





RESEARCH NOTE

Perceptions and attitudes of stakeholders on the return of brown bears (*Ursus arctos*): Contributions from a workshop held in northern Portugal

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Abstract

Brown bears (*Ursus arctos*) were extinct in Portugal by 1843. In the spring of 2019, a male bear was officially confirmed in northern Portugal, and more bears will likely reach the country shortly. We surveyed participants in a workshop held in Bragança in October 2021 to understand the perceptions and attitudes of different stakeholder groups (Administration, Research, Nongovernmental Organizations, and Local Stakeholders) regarding the return of brown bears to Portugal. Results indicate that, generally, participants would feel safe in areas where bears are present, are positive toward the return of brown bears, and see it as an opportunity for local development rather than a threat. Results also indicate a high level of consensus among groups of stakeholders concerning the issues analyzed. These preliminary results provide a baseline for perceptions and attitudes to consider when planning the conservation of brown bears returning to Portugal.

KEYWORDS

Bragança, brown bear, fuzzy numbers, human dimensions, Portugal, stakeholder engagement, *Ursus arctos*

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1 | INTRODUCTION

Brown bear (*Ursus arctos*) populations in Europe have been showing a positive trend in recent decades (Chapron et al., 2014; Cimatti et al., 2021; Linnell & Cretois, 2018), and 15,000–16,000 brown bears are currently estimated in continental Europe (excluding Russia and Belarus) (Linnell & Cretois, 2018). Different factors explain the recovery of bears and other European large carnivores, such as conservation and political commitments, law enforcement, institutional arrangements, context-specific management favoring human–carnivore coexistence, shifts in land use, or changes in public acceptance (e.g., Chapron et al., 2014; Cimatti et al., 2021; Dressel et al., 2015; Eklund et al., 2017; Mammola et al., 2020; Trouwborst, 2010). In some cases, recovery has been boosted by reintroduction actions (Chapron et al., 2014; Palazón, 2017).

In several parts of Europe, positive attitudes toward brown bears have been documented (Dressel et al., 2015; Kutal et al., 2018) but may differ according to the recent history of coexistence. In areas where bears have always been present in large populations (e.g., Eastern European countries, Scandinavia), the persistence of bears is in part related to the positive attitude of local stakeholders (Kaczensky et al., 2004). For example, in southern Transylvania (Romania), despite attacks on sheep, about 50% of shepherds have a neutral to positive attitude toward the conservation of bears (Dorresteijn et al., 2014). In North Macedonia, residents have a positive perception of bears despite damage (Lescureux et al., 2011; Lescureux & Linnell, 2010). In the Rodopi Mountains (Bulgaria), positive perceptions and attitudes of local communities contribute to coexistence (Toncheva et al., 2021). However, Balčiauskas et al. (2020) did not find significant differences in acceptance of teenagers between countries where bears are permanently present and no-bear countries.

In areas where bears have remained in scattered, isolated small populations (e.g., the Cantabrian Mountains and the Pyrenees, Spain, Dinaric Alps, Slovenia, or central Apennines, Italy), perceptions and attitudes vary. In the Cantabrian mountains, López-Bao, Planella, Mateo-Tomás, et al. (2021) found that the majority of inhabitants have a positive perception of bears and see the presence of bears compatible with rural life. In the same area, García-de la Fuente et al. (2010) found that more than 50% of the inquired population was willing to contribute to preserving the species. In the west Pyrenees, although the number of bears is extremely low, the attitude of farmers is very negative due to damage and incapacity to adapt husbandry (Herrero et al., 2021) but this is not generalized to all counties (Piédallu et al., 2016). In the Apennines, residents' attitudes toward

bears are generally positive (Glikman et al., 2012), although dependent on perceived benefits related to the species (Glikman et al., 2019).

Finally, in areas where bears have been absent for several decades/centuries but where they have returned recently or are in the imminence of returning (expansion areas in the Iberian Peninsula, France, northern Sweden, subalpine and alpine regions in northern Slovenia, and northern Italy), perceptions and attitudes depend considerably on stakeholders and dominant productive systems. In a meta-analysis, Dressel et al. (2015) found that in areas where bear reappearance is close, 83% of respondents, on average (four studies), had positive attitudes toward the species. In the French Pyrenees, attitudes were negative in some counties, but in other counties were positive and neutral (Piédallu et al., 2016). In this region, residents born outside the Pyrenees were more positive than those born within the region (Piédallu et al., 2016). In the Alps, farmers and peasant hunters opposed the return of large predators (Breitenmoser, 1998), in particular in regions of Slovenia currently dominated by extensive sheep farming. Kaczensky et al. (2004), comparing one core area with bears that had never been extinct and an outer area where bears were absent until recently, found that attitudes toward conservation were generally positive in both areas and that the perception of harmfulness of bears was the major factor affecting attitudes. In Jämtland and Dalarna, in northern Sweden, recent bear recolonization created conflicts around summer farms due to farmers' loss of knowledge of protection practices (Axelsson Linkowski et al., 2017).

In Portugal, brown bears have been extinct since the mid-19th century (Álvares et al., 2019; Caetano & Pimenta, 2017). Despite evidence of ancestral coexistence (Álvares & Domingues, 2010; Caetano & Pimenta, 2017), currently, there is no collective inter-generational memory of sharing the land with bears in Portugal, which may prompt concern, fear, and resentment in case of return (López-Bao et al., 2017).

The north of Portugal is close to the endangered Cantabrian brown bear population (ca. 100 km in a straight line) that has grown quickly in recent years, particularly on the western side of its permanent range (López-Bao, Planella, Ballesteros, et al., 2021; Palomero et al., 2021). This situation increases the chances of dispersing bears to reach northern Portugal, a suitable habitat for brown bear recolonization (Scharf & Fernández, 2018). Dispersing bears had already been found near the border, and Portuguese authorities confirmed the occasional presence of a male brown bear in the Espinhosela parish in the spring of 2019 (Álvares et al., 2019).

In the Iberian Peninsula, there is a gap in information and knowledge regarding how people in the expansion

territories perceive the arrival of bears and how such perceptions will affect interactions with them (Lozano et al., 2019). Issues related to preparation, awareness, involvement in conservation planning, or minimization of problems and maximization of advantages at the community level will benefit significantly from a better understanding of stakeholders' preferences and attitudes toward the return of bears. This is particularly relevant in Portugal, where the return of brown bears has not been addressed.

Taking advantage of a workshop organized by Nongovernmental Organizations (NGOs) and public institutions in October 2021 to address major conservation issues related to the return of the brown bear, we collected data among participants with the main goal of exploring perceptions and attitudes toward brown bear recovery in northern Portugal. We also aimed to look for differences and potential conflicts in perceptions and attitudes among groups of stakeholders. Despite the small sample size ($n = 42$), the fact that participants are individuals volunteering to participate in the workshop, and the data are preliminary, the study portrays information relevant for understanding how different actors may perceive and behave toward bears, before the eventual establishment of the species. This is the first-ever dataset collected in Portugal that will be fundamental to developing further human dimension research based on a broader population. This information is particularly useful for land and resource managers, rural communities, and conservation authorities and to support future work on brown bear recovery in Portugal, especially when considering attitudes and perceptions related to a broader cross-section of society.

2 | METHODS

Stakeholders were surveyed using a questionnaire at a workshop on the return of brown bears in Bragança (Portugal) on October 28, 2021. All participants in the event were invited and selected to ensure the representation of relevant stakeholders in sectors with a likely relation with bears. Of the 133 individuals invited, 95 participated in the workshop. They were from professional groups such as apiculture, tourism, forest consultancy, environmental NGOs, farmer's associations, forestry associations, hunter's associations, local communities associations, other associations (e.g., dog breeders, mountaineering, etc.), public administration (municipalities and Instituto da Conservação da Natureza e das Florestas [ICNF]) and research. Subsequently, these groups were combined into four broader categories for analyses: Administration, Research, NGOs, and Local Stakeholders.

The category Administration comprises members of national conservation authorities. Research is formed by researchers in higher education institutions and research centers. NGOs comprise members of environmental associations in northern Portugal whose work focuses on nature conservation. Local Stakeholders are comprised of individuals who live in the area and work in the primary (e.g., agriculture, forestry, beekeeping) and tertiary (tourism) sectors.

2.1 | Questionnaire design

The questionnaire was designed under the premises that residents' perception affect their attitudes and behaviors toward bears (Kushnir & Packer, 2019) and that attitudes are good indicators of the social foundation for bear conservation in the future (Dressel et al., 2015). We considered perceptions as mental processes of recognizing and explaining bears according to the organization and interpretation of available information and attitudes as dispositions people have to think, feel, or behave positively or negatively about bears (Almeida et al., 2014). The questionnaire was comprised of 19 closed-ended and two open-ended questions structured in two sections (Table S1). Section I included questions regarding socio-demographic variables, and Section II questions on perceptions (Questions 7–13 and 18–19) and attitudes (Questions 14–17 and 20–21) toward returning bears and potential measures to deal with them in the future.

2.2 | Data analysis

The six questions of Section I were analyzed using descriptive statistics. Most questions in Section II were analyzed based on fuzzy number scales (Arellano et al., 2019). Respondents selected one or several 10-value intervals for each question, continuously representing levels of agreement/disagreement on a 0% (total disagreement) to 100% (total agreement) scale. Responses were fuzzified as triangular fuzzy numbers (x, a, b, c), in which the lowest percentile marked by each respondent formed the lower bound (a), the highest percentile the upper bound (c), and the mean of upper and lower bounds the middle value (b) so that the vertex of the triangle was defined by the point ($b,1$) (Shen et al., 2011).

Responses of each stakeholder group were aggregated into a group fuzzy number (GFN). GFN of group j was defined as $GFN_j = (\bar{a}_i, \bar{b}_i, \bar{c}_i)$, where $\bar{a}_i, \bar{b}_i,$ and \bar{c}_i are the means of lower (a_i) and upper bounds (c_i) and middle value (b_i) of group member i . The relative dispersion of GFN was calculated considering the size of the groups

through group dispersion (GD) (Equation 1) for each GFN. GD provides a measure to compare the relative variation between groups by question (Martin & Gray, 1971):

$$GD = \frac{V(s)}{\sqrt{n-1}} \quad (1)$$

where $V(s)$ is the group standard deviation and n is the group size.

For each GFN, we also calculated the width of the lower- and upper-bound interval to assess the tolerance or flexibility of each group. A larger width indicates higher agreement with other groups.

An overlap analysis was conducted based on overlap percentage (OP) and overlap area (OA) (Equations 2 and 3):

$$OP = \frac{\text{Max } a_j - \text{Min } c_j}{\text{Max } c_j - \text{Min } a_j} * 100, \quad (2)$$

$$OA = \frac{(\text{Min } c_j - \text{Max } a_j) * h}{2}, \quad (3)$$

where h is the height of the overlapped triangle, and Max and Min are the maximum and minimum values of the remaining vertices of the fuzzy triangles. When $\text{Max } a_j < \text{Min } c_j$, there is an overlap of areas between all the groups, and OP is negative; when $\text{Max } a_j > \text{Min } c_j$ there are at least two assessments that do not overlap, and OP is positive.

Overlap and Disagreement intervals were defined as the lowest and the highest bounds formed by the $\text{Min } c_j$ and $\text{Max } a_j$, respectively. For Overlap intervals, the lower bound represents the limit on which the assessment of all the groups begins to match, and the upper bound represents the limit on which the overlap of assessments of all the groups ends. The width of Disagreement intervals represents the distance between the furthest positions. Overlap/Disagreement intervals were constructed as ($\text{Max } a$, $\text{Min } c$).

The fuzzy approach has not been used before in studying human–carnivore conflicts. Its major advantages are assessing levels of agreement between groups of stakeholders, easy visualization of the most important divergences between them and identifying their strongest preferences. This method is helpful to reduce conflicts among stakeholders in the design of conservation strategies and to improve collaborative decision-making processes in conservation. Two questions regarding the sectors most benefited or harmed by the return of bears were rank questions in which each participant gave n votes to the most preferred sector, $n - 1$ to the second

preferred and finally, one vote to the least desired (Hiltunen et al., 2008). Results express the percentage of voters choosing each sector as affected most positively/negatively. The closed yes/no questions 10, 20, and 21 (Table S1) were handled directly.

3 | RESULTS

3.1 | Sample description

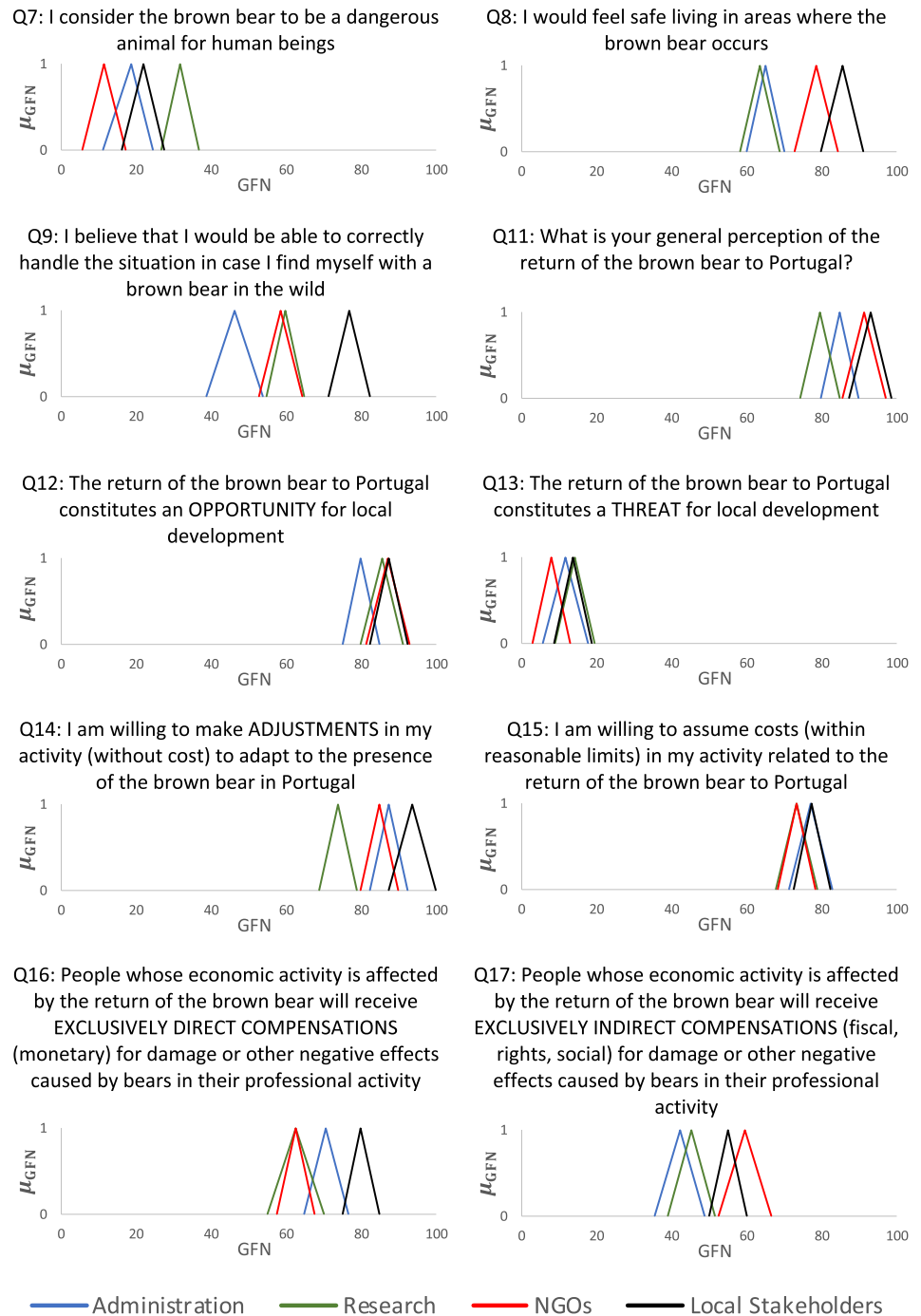
The questionnaire was completed by 42 participants (44.2% of attendees): 18 from Administration (42.9%), 9 (21.4%) from Research, 7 (16.7%) from NGOs, and 8 (19.0%) from Local Stakeholder groups. More than 60% of respondents in Administration and Local Stakeholders were 50 or older, and most NGOs and Research respondents were younger than 50 (Table S2). Gender balance was higher in the NGOs group and lower in the Local Stakeholders group. The level of education was overall very high.

3.2 | Perceptions and attitudes toward bear recovery in Portugal

On average, nearly 83% of respondents considered the return of the brown bear to Portugal likely in the coming 10–20 years (Figure S1) (100% of Local Stakeholders and Research group members). Respondents did not consider, in general, bears as dangerous animals and considered that they would feel relatively safe in bear areas and with potential bear encounters may they return (Q7–Q9 in Figure 1 and Tables S3–S5). However, Administration and Research members considered that they would feel slightly less safe in areas with bears compared to members in other groups. On the contrary, Local Stakeholders considered that they would feel safe in bear areas and that they are better prepared to deal with bear encounters than other groups.

The potential return of the brown bear to Portugal was seen as very positive among respondents (Q11 in Figure 1). All groups had GFN scores higher than percentile 74 (Table S6). The lowest lower bound was found for Administration and the highest for Local Stakeholder groups. Respondents considered the return of brown bears as an opportunity for local development (Q12 in Figure 1 and Table S7). The lowest percentile for this question was for the Research group and the highest for the Local Stakeholders group. Relative dispersion was very low, indicating agreement within groups. Respondents considered the return of bears far from being a socioeconomic threat (Q13 in Figure 1 and Table S8).

FIGURE 1 Fuzzy response charts of Administration (blue), Research (green), NGOs (red) and Local Stakeholders (black) to questions/statements (Q) corresponding to questions in Table S1.



All stakeholder groups indicated that they are willing to make adjustments in their activity, but Local Stakeholders are even more willing to do so (Q14 in Figure 1 and Table S9). Willingness to assume additional costs to adapt to the presence of bears was very high and similar among groups (Q15 in Figure 1 and Table S10).

Preference for payment of exclusively direct compensations was higher than exclusively indirect compensations (Q16–Q17 in Figure 1 and Tables S11 and S12), but most respondents preferred compensations of both types.

Members of the Local Stakeholders' group showed a higher preference for the payment of direct compensation, while members of the NGOs showed a stronger preference for indirect compensation.

There was total agreement among groups (in green in Table 1) regarding opportunities (Q12) and the absence of threats for local development (Q13), as well as the willingness to assume costs at reasonable levels (Q15). We found disagreement (in red in Table 1) for the remaining questions. Most of the conflicts found were between Research and Local Stakeholder groups (Table 1).

TABLE 1 Overlap percentages (green: positive overlap; red: negative overlap), overlap/disagreement interval (green: overlap interval; red: disagreement interval), and conflictive groups or OA between all the groups for topics covered in the questionnaire (see Table S1 for the complete formulation of questions).

Questions	Overlap percentage (%)	Overlap/disagreement interval	Conflictive groups
Q7: Bears dangerous to humans	- 30.78	[17.86,29.05]	Research-NGOs
Q8: Safety of living in areas with bears	- 33.75	[66,76.78]	Research-Local Stakeholders
Q9: Correctly handling encounters with bears	- 40	[56.92,68.46]	Administration-Local Stakeholders
Q11: General perception about bears	- 10.28	[80,90.75]	Research-Local Stakeholders
Q12: Bears as opportunities for local development	+ 14.28	[79.76,90.48]	OA = 0.31
Q13: Bears as threats to local development	+ 24	[7.14,17.86]	OA = 0.75
Q14: Willingness to adjust economic activities	- 27.67	[77.07,87.56]	Research-Local Stakeholders
Q15: Willingness to assume costs	+ 38.94	[72.5,78.33]	OA = 0.84
Q16: Support of direct compensations	- 39.68	[61.71,71.95]	Research/NGOs-Local Stakeholders
Q17: Support of indirect compensations	- 25	[42.73,54.55]	Administration-NGOs

Abbreviations: NGOs, Nongovernmental Organization; OA, overlap area.

Respondents considered that Tourism, Science/Research, and NGOs are the sectors that will benefit the most from the return of bears. This was observed within all groups except the Administration, which considered Administration (Nature Conservation) to benefit more than the NGO sector, and the Research group, which considered Administration (Nature Conservation) to benefit more than the Science/Research (Figure S2 a) sectors. Respondents considered that beekeepers, farmers (agriculture), and hunters (Figure S2 b) would be affected negatively the most. Responses were consistent among groups.

All respondents but one (in the Research group) considered the State to be able to manage additional costs associated with the return of brown bears to Portugal. All respondents agreed that it is necessary to develop an action plan to identify and prioritize conservation measures before the permanent presence of the species in the region.

4 | DISCUSSION

Overall, respondents were positive about the return of brown bears to Portugal. They considered that, in general, brown bears are not dangerous; their presence would not make them feel unsafe, and they are prepared to deal with bear encounters. The return of bears to Portugal is an opportunity rather than a threat; respondents consider

they are willing to adjust their activities to share the landscape with bears or even assume the costs involved in living with bears. In addition to the sample composition, the absence of bears and conflicts in the region for nearly 170 years and the social and cultural changes in rural areas since then may be behind this result (Ghasemi et al., 2021). Nevertheless, in such areas, attitudes can be very negative (Herrero et al., 2021) or become more negative after the bears return (Dressel et al., 2015). It can also be speculated that other factors, such as the awareness of the conservation status of the species and its declining population (Kaczensky et al., 2004), might explain this result. Brown bears in Spain are listed as Threatened (Comité Español de la IUCN & Fundación Naturaleza y Hombre, 2019), and Regionally Extinct in Portugal (Cabral et al., 2005). The fact that respondents in our survey did not consider bears dangerous or fear them might also have contributed to the generally positive perceptions (Balčiauskas et al., 2020; Kaczensky et al., 2004). Dangerousness and fearsomeness are prevalent characteristics of the social stereotype of brown bears related to negative perceptions (Sevillano-Triguero et al., 2022).

The particular roles of the groups of stakeholders surveyed need also to be taken into account. The Administration, comprised of managers and rangers of the national authority for biodiversity conservation in Portugal (ICNF), is committed to legal conservation frameworks. Researchers are often involved in conservation projects, and NGO members, mostly from conservation organizations, tend to have

positive perceptions of large carnivores. The mean age was lowest in these two groups, and low age tends to be more positive toward conservation (Kaczensky et al., 2004; Piédallu et al., 2016). In all cases, respondents' education level was very high (Table S2), which is also often related to pro-conservation attitudes (Oražem et al., 2021).

Although their general perceptions were positive, Research was the group that considered bears to be most dangerous (Q7), felt less safe to live in bear areas (Q8), and were least willing to make adjustments to accommodate bears (Q14). It can be speculated that knowledge of conflicts in regions with bears (through the literature and personal experience) might affect this more cautious attitude, contrary to other groups that are, at this point, unaware of the eventual downsides of the return of bears to Portugal.

Local Stakeholders (beekeeping, tourism, agriculture, animal husbandry, and forestry sectors), although a small group (eight individuals) and older than the remaining groups, showed positive perceptions and attitudes toward conserving brown bears. The importance of bears for the local and regional economy can be very significant (Marquínez et al., 2021; Richardson, 2022), and this understanding might have contributed to the responses. Local Stakeholders are also committed to adapting and supporting costs related to the return of bears. Even considering sample limitations, including that respondents are individuals who voluntarily attended a bear workshop, this is a promising result since these perceptions and attitudes are not always the case in areas where bears are returning (Breitenmoser, 1998; Kaczensky et al., 2004). This result needs, however, to be investigated at a broader scale.

The variability of responses within and among groups of stakeholders was small, indicating a general consensus of perceptions and attitudes despite differences between groups. Based on evidence from other comparable regions (Breitenmoser, 1998; Clark et al., 2002; Kaczensky et al., 2004; Piédallu et al., 2016), a higher degree of divergence could have been expected. Conflicts among groups of stakeholders tend to emerge from threats posed by large carnivores to human life and property (Kaczensky et al., 2004), which could not be perceived here since bears are not present in Portugal.

The sample of this study is, by nature, small in size and restricted in scope as it is comprised of participants in a workshop. Therefore, the study's results express only the perceptions and attitudes of this sample. Despite constraints, our study provides insight into how the groups of stakeholders surveyed perceive and potentially behave toward returning bears in a region where the species is currently absent. This result is significant because the stakeholder groups surveyed are more likely to interact with bears in the eventuality of their return to Portugal.

A comprehensive study on this matter requires a much broader and representative sample. Therefore, the survey's geographical and sectorial expansion is a research priority in the near future.

Land-sharing approaches are fundamental for successfully conserving bears in human-dominated landscapes (Chapron & López-Bao, 2016; Kaczensky et al., 2004; López-Bao et al., 2017; Toncheva et al., 2021), and local communities' acceptance of bear presence is a key condition for their persistence (Dorresteijn et al., 2014; Glikman et al., 2021). The fact that a large group of people without previous experience with bears volunteered to participate in a workshop about the return of bears to their region and that, in addition, a sample based on this group expressed convergent positive perceptions and attitudes regarding that return is a promising contribution to our understanding of the social conditions for brown bear conservation in the region prior to the return of bears. Positive public attitudes are fundamental to supporting actions favorable to bears and tolerating bear damage (Kaczensky et al., 2004). This information can be of interest to other areas in Europe and elsewhere where large carnivores are expanding (Chapron et al., 2014), and similar surveys could be carried out. This is particularly important because the number of studies on human attitudes conducted before the return of bears is very low (Dressel et al., 2015). Finally, this study applied an innovative method of analysis based on fuzzy set theory, suitable for conducting negotiations in decision-making processes involving stakeholders.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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