6.12	9.14	0	100
Indirect economic value	5.63	9.36	0	100
Relational value	4.63	9.22	0	100
Intensive recreational value	2.87	7.20	0	100
Disservice value	1.91	5.33	0	100
Mistrust value	1.84	5.33	0	100

Outcomes of modeling people's positioning on points of controversy regarding the comeback of wolves in the Ardennes

For Question 1, concerning the perceived belonging of the wolf to the natural environment of the Ardennes, 7 independent variables out of 27 were significant (Table 8). For the socio-demographic variables, the older the people were and the higher their level of education was, the less they thought the wolf belongs to the Ardennes. The country/region variables indicate that respondents from Flanders-Brussels and the Netherlands are significantly more negative on the question of belonging than the rest of the sample. For the profile variables, non-nature visitors thought less often that the wolf belongs to the Ardennes, and for the SC

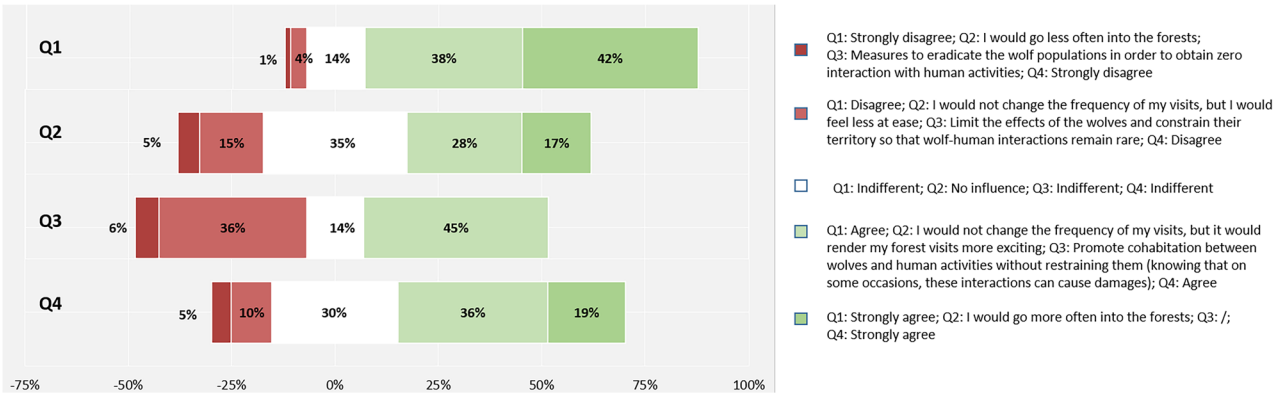

Fig. 2 A visualization of the descriptive results of the answers to Question 1 (**Q1**), Question 2 (**Q2**), Question 3 (**Q3**), and Question 4 (**Q5**). Percentages are rounded off to two digits, leading to a total of 99% instead of 100%; $N = 1461$

value variables, the higher people scored biodiversity and life support values, the more they thought the wolf belongs to the Ardennes. Four interaction variables were significant. The negative effect of age on the question of belonging was stronger for the inhabitants of France; education was significantly less negatively correlated in Flanders-Brussels and the Netherlands compared to the rest of the sample; and the size of the town of residence was positively correlated with the question of belonging for French citizens.

For Question 2 concerning the influence of the return of the wolf on forest visiting behavior, 7 independent variables were significant. Older people, women, people with a higher education, and Flemish people were more likely to consider that the wolf would have a negative impact on forest visits. One profile variable, being a farmer, had a positive impact on forest visits. The higher people scored esthetic, mistrust, and mystical/therapeutic values, the more positive they considered the effect of wolves on their forest visits. Two interaction variables were retained, namely, a positive effect of being female in Germany and a negative effect of education in the Netherlands.

For Question 3 concerning the positioning of respondents along a simplified gradient of financing wolf–human interaction modes, 3 independent variables were significant, of which none were socio-demographic. For the profile variables, tour operators seemed less inclined to favor the financing of a cohabitation. The higher people scored the SC value biodiversity, the more they chose the cohabitation option, whereas the higher people scored the SC value disservices, the less they chose this option. One interaction variable was retained by the model: education was positively correlated in Flanders-Brussels.

For Question 4 concerning whether it was considered normal that a part of general taxes is earmarked for wolf management, 12 independent variables turned out to be significant. The older the person was, the less willing he or she was to accept this idea; French and Germans, as well as Ardennes residents, were more willing to accept this idea than the rest of the sample, whereas the Dutch and people who do not visit nature in general were less willing to accept it; tour operators were more favorable towards this idea than non-tour operators, and people who had already visited the Ardennes were more favorable than people who had not. For the SC values, people who attributed higher scores of life support and disservice values were more favorable, while people who attributed higher scores to extensive recreational and relational values were less favorable. Four more interaction variables were significant. The negative effect of age was stronger for French citizens; in Flanders-Brussels, the larger the size of the town of residence was, the more inhabitants that were favorable; and in the Netherlands, people with a higher income and a higher level of education were also more favorable.

Crossing the country/region row with the FL, FR, GR, and NL columns gives the significance of the respective independent country/region variable. Crossing the other rows containing socio-demographic variables with the FL, FR, GR, and NL columns indicates relevant interaction terms.

All tested socio-demographic variables were significant for at least one of the questions, whether in interaction with the country/region of residence or as an independent variable. However, other variables were included in the initial model

Table 7 Pairwise Spearman rank correlations between the answers to the four wolf questions

Correlations between the wolf questions			
	Q1	Q2	Q3
Q2, correlation	0.314	-	-
(*p* value)	0.000	-	-
Q3, correlation	0.388	0.179	-
(*p* value)	0.000	0.000	-
Q4a, correlation	0.432	0.286	0.231
(*p* value)	0.000	0.000	0.000

Table 8 A summary of the significance of the tested variables for each of the four questions

Questions	Q1 Acceptance					Q2 Forest visits					Q3 Measures					Q4a Taxes				
Variables/regions	**WL**	**FL-BXL**	**FR**	**GR**	**NL**	**WL**	**FL-BXL**	**FR**	**GR**	**NL**	**WL**	**FL-BXL**	**FR**	**GR**	**NL**	**WL**	**FL-BXL**	**FR**	**GR**	**NL**
Socio-demographic variables																				
Age	°°°		°°°			°°°										°°°		°°		
Gender						°°°			**											
Income																				**
Education	°°°	**			*					°°		***								**
Country/region		°°°			°°°													**	***	°°
City size			*														**			
Profile variables																				
Resident																*				
Farmer						**														
Hunter																				
Forest owner																				
Forest logger																				
Tour operator						*					°°°					***				
Non-nature visitor	°°°															°°°				
Ardennes visitor																*				
Socio-cultural values																				
Esthetic						*														
Biodiversity	***										°°°									
Direct economic																				
Indirect economic																				
Extensive recreational																°				
Intensive recreational																				
Future																				
Patrimonial																				
Relational																°°				
Mistrust						**														
Life support	*															**				
Mystical/therapeutic						**														
Disservice											°°°					**				

The symbol ° indicates a negative correlation, the symbol * a positive correlation, the number of symbols indicates the level of significance

Significance codes are ***/°°° $p < 0.01$, **/°° $p < 0.05$, and */° $p < 0.1$, with three symbols representing the highest level of significance

but turned out not to be significant in any of the models: these included the hunter, forest owner and forest logger profile variables, and the indirect or direct economic, intensive recreational, future, and patrimonial SC values. Still, we found that SC values are important variables to explain the answers to the four questions. Using a LR test, we tested whether we could exclude the 13 SC values in a general model where we had included all of the socio-demographic and profile variables. This was rejected with a probability $p < 0.000$ for all four questions.

Discussion

In this section, we first discuss the overall results. We then focus briefly on the observed influence of commonly used explanatory variables, before addressing the added-value of SC values. For the sake of conciseness, only the most insightful correlations with respect to our object of analysis will be discussed.

Overall positioning on points of controversy regarding the comeback of wolves in the Ardennes

A first observation is that even though the specific ways of how to deal with the presence of wolves (Questions 2, 3, and 4) are subject to a diverse set of opinions, the question of belonging (Question 1) reached a high level of positive unanimity within the surveyed population. Whether this could have been influenced by the greater availability of natural areas in Walloon Ardennes than in Flanders (Van Herzele and Aarts 2019) should be verified. The evidence of this high level of unanimity is blurred by the over-representation of stereotypic discourses in the public debate. When, for example, the spokesman for the most important hunting association in the Belgian Ardennes states that "the wolf does not belong to this industrialized world. It is up to the population to give its view on this topic" [translated from French] (Schoune 2020), he clearly overstates the discourse of non-belonging. The case of hunters is further discussed in the What do the SC value variables tell us? section. All wolf-related events (livestock attacks, new observations, road accidents, etc.) are widely portrayed through diverse media channels. Naturalist associations welcome its comeback, which is expressed through a big "finally!" (Natagora 2017); the public nature administration officially favors and emphasizes its "natural" return (Librebe 2020), while some papers and magazines opt for sensitizing titles such as "seven sheep throat cut"(L'Avenir 2016). Within the scope of this study, it has not been underscored what the influence of these mediatized information was on the matter.

Second, the general public addressed through the sampling group is divided on the question of the financing of certain management strategies for coping with human–wolf interactions. Since a cohabitation is envisioned by Walloon policy makers (Schoune 2020), even though the proposed strategies within this study were simplified for methodological reasons, this point will be of major concern for establishing a strategy that can count on public support.

The third wolf-related issue explored in this study is whether its return/presence instead represents an opportunity or a threat (i.e., for this survey oriented towards the frequency and nature of forest visiting behavior). In this instance, the overall effect is positive, though for some people, the presence of the wolf in the forests they frequent seems to generate some fear and precaution. This observation indicates an important point in the communication concerning wolf behavior and wolf–human interactions (Arbieu et al. 2019). Moreover, there seems to be a group of people (about 14% of the respondents) who apparently do not feel concerned to any extent by the content of this survey, expressing indifference through their answers. As could be expected, respondents not having visited a natural environment during the last 5 years seem more likely to be indifferent with respect to Q1 and Q2, though this was not significant on a conventionally statistical level.

Positive and significant correlations between the answers to the four questions indicate a coherence in the way people replied to the questions and clarify possible interactions between questions. Respondents who are positive on the question of belonging are (i) more likely to believe that the wolf will increase the benefit they receive from their forest visits, (ii) prefer the financing a type of management that favors cohabitation, and (iii) are more likely to accept that a part of general taxes be earmarked for wolf management. Thus, to give an example, the positive correlation between the answers to the question on human–wolf interaction strategies and the acceptance of a tax indicates that respondents are willing to pay for a cohabitation strategy and are opposed to the eradication of wolf populations, which could also have been a possibility. Since there are mixed scientific results on the tendency of public support for wolves over time and on the influence of closer-by living populations (Broberg and Brännlund 2006; Dressel et al. 2015; Frank and Sjöström 2007; Killion et al. 2019; Lute et al. 2014), it remains to see if the positive correlation between the question of belonging and financing a cohabitation strategy will endure, once wolf population sizes go up and human–wolf interactions increase (in terms of physical encounters, observed presence, livestock kills or other damages, etc.). Arbieu et al. (2020) underline the importance of positive interactions for an improved coexistence over time, which will be a point of attention for managers and policy makers. Another important point concerns the observation that financial compensation mechanisms for livestock losses, even though these are positively received, do not improve the tolerance levels of the recompensed actors (Naughton-Treves et al. 2003). This remind us that the above

described observations concern correlations and not causality. Complementary, the willingness to pay (WTP) for securing the wolf's survival does not increase with increasing wolf population sizes (Boman and Bostedt 1999), which could be a point of discussion for the revision of budget attributions in the case of increased compensational costs.

Tendencies regarding socio-demographic and profile variables

The observed results regarding socio-demographic variables largely correspond to what has already been demonstrated elsewhere. For instance, the older the respondents are, the more negative they are in their positioning on the points of controversy (e.g., Majić 2007; Piédallu et al. 2016; Røskaft et al. 2007). According to Majić and Bath (2010), the gender effect observed for the question on forest visits (Q2) can be linked to a matter of fear, where women are observed to have a greater fear or safety concern about going to places were wolves are present. Note that fear is not necessarily acceptance-related (Zimmermann et al. 2001). We did not find a statistically significant effect of the level of income, which also confirms previous findings (Broberg and Brännlund 2006; Naughton-Treves et al. 2003). Some studies (Majić 2007; Naughton-Treves et al. 2003; Røskaft et al. 2007) found that higher levels of education correspond to more positive positions towards wolves. The negative correlation observed in this study is somehow surprising and needs further investigation to be correctly interpreted. Note that the bias in representativeness for the education variable is a recurrent issue when using Internet-based surveys (Olsen 2009).

We also observed an influence of the country/region of residence on the stated positioning regarding the questioned points of controversy concerning wolves. Flemish and Dutch citizens are more negative than Walloon citizens, an observation already underlined by Drenthen (2015). This correlation could be due to the lack of cohabitation for the inhabitants of these two regions where the wolf has been absent for a longer time span (Houston et al. 2010; Zimmermann et al. 2001), though not all studies confirm this hypothesis (Treves et al. 2013). Otherwise, a lower disposition of suitable habitat could offer an explanation for more negative responses when respondents (unintentionally) transpose the question to their own area of residence. French and German residents seem to be more positive about the acceptance of a tax. This could be explained by the fact that both are countries where the wolf has been present for a longer time (Houston et al. 2010) and where compensation mechanisms are in place.

We tested five professions/activities (being a hunter, a farmer, a forest owner, a forest logger, and a tour operator) for their significance in explaining the positioning of respondents along the questioned points of controversy, of which tour operator turned out to be strongly correlated. For example, tour operators were more in favor of a general tax for wolf management than non-tour operators. Since the Ardennes is a major tourism destination due to its natural richness, tour operators may be concerned about tourists' reactions to the presence of wolves. The observed disapproval of a cohabitation strategy could thus be a reaction of precaution against the anticipated reaction of tourists, but this should be verified. In this case though, the concern of tour operators could be alleviated with the results to the question about forest visit frequency regarding the presence of wolves, with more people intending to increase than decrease their visits to forests. As a result, the presence of wolves in the Ardennes may also represent an opportunity for ecotourism (Thulin et al. 2015; Vega and Garrido 2016).

Overall, professions/activities[8] were less significant than expected to explain responses. One reason could be that the proportion of each category was rather small (around 5%), which is due to the orientation of the study towards the general public without oversampling particular profiles. Furthermore, profiles may overlap since, for instance, 2.74% of the sample consists of people reporting to be both hunter and forest owner, while these two categories represent 4.4% and 4.0% of the overall sample, respectively. A second explanation is the potential heterogeneity that can be found within common classifications (Killion et al. 2019; Lute et al. 2014; Sponarski et al. 2013). Regarding this heterogeneity, we briefly zoom in on the case of hunters. As aforementioned, this profile mainly concerns big game hunters. This category is often linked to a negative positioning towards wolves (Arbieu et al. 2020; Dressel et al. 2015; Sponarski et al. 2013), whereas no such correlation appeared in our results. Although this could potentially be due to the low size of the sub-sample of hunters (representing 4% of the sample group), we could still expect to detect an effect in the model used if a strong positioning was present for this group as a whole. For instance, for Question 3 on interaction strategies, 24% of the hunters in our sample preferred an eradication of wolf populations, which is much higher than the 6% of the overall sample. However, there are also 24% of the hunters who favor a complete cohabitation (vs. 45% for the overall population). This may explain why the model could not detect any statistically significant correlation since being a hunter does not imply a pronounced and consistent positioning towards the wolf. The official discourses of specific interest groups are often strongly polarized, sometimes having more of a function of enhancing group cohesion than representing the opinions of the organization's members (Van Herzele et al. 2015).

[8] Note that professions/activities were only considered if they were carried out within the Ardennes territory.

What do the SC value variables tell us?

Several authors have underlined the importance of value orientations compared to demographics or profession-based variables in order to interpret the human dimension of human–wildlife interactions (Grilli et al. 2018; Lischka et al. 2010). In this study, this issue was addressed by linking SC values to the main points of controversy regarding the return of the wolf.

Tendencies regarding SC value variables

In general, respondents considered the Ardennes forests highly important in terms of their role for biodiversity conservation, as seen by the fact that the SC value biodiversity had the second highest score of all 13 of the SC values presented. The SC value for biodiversity is also strongly correlated to the question of belonging (Q1) and to the preferred answer option for the interaction modes (Q3). Taken together, these two results seem to indicate that the return of the wolf is part of a larger aspiration for biodiversity protection. More precisely, the wolf belongs to the Ardennes, and financing of a cohabitation strategy should be favored according to those people who associate the Ardennes forests with biodiversity values. People for whom the biodiversity concern is of lesser importance are more inclined to think the wolf does not belong to the Ardennes and chose less often the option of cohabitation.

Another important SC value for forest services (with the third highest score) is life support. The perceived importance of an ecosystem, in this case, the Ardennes forests, in maintaining a healthy environment and in contributing to the mitigation of climate change, is strongly correlated to the positioning of respondents on the questioned points of controversy. This could indicate that the wolf, as well as other species, is seen as being a part of this ecosystem, with its own role to play in maintaining and improving the ecosystem's functioning. We found that esthetic, mistrust, and mystical/therapeutic values relate positively to forest visiting experiences with a wolf presence. Mistrust could either be interpreted as something negative or could refer to a fascination for the wild and the unknown (Drenthen 2015), hence explaining its positive correlation to forest visits. This is in keeping with the observation by Arbieu et al. (2020) that "the excitement to see [have seen] a wolf could be a strong driver of positive attitudes."

People who see the Ardennes forests as representing something negative (SC value "disservices") favor the financing of an eradication or limitation of wolf populations. These people are also in favor of a general tax system for wolf management. Disservices, however, are not related to the question of belonging. Thus, these people are not opposed to the idea that the wolf is a part of the natural environment of the Ardennes but are concerned about minimizing the risks of its presence in terms of potential human–wolf interactions as well as in terms of financial implications. These are important insights for policy makers who are responsible for the implementation of the wolf management plan.

The added-value of using SC value variables

A more thorough understanding of people's concerns, beliefs, and opinions based on SC values could indeed help to develop more detailed and nuanced policy regarding wildlife, including wolf management, by avoiding a stereotypic classification of the actors. With the use of SC values, people are positioned on a gradient of the varying importance allotted to several SC values, which excludes potential problems of overlap between standard profile variables (i.e., multicollinearity in statistical terms). The use of SC values can also help to deal with the issue of heterogeneity within groups, as can be illustrated by the aforementioned example of hunters' positioning on Q3 (i.e., with 24% of the hunters being in favor of eradication and 24% being in favor of cohabitation). When evaluating the differences in value scoring between those two subgroups of hunters, a significant difference[9] can be observed for the SC value biodiversity, which is much higher for the hunters in favor of financing cohabitation (an average of 15.53 votes) than for those in favor of financing eradication (an average of 5.07 votes). It should be noted that biodiversity turned out to be significant for the entire sample for this question (Table 4), so people who consider biodiversity to be an important aspect of the Ardennes, whether they are hunters or not, are more likely to favor the financing of a cohabitation strategy.

The use of standard variables can therefore lead to discussions driven by stereotypes and preconceptions, which reinforce debate and conflict (Van Herzele et al. 2015). Von Essen and Allen (2020) criticize the use of stakeholder participation models that divide the debate on wolf management on the basis of preconceived interest positions for each particular actor group and from which it is difficult to develop new perspectives. The analysis of the position of the general public and the brief exploratory analysis of the case of hunters in this study illustrates how SC values can nuance both the stereotyping of a particular group, such as hunters, as the stereotyping of the public opinion by the institutional discourse of a particular group. Von Essen and Allen (2020) advocate models of deliberation that begin with a common starting point rather than with polarizing differences. Individual SC values could assist in bringing legitimacy and

[9] The p value for the independent sample t tests used was 0.04.

transparency to the negotiation table, which could potentially offer a potential starting point to help build shared values (Kenter et al. 2016) in order to reach consensus.

The use of SC values for ES allows to identify which concrete aspects of a territory are of importance to different persons. These persons can both refer to the general public, as well as to adherents of a particular interest group who might occupy controversial positions on the questions of belonging, opportunity or threat, or management strategy regarding the comeback of the wolf. SC values address landscapes and are thus context-specific and dependent on the situation at stake. They do not represent specific values for wildlife or for a certain species. This makes their use less suited for generalized conclusions on wildlife valuations and for a comparison over territories. Therefore, the concept should be seen as complementary to the use of wildlife value orientations.

Conclusions

Overall, the results of our study tend to reveal a positive positioning on the points of controversy addressed and a general preference to finance a cohabitation between humans and wolves in the case study area. This positioning is positively associated with a consideration of the role of forests for biodiversity and life support. Although there exists a small minority of people who are against the return of wolves, a great majority of the people surveyed see the return of the wolves as a positive asset. The stated negative positions towards wolves have been observed for people not physically concerned by their presence (e.g., non-nature visitors); for people concerned about the potential negative impacts of forests in general (e.g., people with high scores for the SC value *disservices*); and for people for whom nature per se is not that important (e.g., people with low scores for the SC values *biodiversity*, *life support*, or *therapeutic*). Moreover, older people seem to be more negative. The geographical context is important, revealed by significant regional differences in positioning that may be due to the history of human–wolf cohabitation in the different regions.

The aim of this article was to illustrate how the use of SC values for ES evaluations helps to overcome preconceptions and to better understand the underlying reasons behind stated positions on common points of controversy concerning wildlife and wildlife returns. Socio-demographic or profile variables can still be good predictors, but they can also mask heterogeneity within groups. By illustrating the case of hunters, we demonstrated that the SC value biodiversity has proven to be a significant variable not only for hunters, but for the entire sample as well. Without the use of the SC value framework, it would have led to a misinterpretation of the results.

The results of this research point out that careful attention should be paid to the unintended caricaturizing of actors in the public debate. By asking people which SC values, associated with the ES provided by the concerned territory, they consider most important for the territory that the wolf is reclaiming, it is possible to better identify which values are at stake in the case of diverging opinions. These insights can lead to questions about the legitimacy of existing discourses, to transparency in terms of which values are accounted for by an actual or proposed management, as well as to the identification of a common ground to, for example, improve information campaigns.

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Code availability The code used for this paper is available upon request to the corresponding author.

Declarations

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