Can we bear the bear?
Public attitudes towards the Marsican brown bear *(Ursus arctos marsicanus)* in the Abruzzo region, Italy, with management implications for their conservation

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Taea Romagnuolo
University of Plymouth
Drake Circus, Plymouth PL4 8AA
Email: taearomagnuolo@hotmail.co.uk

Abstract

Large carnivore conservation relies heavily on public attitudes towards carnivores. However, many factors influence opinions and contribute towards overall attitudes. Human-wildlife conflict is a worldwide threat to many species; hence ensuring positive perceptions is paramount to avoid the loss of species. This study aimed to assess public attitudes towards the endemic Marsican brown bear *(Ursus arctos marsicanus)* in four villages within the Abruzzo region, Italy. It aimed to identify areas of negativity within attitudes, so these can be targeted within future management strategies. The results suggested that overall, opinions were mainly positive, however fear levels, personal experience and education and knowledge levels did negatively affect attitudes. With continued effective livestock protection methods, an increase in outreach and educational campaigns, as well as increased communication and cooperation between all persons involved in the bear's protection, these positive attitudes can be maintained and negative opinions hopefully reduced.

Keywords Attitudes; Human-wildlife interactions; Marsican brown bear; Abruzzo.

1. Introduction

The field of human-wildlife conflict (HWC) is a major issue within conservation and is receiving increased attention from conservation biologists (Madden, 2004; Dickman, 2010; Marchini, 2014). It is common for HWC to be almost exclusively applied to mega-fauna, such as top predators, like bears *(Ursus)* (Marchini, 2014) and escalates when people living alongside these carnivores feel the needs of these carnivores are given priority over their own (Madden, 2004). This, combined with property damage caused by wildlife, carnivore involvement in livestock predation, can lead to the formation of negative attitudes towards a species (Linnell et al., 1996; Kaczensky, 1999; Kaltenborn et al., 1999; Dickman, 2010; Sakurai and Jacobson, 2011). Due to increasing human development and ever expanding populations in many parts of the world, encroachment into carnivore habitat is inevitable, leading to increased interactions with carnivores.

Attitudes can be described as generally positive or negative evaluations of an object and can be split into three components, relating to attitudes towards wildlife: The liking or disliking of a particular species (affective feelings), beliefs about the species (cognitive attitudes) and lastly behavioural intentions (Glikman et al., 2010; Glikman, 2011). Attitudes towards wildlife are an important element within HWC, as improving positive attitudes can mitigate conflict. More specifically, within the subject area of 'attitudes', there are also "human dimensions of wildlife" (HDW), presented by Hendee & Schoenfeld (1973). HDW depicts the way in which people value wildlife, how they want wildlife to be managed and how they are affected by wildlife and management decisions (Decker et al., 2001, cited in Glikman and Frank, 2011).

Previous attitudinal research mostly suggests that attitudes towards carnivores can be complex (Røskaft et al., 2007). For example, some factors lead to more negative opinions (high levels of self-reported fear), whilst others have been shown to lead to positive attitudes (the 'thrill' of seeing a large carnivore in their natural environment) (Røskaft et al., 2007). Any negative

attitudes can lead to increased conflict, which in extreme cases can result in retaliatory killing of the 'problem' animals or species (Liu et al., 2010). Thus, it is vital to work alongside the people who share the landscape with carnivores whilst also working with wildlife authorities to ensure the protection of species like bears and reduce HWC.

Considering local people's attitudes is fundamental to understanding areas of HWC and this research explores all three dimensions of attitudes as well as human dimensions of wildlife specifically towards the Marsican brown bear *(Ursus arctos marsicanus)* in the Abruzzo region of Italy and addresses possible areas of conflict, which could allow for negative attitudes to develop.

1.1 The Situation in Italy: The Marsican Brown bear

The Marsican brown bear is a morphologically distinct subspecies of the Brown bear *(Ursus arctos),* which is endemic to the Apennine Region of Central Italy (Abruzzo Park; Loy et al., 2008; Morini et al., 2017). The estimated population of 40-50 bears have been isolated from their northern counterparts for between 400-700 years, following random drift and extinction of maternal lineages (Febbo & Pellegrini, 1990, cited in Posilico et al., 2004). They are classified as critically endangered by IUCN (Ciucci and Boitani, 2008; Ciucci et al., 2014).

When monitored over a 15 year period, from January 2000-December 2014 within the Sirente Velino Natural Regional Park, continuous presence of the bear populations within the study area was confirmed, demonstrating that habitat availability is not hindering the bears' ability to survive (Ciucci and Boitani, 2008; Falcucci et al., 2008; Morini et al., 2017). Their entire habitat consists of their core range of around 1500-2500km², along with another 10,000km² of suitable habitat surrounding this area (Fig. 1) (Ciucci and Boitani, 2008; Falcucci et al., 2008; Morini et al., 2017). Despite further expansion of protected areas and increased habitat suitability and landscape connectivity (abandoned orchards and croplands) over recent

decades, the population has failed to increase (Wilson and Castelluci, 2006; Cuicci and Boitani, 2008; Gervasi et al., 2008; Falcucci et al., 2008). This has been put down to illegal or 'accidental' killing by humans and deliberate poaching (Boscagli 1987, Posilico et al., 2002, cited in Ciucci and Boitani, 2008; Morini et al., 2017), as well as vehicle collisions, 'accidental' shootings during wild boar *(Sus scrofa)* hunts and from illegal snares intended for other species (Boscagli, 1987, 1999, Wilson and Catellucci, 2006; Ciucci and Boitani, 2008).

Over time, the greatest source of HWC is from carnivores preying upon livestock (Treves and Karanth, 2003; Conover, 2002, Karlsson and Johansson, 2010, Shivik, 2006, cited in Blackwell et al., 2016) and the situation is no different in Italy. Depredation of livestock has become more of a nuisance in areas like Abruzzo since the late 1960's, as extensive grazing is practised combined with sometimes inadequate husbandry methods (damaged electric fences) (Fico et al., 1993; Meriggi and Lovari, 19996, cited in Cozza et al., 1996; Ciucci and Boitani, 2008). Within the Parco Nazionale di Abruzzo, Lazio e Molise (PNALM), a compensation program set up by WWF-Italy has been in place since 1967, where PNALM authorities have previously verified 87% of damage claims and fully reimbursed farmers for their livestock losses (Ciucci and Boitani, 2008). However, due to unreliable methods of evaluating livestock losses in the Abruzzo area, it is common for carnivores (primarily wolves but also bears) to be blamed by the public, especially local farmers (Fico et al., 1993; Cozza et al., 1996; Ciucci and Boitani, 2008; Glikman et al., 2011). The reason for this uncertainty is that the reliability of damage evaluation methods is weak in relation to identifying between wolf and stray dog attacks, leading to possible increased antagonism towards these predators (Cozza et al., 1996) and subsequently bears also.

1.2 ***This Study***

This study aimed to analyse public attitudes towards Marsican bears in four villages in the Abruzzo region and identify areas of conflict. Specifically, I wanted to test whether differences in specific demographic variables affected negative and positive attitudes. The main variables focused on and tested were:

- Origin (village)
- Age
- Education level and knowledge level (regarding bear ecology and local conservation efforts)
- Level of personal experience with bears
- Level of fear of bears

2. Methods

2.1 Study Area

Four villages in close proximity in the Abruzzo region were sampled, each containing slightly varying population sizes (Fig. 4). These villages were selected as they were accessible via public transport for data collection. Overall, there were 50 participants (who fully completed and returned the questionnaire) from the villages of Anversa degli Abruzzi, Villalago, Scanno and Pettorano sul Gizio. To distribute questionnaires, I stood in the main Piazza of all four villages, where residents usually congregate and many people walk. Questionnaires were further distributed in bars, restaurants and to shop owners in each village. Care was taken to equally distribute amongst the different types of establishment fairly and all staff within the chosen establishments agreed to complete the questionnaire. The questionnaires were given to each participant along with an ethics statement (see Appendix). Only a few people did not agree to complete the questionnaire, usually with the communicated reason of a lack of time/were on their way somewhere. No discussion occurred between the participants and

myself, other than answering any questions they may have had, thus decreasing the possibility of interviewer bias. I mainly used a standard answer to most questions, which usually related to the overall project purpose, in which I briefly described my aim to "collect general views about bears in the area". This was used in the hope to not inflict bias and ensure the participant was at ease. Questionnaires were distributed between the months of July-August 2016. The distribution of questionnaires was proportionate to each of the slightly differing population sizes of the villages. Age and gender were loosely accounted for, however not accurately due to the nature of opportunistic sampling; so overall the sample consisted of approximately 50% male-female ratio (however this was not specifically asked within the questionnaire and hence not tested). Also, a spread over different age categories (younger= 18-30, middle aged= 31-56, older= 57+) (Sheskin, 1985, Hall & Hall, 199, Vaske, 2008, Warner, 2008, cited in Glikman, 2011), albeit not an equal spread.

2.2 Questionnaire Design

The questions were modelled on similar attitudinal research that was carried out in other areas across Europe and the Americas (Oli et al., 1994; Zimmerman, 2001; Conforti et al., 2003; Klieven et al., 2004; Røskaft et al., 2007; Thornton & Quinn, 2009; Majic et al., 2011), but was modified to focus more specifically on the situation in Abruzzo, comparable to Glikman et al., 2011.

The closed questions were grouped into distinct subject categories, to try and gain an understanding of attitudes about a whole range of topics relating to the Marsican bears (Fig. 5).

Age and education level were asked at the beginning of the questionnaire. Usually a 3 or 4-point scale was used, with the possible answers being 'Yes', 'No', 'Maybe' and 'Unsure', or 'Strongly agree', 'Agree at some level', 'Disagree', 'Strongly disagree'. Data analysed was

quantitative, primarily for ease and efficiency of data collection. This, along with the use of closed questions, meant that the questionnaire was quick to complete and the respondent was more likely to stay engaged. The questionnaire consisted of 36 questions. All questions can be related to positive and negative attitudes towards bears.

2.3 Data Analysis

Each possible answer was assigned a number. The number 1 was always assigned to the most positive answer option. Some questions required a simple 'yes' or 'no' answer, (see Appendix for specific questions), so these were either given a 1 or 2. Some questions had three possible answers, 'yes', 'no' or 'unsure', so in this case were either given a 1 for the most positive answer option, 2 for the more negative answer option, or 3 for 'unsure'. An example of how answers were allocated a number is for the question "Do you think bears are important in Abuzzo?" 'Yes', 'No', 'Unsure'. 'Yes' would be assigned with the number 1, as it is the most positive answer and 'no' would be given a number 2 and 'unsure' a number 3.

Once all data was in a quantitative form, the answers were grouped together into subject categories for analysis. For example, there were three questions relating to the respondents personal experience with bears (questions 25, 26, 27), so these were grouped into the category 'personal experience with bears' and an overall score was given for that category. For example, if the respondent answered 2, 2, 1 for the three individual questions, an overall score of 2 was given for the 'personal experience with bears' category. This was applied to all questions within all subject categories. The average score was taken for respondents carefully, to give a fair overall score.

The grouped data was analysed using the statistical package R (R Core Team, 2018). Cross tabs were used to see which variables were associated (for example opinions on bear protection in relation to perceived fear of bears). Then, chi-square tests with Fisher's exact applied were

run, as the data was count-based. I tested each main variable (origin, age, education level, knowledge level, level of personal experience and level of perceived fear) with factors deemed important relating to positive or negative attitudes (opinions regarding bear importance, protection and aggression towards various species). Fisher's exact was applied as all grouped subject categories had values less than 5. Results with a p value <0.05 were classed as significant.

Graphs were created to show the statistically significant relationships between variables, as well as some of the results to certain questions deemed important to contributing to overall positive and negative attitudes.

3. Results

There were 50 respondents. Due to the nature of opportunistic sampling, the gender ratio was not exactly 25 male/female, however it was close. As it was not exact, it was not analysed. No person was unable to complete the questionnaire or screened out for any reason. There was not a fair spread of respondents with different educational backgrounds, as 44/50 respondents had completed some form of further education, compared to only 6 respondents who had either not finished secondary or had completed secondary school but had not completed any further education. Also, the spread over each age category was not fairly distributed, as 26 respondents were middle-aged, but only 10 were within the old aged category and 14 in the young aged category.

3.1 Origin

There were no significant differences between villages of origin compared with variables deemed important relating to overall positive and negative attitudes. These included

relationships between origin and level of fear (p=0.863), level of personal experience with bears (p=0.103), opinions on bear importance in Abruzzo (p=0.560), opinions on bear protection (p=0.124), knowledge regarding bears (p=0. 664) and knowledge regarding local conservation efforts (p=0.102) and finally opinions on bear aggression towards either domestic animals, small/large livestock and humans (all p>0.09).

3.2 Age (personal experience, bear protection and human aggression)

There were no significant differences between age and variables deemed important considering overall attitudes, such as fear (p=0.578), opinions on bear protection (p=0.069), knowledge level regarding bears in the area (p=0.053) and local conservation efforts (p=0.160), opinions on bear importance in Abruzzo (p=0.317), and finally opinions on bear aggression towards either humans, domestic animals or small/large livestock (all p>0.4).

There was a significant relationship between age and the amount of personal experience with bears (p=0.030), with middle-aged (31-56) respondent's having the highest level of personal experience.

3.3 Personal Experience (fear, knowledge level about bears in the area and aggression towards small livestock)

Respondents with the most personal experience with bears had a medium level of fear (p=0.003; Fig. 1), however the category for the most personal experience also had the highest amount of respondent's reporting that they had very little or no fear as well. Also, respondents with the most personal experience were more likely to believe that bears were 'very aggressive' towards small livestock. Significant relationships were found between the level of personal experience and opinions on the level of bear aggression towards small livestock (p=0.011; Fig. 2) and with opinions on whether bears depredated agriculture by eating crops on farms

(p=0.014; Fig. 3). However, there were no significant relationships with opinions of bear aggression towards other animals, like large livestock, domestic pets and humans (all p>0.1).

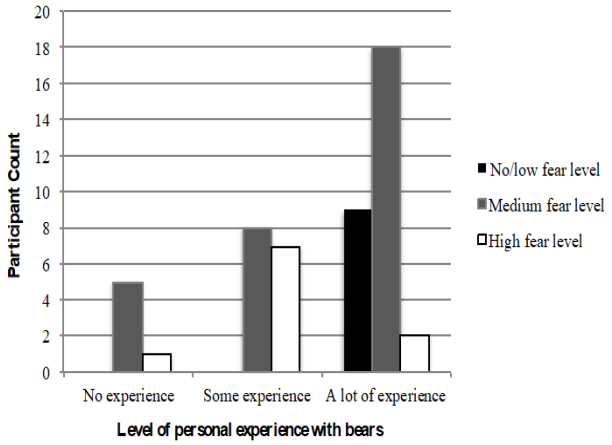

Fig.1 *Graph displaying the relationship between level of personal experience with bears and level of perceived fear of the species.*

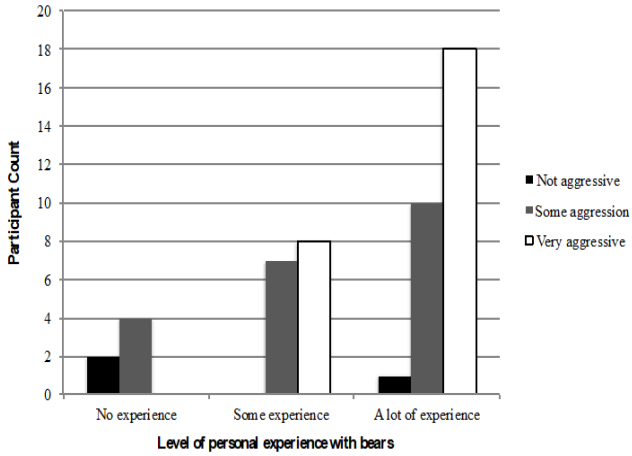

Fig.2 *Graph showing the relationship between the level of personal experience with bears with opinions on bear aggression towards small livestock.*

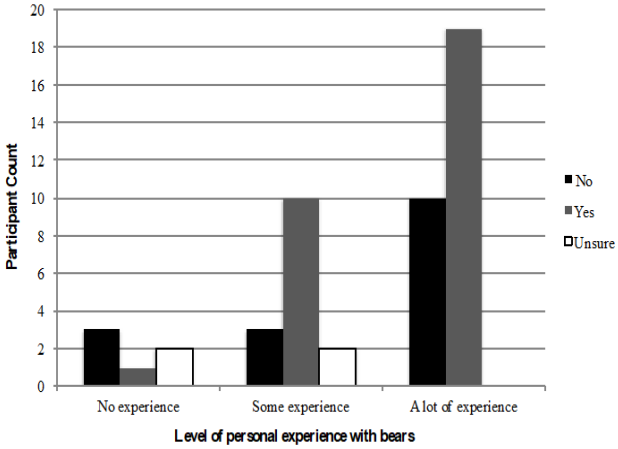

Fig.3 *Graph displaying the relationship between the level of personal experience with bears with opinions on whether bears depredate agriculture by eating farm food (no they don't, yes they do, or unsure).*

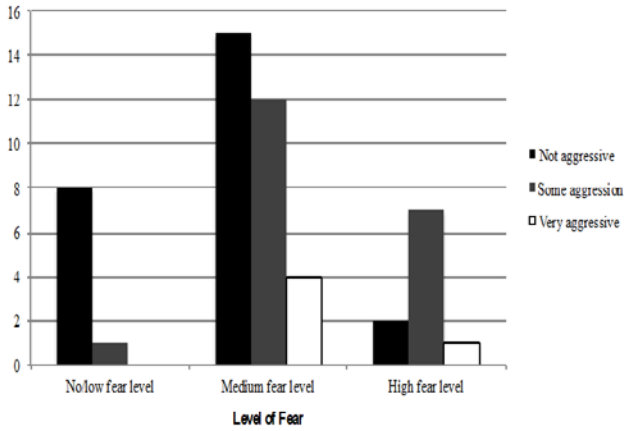

Fig.4 *Graph showing the significant difference between the levels of fear compared with opinions of bear aggression towards humans.*

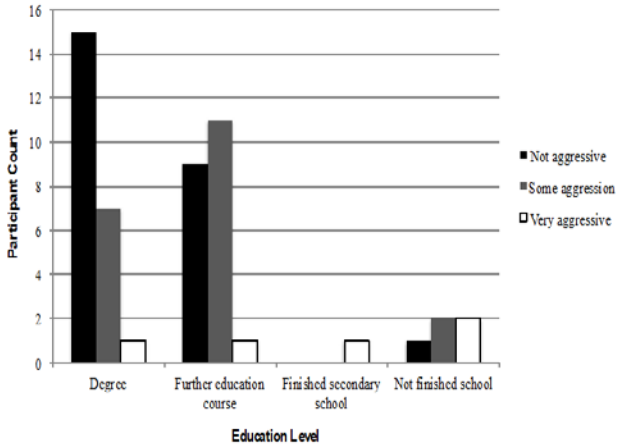

Fig.5 *Graph displaying the relationship between education level and opinions on bear aggression towards humans.*

3.4 Fear of the bear and Opinions on Aggression towards humans

A significant relationship was shown between respondents level of fear and opinions on bear aggression towards humans ($p=0.043$; Fig. 4). However, there were no relationships with opinions of bear aggression towards domestic animals and small/large livestock (all $p>0.2$). There were also no differences observed between fear and other main variables such as age ($p=0.577$), knowledge level regarding bears in the area and local conservation efforts (both $p>0.1$) and opinions on bear protection ($p=0.461$) and importance in Abruzzo ($p=0.298$).

3.5 Education and Knowledge Level

The relationship between education level and bear aggression towards humans proved significant ($p=0.022$; Fig. 5). However, there were no relationships found between education level and opinions on bear aggression towards all other animals (domestic, small/large livestock, all $p>0.2$). There were also no further differences found between education and other main variables. There were two significant relationships observed between the level of knowledge regarding bears in the area and opinions on bear aggression towards both large livestock ($p=0.016$) and domestic animals ($p=0.023$). Aside from these results, there were no other relationships between the level of knowledge (both regarding local conservation efforts and bears in the area) compared with other factors deemed important to contributing to overall attitudes.

Discussion

Human dimensions of wildlife and attitudinal research are useful tools within conservation planning for wildlife. Considering the results from this research and other attitudinal research that has taken place in Abruzzo (Glikman et al., 2011), attitudes overall appear mainly positive. Some results are especially encouraging, such as the fact that 82% of respondents believe that

bears are important in Abruzzo and 86% confidently agree with their continued protection. Furthermore, considering 76% of respondents showed a fair or good knowledge regarding the species and 94% of respondents showed fair or good knowledge regarding conservation efforts, it indicates awareness of the critically endangered status of the species and perhaps of their historic persecution. However, there were concerns over bear aggression towards humans, with 50% of respondents believing that bears could or would act aggressively towards a human if they came into close contact. Furthermore, the fact that opinions on bear aggression towards small livestock increased with the level of personal experience, also adds to the concern about public attitudes. As anthropogenic disturbance increases in rural areas such as Abruzzo, it will increase the likelihood that humans will come into contact with bears in some way (Treves et al., 2013). Consequently, these opinions of bear aggression towards small livestock and humans is important and needs to be addressed, to prevent these opinions from manifesting into fear and negativity, potentially resulting in increased HWC (Kellert, 1994; Røskaft et al., 2007; Johansson and Karlsson, 2011; Frank et al., 2015; Johansson et al., 2016).

4.1 Origin

Contrary to predictions, there was no effect of village of origin on respondents overall attitudes towards bears. This was measured in relation to opinions on bear importance in the area; bear protection, aggression towards other species, perceived fear, personal experience and level of knowledge. Previous research has found relationships between different human population sizes and carnivore perception, where people living in smaller populations expressed significantly more negative attitudes towards carnivores than those from larger towns (Kellert, 1980,1994; Tucker and Pletscher, 1989; Kellert et al., 1996; Conforti et al., 2003; Wechselberger et al., 2005; Røskaft et al., 2007). Overall attitudinal differences were expected, considering the different population sizes. A possible reason why no relationships were found

could be due to all four villages still being relatively geographically isolated from larger, more densely populated towns, whilst also being moderately close to one another, so experiences and attitudes may not vary significantly. If attitudes were compared with larger towns such as Sulmona (population of 24,900 in 2014) (Population.city, 2018) or even cities such as Rome (population of 2,867,672 in 2015) (UN Data, 2018), then the results may have shown significant differences in attitudes.

4.2 Age

Specific factors deemed important to contributing to 'positive' and 'negative' attitudes showed no relationships with age. Numerous studies conducted in various places in the world indicate declining levels of fear with increasing age (Agras et al., 1969; Costello, 1982; Røskaft et al., 2003; Kaltenborn, 2006). This could be due to older people having more knowledge about bears, however this association was not found in this research. Older people did tend to have more personal experience with bears, which can be indirectly linked to overall attitudes (see discussion section 4.3). Past research indicates that younger people usually hold significantly more positive attitudes, with negative associations towards carnivores increasing with age, as predicted in this study (Bjerke et al., 1998; Williams et al., 2002; Klieven et al., 2004; Wechselberger et al., 2005; Røskaft et al., 2007; Dressel et al., 2014). However the sample used was skewed, with over half the respondents falling into the middle-aged category. If the sample was more representative across all age categories, it is predicted that trends would be seen between age and perceived fear, as well as with opinions on bear protection (see discussion section 4.4).

4.3 Personal Experience with bears

Increased personal experience with bears was predicted to correlate with lower levels of fear and more positive opinions regarding bear aggression. The results somewhat agreed with the first prediction regarding fear, however completely disagreed with the second prediction regarding bear aggression. Respondents with the most personal experience with bears were most likely to express a medium level of fear of the species. However, the people who reported the lowest level of fear had the most personal experience also. This implies that more exposure with bears can lead to a decrease in fear somewhat, as people with the most personal experience had the highest amount of participants reporting either medium, or little fear (27 respondents). Comparing this with people who had medium or low levels of personal experience, none of the respondents reported low fear and 13 respondents reported medium or high fear levels. More personal experience with carnivores has led to people feeling less threatened by them and subsequently having less fear (Zimmerman et al., 2001; Røskaft et al., 2003; Majic et al., 2011), so this trend is somewhat applicable here. Fear is linked to negative attitudes, as higher levels of fear lead to people feeling more concerned for themselves and their families safety, so are more likely to believe that carnivores are dangerous (Røskaft et al., 2007). So, the fact that only 10 respondents reported high levels of fear is promising, as it indicates that the majority of people will likely hold more positive feelings about the species. Despite this, the results of this research also found that more personal experience leads to stronger opinions on bear aggressiveness towards small livestock and bears eating agricultural farm food. Respondents with more personal experience with bears are more likely to believe that bears are very aggressive towards small livestock and eat agricultural crops on farmland. Increased HWC can stem from these opinions, as negativity originates from peoples beliefs that bears cause property damage and a threat to livestock (Kaczensky et al., 2004; Røskaft et al., 2007; Sakurai, 2009; Mir et al., 2015). Livestock depredation is directly linked to economic losses to property owners and farmers and when these losses threaten livelihoods, can result in localized targeting

of carnivores by affected individuals, or eradication of the species in high conflict areas by authorities (Oli et al., 1994; Kellert et al., 1996; Linnell et al., 1996; Kaczensky et al., 2004; Klieven et al., 2004; Røskaft et al., 2007; Sakurai, 2009). As human populations increase and settlements and farms encroach further into the bear's habitat, personal experience with bears and livestock losses will most likely increase, resulting in increased human wildlife interactions and potentially more negative attitudes.

4.4 Fear

The questionnaire asked the respondent to self-report their fear of bear attacks on different species (humans, domestic animals and small and large livestock), to see if there were differences in attitudes. The results somewhat followed my predictions, as an increase in fear was shown to affect positivity regarding opinions of bear aggression towards humans. However, there were no relationships found with opinions on aggression towards other species, as well as with other variables deemed important, such as opinions on bear importance and protection. Thus, I cannot report that fear directly affected overall attitudes.

Opinions on the level of bear aggression towards humans coincided with an increase in people's fear of bears. No respondent who reported a low level of fear or no fear at all, believed bears were very aggressive towards humans and only one believed they were somewhat aggressive. This differed from respondents reporting a medium fear level, with 4 believing bears were very aggressive and 12 believing bears show some aggression. Higher fear levels can lead to higher a chance of people believing bears would attack humans unprovoked, which consequently leads to more negative attitudes (Wechselberger et al., 2005; Røskaft et al., 2007; Johansson et al., 2016). In fact, it has been suggested that self reported fear and concern for oneself and the safety of their families is one of the strongest predictors of negative attitudes, along with perceived danger to livestock (Kellert, 1994; Røskaft et al., 2007; Johansson and

Karlsson, 2011; Frank et al., 2015). However, Zimmerman et al., 2001 found that despite a relatively high percentage of people being afraid of carnivores, this did not directly translate to negative attitudes. So, the result from this study should be treated with caution.

4.5 Education & Knowledge Level

Most respondents who had completed a further education course or held a degree did not believe that bears were very aggressive towards humans (48/50 respondents), which suggests one possible relationship between education level and positive attitudes, as anticipated. Likewise, only one respondent with a high knowledge level believed bears were very aggressive towards humans and no respondent with a high knowledge level believed they were very aggressive towards large livestock. This is promising, as higher education and knowledge levels usually leads to an increased understanding of the ecological importance of large carnivores and a greater awareness of wildlife. This, in turn leads to increased predator acceptance, which translates to positive attitudes (Kellert, 1980; Kvaalen, 1998, Szinovatz and Bath, in pres, cited in Zimmerman et al., 2001; Williams et al., 2002).

5. Management & Conservation

Where endangered species are concerned, preserving the current population through careful monitoring of their numbers and location and using methods to prevent poaching is critical (Treves and Karanth, 2003). This has been applied to the Marsican bear population, as data has been collected on their spatial patterns, ecology and population trends, so this should continue in the future to ensure the species survival (Ciucci and Boitani, 2008).

It is important that certain areas of the bears' habitat are continually protected, as well as monitoring of planned development. Furthermore, maintaining traditional livestock protection measures such as guard-dogs and shepherds in rural areas, as well as investing in new

techniques such as electric fencing surrounding livestock have proved successful in decreasing depredation by carnivores and thus limiting HWC (Chapron et al., 2014). All of these measures are in place within Abruzzo, as well as a long-standing livestock compensation scheme (WWF-Italy, cited in Ciucci and Boitani, 2008; Europa.eu, 2018). The compensation scheme should continue, as it has been shown to have public support in other countries (Gunson, 1983, Fritts et al., 1992, cited in Oli et al., 1994; Wechselberger et al., 2005). Perhaps in the future, attitudes towards the scheme and its effectiveness could be assessed, as these attitudes could reflect attitudes towards authorities. For so-called 'nuisance' bears in the area, which are habituated to preying upon livestock and village waste (Beckmann et al., 2004; Latini et al., 2005, cited in Ciucci and Boitani, 2008), there is evidence that using deterrent techniques such as loud noises, pepper spray, dogs within the village and taste aversion techniques may be effective at deterring problem bears (Sillero-Zubiri and Laurenson, 2001; Beckmann et al., 2004). However, so far these methods have only proved effective in the short term.

Involving the public and relevant stakeholders within wildlife management is becoming one of the most important elements regarding decision-making within conservation (Raick et al., 2003, Riley et al., 2003, Fulton et al., 2004, cited in Sakurai, 2009). Further ways of increasing public support is through increased outreach events, as well as educational campaigns. These could all be applied within the Abruzzo region. Public events, which focus on talking to local people and discussing their concerns, as well as rectifying any false beliefs about the species, all greatly contribute towards successful wildlife management (Jackobson and McDuff, 1998, Fulton et al., 2004, cited in Decker et al., 2001). Similarly, outreach within schools inspires the younger generation, ensuring positive opinions are established and an appreciation of nature is guaranteed (Kellert, 1991; Sakurai, 2009). More educated people tend to be less afraid of carnivores and hence are more likely to view them positively. Likewise, increasing people's knowledge regarding bear ecology will further help to decrease fear and improve positive

feelings. With this in mind, teaching children and young people about the importance of the Marsican bear, the number and distribution of the bears and effective methods of preventing livestock losses could prove invaluable (Røskaft et al., 2007). Finally, more cooperation and communication is needed between National Park and Regional Park authorities, park rangers and NGO's (Gunson, 1983, Fritts et al., 1992, cited in Oli et al., 1994). Collectively working together, they should aim to maintain positive public attitudes regarding the Marsican bear and develop a conservation strategy that includes all of the factors mentioned above, as well as address any concerns local people may have.

6. Further research

The main limitation was the sample size and the demographic of the respondents. They were not evenly distributed over the age and educational level categories and did not discriminate between genders, making the study unrepresentative for the village populations as a whole and decreasing its applicability to other areas where carnivores exist. Future research should gather information on public attitudes in larger towns, such as Sulmona, and also in cities like Rome. Attitudes could then be compared to see if negative views are more common in rural locations with smaller populations, as found previously (Wechselberger et al., 2005; Røskaft et al., 2007; Hemson et al., 2009). Furthermore, more research into occupational differences in attitudes may be advantageous. This study did not take into account people's livelihoods and it has been suggested that livestock owners and sheep farmers tend to be more negative than other socioeconomic groups (Kellert, 1980**;** Kaltenborn et al., 1999; Kaltenborn and Bjerke, 2002). If similar results are found within Abruzzo, these specific groups should be targeted in the conservation strategy to try to improve these people's attitudes, in order to mitigate potential future conflict. Another limitation of this study was the fact that sex was not analysed. Future studies should always test this factor, as previous research have shown females displaying

higher levels of fear, but also more support for carnivore protection and conservation than males (Costello, 1982; Williams et al., 2002; Røskaft et al., 2003; Wechselberger et al., 2005; Kaltenborn, 2006; Thornton and Quinn, 2009).

Despite limitations, this research is still useful and somewhat novel, as there is limited previous attitudinal research that specifically looks at public opinions towards the Marsican bear (see Glikman et al., 2011). By understanding where attitudes can be improved, this will hopefully avoid increased levels of conflict between humans and bears. Also, it gives an insight into rural community attitudes towards a critically endangered carnivore species, which is relevant as human development and populations continue to increase worldwide.

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