



## Sharing land with bears: Insights toward effective coexistence

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### ABSTRACT

Cohabiting with large carnivores does not necessarily equate to coexistence. In human-dominated landscapes, an effective coexistence is necessary to ensure long-term viable and sustainable conditions for large carnivores and humans, respectively. To better understand how cohabitation may develop toward coexistence, we used some of the cognitive hierarchy constructs to compare ( $n = 196$  questionnaires) stakeholders' attitudes, beliefs, and behavioral intentions, and their insights for bear conservation in a historical stronghold of the autochthonous and imperiled Apennine brown bear (central Italy). For all stakeholder groups, responses indicated positive attitudes toward bears, yet the strength of agreement between respondents varied. Specifically, attitudinal differences were from positive (shepherds and hunters) to strongly positive (foresters, rangers and hotel owners). There was a low willingness of hunters and shepherds to modify their practices to reduce potential negative impact on bears' survival and behavior. By highlighting the disconnection between holding positive attitudes and undertaking positive behaviors, we discuss ways to encourage solid engagement and participatory decision processes for effective coexistence.

### 1. Introduction

In the long history of human-carnivore cohabitation (i.e., sharing the same land), local communities may often hold positive attitudes and express attachment toward the species they cohabit with, especially if they gain economic benefits (Boitani, 1995; Dorresteijn et al., 2014). Yet, positive attitudes and attachment may not always be enough to catalyze coexistence (Carter & Linnell, 2016; Frank & Glikman, 2019), which implies a willingness to share the land and natural resources with such wildlife for the wellbeing and thriving of both humans and wildlife (IUCN-HWCTF, 2022; Pooley, 2021). An additional challenge to an enduring coexistence is the heterogeneity in perspectives about what human-wildlife coexistence looks like in practice (Frank & Glikman, 2019) and in the willingness to change behavior under certain conditions and circumstances of human-wildlife interactions.

In this paper, we applied a case study about Apennine brown bears (*Ursus arctos marsicanus*) in the Abruzzo, Lazio, and Molise National Park (PNALM, central Italy) to characterize perspectives of an array of stakeholders to understand their role in shaping current and future coexistence. In the PNALM, bears and people have always shared land,

as bears have never been fully extirpated (Benazzo et al., 2017), even though cohabitation has not evolved into a coexistence that is effective enough to foster bear recovery (Ciucci & Boitani, 2008).

Some baseline knowledge about local communities' attitudinal dispositions toward the Apennine bear population is available (Glikman et al., 2012, 2019; Marino et al., 2021). Residents living in and around the PNALM share positive attitudes, and support full protection of bears (Glikman et al., 2012, 2019); however, they differ in some cost-benefits beliefs (Glikman et al., 2019; Marino et al., 2021). For example, perceptions of the extent of damage caused by bears varied across the different administrative districts, with a higher perception of impact in Abruzzo (Glikman et al., 2019). Regarding benefits, residents that feel more intangible benefits (e.g., existence value of the species) hold higher tolerance toward bears, while tangible benefits (e.g., increased tourism due to bears) do not influence the level of tolerance toward bears (Marino et al., 2021).

Building upon the above studies, as well as on previous work conducted on bears in Europe (Dorresteijn et al., 2014; Kaczensky et al., 2004; Majić et al., 2011), we interviewed five groups of stakeholders that might be affected by the presence of bears. Similar to previous

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studies (Ambarli & Bilgin, 2008; Piédallu et al., 2016), we selected hunters and shepherds as they may stand the highest cost of sharing land with bears through hunting limitations and livestock loss, respectively. In addition, we also interviewed hotel owners, with more tangible benefits coming from tourism, and Park rangers (rangers) and State Forestry Corps (foresters), both enforcing national laws and park regulations while managing relations with stakeholders and the general public. To our knowledge, there is only one study assessing the attitudes of foresters toward bears (Balčiauskas & Kazlauskas, 2012), whereas no previous study investigated the perspectives of rangers or hotel owners, both representing relevant stakeholders in our study area.

Our goal was to achieve a deeper understanding of stakeholders nuanced, layered and complex disposition toward Apennine brown bears, where attitudes and behavioral intention may not always align. While the data we collected refer to 2009, we maintain that these data are relevant for the scope of this study because: (1) they are the first and only data illustrating stakeholders' attitudes and perceptions toward Apennine brown bears; (2) they capture conditions shaped by decades of cohabitation between humans and bears that have been long engrained and, as such, they also represent a baseline against which to eventually compare future assessments. Our approach could be used in other systems globally with other large carnivore species to delve more deeply into the topic, and find the roots of willingness of sharing the land by different actors with such wildlife.

## 1.2. Background

The Apennine brown bear represents an emblematic conservation case, featuring a relict and long-isolated autochthonous population of about 50 individuals at a relatively high density (39.7 bears/1000 km<sup>2</sup>; Ciucci et al., 2015), whose core range is centered about the PNALM (Ciucci et al., 2017). Established since 1923, the PNALM always represented a historical stronghold of bears in the Italian Apennines; the legal protection of the species at the national scale since 1939 was clearly not sufficient to prevent extinction of the species elsewhere in the country (Ciucci & Boitani, 2008). Since its establishment in 1923, the PNALM has administered bear management through norms and regulations established and enforced locally by the park authority (i.e., park zoning, livestock and forestry allotments, compensation programs, conflict mitigation policies, tourism regulation, and accessibility; Galluzzi et al., 2021). As a consequence of these limitations, local communities have seen an increase in land use restrictions on agricultural and forestry practices within the park (Ciucci & Boitani, 2008). This approach has resulted in conflicts between park authorities and some residents, with the latter perceiving that bear wellbeing is more important than local communities' livelihoods (Glikman & Frank, 2019). The main economic activities of the PNALM are forestry, tourism, and livestock husbandry. While traditional sheep herding with guardian sheepdogs (i.e., Abruzzo mastiff) is the most common livestock category, cattle and horses are usually left free-ranging (Ciucci et al., 2020). Since 1974, the PNALM reimburses livestock owners of any verified claimed damage caused by large carnivores. In 2000, the Park Authority started providing preventive measures, such as electric fences, to local shepherds (Galluzzi et al., 2021). Although hunting is prohibited within the park, it is allowed in its' external buffer zone (ZPE) where wild boar hunting with dogs is believed to negatively impact occurrence of bears, including those that expand their movements beyond the park borders (Maiorano et al., 2015).

Expansion of the bear range beyond PNALM is deemed among the most fundamental prerequisites to meet viability conditions (Maiorano et al., 2019). Despite the overall positive attitudes held by local residents (Glikman et al., 2019), bears attempting to disperse outside the park area are faced with challenges. Similar to elsewhere in Europe (Can et al., 2014), the recovery of bear population is limited by human activities such as hunting (Maiorano et al., 2015), forestry practices (Rositi et al., 2021), and impact of bears on livestock, beehives and crops

(Galluzzi et al., 2021), all of which cumulatively contribute to an increased risk of illegal and accidental human-caused mortality throughout the landscape (Falcucci et al., 2009). Such constraints hinder the expansion of the range of the Apennine brown bear population despite habitat suitability at the landscape scale (Maiorano et al., 2019) and the relevant conservation efforts put in place during the past 50 years (Ciucci & Boitani, 2008; Ciucci et al., 2017).

## 1.3. Theoretical framework

In this study, we used some of the constructs of the cognitive hierarchy framework (see Appendix 1 for further details, Fulton et al., 1996). Specifically, we investigated attitudes, normative beliefs, and behavioral intentions. Attitudes are defined as the positive to negative evaluation humans associate to an object (e.g., bear; Glikman et al., 2012). This evaluation is composed by two different components: what we feel toward bears (the affective/emotional component) and what we believe to be true about bears and their impacts, but not necessarily objectively factual (the cognitive component) (Vaske & Manfredi, 2012). These two components of attitudes can explain different elements that influence human behaviors (Verplanken et al., 1998), and are therefore best analyzed separately. Normative beliefs are personal judgements about what is appropriate in a specific situation (Zinn et al., 1998, p. 651), such as supporting full protection of bears. All these levels of constructs are intertwined and ultimately determine how a person will behave in a specific situation (see Appendix 1 for further details, Fulton et al., 1996). As a proxy to measure the behavior of an individual, behavioral intentions are used (Vaske & Donnelly, 1999). In this study, we measured the intent of a person to change land-use practices to improve the conservation status of bears.

## 2. Materials and methods

### 2.1. Study area

The PNALM is located in central Italian Apennines, encompassing three administrative regions (Abruzzo, Lazio and Molise). The current range of the PNALM is 507 km<sup>2</sup>, plus an additional 787 km<sup>2</sup> of ZPE, with an average human population density of 14.6 inhabitants per km<sup>2</sup> (Ciucci et al., 2017).

### 2.2. Survey design and data collection

The questionnaire was prepared in English and translated to Italian, it was pre-tested, and final adjustments were made accordingly. The survey was carried out by the lead author, who is a native Italian speaker. For all stakeholders, we used the same questionnaire containing 53 closed and open-ended questions. The questionnaire was divided in 4 sections (see complete questionnaire with exact item wording in Appendix 2). For this study we focused on 2 sections. We explored the two components of attitudes, the emotional (e.g., feelings toward bears) and beliefs (e.g., importance of bear existence), as well as direct cost (e.g., bears caused abundant damages to beehives) and benefits (e.g., tourism) of sharing the territory with bears. We also asked them about their intention of changing their behavior (e.g., changing hunting practice to minimize the impact on bears). All these questions were measured using statements on a 5-point Likert-type scale spanning from 1 = strongly disagree/dislike/negative to 5 = strongly agree/like/positive. In addition, participants were asked their intention in being involved in the process of creating a bear management plan for the park (yes = 1, no = 0).

Furthermore, we asked participants' socio-demographic characteristics (e.g., age, gender, place of residency). While age was measured as a continuous variable, gender was coded dichotomously (male = 0, female = 1). At the end of the questionnaire, we included a general open-ended question (i.e., if you have any comments) where stakeholders had

the opportunity to express their opinion, which provided additional information on their perspective regarding the issue or about the questionnaire. Ethical approval was obtained from the PNALM Authority and by the Miami University Ohio IRB for Human Subject Research (Protocol Number 02898e).

Data were collected between May and June 2009. All questionnaires were self-administered, completed anonymously by the respondent. To reach different stakeholders, the questionnaire was administered through three approaches. First, it was personally delivered to rangers and foresters, who completed the instrument after employee meetings. At the time of our survey, 43 rangers and 30 foresters were working in the PNALM, and 88.4 % (=38) and 80 % (n = 24) of them, respectively, participated to the survey.

Second, a list of registered shepherds and their mailing addresses were provided by the park administration. Third, a list of hotel owners was obtained from the local tourism agency association. From these lists, through the generation of random number, we selected 30 individuals from each category for each regional district included in the PNALM (i. e., Abruzzo, Lazio and Molise regions). As the number of shepherds and hotel owners varied per region, the proportion we selected ranged 30–100 %, respectively, of all stakeholders (see Table 1). The Abruzzo region was stratified into two sub-areas: Abruzzo Marsica and Abruzzo Fucino. For each of these sub-areas we randomly selected 30 individuals per group, for a total of 60 sampled participants. The other regions (i.e., Lazio and Molise) were not stratified for sampling, with 30 participants sampled in each. The questionnaire was personally delivered to shepherds and hotel owners at their households and collected a week after if completed.

Four, as hunting is allowed only in the external buffer area of the PNALM, we interviewed local hunters active in the ZPE, requesting complete lists of hunters and their addresses to the local hunting districts (ATC). We received the list of hunters in Abruzzo (n = 395) and Molise (n = 32), but we failed to receive the list from Lazio. We then sent the questionnaire to all hunters from Molise and to 20 % (n = 60) randomly selected hunters from Abruzzo, to obtain sample of comparable size to the other groups. We sent a questionnaire along with a cover letter illustrating the scope of the survey and a post-marked return envelope. Due to resources constraints at the time of the survey, no follow up reminder was sent to hunters (Dillman et al., 2014).

### 2.3. Data analysis

For this analysis, Likert-type items were treated as continuous data (Vaske, 2008). We used IBM SPSS version 25.0 (Statistical Package for the Social Sciences) for all analyses. Significance was set at  $p < 0.05$  for all tests.

Differences in item means for the five stakeholder categories were evaluated using one-way analysis of variance (ANOVA) with LSD post hoc tests where equal variances could be assumed, and Games-Howell otherwise. Effect size (eta,  $\eta$ ) was used to assess the strength relationships, and was calculated with 0.10 as a *minimal*, 0.243 as a *typical*, and 0.371 as a *substantial* relationship (Vaske, 2008).

The verbatim comments were taken as they were and used to illustrate and enrich the quantitative findings and to provide further insights

**Table 1**

Population of the different stakeholders per region, the random select sample number and the number of participants in the study.

Stakeholder	Abruzzo Total population → selected sample (completed)	Lazio Total population → selected sample (completed)	Molise Total population → selected sample (completed)	Did not state residency	Total Total population → selected sample (completed)
Hotel owner	161 → 60 (31)	35 (7)	5 (5)		201 → 100 (43) = 43 %
Hunters	395-> 60 (21)	N/A	32 (10)		427 → 92 (31) = 33 %
Shepherds	120->60 (29)	50 -> 30 (15)	45 -> 30 (16)		215 → 120 (60) = 50 %
Rangers	(26)	(3)	(1)	8	43→ (38) = 80 %
Foresters	(9)	(2)	(1)	11	30→ (24) = 88 %

of the stakeholders' perspectives (see Appendix 3 all the verbatim comments).

### 3. Results

A total of 196 respondents belonging to the five different stakeholders' groups (38 rangers, 24 foresters, 43 hotel owners, 60 shepherds and 31 hunters) participated to this study. The response rate varied by stakeholders ranging from 88 % of rangers and 80 % foresters, to 50 % both for hotel owners and shepherds, and 30 % for hunters (Table 1).

Most (60 %) of the respondents were between 40 and 64 years of age, in similar proportions across all interest groups. Overall, there were more males (78 %) than females in our total sample, ranging from 66 % among hotel owners to 97 % among hunters. While our sample might appear skewed toward men, this underrepresentation of women reflects the realities of poor representation in these sectors (hunters: Heberlein et al., 2008; foresters: Lidestav & Sjölander, 2007; hotel owners: Menicucci et al., 2019).

The strength of any differences among all the variables we considered showed that the groups of stakeholders differed in their perspectives (i.e., effect sizes ranged from  $\eta = 0.295$  to  $\eta = 0.559$ ).

#### 3.1. Affective component of attitudes toward bears

Overall, all stakeholders held positive feelings (Fig. 1), and existence beliefs toward bears; however, the strength of the responses to the attitudinal items differed across them (Table 2). Shepherds and hunters shared less positive feelings toward bears than the other stakeholders did (Fig. 1).

They were also less positive to have bears in their region, especially compared to rangers (Table 2). While still on the positive spectrum, shepherds also differed in their responses from foresters, rangers, and hotel owners, but not from hunters, in terms of bear's existence beliefs. Similarly, even if shepherds were inclined in agreeing that it is important that bears exist in the area, they were less so in comparison to all other stakeholders, including hunters. Overall, rangers showed the most positive feelings among all other stakeholders for the items we tested (Table 2).

#### 3.2. Cognitive component of attitudes: Direct cost and benefits

We identified similar patterns regarding the cost and benefits of sharing land with bears, with benefits outweighing the costs for both shepherds and hunters, but more so for all other stakeholders (Fig. 2; Table 3).

Shepherds and hunters were also inclined to believe that bears increased tourism, but significantly less than the other stakeholders (Table 3). Compared to the other stakeholders, shepherds, more so hunters, were more convinced that bears caused abundant damage to livestock. Similar trends were reported for bears damaging beehives and agricultural crops, though with some minor differences among groups (Fig. 3; Table 3).

Rangers were more prone, followed by foresters and hotel owners, to believe that bears are important to keep nature in balance in the park,

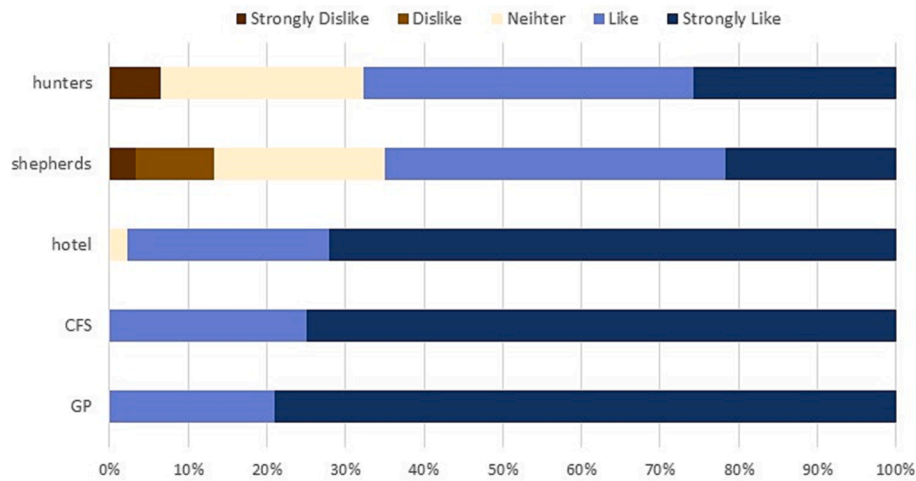


Fig. 1. Differences in the feelings toward bears among hunters, shepherds, hotel owners (hotel), state forestry corps (CFS) and park rangers (GP) measured in a 5 point Likert-type scale from strongly dislike to strongly like

Table 2

Differences in the affective component attitudes items toward bears among shepherds, hunters, hotel owners (HO), state forestry corps (CFS) and park rangers (GP). All effect size (eta, η) showed in the table are within the substantial relationship range > 0.371 (Vaske, 2008).

Questions	Shepherds	Hunters	HO	CFS	GP	F	Eta (η)
Which of the following best describes your feelings toward bears? <sup>1</sup>	3.70 <sup>a</sup>	3.81 <sup>a</sup>	4.70 <sup>b</sup>	4.75 <sup>b</sup>	4.79 <sup>b</sup>	20.267 <sup>***</sup>	0.498
To have bears in my region is for me <sup>2</sup>	3.67 <sup>a</sup>	3.77 <sup>a</sup>	4.72 <sup>b</sup>	4.88 <sup>b,c</sup>	4.97 <sup>c</sup>	20.954 <sup>***</sup>	0.559
It is important to me to maintain bear populations in my region so that future generations can enjoy them <sup>3</sup>	3.87 <sup>a</sup>	4.35 <sup>a,b</sup>	4.81 <sup>b,c</sup>	4.75 <sup>b,c</sup>	4.95 <sup>c</sup>	14.713 <sup>***</sup>	0.422
Whether or not I see a bear, it is important to me that they exist in the area of the park where I live <sup>3</sup>	3.82 <sup>a</sup>	4.39 <sup>b</sup>	4.74 <sup>b,c</sup>	4.75 <sup>b,c</sup>	4.95 <sup>c</sup>	16.117 <sup>***</sup>	0.447

Means with different letters superscripts are significantly different at p < 0.05 (\*\*\*) p < 0.001) based upon Games-Howell post-hoc test.

<sup>1</sup> Question was measured using a Likert-type scale Completely dislike, 1, Dislike, 2, Neither like or dislike 3, Like 4, Completely like, 5.

<sup>2</sup> Question was measured using a Likert-type scale Completely negative, 1, Negative, 2, Neither negative or positive, 3, Positive, 4, Completely positive, 5.

<sup>3</sup> Questions were measured using a Likert-type scale Strongly disagree, 1, Disagree, 2, Neither agree or disagree, 3, Agree, 4, Strongly Agree, 5.

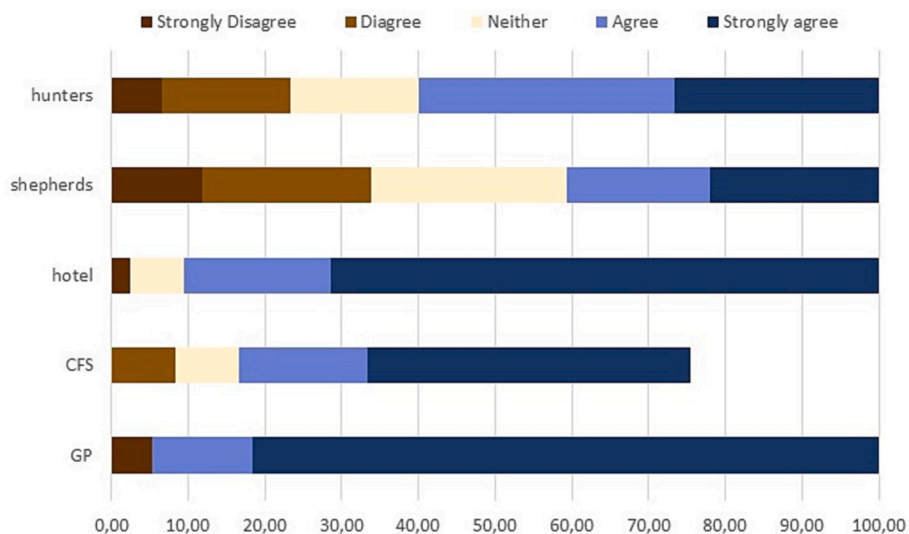


Fig. 2. Differences in the belief that there are more benefits in having bears than disadvantages among hunters, shepherds, hotel owners (hotel), state forestry corps (CFS) and park rangers (GP) measured in a 5 point Likert-type scale from strongly disagree to strongly agree

but noteworthy also, shepherds and hunters believed bears are an important component of the ecosystem (Table 3).

### 3.3. Management options

When looking at management options, all stakeholders were overall supportive of total protection of bears (Table 4), though shepherds less

**Table 3**

Differences in perceived beliefs of cost and benefits of sharing land with bears among shepherds, hunters, hotel owners (HO), state forestry corps (CFS) and park rangers (GP). All effect size (eta, η) showed in the table are above the typical (η = 0.243) and in the substantial relationship range (η= 0.371) (Vaske, 2008).

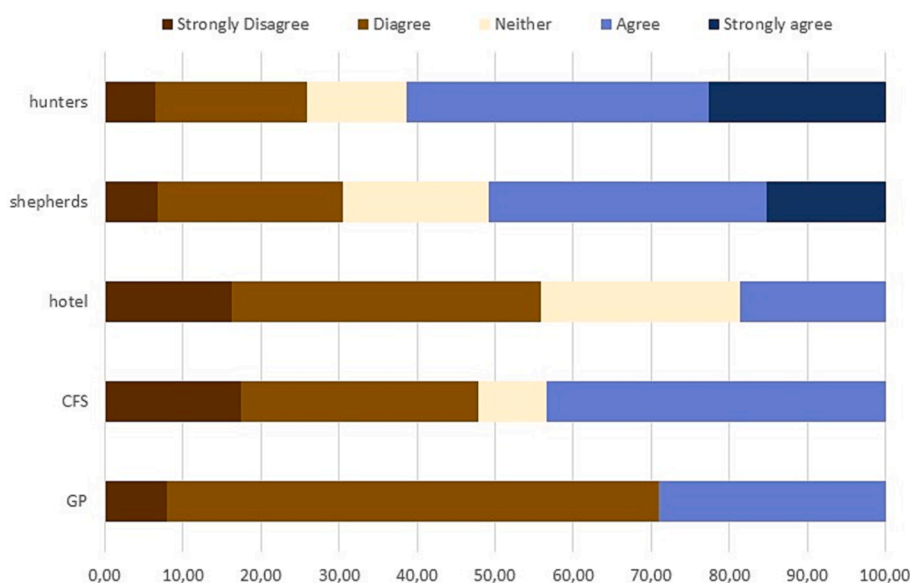
Questions	Shepherds	Hunters	HO	CFS	GP	F	Eta (η)
To me there are more benefits to having bears in the area of the park where I live than disadvantages	3.12 <sup>a</sup>	3.45 <sup>a</sup>	4.47 <sup>b</sup>	4.42 <sup>b</sup>	4.66 <sup>b</sup>	14.854 <sup>***</sup>	0.473
I believe that having bears in the area of the park where I live increases tourism	3.39 <sup>a</sup>	3.48 <sup>a</sup>	4.63 <sup>b</sup>	4.54 <sup>b</sup>	4.89 <sup>b</sup>	18.902 <sup>***</sup>	0.524
I believe that bears cause <u>abundant</u> damages to livestock in the area of the park where I live	2.97 <sup>a</sup>	3.29 <sup>a</sup>	2.09 <sup>b</sup>	2.08 <sup>b</sup>	1.89 <sup>b</sup>	11.213 <sup>***</sup>	0.426
I believe that bears cause <u>abundant</u> damages to beehives in the area of the park where I live	3.23 <sup>a</sup>	3.52 <sup>a</sup>	2.47 <sup>b</sup>	2.67 <sup>a,b</sup>	2.50 <sup>b</sup>	6.333 <sup>***</sup>	0.396
I believe that bears cause <u>abundant</u> damages to orchards and agriculture crops in the area of the park where I live.	3.20 <sup>a</sup>	3.13 <sup>a,b</sup>	2.42 <sup>b</sup>	2.67 <sup>a,b</sup>	2.53 <sup>a,b</sup>	3.734 <sup>**</sup>	0.295
I believe that bears are important to keep nature in balance in the park	3.58 <sup>a</sup>	3.94 <sup>a,b</sup>	4.28 <sup>b,c</sup>	4.50 <sup>b,c</sup>	4.68 <sup>c</sup>	8.298 <sup>***</sup>	0.373

Means with different superscripts are significantly different at p < 0.05 based upon Games-Howell post-hoc test except than question 8. that is based upon LSD post-hoc test as equal variance was assumed.

All questions were measured using a Likert-type scale *Strongly disagree, 1, Disagree, 2, Neither agree or disagree, 3, Agree, 4, Strongly Agree, 5.*

\*\*\* p < 0.001.

\*\* p = 0.006.



**Fig. 3.** Differences in the belief that bears cause abundant damages to beehives among hunters, shepherds, hotel owners (hotel), state forestry corps (CFS) and park rangers (GP) measured in a 5 point Likert-type scale from strongly disagree to strongly agree

**Table 4**

Differences in management options regarding bears, among shepherds, hunters, hotel owners (HO), state forestry corps (CFS) and park rangers (GP). All effect size (eta, η) showed in the table are above the typical (η = 0.243) and in the substantial relationship range (η= 0.371) (Vaske, 2008).

Questions	Shepherds	Hunters	HO	CFS	GP	F	Eta (η)
I support bears remaining completely protected:	3.82 <sup>a</sup>	4.61 <sup>b</sup>	4.44 <sup>b</sup>	4.63 <sup>b</sup>	4.89 <sup>b</sup>	9.088 <sup>***</sup>	0.353
I support killing selectively bears in my region where continuous attacks to livestock occur:	2.17 <sup>a</sup>	2.13 <sup>a,b</sup>	1.49 <sup>b</sup>	1.42 <sup>b,c</sup>	1.05 <sup>c</sup>	11.777 <sup>***</sup>	0.475

Means with different superscripts are significantly different at p < 0.05 (\*\*\*) p < 0.001) based upon Games-Howell post-hoc test.

All questions were measured using a Likert-type scale *Strongly disagree, 1, Disagree, 2, Neither agree or disagree, 3, Agree, 4, Strongly Agree, 5.*

so than the other groups; similarly, all groups were against the selective removal of nuisance bears, even though shepherds less, and rangers more, than the other groups (Fig. 4; Table 4).

**3.4. Hunters' and Shepherds' behavioral intentions**

When asked about the intention to change their hunting practices to reduce the potential impact on bears, nearly half (48 %) of the hunters either disagreed (n = 9, 29 %) or strongly disagreed (n = 6, 19 %). In addition, many (61 %) were contrary (36 % disagree, 26 % strongly

disagree) to change hunting grounds. Three hunters from Abruzzo voluntarily specified the reason why they would not change their hunting practices or location. A hunter stated that “[...] I am convinced that hunting does not jeopardize these ‘wonderful’ animals.” Another one stated that “bears and wolves are animals which existence have always involved shepherds and hunters, people that for different reasons have lived in the mountains. It would be sufficient that each of us would properly behave and respect the rules.” Finally, the third hunter reported that: “Because hunting as old as human, and as it represents a civic use, it is feasible also where bears and wolves live as most of

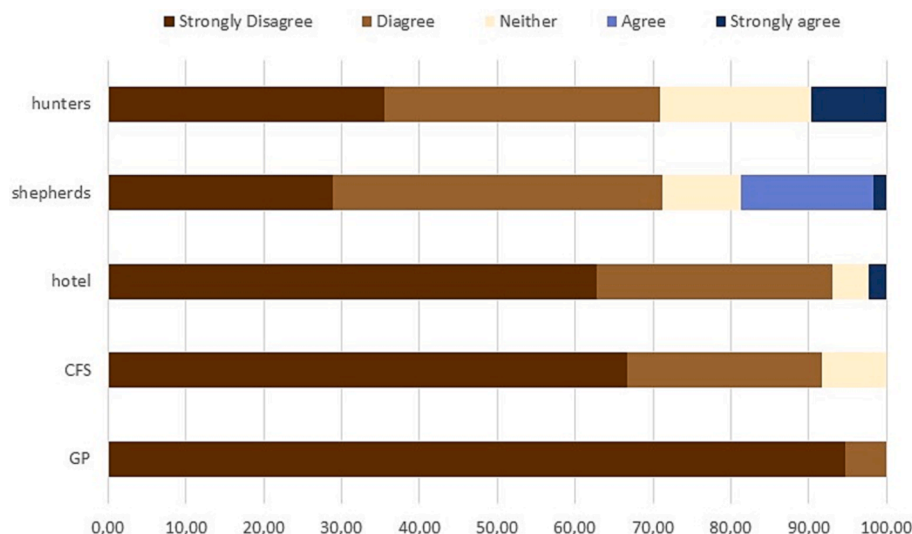


Fig. 4. Differences in the support of killing selectively bears that cause countinuous damages to livestock among hunters, shepherds, hotel owners (hotel), state forestry corps (CFS) and park rangers (GP) measured in a 5 point Likert-type scale from strongly disagree to strongly agree

hunters respect them.”.

Finally, most of the hunters (74 %) agreed with the idea of being part of the decision-making process in possibly defining hunting practices more compatible with bear presence and conservation.

Similarly, when shepherds were asked about their intention to modify their livestock husbandry practices to reduce depredation by bears, 63 % of them disagreed (40 % disagreed, 23 % strongly disagreed).

#### 4. Discussion

The groups of stakeholders differed in the intensity of agreement in their responses rather than in holding contrasting viewpoints. Indeed, all responses ranged from positive (shepherds and hunters) to strongly positive (foresters and rangers) attitudes toward bears, in believing that bears have a relevant ecological role, as well as in supporting the complete protection of bears. Even within the perceived beliefs cost and benefits of sharing the land with bears, the array of responses tended to be from neutral (shepherds and hunters) to agree (foresters and rangers) in terms of benefits, and to disagree (foresters and rangers) in terms of costs.

##### 4.1. Affective component of attitudes toward bears

In accordance with other studies in Europe (Dorresteijn et al., 2014; Dressel et al., 2015), our findings indicated that in areas where humans and bear have cohabited since historical times, not only attitudes were overall positive toward bears, but also similar among different stakeholders. Contrary to other findings that reported negative attitudes toward large carnivores (e.g., Herrero et al., 2021; Piédallu et al., 2016; Zeiler et al., 1999), in the PNALM, shepherds and hunters held positive feelings toward bears. Findings in the same study area also showed that the public residing in the PNALM held extremely positive attitudes, and was proud of bears, expressing attachment toward the species (Glikman et al., 2019); this represents a fundamental asset to create a widespread common ground for bear conservation in the area. An important highlight of our findings is that, despite such common ground, some stakeholders aligned more together than others. This is the case of hunters and shepherds that were “less” positive than the other groups in all the relevant questions. What makes shepherds and hunters different is the scale of the relationship they have with bears: compared to the other groups, they have a more personal and direct link to bears, and their

activities may be directly and physically impacted by bears. The relationship of the other stakeholders with bears is mainly indirect, less physical, and more abstract. This suggests that instead of the stereotypic identification of stakeholders based on thematic groups (i.e., occupational), their stated interest (e.g., whether they believe bears cause abundant damages; Cusack et al., 2021) might provide a more accurate identification.

##### 4.2. Perceived beliefs of cost and benefits

Although overall positive feelings toward bears were largely shared among residents in the Apennines, the level of disagreement among stakeholders raised when discussing bearing costs and accessing benefits from living with bears. Regarding costs, all the stakeholders were in agreement that bears caused abundant damages to beehives and orchards, which could imply the recognition that more prevention methods are needed to reduce further these types of impact. This was reported as a definitive cost of living with the species, to the point that even a few foresters and rangers were moderately supportive of the culling of some individual bears if deemed problematic (Table 4). Regarding benefits, shepherds and hunters were hesitant in recognizing both tangible (i.e., tourism) and intangible (i.e., keeping nature in balance) positive outcomes. Tangible benefits are usually perceived at individual level, and not likely to be distributed across community members (Thondhlana et al., 2020) or in this case across stakeholders. However, enhancing the recognition of the link between benefits and conservation has improved wildlife protection (e.g., Hazzah et al., 2014). As such, increasing awareness among shepherds and hunters about available damage-prevention methods, and on how the presence of bears can benefit their relatives, neighbors, and more in general their whole community through tangible benefits (e.g., tourism), might anticipate a growing support for bear conservation.

##### 4.3. Behavioral intentions

Hunters and shepherds reported a low willingness to change their practices to improve bears’ protection, despite it has been suggested that this might enhance bear conservation (Galluzzi et al., 2021; Maiorano et al., 2019). Wild boar hunting in and around the park, for instance, is thought to negatively affect bears through direct disturbance, lower accessibility to resources, and the risk of unintentional killing. Uncontrolled and free-ranging livestock, on the other hand, may facilitate

diseases transmission (e.g., *Brucella spp.*) to bears (Ciucci & Boitani, 2008; Di Francesco et al., 2015). A potential reason why shepherds and hunters expressed their dissent about changing their practices could be of fear that park-centered policies would further restrict their activities. Traditionally, local hunters and shepherds have not been involved in decision-making processes, nor specifically informed about bear conservation needs, such as the importance to allow this bear population to significantly expand the range beyond the park borders.

It is pivotal for the park to start using innovative and creative means to incentivize proactive changes in hunters and shepherds' behaviors. While those groups somehow recognize that bears cause damages (see Table 2), they also value and want to have bears around. Sharing this information could represent a starting point for discussions around how to prompt change in husbandry and hunting practices that is compatible with bear presence and conservation. This is further demonstrated by the strong support expressed by hunters (74 %) and shepherds (65 %) in taking part in future decision-making opportunities for refining hunting and husbandry procedures practices. We therefore encourage the Park and other local administrations to design a solid engagement process that allows stakeholder to participate in such decision-making processes, which is a critical component for an effective coexistence (Ambarli & Bilgin, 2008; Glikman et al., 2022).

We are aware that coexistence does not equate with the absence of conflict, yet proper and timely conflict management may go a long way toward a more effective coexistence (Hill, 2021; IUCN, 2022). While human-wildlife coexistence occurs when neither species hinders the survival of the other, it represents a dynamic process without a fixed ending state when human-wildlife intersect, with a delicate interplay between positive and negative aspects of human-wildlife and human-human interactions (Glikman et al., 2019).

## 5. Practical implications

While studying nuanced, layered and complex human disposition toward bears might not be novel in the literature, our contributions help address a real-life local situation that is stuck in time without being improved, calling attention to other potential human-wildlife conflict to coexistence situations where this may be occurring because of the clash between positive attitudes and unwillingness to change behaviors for a species conservation.

In the PNALM, we found that an overall common ground exists between stakeholders and the public about attitudes toward bears (Glikman et al., 2019). We believe that the positive attitudes revealed in our study is also due to the less aggressive behavior of the Apennine brown bear that, in contrast with other brown bear populations worldwide, has never attacked or even threatened humans in the region (Benazzo et al., 2017; Bombieri et al., 2019). The challenge may not be improving further positive dispositions toward bears, but maintaining in the long term the positive attitudes we revealed.

In this perspective, based on our findings, we suggest insights for enhancing human-bear coexistence both in the PNALM and elsewhere:

- (1) Creating opportunities for positive events and connections between humans and carnivores (Marino et al., 2021). Positive human-bear interactions, may they be through direct encounters, storytelling, or participation in management actions, are essential to maintain the basis for positive disposition and cultural attachment toward such species. Sharing positive feelings toward bears can foster a sense of ownership from which to identify pathways that support the development of trust and norms of reciprocity among different players in a conservation project.
- (2) Reducing anthropogenic mortality (both accidental and illegal), which still fails to raise widespread social opposition. To move forward there is a need to shift from positive attitudes to positive behaviors that result in actions for human-bear coexistence. Building solid engagement and participatory processes that

create a sense of social responsibility and belonging is key (Salvatori et al., 2021) for an effective coexistence. It is desirable that the bear is not seen solely as an institutional responsibility and a burden for the communities. It is essential that the entire community gets involved and share the pride and success of bear conservation (Can et al., 2014). Such change in social responsibility will make some behaviors (e.g., exceeding speed limits, dumping off food attractants) including the illegal killing of bears morally unacceptable.

- (3) Sharing results of our and similar studies might allow residents to reinforce their sense of responsibility toward 'their' bear. Research findings needs to be shared beyond the academic realm to enhance social awareness on the value of local bear populations. We believe that the less positive attitudes we revealed for some stakeholders reflect their perceived burden of living with bears. There is an opportunity to target those stakeholders for which customized programs/actions can be created to increase their involvement in bear management (e.g., by contributing the design of compensation programs or planning more compatible hunting practices). The participation in creating technical solutions will create a sense of ownership in the process and in the outcomes (Chausson et al., 2022).
- (4) Ensuring the political willingness, determination, and capability to drive and govern the needed change, fundamental to foster collaborative conservation and a necessary step toward consolidating the bear population within the park territory and beyond.

Strengthening collaborative conservation (Wilkins et al., 2021) among all the array of stakeholders is a constant theme throughout our previous suggestions (Chausson et al., 2022) and this contribution. Such approach allows to promote positive human-bear interactions as both consider and offer a central role in decision making to those who bear the costs of living with wildlife. Implementing participation in management actions, building solid engagement and participatory processes, targeting stakeholders to increasing their involvement in bear management are indeed all mechanisms that foster building shared solutions that are expected to be more effective, innovative, and longer-lasting as agreed upon between interested parties.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Data availability

Data will be made available on request.

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## Appendix A. Supplementary material

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jnc.2023.126421>.

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