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Conditional social acceptability of lethal control of large carnivores in Germany

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Large carnivore coexistence in Europe is at a critical juncture. The European Commission's decision to downlist wolves (*Canis lupus*) could potentially increase the use of lethal control. Political and media debates often reflect polarized positions among organized interest groups, but public acceptability remains underexplored despite its importance for effective and legitimate wildlife management policies. We surveyed a stratified sample of the German public (n = 1505) to assess acceptability of lethally controlling wolves, lynx (*Lynx lynx*) and bears (*Ursus arctos*). Using experimental vignettes, we varied carnivore species, incident type (scare or attack), victim (human, pet or livestock) and management response (targeted versus non-targeted lethal control). Acceptability was higher for bears, attacks, human victims, and when the management response would target the individual animal responsible. Acceptability was greater among men and those who would prioritize human interests over those of wild animals, and lower among participants with more knowledge of carnivores and their management. Rural–urban differences were minimal, and there was no evidence of strongly polarized perspectives on lethal control of large carnivores. These findings suggest that public views are more nuanced than often portrayed and highlight the need for evidence-based, context-sensitive management decisions and policies to improve coexistence with large carnivores.

1. Introduction

Large carnivore populations have been recovering across Europe in recent decades, primarily as a result of strict legal protections and targeted management efforts [1,2]. While this recovery is welcomed by many as a conservation milestone, with potential ecological and economic benefits [3,4], it also presents new challenges, particularly regarding how people can coexist with large carnivores in shared landscapes [5,6].

Living alongside large carnivores can bring emotional, financial and safety concerns, especially when large carnivores threaten or attack livestock, pets or, more rarely, people [7–9]. The occurrence, or even the possibility, of such incidents creates risks for people living in shared landscapes with large carnivores. While the perception of risk is subjective, and tolerable levels differ based on individual experience and socio-cultural context [10,11], such incidents can fuel negative public attitudes and reduce tolerance for large carnivores [12,13]. As a result, large carnivore management, especially the use of lethal control in response to threats or attacks, is a polarizing and politically sensitive topic.

Recent and ongoing political debates reveal strongly divergent opinions around large carnivore management in Europe, exemplified in controversy around the European Commission's proposal to downlist the wolf from

'strictly protected' to 'protected', approved in June 2025 [6,14]. While the European Commission claims that downlisting is based on scientific evidence, critics argue that scientific results on both carnivore ecology and livestock predation have been misused or misinterpreted to favour this decision [15,16]. The downlisting decentralizes decision-making to national and local governments, permitting more flexible management. More flexible management could include increased lethal control, or lethal control strategies that are less targeted towards 'problem' individuals or packs than when legal protections were stricter [17,18]. In April 2026, wolves were incorporated into the Federal Hunting Law in Germany, reducing restrictions on lethal control measures and allowing states to introduce regulated wolf hunting [19]. However, the effectiveness of lethal control in reducing wolf predation on livestock remains uncertain [20,21] and may even be counterproductive when social structures of a pack are disrupted, leading to increased predation or new individuals filling the vacant territory [16,22].

Germany has been central in these discussions, as one of the major agricultural producers in the European Union [23] where shepherding is valued for its cultural and ecological functions [24]. Large carnivores have returned to many areas of Germany, including landscapes in which livestock production is widespread. Eurasian lynx (*Lynx lynx*) populations remain small and fragmented after three reintroduction projects between the 1970s and 2020 [25] in the Bavarian Forest National Park [26], the Harz mountains [27] and the Palatinate Forest [28]. Grey wolf (*Canis lupus*) populations have grown rapidly since the first successful reproduction within Germany in 2000 [29], owing to a relatively high survival rate and substantial available habitats [30]. Wolves have expanded their habitat to all German states, with the highest densities in the northeast of the country [31]. Bear JJ1, known as Bruno, was the first to cross the Alps from Italy into Germany in 2006, since brown bears (*Ursus arctos*) were eradicated in the early nineteenth century [32]. While there are currently no established populations in Germany, population increases in neighbouring countries and individuals dispersing into border regions suggest the possibility of re-establishment [33].

Intense public and political debates reveal strongly differing positions among organized advocacy groups, such as those representing livestock farming, hunting and conservation interests [6]. The combination of increasing large carnivore populations and social conflict following reductions in their legal protection [34] creates substantial management challenges for decision-makers who must balance biodiversity conservation and economic development. These challenges are particularly pressing when suggested management tools—such as lethal control—are politically and ethically sensitive [14,15,35,36]. However, relatively little is known about the wider German public's views on large carnivore management, especially the possibility of lethal control of individual animals. Understanding broad public perceptions can provide valuable evidence for decision-makers, especially around controversial conservation issues [37–40], including recovery of contentious wildlife species in Germany [41].

One frequently reported narrative in media and policy debates is a stark rural–urban divide in attitudes towards carnivores, especially towards wolves [35]. Rural residents, who are more directly affected by carnivore presence [42], are typically depicted as more hostile towards carnivores than urban residents. This framing was central to the European Commission's rationale for downlisting as well as the German government's decision to include the wolf into the Federal Hunting Law, which specifically addressed challenges faced by farmers and rural communities [19,34].

To help inform difficult and politically contentious decisions, we developed an online questionnaire to generate new knowledge on public perceptions of lynx, bears and wolves and their management in Germany. We included all three species to represent different stages and challenges of large carnivore recovery in Germany: established (lynx), active expansion (wolf) and potential re-establishment (bear). To ensure policy relevance and inclusivity of diverse interests, we co-created the survey with stakeholders and experts from across sectors affected by the presence of large carnivores and relevant to their management. This participatory approach aimed to reduce disciplinary bias [14], incorporate multiple knowledge types [43,44] and increase the social legitimacy of the study [45].

Our primary objective was to investigate how members of the German public perceived local government proposals to lethally control large carnivores if they scare or attack people, pets or livestock. We hypothesized that acceptability of lethal control proposals would depend on:

- H1: the characteristics of the incident and management response:
  - (i) animal: acceptability would be highest for incidents involving bears, lower for incidents involving wolves and lowest for incidents involving lynx;
  - (ii) incident: acceptability would be higher when a large carnivore attacks than scares;
  - (iii) who: acceptability would be higher when the victim is a human than when a pet or livestock; and
  - (iv) reaction: acceptability would be higher when the local government proposes to kill the specific animal that caused the incident than any animal of that species in the area.
- H2: participants' residential status: acceptability would be higher among participants who live in rural areas compared to urban areas.
- H3: participants' characteristics and conservation priorities:
  - (i) gender: acceptability would be higher among men than women;
  - (ii) age: acceptability would be higher among older participants than younger participants;
  - (iii) formal education: acceptability would be lower among participants with a higher level of formal education; and
  - (iv) conservation priorities: higher among participants who would prioritize the interests of people over the interests of wild animals when these interests clash.
- H4: participants' knowledge on the topic of large carnivores and their management in Germany: acceptability would be lower among participants with more knowledge about large carnivores and their management.

Our secondary objective was to assess the extent to which perspectives on lethal control of large carnivores were polarized among members of the broader public. We hypothesized that:

— H5: perspectives on lethal control of wolves would be more polarized than lethal control of bears or lynx.

Detailed *a priori* predictions can be found in the electronic supplementary material, table S1.

2. Methods

(a) Participatory questionnaire development

We co-developed a questionnaire with cross-sectoral experts on large carnivores and livestock protection in Germany to maximize our study's practical relevance and to reflect multiple perspectives. We invited 16 representatives of wildlife non-governmental organizations (NGOs), hunting associations, relevant governmental authorities and ministries, livestock protection projects, forestry, tourism, animal welfare NGOs, research institutions and human–wildlife conflict mitigation practitioners to two online workshops, with the explicit aim of incorporating their expertise and interests into the questionnaire design.

In the first workshop (August 2024, $n = 13$), the experts discussed priority topics for understanding public perceptions. We developed a draft questionnaire based on these inputs and shared it with all experts in advance of the second workshop. In the second workshop (November 2024, $n = 8$), the experts reviewed and refined the draft questionnaire. We collected individual feedback from experts unable to attend the first workshop via online interviews ($n = 2$), and those unable to attend the second workshop via written responses ($n = 2$). We incorporated all feedback into a final version of the questionnaire.

The final questionnaire included sections on knowledge of large carnivore ecology and management, acceptability of lethal control of large carnivores and participants' sociodemographic characteristics. In the knowledge section, participants answered 19 multiple choice questions: 12 on large carnivore ecology (four each for lynx, bear and wolf), five on technical effectiveness of livestock protection from wolves, and two on existing livestock protection and compensation arrangements (table 1). We used experimental vignettes for the lethal control section [37,38], detailed in §2.2. In the sociodemographic and beliefs section, participants recorded their highest degree of formal education (four levels: primary school, secondary school, college or university degree, postgraduate degree) and whether they would prioritize the interests of people or wild animals if they clash (six levels: strongly prioritize wild animals, prioritize wild animals, prioritize neither wild animals nor people, prioritize people, strongly prioritize people, do not know) [46].

(b) Experimental design

Each vignette was a written hypothetical scenario describing an incident involving a large carnivore, in response to which the local government proposes to kill an animal. Each vignette comprised a unique combination of four factors: which animal was involved in the incident (hereafter *animal*), the nature of the incident (hereafter *incident*), who was the victim of the incident (hereafter *who*), and how the local government proposes to react (hereafter *reaction*). There were three levels for *animal* (lynx, wolf or bear), two levels for *incident* (scare or attack), three levels for *who* (a human, a pet or livestock) and two levels for *reaction* (kill the specific animal that caused the incident or kill any animal of that species in the area). A full-factorial ($3 \times 2 \times 3 \times 2$) design yielded 36 scenarios, and all vignettes had identical text except for the levels of the four experimental variables we manipulated (*animal, incident, who* and *reaction*; table 2).

We first asked participants to carefully read an introductory text about the current situation of the three carnivores in Germany. We then randomly assigned participants two of the 36 vignettes, for both of which they rated the acceptability of the local government's proposal to lethally control a large carnivore, using a 7-point Likert-type scale ranging from *very unacceptable, unacceptable, somewhat unacceptable, neither acceptable nor unacceptable, somewhat acceptable, acceptable* and *very acceptable*, with an additional option, *I don't know,* to differentiate participants who were neutral from those who genuinely did not know how acceptable or unacceptable they perceived the proposal to be [47]. Full experimental design, introductory text, and two example vignettes are shown in table 2.

(c) Procedure

We collected data during three weeks in June and July 2025, hosting our questionnaire on the Qualtrics online survey platform (www.qualtrics.com). Qualtrics LLC recruited a sample of people over 18 years of age living in Germany, stratified by gender, age and residential status (rural or urban), to match German population statistics from 2022 [48]. Descriptive statistics and a comparison of our sample with the German population benchmarks are presented in the electronic supplementary material, table S2. Participants provided informed consent and then answered initial screening questions about their country of residence, gender, age and self-assessed residential status (on a four-level scale: *very urban, somewhat urban, somewhat rural* and *very rural*). Participants either continued to answer the full questionnaire or were screened out based on whether the sample quotas were saturated. The questionnaire was conducted in German. German and English versions are in the electronic supplementary material, tables S5 and S6.

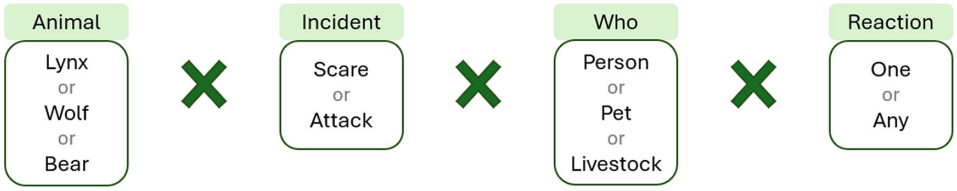
Table 1. Knowledge of large carnivore ecology and conservation items. (Response options were multiple-choice (illustrations and text responses) and a total of 19 questions were worth a possible total of 19 points.)

topic	question
carnivore ecology[a]	what best describes the current situation of this animal in Germany?
carnivore ecology[a]	which of these most accurately represent the size of the animal? (*Illustrations)*
carnivore ecology[a]	what is the main diet of this animal in central Europe?
carnivore ecology[a]	do these animals live alone or in groups?
management (livestock protection)[b]	will the following type of fences keep the wolf out? (*Illustrations)*
policy (livestock protection)	is there currently any government financial support for livestock protection (e.g. building fences) in Germany?
policy (compensation)	what best describes what currently happens when a farmer in Germany experiences a wolf attack on his livestock?

[a]Four items on carnivore ecology for each species (lynx, wolf and bear) separately, resulting in 12 points (4 × 3).
[b]Evaluation of five different fence illustrations (yes/no) for the management question (5 points), and two policy items (2 points).

Table 2. Experimental design and example vignettes. (The experimental design used four experimental conditions: animal (three levels: lynx, wolf or bear), incident (two levels: scare or attack), who (three levels: human, pet or livestock) and reaction (two levels: kill the animal who caused the incident or kill any animal in the area). Introductory text explains the current situation of bears, lynx, and wolves in Germany. Each participant evaluated two randomly assigned vignettes from the full set of 36. English translations from the German data collection instrument.)

Experimental design



Introductory text

Wolves, lynx and bears once disappeared from the German landscapes, but now the animals are in various stages of returning to the country. Wolves have naturally returned to Germany from neighbouring countries, and their numbers and habitats have increased since the first reproduction in Germany in 2000. Lynx have returned to Germany mainly through reintroduction programmes that began in the 1970s and are still found mainly in these reintroduction areas. Growing bear populations in neighbouring countries (e.g. Italy) and occasional sightings of bears in southern Germany suggest that they may return in the future.

Some people see the return of these animals as a good thing. Others are concerned about the challenges they face or could face in living with these animals, especially in sectors like grazing livestock farming, that are directly affected.

Example vignette 1

A lynx has scared a person in an area in Germany. In response, the local government proposes to kill the lynx that caused the incident, as they believe doing so would prevent similar events in the future.

Example vignette 2

A bear has attacked livestock in an area in Germany. In response, the local government proposes to kill any bear in the area, as they believe doing so would prevent similar events in the future.

question	response options
in your opinion, how acceptable or unacceptable would it be, if the local government decided to implement this proposal?	very unacceptable | unacceptable |somewhat unacceptable | neither acceptable nor unacceptable | somewhat acceptable |acceptable |very acceptable | I don't know

To check the functionality of the questionnaire, we conducted a soft launch (n = 50) and continued with the full data collection after verifying that it was working as expected. The median duration for completing the questionnaire was 630 s. To ensure data quality, we removed responses less than half of the median (<315 s) or more than six times the median (>3780 s), leaving completed questionnaires from 1520 participants. Regrettably, we removed responses from 15 participants who answered *non-binary, or other*, or *prefer not to say* to the gender question, as it was too small to permit statistical analysis. Our final dataset therefore contained completed questionnaires from 1505 participants.

To test for rural–urban differences, we combined *very urban* and *somewhat urban* into the category *urban*, and *very rural* and *somewhat rural* into *rural* prior to statistical analysis, reducing residential status to a two-level variable. Our dataset included 1157 (76.9%) participants from urban areas and 348 (23.1%) from rural areas. Owing to a limited number of participants selecting *primary school* (52) to the formal education question, we combined *primary school* and *secondary school* into a category *primary or secondary school*, resulting in three formal education categories.

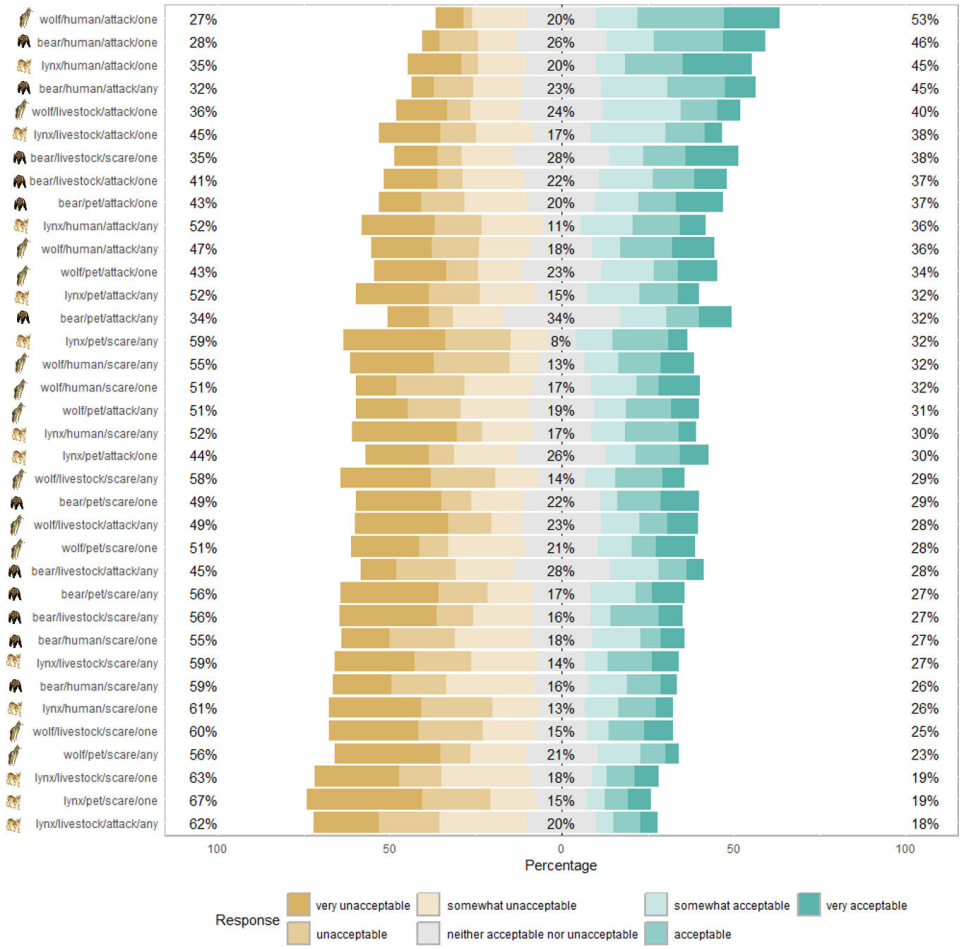


Figure 1. Acceptability of the local government proposal across 36 experimental scenarios ($n = 2852$). Each bar represents a unique scenario, labelled as the animal which caused the incident, the type of incident, the victim of the incident and the local government's proposed reaction. Yellow tones represent very unacceptable, unacceptable and somewhat acceptable responses; green tones represent very acceptable, acceptable and somewhat acceptable responses; grey represents neither acceptable nor unacceptable responses. Percentages show combined proportions of each of the response groups: unacceptable (left), neutral (middle) and acceptable (right). I don't know responses were removed before visualization.

As each participant answered two vignettes, we had 3010 responses to vignettes in total. We removed 158 *I don't know* responses to retain only responses on the scale from *very acceptable* to *very unacceptable*, resulting in 2852 responses for analysis. The number of responses per vignette ranged from 75 to 92, and the median was 83.5.

This study received ethical approval by the Research Governance, Ethics & Assurance (RGEA) Team of the University of Oxford (MS IDREC 1030158).

(d) Data analysis

We conducted all statistical analysis in R statistical software (R Core Team, v. 4.3.3). We used ordinal logistic regression ordinal package [49] to examine associations between acceptability of the local government's proposal to lethally control a large carnivore and:

(i) experimental factors (animal, incident, who and reaction);
(ii) sociodemographic factors (age, gender, highest level of formal education, residential status);
(iii) knowledge score (number of correct answers out of 19); and
(iv) conservation priorities (whether participants would prioritize the interests of people or wild animals if they clash).

This model (hereafter, acceptability model) included two-way interactions among all four experimental factors and between each experimental factor and participants' residential status, main effects of sociodemographic factors, knowledge score and conservation priorities, and a random effect to account for repeated observations from the same participants (electronic supplementary material, table S3). We did not perform model selection, as our objective was inference, not prediction [50].

We calculated variance inflation factors (VIF) to assess multicollinearity among predictor variables (car package [51]). All VIFs ≤ 1.13, so we did not remove any [52]. We considered variables to have a significant association with acceptability if they had a p-value < 0.05 from an analysis of deviance (ANODE) of the acceptability model (car package [51]). To assess categorical predictors with more than two levels, we performed *post hoc* Tukey tests (emmeans package [53]), again considering $p < 0.05$ to be statistically significant. To assess interaction effects, we calculated model predictions for significant interactions, while accounting for all other variables (emmeans package [53]).

We evaluated whether there were any significant differences in degree of polarization in participants' ratings (n = 2852) of the acceptability of lethal control proposals involving bears (n = 960), lynx (n = 935) or wolves (n = 957) across our 36 vignettes. Polarization is the extent to which opinions are divided, so we considered responses at the extremes of the seven-point acceptability scale to represent more polarized positions than responses towards the middle of the scales. We categorized responses to vignettes according to their degree of polarization: *very acceptable* and *very unacceptable* representing high polarization, *acceptable* and *unacceptable* representing moderate polarization, *somewhat acceptable* and somewhat *unacceptable representing* low polarization, and *neither acceptable nor unacceptable* representing no polarization. We then calculated the proportion of responses representing each degree of polarization (*high*, *moderate*, *low* or *none*) for vignettes involving each animal (bear, lynx, wolf). To test for differences in polarization between vignettes involving different animals, we used ordinal logistic regression with degree of polarization as the response variable and a single categorical predictor of animal (hereafter polarization model).

We used the Likert [54], ggplot2 [55] and ggeffects [56] packages to visualize estimates and predictions from the acceptability model, and multcomp [57] and multcompView [58] packages to add compact letter displays to figures.

3. Results

(a) Responses to vignettes

The mean knowledge score was 8.67 (s.d. = 2.87). Across all 36 scenarios, acceptability of a local government's proposal to lethally control a large carnivore in response to an incident tended slightly towards the unacceptable end of our scale. Depending on the scenario, between 26.7% and 66.7% of participants rated the proposal *very unacceptable*, *unacceptable* or *somewhat unacceptable* combined, and between 17.7% and 53.3% rated the proposal *very acceptable*, *acceptable* or *somewhat acceptable* combined (figure 1).

The least acceptable scenario was when the local government proposes to kill the specific lynx that scared a pet (66.7% rated this as *very unacceptable*, *unacceptable* or *somewhat unacceptable*). By contrast, the most acceptable scenario was when the local government proposes to kill the specific wolf that attacked a human (53.3% rated this as *very acceptable*, *acceptable* or *somewhat acceptable*; figure 1). There were no stark differences between rural and urban participants across the scenarios (electronic supplementary material, figure S1).

(b) Acceptability model

We found statistically significant associations between acceptability and *gender*, *formal education*, *people versus animals*, *knowledge score* and the interactions between *who* and *incident*, *residential status* and *reaction*, and *incident* and *reaction*. We found no statistically significant association between acceptability and *age* or the remaining interaction variables (ANODE; table 3).

Participants were significantly more likely to accept lethal control of *bears* compared to *lynx* (Tukey test: estimate = 0.63, $p < 0.001$). We found no significant difference between acceptability of lethal control of *bears* compared to *wolves* (Tukey test: estimate = 0.30, $p = 0.08$) or *wolves* compared to *lynx* (Tukey test: estimate = 0.33, $p = 0.05$; figure 2a).

For both rural participants (Tukey test: estimate = 0.89, $p < 0.001$) and urban participants (Tukey test: estimate = 0.41, $p = 0.001$), lethal control of specific animals that caused an incident (*one*) was significantly more acceptable than lethal control of any animal of that species (*any*). The differences between rural and urban participants for the same reaction (*one* or *any*), were not significant (*one*: estimate = 0.38, $p = 0.38$ and *any*: estimate = 0.11, $p = 0.97$; figure 2b).

For the same victim (*who*), it was always more acceptable to lethally control the carnivore, if the incident was *attack* compared to *scare* (*human*: estimate = 1.65, $p < 0.001$, *pet*: estimate = 1.18, $p < 0.001$, and *livestock*: estimate = 0.66, $p = 0.004$; figure 2c). When the incident was *attack*, it was significantly more acceptable to kill the carnivore, if the victim was *human*, compared to *pet* (Tukey test: estimate = 0.78, $p < 0.001$) or *livestock* (Tukey test: estimate = 1.00, $p < 0.001$), while there was no significant difference between *pet* and *livestock* (Tukey test: estimate = 0.21, $p = 0.85$). When the incident was *scare*, there were no significant acceptability differences between any victim (*who*).

Participants perceived lethal control to be significantly more acceptable if the incident was *attack* compared to *scare*, for both reactions (*one*: estimate = 1.43, $p < 0.001$ and *any*: estimate = 0.89, $p < 0.001$; figure 2d). While it was significantly more acceptable to lethally control the animal that caused the incident (*one*) compared to any animal in the area (*any*), when the incident was *attack* (Tukey test: estimate = 0.92, $p < 0.001$), there was no significant difference when the incident was *scare* (Tukey test: estimate = 0.38, $p = 0.06$).

Participants with a *college or university degree* perceived lethal control to be significantly more acceptable than those with a *primary or secondary school degree* (Tukey test: estimate = 0.65, $p = 0.02$). There were no significant differences between *college or university degree* and *postgraduate degree* (Tukey test: estimate = 0.61, $p = 0.14$), or *postgraduate degree* and *primary or secondary school* (Tukey test: estimate = 0.04, $p = 0.99$; figure 3a). Men perceived lethal control to be significantly more acceptable than women (Tukey test: estimate = 0.80, $p < 0.0001$; figure 3b). There was no statistically significant association between acceptability and age.

Participants who would strongly prioritize the interests of people over the interests of wild animals perceived lethal control to be significantly more acceptable than participants who expressed any other priority (figure 3c). Carnivore-specific knowledge was negatively associated with acceptability (estimate = −0.34, $p < 0.0001$; figure 3d).

Table 3. Summary results from analysis of deviance (ANODE) of the acceptability model. (d.f. refers to degrees of freedom, χ^2 refers to chi-square statistic and p is the corresponding p-value.

	d.f.	χ^2	p
residential status	1	0.5	0.48
animal	2	22.5	<0.001
who	2	18.5	<0.001
incident	1	98.9	<0.001
reaction	1	28.0	<0.001
gender	1	19.7	<0.001
age	1	2.7	0.10
formal education	2	7.4	0.03
people versus animals	5	65.1	<0.001
knowledge score	1	101.9	<0.001
residential status × animal	2	2.6	0.27
residential status × who	2	1.1	0.57
residential status × incident	1	3.5	0.06
residential status × reaction	1	4.3	0.04
animal × who	4	2.9	0.58
animal × incident	2	1.4	0.50
animal × reaction	2	0.6	0.75
who × incident	2	1.8	<0.001
who × reaction	2	1.9	0.38
incident × reaction	1	8.0	<0.01

(c) Polarization model

Proposals to lethally control bears were significantly less polarized than proposals involving lynx (Tukey test: estimate = 0.32, $p < 0.01$) or wolves (Tukey test: estimate = 0.23, $p = 0.02$; figure 4; electronic supplementary material, table S4). There was no significant difference in polarization between proposals to lethally control wolves and lynx (Tukey test: estimate = 0.09, $p = 0.48$).

4. Discussion

Using an experimental vignette approach, we measured perceptions of lethal control of wolves, bears and lynx among a broad sample of the German public and assessed the degree of polarization towards the three species. We found support for three out of four hypotheses for acceptability of lethal control. Social acceptability depended on incident characteristics and management reaction (H1), participants' demographic background and conservation priorities (H3), knowledge of large carnivores and their management in Germany (H4), but not residential status (H2; electronic supplementary material, table S1). The hypothesis that polarization would be highest for wolves was not supported (H5; electronic supplementary material, table S1). This shows that social acceptability of lethal control is not monolithic but depends on incident characteristics, the specific lethal control proposed and participants' personal characteristics.

Consistent with H1, the nature of the incident strongly influenced acceptability of lethal control. All else equal, participants perceived lethal control of bears to be more acceptable than lethal control of lynx. This may reflect perceived threat levels: bears are larger and have been involved in fatal attacks on people [59], with thorough media coverage of high-profile cases [60]. By contrast lynx typically do not attack people, and no attacks have been reported since their return to Germany. Wolves rarely attack people; the first incident in Germany since the late 1990s was on 30 March 2026, when a young wolf injured a person, who attempted to free it from a glass door in the city centre of Hamburg. Experts' assessment suggested that the young wolf was dispersing in search for its own territory and was trying to find its way out of the city, after accidentally wandering far into the centre [61]. While people in Europe generally hold more negative attitudes towards wolves than bears [62], we found no evidence of differences in acceptability of lethal control between these two species in Germany. Higher acceptability of lethal control of bears, despite the lack of an established population in Germany, may indicate public resistance to any future establishment or expansion in bear populations. Previous studies show that public support towards large carnivore conservation tends to decrease over time as people gain more experience living alongside them [62], which could foreshadow decreasing tolerance as bear presence increases. As there is a possibility of brown bears naturally dispersing to Germany

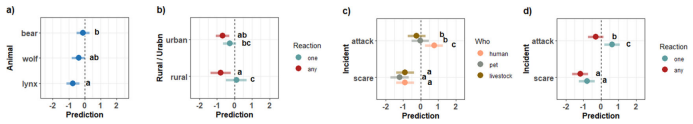


Figure 2. Predicted relative acceptability of the significant effects of experimental variables in the acceptability model. Circles show parameter estimates (log odds ratio) and error bars show 95% confidence intervals for: (a) animal that caused the incident, significant interactions between two variables, respectively: (b) residential status and reaction, (c) who and incident and (d) reaction and incident. Compact letter displays show statistically significant differences between levels of categorical predictors (groups sharing a letter are not significantly different: e.g. a and b differ significantly, a and ab do not).

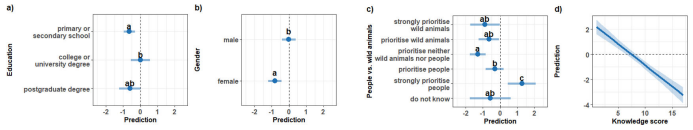


Figure 3. Associations between acceptability of the local governments' proposal to lethally control a large carnivore and significant effects of participant characteristics in the acceptability model. Graphs show model estimates (log odds ratio) and 95% confidence intervals for: (a) highest level of formal education, (b) gender, (c) whether participants would prioritize wild animals or people if their interests clash, and (d) large carnivore knowledge score. Compact letter displays show statistically significant differences between levels of categorical predictors (groups sharing a letter are not significantly different: e.g. a and b differ significantly, a and ab do not).

[33], it is essential to understand public sentiment and start addressing concerns before the population establishes in order to mitigate future conflict. The large carnivore that caused the incident (*animal*) was not involved in any interaction effects with the remaining experimental conditions (*incident*, *who* and *reaction*). This surprising finding indicates that participants' perceptions of lethal control did not vary by species, if the incident, victim and response, were the same.

Lethal control was more acceptable when animals attack compared to scare people, pets or livestock, suggesting that physical harm shapes perceived tolerable risk from large carnivores in Germany [8,63]. Lethal control was especially acceptable when large carnivores attack people, possibly reflecting heightened prioritization of human health and safety [64], a motivator for support of lethal animal control more generally [36,65]. Despite emotional closeness to pets [12], the lack of significant difference between incidents involving pets and livestock suggests that the type of non-human victim may be less influential than we anticipated. Livestock is particularly important to farmers, for both economic and emotional reasons, with the wellbeing of livestock closely linked to the wellbeing and livelihood of farmers [66]. Therefore, this result may indirectly reflect concern for farmers and their livelihoods.

A notable finding is the distinction between targeted and non-targeted lethal control. Participants perceived lethal control of the individual that caused the incident (*one*) to be more acceptable than control of any animal of the same species in the area. While this might reflect ecological concerns connected to non-targeted lethal control [16,22], this idea is contested and probably not well known among the general public. This may also indicate that people appreciate individual behavioural differences in animals, based on their personalities and learning histories [67]. The fact that one animal is disposed to attack humans or predate livestock does not imply that other individuals of the same species will behave similarly [68]. Another possible explanation is that the lethal control of the individual that caused the incident, i.e. the offender, is in line with general conceptions of justice and punishment [69]. Thus, attempts to reduce conflict by non-targeted control (*any*) might be perceived as unjust or unacceptable and could risk undermining public support for and legitimacy of wildlife management more generally [39].

Contrary to prevailing narratives and some previous studies [35,70], among our sample rural and urban perspectives on this contentious issue were not sharply divided. The only notable difference appeared in response to the local government's proposed reaction: the acceptability difference between targeted (*one*) and non-targeted (*any*) was more pronounced among rural participants (figure 2b). This could reflect a greater knowledge of wildlife dynamics or a greater awareness of the potential negative impact of non-targeted lethal control on wolf behaviour among rural residents [16,22]. However, the limited and context-specific nature of the differences suggests caution in reinforcing the narrative of the 'rural–urban divide' [70,71]. Recent changes in German population dynamics, such as growing rural in-migration enabled by more flexible post-pandemic circumstances [72], may be blurring traditional boundaries between urban and rural perspectives. Nevertheless, we acknowledge that people in rural areas often pay the cost of living alongside large carnivores [42,73], especially those whose livelihoods and ways of life are directly affected (e.g. livestock keepers, dog walkers). Our sampling strategy meant that we were unlikely to reach large numbers of rural residents who are directly affected. It is therefore important that their concerns are understood and considered in developing strategies to manage conflict over large carnivores [74]. Our results highlight that rural perspectives on lethal control of large carnivores are not homogeneous. There is notable variation in perception of targeted versus non-targeted management, and some rural perspectives are largely similar to urban perspectives. Wildlife policies or programmes based on an overly simplistic rural–urban distinction risk overlooking the needs, interest and concerns of people who live closest to large carnivores. This is particularly pertinent in light of the European Commission's decision to downlist the wolf's protection status [34,75], which could permit more liberal use of lethal control when risks from large carnivores are, or are perceived to be, unacceptably high. Such measures may miss their intended effect or inadequately address the concerns of some affected groups.

Participants' characteristics influenced acceptability of lethal control, consistent with our hypothesis (H3). The higher acceptance of such measures among men compared to women echoes other studies suggesting men are especially likely to find lethal control acceptable across contexts. While some studies link such differences to men holding more utilitarian views towards wildlife, compared to women, who are more concerned with animal welfare [76], we cannot evaluate specific

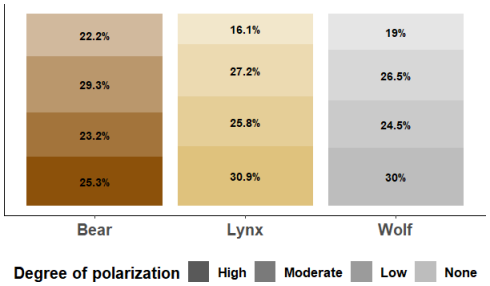


Figure 4. Degree of polarization of proposals to lethally control bears, wolves or lynx. Values for polarization are derived from 2850 responses to vignettes involving proposals to lethally control a bear ($n = 960$), lynx ($n = 935$) or wolf ($n = 957$). High polarization represents very acceptable and very unacceptable responses combined, moderate polarization represents acceptable and unacceptable responses combined, low polarization represents somewhat acceptable and unacceptable responses combined, and no polarization represents neither acceptable nor unacceptable responses. Percentages show the proportion of responses in each category of polarization for each species.

mechanisms for gender differences in this study. Participants who would strongly prioritize human interests over wild animals' interests found lethal control more acceptable, indicating that a human-centred view of living alongside problematic animals is associated with increased acceptability of lethal control [77,78], and echoing findings that how people prioritize people versus wild animals helps explain differences around other controversial issues in wildlife conservation [37,38,40].

Formal education and knowledge about large carnivore ecology and conservation showed different effects: the only significant difference observed for formal education was that participants with a college or university degree showed higher acceptability of lethal control compared to those whose highest degree of education was primary or secondary school, while context-specific knowledge corresponded to lower acceptability. This suggests that general formal education and context-specific knowledge can influence perceptions in different ways. This result also contradicts some previous findings, for example Dawson [79] who report that higher knowledge increased acceptability of lethally controlling kangaroos (*Macropus* spp., *Osphranter* spp.) among Australians. However, this difference may come from contextual differences. Unlike kangaroos, large carnivores in Germany are not considered overpopulated by management authorities and wildlife biologists, nor has lethal control proved categorically effective in reducing conflict [16,20,22]. Our findings highlight the importance of knowledge in shaping more critical and careful perspectives on management. Increasing knowledge alone is unlikely to change underlying values [78,80], but it can be an initiation point for wider dialogue. Positive and negative attitudes towards wildlife are often deeply rooted in cultural identity and social context [44,81], and these factors should be considered when addressing stakeholders in efforts to manage conflicts around and improve coexistence with potentially dangerous animals [82].

Across scenarios, we found that polarization around the issue of lethal control was generally low (figure 4). This challenges the common narrative of wolf conflict and coexistence being highly polarizing in Germany [35]. The fact that bears, which were more acceptable targets for lethal control, also showed the least polarization, is consistent with the possibility that lethal control of animals perceived as high-risk (e.g. bears) can be less controversial [59]. These findings of nuanced public perceptions reinforce calls to incorporate diverse and under-represented perspectives in conservation dialogues [83]. Research that specifically investigates polarization, including and beyond lethal control, could test the extent to which our findings from this study generalize to broader perspectives on large carnivore management.

There are several limitations to this study. Our survey included questions on participants' social identities and conservation priorities, but it was not designed to capture in-depth information on prior personal experience with large carnivores or cultural identities, which are difficult to assess in a quantitative questionnaire. Sample size limitations also constrained our ability to explore some potentially interesting comparisons in a statistically robust manner, such as differences in perceptions across Germany's 16 federal states, which are at different stages of wolf recolonization. The distribution of lynx is also limited to certain German states, and the potential return of bears primarily affects those in the south. While the online survey format allowed us to reach a large number of people efficiently, it may under-represent certain demographic groups, including older generations, who are less familiar with digital survey tools.

5. Conclusion

As Europe enters a new period of large carnivore management—potentially involving wider lethal control because of recent legislative changes [6,19,34]— evaluating public perceptions becomes essential. Social acceptability is as critical as ecological effectiveness and practicability when designing strategies for coexisting with and managing conflicts around large carnivores [14], because large carnivore conservation and survival in human-dominated landscapes ultimately depends on tolerance and willingness to coexist [11]. We recommend longitudinal studies on the lethal control of large carnivores, and willingness to coexist, accounting for specific context and changing conditions, to better understand public perceptions and inform adaptive management approaches.

Ethics. This study received ethical approval by the Research Governance, Ethics & Assurance (RGEA) Team of the University of Oxford (MS IDREC 1030158).

Data accessibility. The raw data and code to reproduce the results are provided in the electronic supplementary material, available online [84].

Declaration of AI use. We used AI (ChatGPT and DeepL) to help generate R code and to suggest ways to improve clarity of text initially drafted by authors whose first language is not English.

Authors' contributions. E.-F.O.-M.: conceptualization, formal analysis, investigation, methodology, visualization, writing—original draft; S.H.: investigation, writing—review and editing; D.H.: conceptualization, formal analysis, funding acquisition, methodology, visualization, writing—original draft, writing—review and editing.

All authors gave final approval for publication and agreed to be held accountable for the work performed therein.

Conflict of interest declaration. D.H. has consulted for WWF Germany on human-wildlife conflict.

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