

## **Public attitudes toward the brown bear in Croatia:**

**A change over time.**



**Agnese Marino**

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### **Acronyms**

**AIC:** Akaike Information Criterion

**BMP:** Bear Management Plan

**CITES:** Convention on International Trade in Endangered Species of Wild Fauna and Flora

**EU:** European Union

**PCA:** Principal component analysis

**Word count:**

**12,300**

## **Abstract**

This study seeks to identify the forces that shape public attitudes toward bears and bear management in Croatia, and determine how these have changed over time. By examining attitudes in two points in time, the study accounts for the fact that attitudes toward wildlife are continuously evolving and depend on species population dynamics, their management and broader social change. Value systems through which the public perceives bears and their beliefs regarding optimal bear population numbers, are analyzed to see whether they have changed in response to several developments occurring within Croatia's political, economic and social context. In particular the effects of a change in Croatian bear management as well as an increase in the bear population are evaluated through their impact on people's experiences and perceptions of bears. Results suggest that more centralized management of wildlife amplifies people's perception of threat and that the increase in the bear population intensifies the negative experiences of damage and encounters with bears in the wild.

This study shows that attitudes are socially constructed and dependent on perceptions. However these are in turn influenced by political, social and ecological changes, as well as actual experiences. Therefore, this study concludes that negative attitudes toward wildlife require management approaches that aim to reduce human bear conflicts and increase public involvement in wildlife management decisions.

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## 1. INTRODUCTION

The brown bear (*Ursus arctos*) has historically been a hunted species in Croatia. It was considered a dangerous animal that damaged crops, preyed on livestock and competed with hunters for deer and other game. For centuries it was pursued through tracking, still hunting, snares and poisoning (Dec̆ak et al 2008). With the establishment of bounties in 1915 to further encourage its extermination, the bear population reached its lowest numbers at the time of World War II (Huber et al 2008). Following the 1947 Hunting Act the status of the bear was improved and hunting was restricted to specific seasons and methods. However it was not until 1960, when the use of poison targeted at wolves and foxes was banned, that the bear population began a steady recovery (Dec̆ak et al 2008). Following the political changes that occurred in Croatia in the 1990's, the hunting system was changed and number of hunting managers and leaseholders grew considerably. Due to an increase in international tourism for trophy hunting, the bear became the profitable game species that it is today (Dec̆ak et al 2008). In 1993 a picture of the bear was put on the five kuna coin, and the bear was made into a national symbol. For the past thirty years, its population has been within sustainable levels and still today, it is believed to be growing (Dec̆ak et al 2008). This makes for an exceptional case within Europe, where the Brown Bear is listed as a vulnerable species (IUCN, 1999) and most populations are small and fragmented.

The key to successful conservation of the brown bear lies in stakeholder acceptance: management of large carnivores is more about socio-political issues than about biological ones (Bath and Buchanan, 1989). The acceptance threshold for wildlife in human dominated landscapes depends on the interaction between the positive and negative values that people give to a species, and these in turn are influenced by other factors. While a lot of literature has been published on carnivore acceptance across the world, very few studies (Bath and Majić, 2009; Zimmerman et al 2001) account for the fact that attitudes toward wildlife are continuously evolving and depend on species population dynamics, their management and broader social change. This study is aimed at identifying the forces that shape public attitudes toward bears and bear management in Croatia, and determine how these have changed over time, between 2002 and 2008.

The context for stakeholder acceptance of the brown bear in Croatia has changed considerably in the past decade. Having applied for EU membership in 2003, Croatia is currently involved in negotiations that should result in its accession by 2011. Therefore it has had to commit to a series of international conventions, the most important of which are: the Bern Convention, the Habitat Directive, and CITES (Dec̃ak et al 2005). Although it can often be difficult to trace the effects of European legislation on national conservation policy, Croatia owes the development of its currently most important piece of bear management policy to external intervention. In 2002, CITES refused Croatia permits to export bear trophies until it fulfilled the requirements laid out by the Bern Convention (Huber, 2010). The 2005 Bear Management Plan that was developed as a result, established a more centralized management of the bear, and changed both the way the bear is hunted and the way that the damage it causes is mitigated. Meanwhile, the bear population has continued to increase, and estimates indicate that it may now be exceeding the social carrying capacity of Croatia.

This study is novel because it analyzes a change in attitudes over time and in response to a change in bear management. Policy issues discussed in the paper will be the effects of localized versus centralized bear management on public attitudes. Moreover, the role of hunting as a conservation tool will be examined, providing an example of management that differs considerably from the more protectionist European approaches to bear conservation. Theoretical contributions of my study to the field of human dimensions will conduce to an increased understanding of how attitudes towards wildlife and the forces shaping them are influenced by contextual changes. The interaction between real change and perceptions of change will be analyzed to reach a better understanding of the notion of social carrying capacity and the extent to which it can be manipulated. Lastly, the practical implications of the study will provide feedback on the 2005 Bear Management Plan.

## 1.2 Aims and objectives

Two similar questionnaires regarding attitudes toward bears and bear management were distributed across the Croatian bear range in 2002 and in 2008. This research analyzes the responses given in the two questionnaires. The overall aim is to understand the changes in the general public's attitudes toward bears and bear management in Croatia.

- **Objective 1:** Identify changes in Croatian politics and bear biology in the period between 2002 and 2008, and understand their ramifications across all levels of human-bear interaction.
  - **Hypothesis a:** The increase in the bear population and the 2005 Bear Management Plan will have influenced public attitudes and opinions about bear management.
- **Objective 2:** Identify the cognitive forces shaping public attitudes toward bears and bear management in Croatia
  - **Hypothesis b:** Attitudes toward bears and bear management are formed through a cognitive process. Socio-demographic variables, experience with bears, knowledge about bears and value orientations will all be important elements in shaping public attitudes towards bears and bear management.
- **Objective 3:** Record the change in public attitudes and opinions about bear management.
- **Objective 4:** Understand the impacts of Croatian politics and bear biology on public attitudes toward bears and bear management
  - **Hypothesis c:** The recorded shift in public attitudes toward bears and bear management can be explained by how changes in Croatian politics and bear biology have affected the cognitive forces that influence public attitudes toward bears and bear management.

## **2. THE CROATIAN CONTEXT**

This section will identify events in Croatian politics and bear ecology that are predicted to have had an affect on public attitudes towards bears and bear management in the period between 2002 and 2008. Information was collected from published reports on bear management, through consultation with experts and informal interviews with hunting ground managers (see section 4.2.2).

### **2.1 Human-Bear Conflict**

The most common form of conflict between humans and bears in Croatia is damage on wheat, oats, and fruit tree plantations. Depredation on livestock is also relatively frequent (Dec̆ak et al 2005) and emphasized in the media following extreme events like an incident on Krk island, where 400 sheep and goats were killed in a few years. Honey production is an important business in the core regions of the bear range and bee keepers there have reported that bears destroy several thousand bee hives every year (Dec̆ak et al 2008). Bears also cause damages to built structures such as fences and stables. Lastly, traffic accidents due to collisions with bears, although rare, can amount to greater due compensation than all other damages put together (Dec̆ak et al 2005).

Once damage is verified, compensation is paid by the local hunting ground, and the amount paid is negotiated on a case by case basis (Dec̆ak et al 2008). Official estimates suggest that bears in Croatia do not cause a lot of damage. The registered cases of damage were 24 in 2004, 88 in 2005, 16 in 2006, 46 in 2007, and 47 in 2008. The average amount of compensation paid per year was 7,000 euro (Sindicic, 2009). However damages are likely to be higher. Because the system of compensation is localized, there may be less of an incentive to declare damages, since the people paying for them may be friends and neighbours or even the very same people incurring the damage, if they are members of the local hunting club (Huber, interview 2010). Interviews carried out with hunting ground managers revealed that compensation for damage can also come through informal ways, for example hunters will volunteer labor to repair damages. Therefore it is not really possible to use official estimates to determine whether damages have increased or decreased in the period between 2002 and 2008. However, this research will use responses to the questionnaires to try to determine whether there has been a change in the number of damages incurred by the local population, as well as whether the experience of damage has changed, between 2002 and 2008.

## **2.2 Bear population size and carrying capacity**

Although monitoring of the bear population before 2005 has been inconsistent, it is possible to discern a clear trend of population increase by using estimates from the last 50 years, since the start of trophy hunting. According to counts carried out in individual hunting grounds, there were about 100 bears in the late 1950s (Frkovic' et al. 1987, Huber and Frkovic' 1993). A similar system of counting yielded an estimate of 800 bears in 2005 (Dec'ak et al. 2005). Finally, a genetic study carried out in 2008 allowed for the more accurate estimation of 1000 bears. Given the overall trend it is likely that the bear population has continued to increase between 2002 and 2008 (Dec'ak et al. 2005).

The ecological carrying capacity for the bear range of Croatia, given the current habitat availability and maximum density of bears it can hold, was calculated to be about 1100 bears (Huber et al, 2008). As for all carnivores, the social carrying capacity for the bear is hypothesized to be lower than that. Following a descriptive analysis of the questionnaires collected in 2002 the social carrying capacity was officially set at 20% below the ecological carrying capacity. This would mean that there are currently about 100 more bears than were deemed socially acceptable in 2002. This research will analyze whether the increase in the bear population has changed people's general attitudes toward the bear as well as their specific beliefs about how many bears there should be.

## **2.3 Bear Management in Croatia**

### ***2.3.1 Bear management prior to 2005***

The bear management regime in place at the time that the first set of questionnaires was collected, in 2002, consisted of a heavily decentralized form of bear management, run by individual hunting ground units. The 1994 Hunting Act essentially provided for hunting rights to be handed over to either private land owners or managers of state owned or communal land, delegating the major responsibilities of bear management to the heads of the hunting grounds, both in terms of paying for damages caused by bears, and in terms of setting hunting quotas (Kerezi, 2010). Bear management was therefore regulated by Hunting Management Programs, devised by and implemented within each hunting ground unit. The number of bears in each unit was estimated by counting, and a yearly quota was set from that estimate (Kerezi, 2010). The total number of bears harvested in Croatia was therefore given by the sum of those individually estimated quotas.

### ***2.3.2 The 2005 Bear Management Plan (BMP)***

Changes in bear management brought about in 2005 were prompted by Croatia's admission process to the European Union and sought to resolve issues of lack of coordination between the bear management entities. This was essentially achieved by involving different stakeholders into an integrated, more centralized, decision-making process.

#### ***2.3.2.1 Hunting***

The most visible changes brought about by the BMP affected the bear hunting business. The hunting season for bears was shortened by 2.5 months. Furthermore, the bear was taken out from the list of species controlled by the Hunting Ground Management Plans, and the hunting quotas for the bear were decided on at the national level by experts from the scientific community. An annual removal ranging between 10 and 15% of the estimated bear population was set as the total harvesting quota for all of Croatia. Hunting grounds today are allocated quotas based on the above figure (Dec̄ak et al, 2005). While the head of a hunting club claimed that quotas are now lower than they used to be (Interview 2010), experts claim that they have actually increased (Huber, 2010). Furthermore, it has been reported that quotas are actually not being fulfilled because there is not enough demand by foreign tourists to match them (Kerezi, 2010). This research will investigate how changes to the bear hunting business and the allocation of hunting quotas, have affected public attitudes.

#### ***2.3.2.2 Problem bears, damages and compensation***

With regards to this study, the most important point in the BMP concerns the efforts directed at mitigating human-bear conflict by reducing both the damages caused by bears and the frequency of encounters between humans and bears. The primary source of human-bear conflict is the encroachment of bears into human inhabited areas, as they are attracted by illegal garbage dumps. Bears that become habituated to human smells and human presence often cause a lot of disturbance, for this reason they are called 'problem bears'. The BMP sets out a series of measures to reduce the number of problem bears: firstly by enforced the ban on illegal garbage dumps and recommending preventive measures such as electric fences and garbage containers that are inaccessible to bears; secondly, by addressing the issue of orphaned bears, who often grow to become problem bears. Finally the BMP established a Bear Emergency Team, which manages problem bears either by capture and translocation or through lethal control (Dec̄ak et al 2008). This research will determine whether the steps taken by the BMP to reduce human-bear conflict have had a positive effect on public attitudes toward bears.

### **3. THEORETICAL APPROACHES**

The field of human dimensions was developed out of the need to understand human thoughts and actions toward wildlife. Its fundamental aim is to identify agreeable wildlife management goals (Blanchard 2000). Human dimensions research borrows much of its theory from the field of social psychology and is based on a paradigm of cognitive hierarchy, which explains the human thought process. Values, value orientations, attitudes, normative beliefs and behaviors form a hierarchical model in which each element in turn influences the one after it (Fulton et al 1996). This research investigates the cognition model at several levels.

The aim of this section is to provide a theoretical framework for analyzing attitude shifts over time. Examples from the literature will be used to explain ways in which normative beliefs, attitudes, value orientations, and other characteristics of the general public are subject to change.

#### **3.1 Attitudes toward management**

Cognitive theory uses the term “normative beliefs”, to refer to attitudes toward management. These are defined as standards that the general public uses to judge management actions and policy (Zinn et al 1998). Normative beliefs are influenced by: external situational specifics, in the case of this research real changes in wildlife management and population numbers; and by internal psychology, such as people’s value orientations and attitudes towards wildlife (Zinn et al, 1996).

##### ***3.1.2 Social carrying capacity***

Determining the maximum number of individuals of a species that can coexist with the local population is often a primary management concern (Ellingwood and Spingesi, 1986). Social carrying capacity is determined both by land use and by public attitudes toward a species (Zinn et al 2000). However, even when public attitudes are positive, social carrying capacity can be low. For example Kaczensky et al (2004) found overall positive attitudes towards bears in Slovenia, but no support for a policy of bear population expansion. Acceptability of carnivores can reach a rapid peak as “real (animals) replace hypothetical (animals)” (Ericsson and Herbelein 2003, p.157). A study by Naughton-Treves et al (2003) shows how people who suffered damage from wolves wanted the wolf population to be reduced. This suggests that experience plays a decisive role in determining social carrying capacity.

On the other hand, Wagner and Seal (1992) argue that it is people's value orientations that determine whether a wildlife population has reached undesirable numbers. Therefore perceived risk is likely as important as actual experienced risk (Naughton-Treves et al 2003). Whether or not social carrying capacity is subject to perceptions has implications for the extent to which it can be manipulated and raised. This study seeks to firstly assess the overall carrying capacity for bears in Croatia, secondly identify the factors influencing it, and thirdly determine whether it has changed between 2002 and 2008.

### **3.2 Attitudes toward wildlife**

Attitudes generally range from positive to negative, depending on the interaction between positive value orientations and negative value orientations (Decker and Purdy, 1988). Value orientations are broad beliefs regarding the relationship between humans and wildlife (Zinn et al 1998).

#### ***3.2.1 Positive value orientations***

Nature's worth to the human experience can be divided into 'non-use', and 'use' values. Some 'non-use' values of nature are: moral, ecological, aesthetic, spiritual, emotional and existence and bequest values. The latter are concerned with the intrinsic value of nature and the rights of future generations to experience it (Zinn et al 1998; Scarce 1998; Bjerke et al 2000). Non-use values are formed at any early age and are deeply entrenched in people's lifestyle, occupation, even gender (Naughton-Treves et al 2003). As a result they are unlikely to be altered unless broader social changes take place. 'Use' values of nature are extractive or recreational (Manfredo et al xx), and in the case of this research they are trophy hunting and tourism. 'Use values' are tied to more dynamic forces such as markets, development plans and

management regimes, and are therefore more likely to be under constant transformation. This research will investigate both 'use' and 'non-use' values of bears in Croatia, to see whether they have changed over time.

### ***3.2.2 Negative value orientations***

While bears pose undeniable risks to rural populations, the way these risks are perceived depends on people's values and lifestyles. For example, anthropocentric value orientations, that emphasize human dominance and supremacy over nature, serve to lower people's tolerance of setbacks caused by wildlife (Vaske and Donnelly, 2001; Bjerke and Kaltenborn, 1999; Kellert, 2004; Bjerke et al, 2000). Moreover time, labour and emotions invested into rearing livestock and cultivating land, further intensify the experience of damage. Bears can therefore come to symbolize more than just economic loss: by threatening people's livelihoods and the security of their personal space they are perceived as "lifestyle wreckers" (Scarse, 1998 p. 35). This research seeks to identify those respondents with the most negative value orientations because they are the ones that require most attention.

Furthermore, this research hypothesizes that public perceptions of risk are also dependent on external influences. The frequency with which damages and encounters with bears occur, and the way they are dealt with, are likely to influence public perceptions. For example, it has been documented that in cases where wildlife management is in the hands of central authorities, a broader political struggle over the control of resource use is reflected in rural people's negative attitudes toward wildlife. Therefore opposition to wolves can stem from mistrust in the central government (Bjerke et al, 2000; Scarse, 1998; Kellert, 1994). In this research changes in people's perception of risk will be analyzed both in terms of an increase in real risks, due to the growing bear population, and in terms of a shift in governance towards the more centralized bear management introduced by the BMP.

### **3.3 Other factors**

Some experts call for the need to expand the cognitive model to include factors that might influence value orientations and provide an indication of people's lifestyle, background and personal disposition (Vaske and Donnelly, 1999; and Vaske et al, 2000). Due to the design of the questionnaires, this study focuses on past experience with bears, socio-demographic characteristics, and knowledge.

### ***3.3.1 Experience***

Past experience with wildlife is discussed in the literature as a major influence in people's attitudes and normative beliefs. Findings indicate that direct experience with carnivores can cause more extreme attitudes (Ericsson Herberlein, 2002). While damage unsurprisingly produces more negative attitudes (Ericsson Herberlein, 2002) and normative beliefs (Naughton-Treves et al, 2003), other forms of experiencing wilderness such as hiking and hunting have been associated with reduced fear of wolves (Roskaft, 2003). On the other hand, more frequent encounters with wolves have been associated with more negative attitudes toward them (Stronen et al, 2007). Differences in both the nature and frequency of people's experience with carnivores can therefore affect public attitudes. This study will analyze the relationship between experience with bears and perceived risk, and also try to determine whether the increase in the bear population and the change in bear management have affected people's experiences with bears.

### ***3.3.2 Socio demographic characteristics***

The goal of human dimensions studies is to understand public values and how they are distributed among major social groups (Kellert, 1994). This study focuses on age and gender, to try to identify a trend in the types of value orientations held by the different cohorts. Age has been investigated in several researches. Older people have been found to be more negative towards carnivores (Bath, 1989; Kleiven et al, 2004), more fearful of them (Roskaft et al, 2003), and to express stronger anthropocentric value orientations (Deruiter and Donnelly, 2002). The relationship between gender and value orientations has also been extensively documented: while Kleiven et al (2000) found that females had more negative attitudes toward carnivores than males, Majić (2007) found females to be more positive overall, even though they were more afraid (Majić, 2007; Kellert and Berry, 1987; Roskaft et al, 2003). Furthermore, females have been found to have more protectionist (Kellert and Berry, 1987) and eco-centric value orientations (Vaske et al, 1999; 2001) as well as a greater emotional and aesthetic appreciation for nature (Deruiter and Donnelly, 2002). On the other hand men have been found to hold more utilitarian value orientations (Kellert and Berry, 1987).

This study will also investigate the effect of being a hunter on public attitudes toward bears and bear management. Whether respondents are hunters is already an indication that they hold utilitarian values (Naughton-Treves et al, 2003). However their opinions are important because hunters are directly affected by the changes to the hunting business brought about by the BMP. Therefore hunters' attitudes and opinions will be investigated to see if and how they respond to the management change.

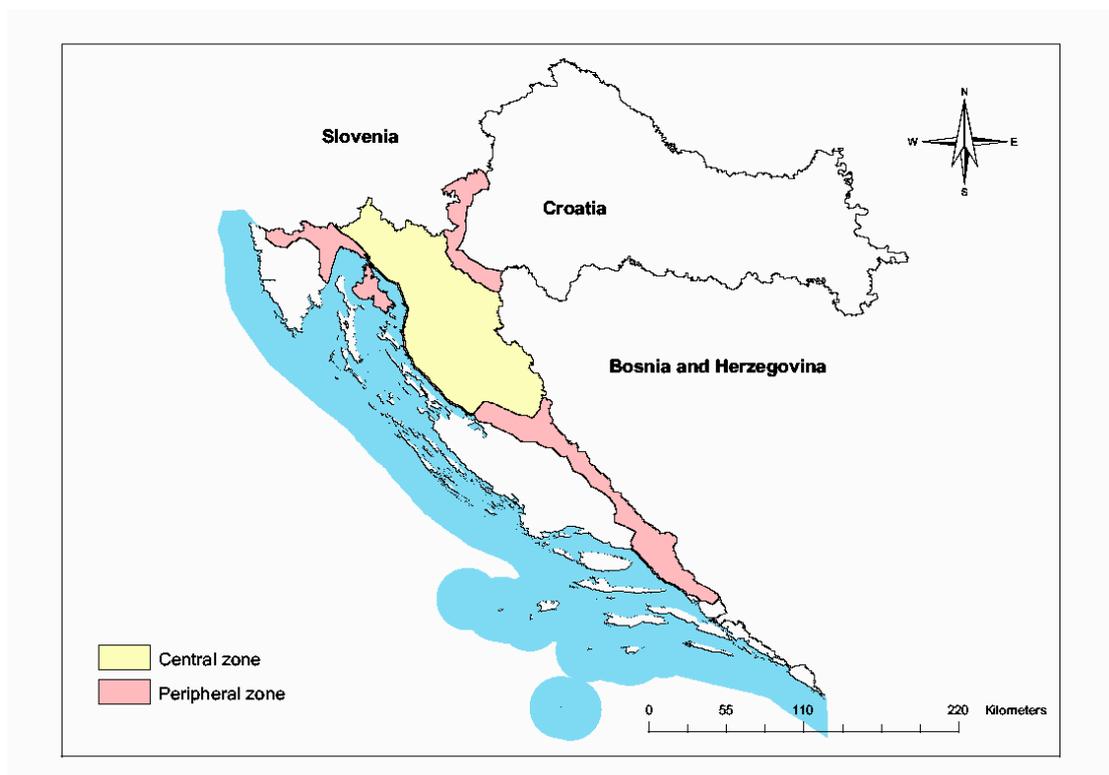
### ***3.3.3 Knowledge***

Management approaches aimed at improving attitudes often involve education campaigns. Since attitudes are at least in part affected by perceptions, they are expected to change as people become more aware of reality. It is widely assumed that increased awareness of conservation issues and animal biology raises people's ecological appreciation and emotional empathy, while also decreasing fear of the wild. However, findings in the literature are contrasting: some suggest that knowledge does improve attitudes toward carnivores (Kellert, 1985); some find no relationship between knowledge and attitudes (Williams et al, 2002; Bjerke et al, 1998); others find that knowledge only reinforces preexisting convictions, and often people with more knowledge have more negative attitudes (Kellert et al, 1996; Ericsson and Herberlein, 2003; Kaczensky et al, 2004). Therefore, it is not always clear whether education campaigns are an appropriate management tool. I investigate this question by testing whether knowledge of bear biology and bear management improves respondent's attitudes.

## 4. METHODS

### 4.1 Study site

The bear range in Croatia, as identified by Huber and Kusac (2008) can be divided into two parts: the Central zone and the Peripheral zone (figure 1). This study only analyzes responses from the central area, due to sampling bias in the questionnaires collected in 2008. The central area is made up of Gorski kotar and Lika regions, with an area of 9.573,36 km<sup>2</sup> (Majić, 2003; Decak et al, 2005). These are largely forested mountain regions with low human densities (about 25/Km<sup>2</sup>) and decreasing human population due to outward migration to the urban and coastal areas of Croatia (Bath and Majić 1999). In Gorski kotar forestry and small farms provide the primary source of income for the population and livestock concentrations are low (4.5 sheep/Km<sup>2</sup>). In Lika large valleys have been converted into grazing land and sheep density is higher (21 sheep/Km<sup>2</sup>). Bears are hunted throughout the central area, where they are permanently present and able to satisfy all their food and reproductive requirements.



*Figure 1: Map of Croatian bear range (Majić, 2003)*

## **4.2 Data Collection**

### ***4.2.1 Questionnaires***

Questionnaire design, distribution and collection was carried out by Aleksandra Majić from the Department of Veterinary Science of Zagreb. Questionnaires were based on Bath and Majić's (2000) and Kaczensky's (2000) question format. Only questions in common between the 2002 and 2008 questionnaires are analyzed in this paper and these consisted of 48 multiple choice questions, most of which on a 5 point Likert scale, and three open ended questions. The questionnaire (appendix 1) was divided into five thematic sections:

- General attitudes toward bears
- General knowledge about bear biology and management
- Attitudes toward bear management
- Past experience with bears
- Socio demographic details of respondents

The same procedure of random sampling was used in both 2002 and 2008 (Majić, 2008). Responses were pooled together by students from the Veterinary Faculty of the University of Zagreb. Open-ended responses were then translated into English by myself, with the help of a translator.

### ***4.2.2 Informal interviews***

Qualitative data was collected through informal semi structured interviews with experts and hunting managers in the region of Gorski kotar. The aim was to collect further information about the changes that have taken place between 2002 and 2008 with regards to bear management, in order to better contextualized the shift in public attitudes toward bears. Djuro Huber, the principal author of the Bear Management Plan, was consulted for clarifications regarding bear management and policy changes. Informal interviews were conducted with one head of a village hunting ground, one head of a village forestry office and one manager of a state owned hunting ground. The interviews explored the economics of bear hunting, the implementation of the Bear Management Plan, its impact on the hunting business and its success in mediating human-bear conflicts. Findings were presented in section 2.

### 4.3 Quantitative data analysis

#### 4.3.1 Preparatory analysis

All analysis was carried out in Excel (97-2004) and R (2.11.0). A large portion of analysis was directed at the preparation of data to use in the models. Firstly, potential biases were taken into account. Four different datasets were created in order to account for differences in geographical sampling between the two years (see section 4.1), as well as the fact that some respondents answered the questionnaires both in 2002 and in 2008. It was hypothesized that the inclusion of the latter respondents could cause bias if a portion of the analysis recorded individual attitude change.

Results from non parametric tests (see below) on the different datasets were compared, the effects of the potential biases were verified, and finally the dataset containing responses from the central area only, without the responses of those people who had compiled the questionnaire in both years, was saved as the main dataset and used in further analysis. Following the exclusion of data points due to bias, the data set was reduced to a total of 548 data points: 284 in the year 2002 and 264 in the year 2008. Since many respondents left some questions blank, the dataset was further reduced for the modelling part of the analysis, to 404 data points: 226 for 2002 and 178 for 2008.

Non-parametric tests were carried out to detect changes in responses to each question between 2002 and 2008. This was done to understand the responses better, calculate averages and identify the main areas of change. Multiple choice questions based on a 5 point Lickert scale were analyzed by carrying out Wilcoxon's test. The t-test was used on the knowledge score, and the rest of the responses were analyzed with Fisher's test.

Finally, questionnaire responses were grouped in order to simplify analysis. In the knowledge section of the questionnaire respondents were awarded zero points for every wrong or unanswered question, and one point for every correct answer. The points were then added to compute a single knowledge score ranging between 0 and 7. Furthermore, principal component analysis with a varimax rotation to maximize loadings was performed on the section on general feelings toward bears and the section on opinions about bear management with the R package "psych". Three principal components were extracted, and the PCA loadings are discussed in more depth in the results section.

### **4.3.2 Modelling**

#### *4.3.2.1 Variable selection*

Three models were designed to try and explain the forces shaping general attitudes toward bears and bear management. Therefore the response variables used in the models were the scores of the three principal components mentioned above, which were interpreted as: “existence, bequest and use values”, “perceived threat from bears”, and “support for controlling bear numbers”. The explanatory variables used in the models were derived from answers to questions in the questionnaire. *Table 1* shows variable abbreviations and descriptions in terms of how they were calculated and the exact wording of the questions. Explanatory variables were checked for autocorrelation. Only the explanatory variables with a correlation coefficient below 0.5 were selected and used in the same model. *Table 2* shows a list of the models and the variables used in them.

Most variables represent themes that have been stressed in the literature, there were discussed in section 3. However, ‘year’ is the most important variable in this study, and with the exception of Majić and Bath (2009), it has not been explored before. ‘Year’ denotes whether responses come from questionnaires collected in 2002 or in 2008, but more importantly it represents the changes in bear biology and Croatian politics described in section 2. For this reason, interactions between year and explanatory variables were also included in the models to investigate whether time (and the associated changes) affected the way some explanatory variables relate to the response variables. For example the interaction between year and damage was used in the model that sought to explain existence, bequest and use values to see whether, due to the measures implemented by the Bear Management Plan, the experience of having damage produced less negative attitudes in 2008 than it did in 2002.

*Table 1: Description of variables used in the models*

| Abbreviation                         | Description   |
|--------------------------------------|---|
| Existence, bequest and use values    | Score of first principal component from PCA carried out on the section about general attitudes toward bears                 |
| Perceived threat from bears          | Score of second principal component from PCA carried out on the section about general attitudes toward bears                |
| Support for controlling bear numbers | Score of first principal component from PCA carried out on the section about attitudes toward bear management               |
| Knowledge                            | Knowledge score (between 0 and 7)   |
| Year                                 | Whether response came from the questionnaires collected in 2002 or 2008.  |
| Gender                               | Respondent's gender (M/F)   |
| Hunter                               | "Are you a hunter?"(Y/N)  |
| Age                                  | Respondent's age  |
| Seen in wild                         | "Have you ever seen a bear in the wild?" (Y/N)  |
| Had damage                           | "Have you ever had damage caused to your property by a bear?" (Y/N)   |
| Keeping informed                     | "On a scale from 1 to 10 how important is it to you that you keep up to date with the issue of bear management in Croatia?" |

*Table 2: List of models and variables used in them*

|                                  | Response variable                       | Explanatory variables  |
|----------------------------------|---|--|
| General attitudes toward bears   | 1. Existence, bequest and use values    | 'Year', 'gender', 'hunter', 'age', 'seen in wild', 'had damage', 'inform', 'knowledge', 'year*hunter', 'year*seen in wild', 'year*had damage'.   |
|                                  | 2. Perceived threat form bears          | 'Year', 'gender', 'hunter', 'age', 'seen in wild', 'had damage', 'keeping informed', 'knowledge', 'year*hunter', 'year*seen in wild', 'year*had damage'.   |
| Attitudes toward bear management | 3. Support for controlling bear numbers | 'Year', 'gender', 'age', 'hunter', 'knowledge', 'existence, bequest and use values', 'perceived threat from bears', 'seen in wild', 'had damage', 'keeping informed', 'year*had damage', 'year*seen in wild', 'year*hunter', 'year*existence, bequest and use values', 'year*perceived threat from bears'. |

#### 4.3.2.2 Model selection

Recent literature in the fields of psychology, ecology and evolution is beginning to favour model selection through likelihood theory approaches over classical null hypothesis testing (Johnson and Omland, 2004; Burnham and Anderson, 2002; Whittingham, 2006; Towner and Luttbeg, 2007). Because of the nature of attitudinal studies it is difficult to formulate a meaningful hypothesis that can be rejected by a single test, rather it is more appropriate to compare multiple alternative models or hypotheses, by evaluating the relative support in the data for each model (Johnson and Omland, 2004; Towner and Luttbeg, 2007). The Akaike Information Criterion (AIC) allows to measure lack of model fit to the observed data, while penalizing models that are more complex. The model with the lowest AIC is considered to be the best model, or the model closest to the truth. AIC differences can then be calculated as a measure of distance of each remaining model relative to the best model. Furthermore, AIC weights provide a way to scale and interpret AIC values by providing a measure of likelihood of a model given the data. In this way it is possible to account for model selection uncertainty.

Since the data in this study is observational (not subject to experimental manipulation) and non orthogonal (variables are autocorrelated), the significance of factors depends on the order in which they are removed from the model (Crawley, 2007). For this reason, three complex models were identified (Table 2) and then model simplification was carried out with the R package “glmulti”, by running models for all the possible combinations of the variables in those three complex models. AICc was used in place of AIC, to account for the small sample size. A confidence set of models was generated by calculating AICc differences and using the cut off point of 4, recommended by Burnham and Anderson (2002). The confidence set that was retained is a set of models that are strongly supported by the data. The relative importance of each variable was measured across the confidence set of models, by adding the weights of the all the models in which each variable featured. This allowed for the variables to be ranked by importance according to their contribution to the entire set of likely models. Lastly, model averaging was performed across the confidence set of models, to produce averaged estimates and mean standard errors for each parameter.

#### **4.4 Qualitative data analysis**

Discourse analysis (DeRuiter and Donnelly, 2002) was carried out on the open-ended sections of the questionnaire. Two questions asked about respondent's reasons for agreeing or disagreeing with increasing the bear population and the answers present interesting information about how the respondents value the existence of bears. Recurrent ideas were linked to determine whether there was a change in people's way of valuing bears between 2002 and 2008.

## 5. RESULTS

### 5.1 Preparatory analysis

Results will be presented separately for each variable that was tested in the models. Firstly, averages and comparisons of questionnaire responses will be provided (*Tables 3 and 5*). The red text in the tables denotes questions for which a significant difference between responses in 2002 and in 2008 was detected. Secondly, where PCA was carried out, the interpretation of principal components will be explained by presenting PCA loadings (*Tables 4 and 6*). These are actually measures of correlation between the original variables (in this case questions) and the component. The larger the loading of a variable, the more accurately the variable describes the component (Tabachnick and Fidell, 1989). Thirdly, the distribution of each variable will be plotted.

#### 5.1.1 Attitudes toward bear management

##### 5.1.1.1 Significant changes between 2002 and 2008

*Table 3* shows the results of the parametric tests carried out on the management section of the questionnaire. Answers to questions about the increasing bear population (12, 13, 23, 24 and question 4 because of the word “abundant”) seem to indicate that overall respondents were positive towards increasing the population. However, attitudes have become more negative between 2002 and 2008. In 2008 significantly less people agree with increasing the bear population, less people agree that we should assure an abundant population of bears for future generations and less people also disagree with the statement that there are enough bears in Croatia.

Answers to questions about compensation issues varied considerably. On average, respondents agreed that the state and hunting grounds should pay for damages caused by bears. The averaged answers to questions about donations (22), insurance (26) and conditions for compensation (25) ranged between disagreement, neutrality and agreement. More importantly answers differed between 2002 and 2008. Significantly more people in 2008 disagreed with the statement that compensation should be paid only when appropriate precautions are taken, and significantly less people in 2008 agreed with the statement that farmers should buy insurance against damages. Therefore compared to 2002, in 2008 less people thought that the costs of damages should be borne by individuals.

Lastly, respondents overall showed support for a controlled system of bear hunting. There was strong disagreement with the statement saying that bears should be killed by all means (17) and also low support for year round hunting (16). Respondents also agreed with removing problem bears (21). On average, respondents agreed with the statement that quotas should be decided on a national level (18), were neutral in 2002 and agreed in 2008 with the statement that they should be decided on a county level (19), and were neutral towards the statement that they should be decided on the hunting ground level (20). In 2008 more people agreed with the statement that bears should be hunted in a specific season, and few yet significantly more people agreed with the statement that bears should be hunted all year.

#### *5.1.1.2 Principal components analysis*

The first principal component that was extracted from the management section of the questionnaire explains 17% of the total variance in the responses. *Table 4* shows the loadings of the component. The most important variables describing this component are negatively loaded, and express negative feelings towards increasing bears (12, 13). These are followed by variables expressing respondent's opinions that there are already enough bears in Croatia (22, 23). Then come variables expressing feelings that bears should be hunted more than they already are (16, 17) and that they should not be completely protected (14). Finally comes a variable expressing respondents' opinion that hunting quotas should be allocated on the hunting ground level (20). This component clearly suggests negative feelings towards increasing the bear population, and was interpreted as "support for controlling bear numbers".

Table 3. Averages and significant differences between the answers to the management section of the questionnaires, in 2002 and in 2008.

|  | 2002 |        | 2008 |        | Wilcoxon test |
|--|------|--------|------|--------|---------------|
|  | Mean | Median | Mean | Median |               |
| 12. I would agree with increasing bear numbers in Croatia *  | 3.86 | 4      | 3.60 | 4      | 0.001225      |
| 13. I would agree with increasing bear numbers in my region *  | 3.76 | 4      | 3.54 | 4      | 0.005755      |
| 14. Bears should be completely protected *   | 3.83 | 4      | 3.48 | 4      | 0.0001815     |
| 15. Bears should be allowed to be hunted in a specific season *  | 3.00 | 3      | 3.81 | 4      | 3.42E-16      |
| 16. Bears should be allowed to be hunted all year round *  | 1.80 | 2      | 1.98 | 2      | 0.007466      |
| 17. Bears should be killed by all means *  | 1.49 | 1      | 1.53 | 1      | 0.5791        |
| 18. Hunting quotas for bears should be agreed on a national level *  | 3.64 | 4      | 3.61 | 4      | 0.5518        |
| 19. Hunting quotas for bears should be agreed on a county level *  | 3.09 | 3      | 3.37 | 4      | 0.004435      |
| 20. Hunting quotas for bears should be agreed on a hunting ground level *                                    | 2.96 | 3      | 3.05 | 3      | 0.4477        |
| 21. If a bear repeatedly causes damages I would agree with killing this problem animal *                     | 3.61 | 4      | 3.56 | 4      | 0.6006        |
| 22. I would be willing to contribute money toward compensation program for losses due to bears *             | 3.01 | 3      | 2.85 | 3      | 0.0623        |
| 23. We already have enough bears in Croatia *  | 2.66 | 2      | 2.97 | 3      | 0.0003991     |
| 24. We already have enough bears in this region *  | 2.80 | 3      | 3.06 | 3      | 0.009122      |
| 25. Compensation for the damages caused by bears should not be paid if appropriate prevention was not used * | 3.06 | 3      | 2.68 | 2      | 0.0001417     |
| 26. Farmers should buy insurance for protection of their crops and animals against bear damages *            | 3.28 | 4      | 3.04 | 3      | 0.02083       |
| 27. Hunters that manage bears should pay for compensation for the damages caused by bears *                  | 3.75 | 4      | 3.78 | 4      | 0.6255        |
| 28. Administration should pay for compensation for the damages caused by bears *                             | 3.76 | 4      | 3.93 | 4      | 0.07145       |
| 29. Bear coat and skull should be removed from the list of hunting trophies *                                | 3.03 | 3      | 3.20 | 3      | 0.1111        |
| 30. Hunter can keep the trophy after it has been properly registered in the national database *              | 3.73 | 4      | 3.61 | 4      | 0.08236       |

\* The answers to these questions were measured on a scale from 1-5: 1. Strongly disagree; 2. Disagree; 3. Neutral; 4. Agree; 5. Strongly Agree.

Table 4. PCA loadings for component interpreted as  
‘Support for controlling the bear population’

|  |        |
|--|--------|
| 12. I would agree with increasing bear numbers in Croatia  | -0.71  |
| 13. I would agree with increasing bear numbers in my region  | -0.70  |
| 14. Bears should be completely protected   | -0.52  |
| 15. Bears should be allowed to be hunted in a specific season  |        |
| 16. Bears should be allowed to be hunted all year round  | 0.64   |
| 17. Bears should be killed by all means  | 0.57   |
| 18. Hunting quotas for bears should be agreed on a national level  |        |
| 19. Hunting quotas for bears should be agreed on a county level  |        |
| 20. Hunting quotas for bears should be agreed on a hunting ground level                                    | 0.32   |
| 21. If a bear repeatedly causes damages I would agree with killing this problem animal                     |        |
| 22. I would be willing to contribute money toward compensation program for losses due to bears             |        |
| 23. We already have enough bears in Croatia  | 0.68   |
| 24. We already have enough bears in this region  | 0.69   |
| 25. Compensation for the damages caused by bears should not be paid if appropriate prevention was not used |        |
| 26. Farmers should buy insurance for protection of their crops and animals against bear damages            |        |
| 27. Hunters that manage bears should pay for compensation for the damages caused by bears                  |        |
| 28. Administration should pay for compensation for the damages caused by bears                             |        |
| 29. Bear coat and skull should be removed from the list of hunting trophies                                |        |
| 30. Hunter can keep the trophy after it has been properly registered in the national database              |        |
| Proportional Variance explained  | 17.40% |
| Cumulative Variance explained  | 17.40% |

Below is a histogram of the component (*figure 2*) showing how individual respondents scored against it. The majority of respondents range between being mildly in favour and mildly against controlling bear numbers.

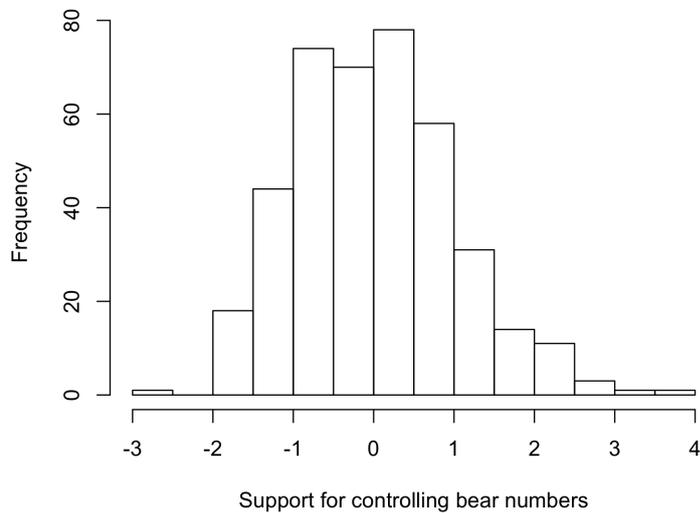


Figure 2. Histogram of PCA scores for the component interpreted as “support for controlling bear population numbers”.

## **5.1.2 General attitudes toward bears**

### *5.1.2.1 Significant changes between 2002 and 2008*

Overall responses reflect a general positive attitude toward bears: on average, respondents agreed with the positive statements about bears and disagreed with the negative statements. With the exception of question 4, all the questions pertaining to existence and bequest value orientations as well as perceived damages from bears (1-9) did not differ significantly between the two years. However, fear (10-11) of bears has increased since 2002.

Table 5. Averages and significant differences between the answers to the general attitudes section of the questionnaire, in 2002 and in 2008.

|   | 2002 |        | 2008 |        | Wilcoxon test |
|---|------|--------|------|--------|---------------|
|   | Mean | Median | Mean | Median |               |
| 1. What are your feelings toward bears? 1. Completely against; 2. Against; 3. Neutral; 4. In favor; 5. Completely in favor      | 3.98 | 4      | 3.94 | 4      | 0.7176        |
| 2. To have bears in Croatia is: 1. Good; 2. Bad; 3. Don't know  | 1.07 | 1      | 1.13 | 1      | 0.06634       |
| 3. It is important to maintain the bear population for future generations *   | 4.32 | 4      | 4.23 | 4      | 0.8968        |
| 4. We should assure that future generations have an abundant bear population *  | 4.03 | 4      | 3.79 | 4      | 0.003189      |
| 5. Whether or not I get to see a bear, it is important to me that they exist in Croatia *                                       | 4.29 | 4      | 4.19 | 4      | 0.4556        |
| 6. It is unnecessary to have bears in Croatia because abundant populations of bears already exist in other European countries * | 1.78 | 2      | 1.82 | 2      | 0.9222        |
| 7. Having bears in your region increases tourism *  | 3.97 | 4      | 3.84 | 4      | 0.3874        |
| 8. Bears cause abundant damage to livestock *   | 2.33 | 2      | 2.38 | 2      | 0.8052        |
| 9. Bears cause abundant damages to crops and orchards *   | 2.59 | 2      | 2.73 | 2      | 0.1334        |
| 10. In areas where bears live in close proximity to humans, bear attacks on humans are common*                                  | 1.88 | 2      | 2.14 | 2      | 0.001161      |
| 11. I would be afraid to hike in the woods if bears were present*   | 2.37 | 2      | 2.68 | 2      | 0.001993      |

\*The answers to these questions were measured on a scale from 1-5: 1. Strongly disagree; 2. Disagree; 3. Neutral; 4. Agree; 5. Strongly Agree.

### 5.1.2.2 Principal components analysis

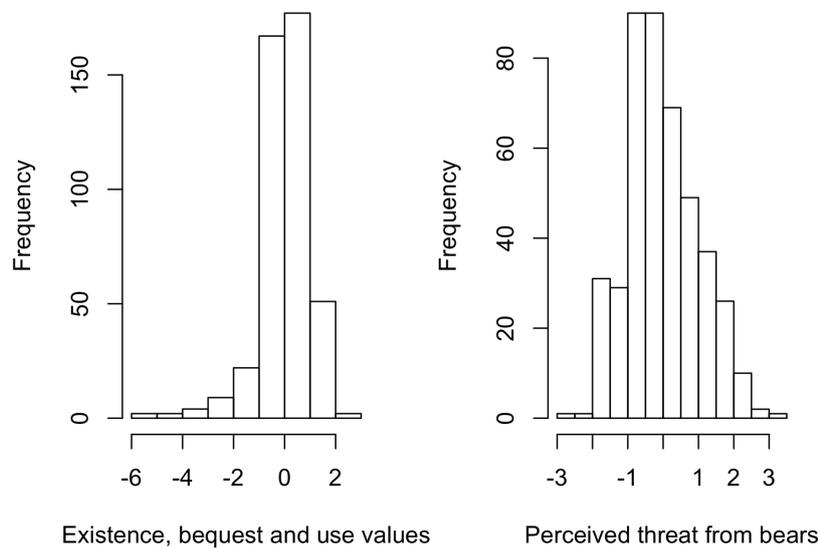
The first principal component explained 31% of the total variance of the variables in the general attitudes section. Variables 3 and 5, expressing respondent's bequest and existence value orientations respectively, featured as the most important contributors to this component. Second came variables 4 and 7, relating again to respondents' bequest value orientation, and respondents' use values of bears. Then came variable 1, reflecting respondents' general feelings toward bears. Furthermore a series of variables were negatively and weakly correlated to the component: the negative loading in variable 6 again expresses respondent's existence values, and variable 10 expresses a low level of fear of bears. It can be concluded that this component describes positive value orientations. It was therefore interpreted as "existence, bequest and use values".

The second principal component explained 22% of the total variance. The variables that featured as most important were: variable 9 expressing respondents' perception that bears cause a lot of damages to crops and orchards, variable 8 expressing respondents' perception that bears cause abundant damages to livestock, and questions 11 and 10 expressing respondent's fear of bears. Variables that featured negatively, and weakly, were those regarding bequest values (4) and general feelings towards bears (1). Therefore, this component represents negative values of bears and was interpreted as "perceived threat from bears".

Table 6. PCA loadings for components interpreted as 'Existence, bequest and use values' and 'Perceived threat from bears'

|   | 'Existence, bequest and use values' | 'Perceived threat from bears' |
|---|-------------------------------------|-------------------------------|
| 1. What are your feelings toward bears? Completely against/Against/Neutral/In favor/Completely in favor                       | 0.64                                | -0.37                         |
| 2. To have bears in Croatia is: Good/Bad/Don't know   | -0.60                               |                               |
| 3. It is important to maintain the bear population for future generations   | 0.77                                |                               |
| 4. We should assure that future generations have an abundant bear population  | 0.65                                | -0.32                         |
| 5. Whether or not I get to see a bear, it is important to me that they exist in Croatia                                       | 0.77                                |                               |
| 6. It is unnecessary to have bears in Croatia because abundant populations of bears already exist in other European countries | -0.55                               |                               |
| 7. Having bears in your region increases tourism  | 0.65                                |                               |
| 8. Bears cause abundant damage to livestock   |                                     | 0.81                          |
| 9. Bears cause abundant damages to crops and orchards   |                                     | 0.88                          |
| 10. In areas where bears live in close proximity to humans, bear attacks on humans are common                                 | -0.45                               | 0.52                          |
| 11. I would be afraid to hike in the woods if bears were present  |                                     | 0.60                          |
| Proportion of variance explained  | 31.1%                               | 22.2%                         |
| Cumulative variance explained   | 31.1%                               | 53.3%                         |

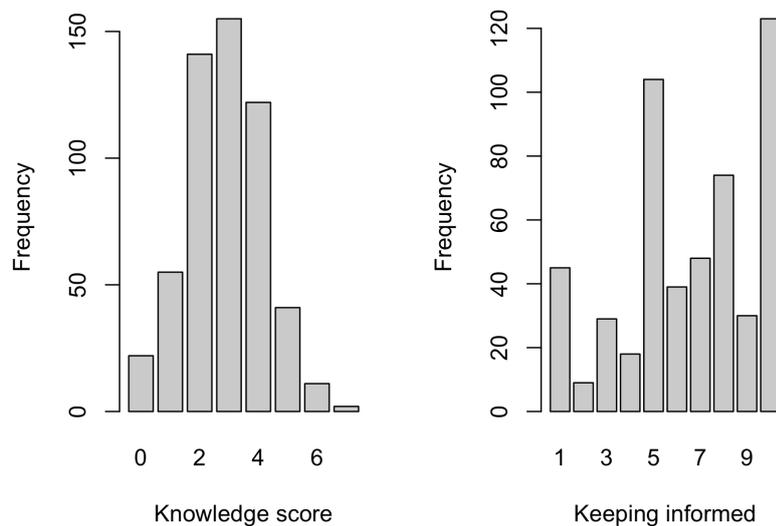
Below are histograms showing how individual respondents scored against the two principal components that represent general attitudes towards bears (*figures 3 and 4*). In the first component, “Existence, bequest and use values”, the majority of respondents hold positive and moderately positive value orientations toward bears, although a few respondents score very low. In the second component, “Perceived threat from bears”, the majority of respondents think that bears pose a medium threat to crops, livestock and personal safety. A few respondents feel very threatened by bears and a few also seem to think that bears are harmless.



Figures 3 and 4. Histograms of PCA scores for components interpreted as “Existence, bequest and use values” and “Perceived threat from bears”.

### 5.1.3 Knowledge and level of interest

Respondent's average knowledge score was low, with a mean of 3 out of seven correct answers. Instead, average interest in keeping informed with bear management was relatively high, with a mean of 8 out of 10. Neither differed significantly between 2002 and 2008 ( $p=0.2728$  and  $p=0.1711$ , respectively). As part of the knowledge score, it is interesting to note that, of the respondents, 82% underestimated, 5% overestimated, and only 13% accurately estimated the number of bears. Knowledge is normally distributed and slightly skewed towards the left, with more people being less knowledgeable and with very few people answering all the questions correctly (*figure 5*). In contrast respondent's interest in keeping informed with bear management is not normally distributed (*figure 6*).

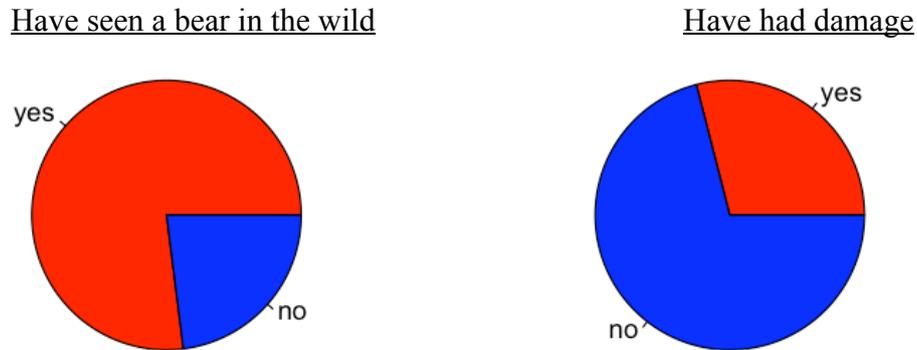


Figures 5 and 6. Knowledge score and interest in keeping informed with bear management issues

### 5.1.4 Experience

Overall there was not a significant change in the number of respondents experiencing damage ( $p=0.219$ ), nor in the number of respondents seeing a bear in the wild ( $p=0.3545$ ). However this does not mean that the total number of damages and encounters with bears did not increase over time, because these numbers do not account for the amount of damages or encounters experienced by each respondent. Therefore it is possible that the same respondents that experienced damage and encounters with bears in 2002 experienced even more damages and encounters with bears in 2008. It is likely that only a portion of the respondents would be prone to having experience with bears,

either because they live near forests or because they cultivate crops or rear livestock. Below are graphs showing the overall proportion of respondents that claim to have seen a bear in the wild (*figure 7*) and had damage from a bear (*figure 8*).



Figures 7 and 8. Proportion of respondents that have seen a bear in the wild and have had damage from a bear

### 5.1.5 Socio demographic characteristics

Because of random sampling, the demographic characteristics of the respondents do not vary significantly between the samples of 2002 and 2008. The gender (*figure 10*), age (*figure 9*), and hunting (*figure 11*) structure of the data is given below. The gender bias of the responses might be explained by the fact that the male head of the household will have more often completed the questionnaire.

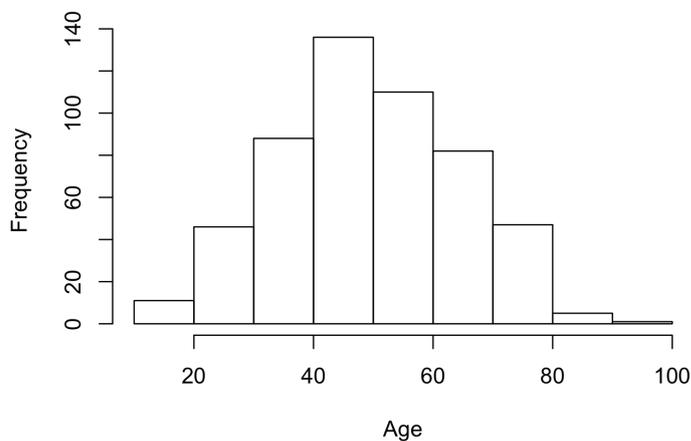
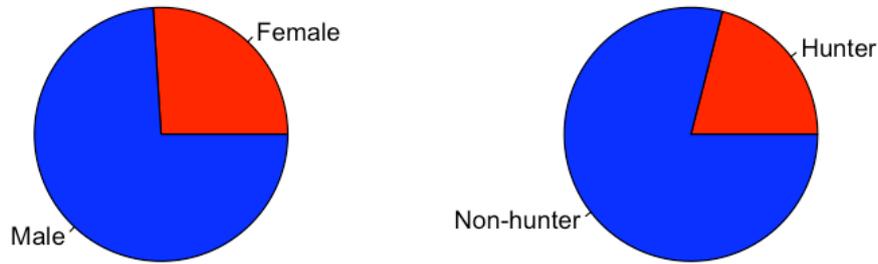


Figure 9. Age distribution of respondents



Figures 10 and 11. Gender composition and proportion of respondents that were hunters

## 5.2 Models

None of the results provided strong evidence in support of a single best model. Instead, a confidence set of models was created in each case, and model averaging was performed across it. The results in this section are presented separately for each model with a table showing the relative importance and the estimated coefficients and standard errors of the explanatory variables, followed by an account of their relationship with the response variable.

### 5.2.1 Existence, bequest and use value orientations

Table 7. Relative importance of variables and parameter estimates of the averaged model predicting ‘Existence, bequest and use value orientations’

|                                | <i>Coefficient</i> | <i>Standard Error</i> | <i>Strength of evidence:</i> |
|--------------------------------|--------------------|-----------------------|------------------------------|
| (Intercept)                    | -0.373             | 0.063424265           | 1                            |
| Had damage (y)                 | -0.244             | 0.011771617           | 1                            |
| Age                            | -0.009             | 1.11E-05              | 1                            |
| Keeping informed               | 0.121              | 0.00036298            | 1                            |
| Knowledge                      | 0.058              | 0.000462971           | 0.625                        |
| Year (2008)                    | -0.105             | 0.002601476           | 0.560                        |
| Hunter (y)                     | 0.157              | 0.003946962           | 0.513                        |
| Seen in wild (y)               | -0.120             | 0.002347706           | 0.299                        |
| Gender (m)                     | 0.006              | 0.000752776           | 0.189                        |
| Year (2008) * had damage (y)   | -0.144             | 0.001151979           | 0.101                        |
| Year (2008) * hunter (y)       | 0.431              | 0.002795871           | 0.072                        |
| Year (2008) * seen in wild (y) | -0.148             | 0.000276171           | 0.011                        |

To explain existence, bequest and use value orientations toward bears, 85 different models were included in the confidence set. The experience of damage from a bear and the experience of seeing a bear in the wild both impacted negatively on whether respondents held existence, bequest and use value orientations. On the other hand, as knowledge and respondent's interest in bear management issues increased, so did respondent's positive value orientations. Males, hunters and younger people held more positive value orientations than females, non-hunters and older people. Overall, respondents had weaker existence, bequest and use value orientations in 2008 than they did in 2002.

Furthermore, experiencing damages and seeing a bear in the wild had a stronger, negative effect on respondent's positive value orientations in 2008 than they did in 2002. Whether respondents were hunters also more strongly affected whether they held existence, bequest and use value orientations in 2008 than it did in 2002.

### 5.2.2 Perceived threat from bears

Table 8. Relative importance of variables and parameter estimates of the model predicting 'perceived threat from bears'

|                     | <i>Coefficient</i> | <i>Standard Error</i> | <i>Strength of evidence:</i> |
|---------------------|--------------------|-----------------------|------------------------------|
| (Intercept)         | 0.695              | 0.045061655           | 1                            |
| Had damage (y)      | 0.375              | 0.012206484           | 1                            |
| Keeping informed    | -0.049             | 0.000330974           | 1                            |
| Gender (m)          | -0.287             | 0.013459724           | 0.964                        |
| Seen in wild (y)    | -0.259             | 0.011014942           | 0.825                        |
| Knoweldge           | -0.078             | 0.000959805           | 0.724                        |
| Age                 | 0.003              | 1.00E-06              | 0.268                        |
| Hunter (y)          | -0.101             | 0.001693243           | 0.246                        |
| Year (2008)         | 0.002              | 0.000497731           | 0.191                        |
| Year * had damage   |                    |                       | 0                            |
| Year * hunter       |                    |                       | 0                            |
| Year * seen in wild |                    |                       | 0                            |

To explain perceived threat from bears, 25 different models were included in the confidence set, and model averaging was performed on them. Only the main effects featured as important predictors in this confidence set of models. Respondents that experienced damage felt more threatened than respondents that did not experience damage. Instead, people that had seen a bear in the wild felt less threatened than people who hadn't. Similarly respondents with more knowledge and more interest in bear management, as well as males, hunters and younger respondents felt less threatened by bears than did the less knowledgeable, less interested, female, non-hunters, and older respondents. Overall respondents felt slightly more threatened by bears in 2008 than they did in 2002.

### 5.2.3 Support for controlling bear numbers

Table 9. Relative importance of variables and parameter estimates of the model predicting ‘support for controlling bear numbers’

|                                | <i>Coefficient</i> | <i>Standard Error</i> | <i>Strength of evidence</i> |
|--------------------------------|--------------------|-----------------------|-----------------------------|
| (Intercept)                    | -0.163             | 0.020258587           | 1                           |
| RC1                            | -0.516             | 0.001882367           | 1                           |
| RC2                            | 0.334              | 0.00181128            | 1                           |
| Year (2008)                    | 0.166              | 0.005550066           | 0.848                       |
| Knowledge                      | 0.045              | 0.000241485           | 0.487                       |
| Seen in wild (y)               | 0.098              | 0.000719662           | 0.297                       |
| Hunter (y)                     | 0.138              | 0.00239097            | 0.270                       |
| Had damage (y)                 | 0.076              | 0.000616743           | 0.225                       |
| Gender (m)                     | -0.095             | 0.000600093           | 0.206                       |
| Year (2008) * hunter (y)       | -0.403             | 0.002318838           | 0.186                       |
| Keeping informed               | 0.013              | 1.02E-05              | 0.162                       |
| Age                            | 0.001              | 1.05E-07              | 0.099                       |
| Year (2008) * RC1              | 0.013              | 4.98E-05              | 0.090                       |
| Year (2008) * RC2              | 0.014              | 5.99E-05              | 0.085                       |
| Year (2008) * had damage (y)   | 0.272              | 0.000145448           | 0.032                       |
| Year (2008) * seen in wild (y) | -0.048             | 4.51E-06              | 0.016                       |

116 models were included in the confidence set to explain general support for controlling the bear population in Croatia. Respondents with strong existence, bequest and use value orientations expressed low support for controlling bear numbers, whereas respondents that felt threatened from bears expressed strong support for controlling bear numbers. Furthermore, support for controlling bear numbers increased over time, with age, and with more knowledge and interest in bear management issues. The experience of damage and seeing a bear in the wild also positively influenced support for controlling bear numbers. Finally, females and hunters supported controlling bear numbers more than males and non-hunters.

Support for controlling bear numbers was not only higher in 2008, it also decreased less steeply as attitudes towards bears were more positive, or rather as respondents had stronger existence, bequest and use values and felt less threatened by bears. In this way value orientations and attitudes had less of an effect on whether or not respondents supported controlling bear numbers in 2008, than they did in 2002. Furthermore, while in 2002, whether respondents had damage had no effect on their support for controlling bear numbers, in 2008 the experience of damage increased respondents’ support for controlling bear numbers. Lastly in 2008 being a hunter had a negative influence on support for controlling bear numbers, whereas in 2002 it had had a positive influence.

### 5.3 Qualitative results

The majority of responses to the open ended questions that referred to respondents' reasons for being in favour or against increasing the bear population, mentioned themes that were similar to those covered in the questionnaires. Positive responses referred to bequest, aesthetic, spiritual and ecological values of the bear. For example, the bear was described as "beautiful", "peaceful", "noble", and as the "king" and "core... of the forest". Furthermore the phrase "natural balance" was mentioned often. Negative responses mentioned concerns for personal safety, damages and the fact that bears are increasingly approaching inhabited areas and expanding beyond their natural habitat. More extreme attitudes are represented by claims that people were "...very afraid", and considered bears "dangerous beasts".

The overall the pattern of positive and negative value orientations expressed in these answers was not very different between 2002 and 2008. However, two aspects of positive values of the bear did seem more prominent in 2008 than in 2002. The first was the belief that bears bring tourism to Croatia. More people mentioned hunting tourism and profit as a reason to increase the bear population in 2008 than they did in 2002. Secondly, the idea of the bear as a national symbol seemed more developed in 2008 than in 2002. Respondents in 2008 claimed that bears: "...enrich Croatia", are "...nice to have (...) in Croatia." and are the "pride of (the) forest and of Croatia". Furthermore, in 2008 some respondents mentioned a moral obligation for conserving bears: "bears used to live all over Europe, but they ran to Croatia. Their trust should not be betrayed...", and furthermore "(bears are a) fortune of Croatia, few countries in Europe have them". Therefore, some respondents in 2008 took pride in the bear's existence because it is unique with respect to the rest of Europe.

## 6. DISCUSSION

### 6.1 General attitudes toward bears

Principal components analysis suggested that attitudes towards bears are composed of positive and negative values orientations, and that these should be analyzed separately. The two components explain 53% of the total variance of the responses in the general attitudes section, but existence bequest and use values of bears explain more of the variance in attitudes than perceived threat from bears.

#### *6.1.1 Positive value orientations: 'existence, bequest and use values'*

Some literature discusses value orientations in terms of 'use' and 'non-use' values, placing them on opposite ends of the same scale (Bjerke and Kaltenborn, 1999; Vaske and Donnelly, 1999). In this way eco-centric and protectionist values are seen to reflect positive attitudes toward wildlife, while anthropocentric and utilitarian values represent negative attitudes toward wildlife. Findings in this study do not support that theory. Existence and bequest value orientations loaded highly on this component, but so did hunting tourism. This indicates that for Croatians the use value of the bear is as important as its intrinsic value, and that for the majority of people, the two are not conflicting. In this study use values contribute to strengthen positive attitudes toward the bear.

##### *6.1.1.1 Socio- demographic characteristics*

Economic benefits brought by bear hunting are therefore likely to play an important role in increasing public acceptance of the species. Results from the model show that hunters in Croatia scored higher than non-hunters on the scale of existence, bequest and use values of bears. In this case the hunters' utilitarian values may have worked to enhance their existence and bequest values. Similarly, males who in the literature have been found to have more utilitarian approaches to wildlife than females, scored higher on the scale of existence, bequest and use values. These results corroborate findings by Kleiven et al (2000) that females are overall more negative towards carnivores, yet they contrast with Kellert and Berry's (1987), Vaske et al's (1999 and 2001) and Deruiter and Donnelly's (2002) findings that females have more positive attitudes towards carnivores because they hold more eco-centric, spiritual and emotional attachments to nature. Therefore, when attitudes are not measured against the eco-centric/anthropocentric dichotomy, it is possible to reach new conclusions.

### *6.1.1.2 Experience*

Experience with wildlife appeared to lower respondents' existence, bequest and use value orientations. Damage featured as a powerful predictor in all of the models that were included in the confidence set, and was found to have a negative effect on whether respondents held existence, bequest and use values. Seeing a bear in the wild did not feature as strongly as damage, but nonetheless it had a negative effect on respondent's existence, bequest and use values. These findings contrast with theory in the literature, which sees existence and bequest value orientations as "enduring belief(s)" (Rokeach, 1973, p. 5) that are unlikely to change through experience. Kaltenborn et al (1999) argue that value orientations are created early on in life, as individuals are socialized into different professional cultures and lifestyles that dictate their views and their relationship with nature. Unfortunately data on respondent's occupation was not available, but it is possible that in this case, increased experience with bears actually denotes membership to a certain cohort or social group. For example, it probably indicates that respondents lived closer to forests and practiced rural livelihoods such as crop cultivation and livestock rearing. These individuals would therefore be expected to have predetermined value orientations typically characteristic of rural inhabitants, which studies have found to be more exploitative of wildlife (Layden et al 2001). Therefore it is possible that experience alone is not enough to alter deeply entrenched beliefs.

### *6.1.1.3 Changes over time*

Nonetheless, this study shows that value orientations are at least in part subject to external influence. "Year" showed up as an important predictor in more than half the models that were included in the confidence set, and indicated that respondents held weaker existence, bequest and use values in 2008 than they did in 2002. In particular, the effects of year can be better understood if traced through how they interact with other variables. Overall, time appears to have reinforced some of the relationships mentioned above. Experiencing damages and seeing a bear in the wild had a stronger, negative effect on respondent's existence, bequest and use values in 2008 than it did in 2002. Furthermore, results from the non-parametric tests on the management section show that respondents in 2008 were more concerned with compensation issues than respondents in 2002. More respondents believed that the costs of damages should not be borne by individuals, and that the hunting grounds and the state should be responsible for paying compensation. Since results show that the number of respondents experiencing damage and seeing a bear in the wild did not

increase between 2002 and 2008, these results can only be interpreted in two ways: damages and encounters with bears must have changed either in frequency and in intensity for the same respondents, or in the way that the public perceived the experience.

Events in the Croatian context that might explain these results are both the increase in the bear population, and the effects of the Bear Management Plan. Official estimates do not record an increase in damages, however these are not completely reliable because as mentioned earlier, people often do not declare damages. Instead, it is likely that damages have slightly increased along with the growth in the bear population. Even though the number of people experiencing damages has not increased, it is possible that the people that had damage in 2002 had even more damage in 2008. This may have turned the experience of damage into a more negative one. Similarly, it is likely that the frequency of encounters with bears in the wild was intensified in 2008 for the same respondents that had seen a bear in the wild in 2002. Findings by Stronen et al (2007) have proven that whether respondents enjoy the experience of seeing a wolf in the wild depends on the frequency with which the encounters occur.

Although the BMP takes many important steps to mitigate both human-bear encounters and the damages cause by bears, it is possible that the positive results of these actions have not yet been felt by the local population. This might be because they have not been properly implemented everywhere, or because the population does not know of them. Instead, the more immediate effects of the bear management plan, such as the shortening of the hunting season, and the fact that management has been taken off the hands of local administrations, may have spurred more public discussion, inducing the perception that bears have become more protected and that local stakeholders have been deprived of their rights to self-determination. These perceptions may be acting to weaken respondent's existence, bequest and use values.

Findings also suggest that time has reinforced hunters' existence, bequest and use values. This indicates that provisions in the Bear Management Plan that limit hunter's ability to control bear management are not actually affecting their positive attitudes toward the bear. This might be explained by the fact that hunters are more informed about the BMP, and realize that it does not stop them from profiting from bear hunting.

The joint effects of time and hunters, as well as time and whether respondents experienced damage and had encounters with bears, provide an interesting discussion because they demonstrate the impact of Croatian policy change and bear population change, on respondent's value orientations. However it is important to note that they featured last in the ranking of the most important variables, and so are not the main predictors of respondents' existence, bequest and use values. Other factors, which featured more prominently in the results, indicate that the very foundations on which value orientations are based might be shifting as part of a broader process of social change.

#### *6.1.1.4 Broader social changes*

Age featured in all of the models included in the confidence set, and resulted as a powerful force lowering respondent's existence, bequest and use values in older respondents. This is consistent with literature that discusses the phenomenon of global environmentalism, whereby younger generations are becoming more concerned with nature (Vaske et al, 2001). This suggests that traditional ways in which individuals are socialized into certain value orientations are being overshadowed by broader social changes.

On the other hand, a different form of cultural change was detected in the qualitative analysis of the open-ended responses. Findings suggest that nationalistic feelings may have been awakened by Croatia's EU accession process, and reflected in the way that the bear is viewed as the symbol of Croatia's pristine natural heritage and uniqueness with respect to the rest of Europe. The bear has been figured on the national currency since the birth of the Republic of Croatia in the early 90's and has come to be part of the Croatian national identity. Furthermore, since bear hunting is a historically established tradition in Croatia, it is possible that the bear has also come to symbolize an aspect of the nation's cultural heritage. Moreover, improvements in Croatia's economic development and political stability may be allowing the public to turn their concerns to environmental issues, previously considered a second order priority. Results from the qualitative analysis also indicate that increasingly more people are realizing the benefits that bear hunting brings to tourism. This might be due to an expanding tourism industry and the possibility that EU accession might refuel bear hunting demand (Kerezi, 2009).

These broader political, economic and social changes may have contributed to reinforce bequest values of the bear in 2008, by emphasizing its value as part of both a natural and cultural heritage, to be preserved for future generations.

#### *6.1.1.5 Practical implications*

Findings suggest that existence, bequest and use value orientations are rooted in social group membership, but they are also open to external influences. Knowledge featured as a powerful predictor of existence, bequest and use values and the model showed that higher levels of knowledge are associated with stronger existence, bequest and use values. Therefore an awareness raising campaign might successfully influence public perceptions and further improve attitudes toward the bear. However, it should be taken into consideration that respondents' interest in keeping informed with bear management was correlated with knowledge, so that people with lower interest also held weaker existence, bequest and use values. This suggests that those with lower attitudes would also be the most difficult to reach through an education campaign.

#### ***6.1.2 Negative value orientations: 'perceived threat from bears'***

The component representing perceived threat from bears emerged through the strong correlation between respondents that believed bears to cause abundant damages to crops and livestock, respondents who feared bears for personal safety reasons, and respondents that on the whole had negative feelings toward bears. Results from the model provide some potentially useful management implications.

##### *6.1.2.1 Experience*

The model shows that perceived threat was highly dependent on real threat, at least for damages. Damage showed up as an important predictor in all of the models in the confidence set, revealing that respondents that had experienced damage from bears expressed higher levels of perceived threat. Once again it is possible that respondents that experienced damage are also those belonging to specific groups that are generally known to have more negative value orientations toward wildlife, but nonetheless the detected effect of real risk on perceived risk is a result worth considering.

The model also shows that respondents that had experiences with bears that are not negative per se, such as hunting and encounters in the wild, felt less threatened by them. Therefore, even though seeing a bear in the wild lowered respondent's existence, bequest and use values (section 6.1.1.2), it did not overall increase their perception of threat. It has been argued that when experience is non-threatening and increases knowledge of carnivores, it can serve to reduce fear of them (Roskaft 2003). This is supported by the fact that knowledge figured as a positive force, decreasing respondents' perceived threat in more than 70% of the models in the confidence set. The fact that hunters felt less threatened and believed bears to be less harmful than non-hunters is consistent with the fact that they, or at least their local hunting club, are the ones profiting from bears as well as having to pay compensation for the damages caused by them. Therefore it would make sense for hunters to try to minimize the extent of damages caused by bears.

#### *6.1.2.2 Fear*

Gender featured as a very important predictor to perceived threat, with females being more threatened by bears than males. This finding is consistent with the literature, where females are described as being in general more fearful (Majić, 2007; Kellert and Berry, 1987; Roskaft et al, 2003). Roskaft et al (2003) have explained this in terms of gender socialization in the way that, from an early age, girls are encouraged to be emotional and as a result are often more inclined to express fear. On the other hand, males have been described as more likely to participate in activities like hunting and hiking, which this model shows as having a positive effect on decreasing fear (Roskaft et al, 2003). This pattern is consistent with results from the previous section (6.1.1.1), which found females to have more negative attitudes toward bears than males. Age also once again featured as a predictor of more negative value orientations, with older respondents feeling more threatened by bears than younger respondents. These results may reflect the positive effect of social change in the younger generation. Another explanation might be the fact that people become more cautious as they grow older (Roskaft et al, 2003). Results show that the same social groups that held higher existence, bequest and use values, also felt less threatened by bears.

Year showed as an important predictor of perceived threat in 19% of models in the confidence set. In 2008, respondents had higher levels of perceived threat than in 2002. Results from the non-parametric tests showed that fear of bears was significantly greater in 2008 than it was in 2002. Events in the political background of Croatia that might explain this shift are both the relatively more centralized bear management resulting from the BMP, as well as the fact that the hunting

season was shortened. Bjerke et al (2000) have shown that higher levels of marginalization of the rural community from political decisions were positively associated with fear. Similarly Treves (2009) discusses risk perception in terms of people's ability to exert control over their environment. Therefore it is possible that the decision to withhold the rights of local authorities to control bear hunting quotas and the hunting season, may have served to intensify people's fear of bears.

### *6.1.2.3 Practical implications*

Results from the non-parametric tests show that although fear has increased over time, it is still overall low. However it is important not to underestimate the significance of fear, as it is human instinct to place personal safety and the safety of loved ones above everything else (Roskaft et al 2003). Even if they are held by a minority of the population, it is these strong feelings that form the basis of opposition to bear conservation. Since the model shows that fear of bears is socially constructed, an awareness raising campaign might constitute a successful management tool to reduce fear. However, the fact that fear has increased over time shows that it may also be based on tangible management decisions. Furthermore the fact that damages show as important predictors in all of the models suggests that threats are real, and not a figment of people's imagination. Therefore management efforts would perhaps be better spent if directed toward addressing conflicts, preventing damage and reducing dangerous encounters with bears.

## **6.2 Attitudes toward bear management**

### ***6.2.1 Normative beliefs: 'support for controlling bear numbers'***

The component explaining the greatest amount of variance in the answers from the management section of the questionnaire was related to negative feelings toward increasing the bear population, and positive feelings toward hunting the bear and retaining its management at the hunting ground level. This shows that respondents associated higher hunting quotas and support for hunting, with having management at the local level. It is important to note that the majority of people were in favour of increasing the bear population, as shown by the results of the non-parametric tests. This component therefore does not represent the overall sentiments of the population, but merely a stream of correlation between them.

### *Socio demographic characteristics*

Support for controlling bear numbers increased with age, and was higher in females. This once again confirms that older people and females are overall less tolerant of bears than younger people and males. Instead findings from this model contrasts with the results from the previous models with regards to hunters, who supported controlling bear numbers more than non-hunters. Therefore, although hunters have higher existence bequest and use values, and lower perceived threat of bears, they support controlling bear numbers more than non-hunters. This is probably because respondents associated controlling bear numbers with hunting, and in particular with having higher hunting quotas. Since hunter's positive value orientations are likely to be based on their use values of the bear, it makes sense for them be in favour of more hunting.

#### *6.2.1.1 Value orientations and experience*

The variables with the strongest weight of evidence in favour of predicting support for controlling bear numbers were the two principal components of the general attitudes section: existence, bequest and use values, and perceived threat from bears. Respondents with strong existence, bequest and use value orientations expressed low support for controlling bear numbers, whereas respondents that felt threatened from bears expressed strong support for controlling bear numbers. These findings are confirmed by the theoretical literature: cognitive theory sees normative beliefs as directly influenced by value orientations (Vaske et al 2001; Zinn et al 1998). The experience of damage and seeing a bear in the wild also positively influenced respondents' support for controlling bear numbers, however these only showed as seventh and fifth, respectively, in the list of most important predictors. These results indicate that perceived risk, rather than actual experienced risk, was overall a more important influence on whether respondents were in favour of controlling bear numbers.

#### *6.2.2.2 Changes over time*

Year showed as the third most important predictor, featuring in 85% of the models in the confidence set. The model shows that support for controlling bear numbers increased over time. These results were confirmed by the non-parametric tests, which show that over all less people were in favour of increasing the bear population in 2008 than they were in 2002. Results also show that time affected the relationship between experienced risk and perceived risk.

The model shows that value orientations and attitudes had less of an effect on whether respondents supported controlling bear numbers in 2008, than they did in 2002. Instead, whether respondents experienced damage had more of an effect on whether they supported controlling bear numbers in 2008, than it did in 2002. Therefore while in 2002, whether respondents had damage or not had hardly any effect on their support for controlling bear numbers, in 2008 the experience of damage increased their support for controlling bear numbers. This might be explained by changes in the bear population. It is possible that as the bear population increased, the real effects of damage were felt more strongly by the public, so that damage came to play a more central role in affecting the public's acceptance threshold for bears.

In 2008 less people also thought that bears should be completely protected, and few yet significantly more people agreed with the statement that bears should be hunted all year round. In addition, after management was moved to the national level, more people became in favour of having management at the county level. These changes might be explained by the fact that some of the actions implemented by the BMP, such as the shorter hunting season, may have been perceived as an attempt to increase protection of the bear. Furthermore, an interview with the head of a local hunting club also suggested that the public might be under the impression that quotas have been lowered since management was centralized, even if it is not so (Huber, 2010). The detected change in responses between 2002 and 2008 could therefore be either a response to the perceived increased protection of the bear, or the expression of less tolerant attitudes toward the growing bear population.

#### *6.2.1.3 Practical implications*

Finally, the fact that support for controlling bear numbers was strongly influenced by existence, bequest and use values, as well as perceived threat seems to indicate that social carrying capacity is open to manipulation. However, seeing that support for controlling bear numbers increased with more knowledge, and that 82% of respondents actually underestimated the bear population, it is likely that an information campaign would actually negatively impact public support for increasing the bear population. Once again, results from this research show that an awareness raising campaign might not be the best management option. It might instead be useful to consider overabundance in terms of how respondent's positive values of the bear are being surpassed by their negative values (Wagner and Seal 1992; Decker and Purdy, 1988). It is possible that in this case damages from bears have been increasing, but the actual profit made by hunting them has not, since demand for bear hunting is limited (Kerezi 2010). Therefore mitigation of damages caused by bears might constitute a more effective management approach.

### 6.3 Conclusions

This research has shown that hunting is an integral part of public perceptions toward the bear in Croatia. It was found to improve public attitudes in three main ways: by providing for financial profit that covers some of the costs of bear conservation; by controlling bear numbers in order to maintain optimal population levels; and by contributing a sense of ownership and control over the bear. Starting from the Convention on Biological Diversity (CBD, 2010), much has been said in the literature about the benefits of integrating conservation and sustainable use. Property rights, self-determination and entitlements to the extractive use of natural resources by local residents, are concepts that are currently in vogue in many areas of conservation (Ostrom et al, 2003; Child and Chitsike, 2000). These have been applied to human dimensions, and in particular it has been shown that people are more willing to accept the negative effects of large carnivores when they feel ownership of them, in other words when they can profit from them and when they can control how many there are (Treves, 2009).

While the effects sustainable use of wildlife and political control over it, have been extensively discussed in the literature, this is the first time they are documented as a direct outcome of a change in conservation policy. This study suggests that reforms brought by the BMP to bear hunting have negatively impacted public attitudes. It is likely that the more centralized management of the bear and the shorter hunting season have created the perception that the bear is more protected, and have left local residents feeling powerless in the face of a growing bear population. This study also suggests that the increase in the bear population may be intensifying the negative experiences of damage and encounters with bears in the wild, as these become more frequent. On the other hand more positive changes in public attitudes have been traced to the generational shift toward more eco-centric values of nature, as well as broader political, economic and cultural changes occurring within Croatia, which have made the general public more aware of its unique natural heritage.

Theoretical advances made in this research concern the relationship between real risk and perceived risk, and their respective influence in shaping social carrying capacity. Results showed that attitudes are socially constructed and dependent on perceptions. However these are in turn influenced by political and social changes, as well as actual experiences. Therefore, my research suggests that negative attitudes toward wildlife should not be considered abstract perceptions, because they are grounded in real problems.

A practical conclusion that can be drawn from this theory is that education campaigns are likely to fall short of improving public attitudes. Rather, results from this research show support in favour of the conflict-resolution approach taken in the BMP. The fact that attitudes have become more negative, despite the provisions in the BMP to mitigate human-bear conflict, suggest that the reforms that were more restrictive in surface might also have had a more immediate impact on the general public, whereas it may take longer for the positive impacts of the BMP to trickle down into public consciousness. This could be facilitated by the dissemination of BMP guidelines and by involving the public in BMP meetings. Greater public involvement should also serve to counteract the perception that the local population has been marginalized from the decision making process.

This study shows that attitudes toward the bear in Croatia are overall positive and that the majority of the public is willing to accept an increase in the bear population. However, a closer look at the results from the models showed that people who experienced damages wanted the bear population to be reduced. These results warn against the danger of looking at averages, and ignoring the voices of those who live in close contact with bears and incur the costs of bear conservation. This study is a step forward to understanding and validating their opinions. However, the real challenge ahead lies in turning this one-way stream of information into an a two-way dialogue, between those who are in charge of bear conservation and those who are most affected by it.

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**Appendix 1:**

Sample questionnaire.  
Designed and distributed by Aleksandra Majic

**1. Which of the following best describes your feelings toward bears?**

- a) Completely against.
- b) Against.
- c) Neither in favour nor against.
- d) Moderately in favour.
- e) Completely in favour.

**2. To have bears in Croatia is:**

- a) Good. b) Bad. c) Indifferent.

**3. To have bears in your respective region is:**

- a) Good. b) Bad. c) Indifferent.

1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree.

**4. It is important to maintain bear population in Croatia for the future generations.**

1 2 3 4 5

**5. It is important to maintain bear population in your respective region for the future generations.**

1 2 3 4 5

**6. It is important to have healthy population of bears in Croatia.**

1 2 3 4 5

**SECTION A:** The first few questions ask about your feelings toward bears.

Please circle the response that best describes your opinion.

To continue, we are going to list a series of statements. Please choose the response that best describes your opinion according to the following scale:

1 = Strongly Disagree; 2 = Disagree;  
3 = Neutral; 4 = Agree; 5 = Strongly Agree.

**7. We should assure that future generations have an abundant bear population.**

1 2 3 4 5

**8. Whether or not I would get to see a bear, it is important to me that they exist in Croatia.**

1 2 3 4 5

**9. It is unnecessary to have bears in your respective region because abundant populations of bears already exist in other parts of Croatia.**

1 2 3 4 5

**10. It is unnecessary to have bears in Croatia because abundant populations of bears already exist in other European countries..**

1 2 3 4 5

**12. Having bears in your respective region, increases tourism in that region.**

1 2 3 4 5

**13. Bears cause abundant damages to livestock.**

1 2 3 4 5

**14. Bears cause abundant damages to crops and orchards.**

1 2 3 4 5

**15. In areas where bears live in close proximity to humans, bear attacks on humans are common.**

1 2 3 4 5

**16. I would be afraid to hike in the woods if bears were present.**

1 2 3 4 5

**17. In your opinion, which animal is most dangerous to humans?**

- a) Wolves.
- b) Bears.
- c) Lynx.
- d) Equally dangerous.
- e) None is dangerous.

**SECTION B:** The next few questions ask about your general knowledge of the bear. Please circle the response that you feel best answers the question.

**18. How many bears do you believe currently exist in Croatia?**

\_\_\_\_\_ bears.

**19. Do you believe bear numbers in Croatia are:**

- a) Increasing.
- b) Decreasing.
- c) Remaining the same.

d) I don't know.

**20. Bears in Croatia eat:**

- a) Mainly food of the animal origin.
- b) Mainly food of the plant origin.
- c) Equal shares of food of animal and plant origins.
- d) Not sure.

**21. It is generally true that bears in Croatia hibernate.**

- a) Yes.
- b) No.
- c) Not sure.

**22. In spring, female bear usually brings out from her den how many cubs?**

- a) One cub.
- b) Two cubs.
- c) Three cubs.
- d) Four cubs.
- e) Not sure.

**23. In Croatia, cubs leave their mothers:**

- a) Right after they leave the den.
- b) During the first year of their life.
- c) During the second year of their life.
- d) During the third year of their life.
- e) During the fourth year of their life.

**24. In Croatia, bears are completely protected by law.**

- a) Yes.
- b) No.
- c) Not sure.

**25. I would agree with increasing bear numbers in Croatia.**

1 2 3 4 5

If you **disagree** or **strongly disagree**, what is your primary reason for not wanting bear numbers to increase in Croatia?

If you **agree** or **strongly agree**, what is your primary reason for wanting wolf numbers to increase in Croatia?

**SECTION C:** These last few questions ask about your feelings toward various management practices and your behaviour toward bears. Please, put a circle in the response that best describes your opinion, using the following scale:

**1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 =**

**Strongly Agree.**

**26. I would agree with increasing bear numbers in my respective region.**

1 2 3 4 5

**27. Bears should be completely protected in Croatia.**

1 2 3 4 5

**28. Bears should be completely protected in your respective region.**

1 2 3 4 5

**29. In your respective region bears should be allowed to be hunted during a specific hunting season.**

1 2 3 4 5

**30. In your respective region bears should be allowed to be hunted all year round.**

1 2 3 4 5

**31. In your respective region bears should be killed by all means.**

1 2 3 4 5

**32. Hunting quotas for bears should be agreed on a national level.**

1 2 3 4 5

**33. Hunting quotas for bears should be agreed on a county level.**

1 2 3 4 5

**34. Hunting quotas for bears should be agreed on a hunting ground level.**

1 2 3 4 5

**35. If a bear repeatedly caused damages, I would agree with killing this problem animal.**

1 2 3 4 5

**36. I would be willing to contribute money toward compensation program for losses due to bears.**

1 2 3 4 5

**37. We already have enough bears in Croatia.**

1 2 3 4 5

**38. We already have enough bears in this region.**

1 2 3 4 5

**39. Compensations for the damages caused by bears should not be paid if appropriate prevention was not used.**

1 2 3 4 5

**40. Farmers should buy insurance for protection of their crops and animals against bear damages.**

1 2 3 4 5

**41. Hunters that manage bears should pay compensation for the damages caused by bears.**

1 2 3 4 5

**42. Administration should pay compensations for the damages caused by bears.**

1 2 3 4 5

**43. Bear coat and skull should be removed from the list of hunting trophies.**

1 2 3 4 5

**44. Hunter can keep the trophy after it has been properly registered in the national data base.**

1 2 3 4 5

**45. Have you ever seen a live bear in the wild?**

a) Yes. b) No.

**46. Have you ever seen a bear in captivity?**

a) Yes. b) No.

**47. Have you ever fed a bear?**

a) Yes. b) No.

**48. Have you ever killed a bear?**

a) Yes. b) No.

**49. On a scale from 1 to 10, how important is the issue of bear management to you personally (circle the number)?**

Not important 1 2 3 4 5 6 7 8 9 10 Extremely important

**SECTION D:** Your experience, if you have any, with bears:

**50. On a scale from 1 to 10, how important is it to you that you keep up to date with the issue of bear management in Croatia?**

Not important 1 2 3 4 5 6 7 8 9 10 Extremely important

**51. Have you ever had a damage caused to your property by a bear?**

a) Yes. b) No.

**A) Have you asked for a compensation of your damage?**

- a) Yes.
- b) No.

**B) Have you received the compensation?**

- a) Yes.
- b) No.

**C) Was the compensation sufficient?**

- a) Yes.
- b) No.

**I. Gender:**

- a) Female.
- b) Male.

**II. Age:** \_\_\_\_\_ years.

**III. Place of residence (name of the community):** \_\_\_\_\_

**IV. Occupation:** \_\_\_\_\_

**V. Are you a hunter?**

- a) Yes.
- b) No.