Human Dimensions in Wolf Management in Croatia: Understanding Public Attitudes toward Wolves over Time and Space

BY

©ALEKSANDRA MAJIĆ

A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF SCIENCE

DEPARTMENT OF GEOGRAPHY MEMORIAL UNIVERSITY OF NEWFOUNDLAND

MAY, 2007

ST.JOHN'S, NEWFOUNDLAND

1. Abstract

Most of human dimensions studies are one-shot case studies that focus on how attitudes and beliefs vary across different interest groups. As such they fail to allow for more spatially flexible management, comparisons of data and evaluations of implemented activities. Consequently such human dimensions studies fail to fairly inform management as a dynamic and goal-driven process. We carried out personal structured interviews with the residents of three regions within the Croatian wolf range in 1999 (n=1209) and repeated the study in 2003 (n=1172). We found that attitudes were more positive in the north (Gorski Kotar) than in the southern regions (Lika and Dalmatia). Beliefs did not vary amongst the three regions. Fear of wolves was the strongest predictor of attitudes. Knowledge was not important in predicting attitudes but did influence fear of wolves. Changes in attitudes were documented in Lika and Dalmatia with attitudes shifting towards more neutral position. Using human dimensions research as an evaluative tool can help the managers to be more adaptive and thus effective in their management solutions.

2. Acknowledgments

I would like to deeply thank the various people and organizations who, during the several years in which this endeavour lasted, provided me with useful and helpful assistance. Without their care and consideration, the projects and this thesis would likely not have happened.

First of all, I would like to thank all the interviewers, for their dedicated contribution to the projects. To: Melanija Krušinski, Lucija Urli Trakošćanec, Ivona Šavor, Dubravka Pavlović, Magda Sindičić, Teuta Skorin, Dalibor Gajdoš and Vedran Trakošćanec.

Secondly, I would like to thank all the organizations which gave financial and other support to my research. To the Large Carnivore Initiative for Europe, the State Ministry for Nature Protection of the Republic of Croatia, European Commission (LIFE Third countries), Veterinary Faculty of the University of Zagreb, Ministry of Agriculture, Forestry and Water Management of the Republic of Croatia, Croatian Forests, Hunters' Association of Croatia, Ministry of Tourism of the Republic of Croatia and the Memorial University of Newfoundland.

Thirdly, I would like to thank all my dear friends and colleagues who discussed the research projects with me. Djuro Huber and Josip Kusak provided me with early directions for understanding wolf management in Croatia. Dražen Sertić provided a helpful insight into the foresters' and hunters' viewpoints concerning wolf management. Ana Štrbenac provided a manager's view, especially during the preparation of the follow-up research project. My supervisor, Alistair Bath, members of committee, Keith Storey and Evan Edinger, and Alvin Simms, for their invaluable advices and feedbacks.

Most important, I also thank all the respondents who without offering their opinions about wolves I would have no data.

3. Table of Contents

1.	Abstract	ii
2.	Acknowledgments	iii
3.	Table of Contents	v
4.	List of Tables	vii
5.	List of Figures	viii
6.	List of Abbreviations and Symbols	ix
7.	Introduction and Overview	11
7 7 7 8. 8.	 Geographical Approach to Human Dimensions Research Wolf Management in Croatia Rationale 7.3.1 First Study (1998-2000) 7.3.2 Second Study (2003-2005) 7.3.3 Purpose of the Thesis 4 Methods 7.4.1 Study Area 7.4.1 Gorski Kotar. 7.4.1.2 Lika 7.4.1.3 Dalmatia 7.4.2 Questionnaire 7.4.3 Sampling 7.4.4 Data Collection. 7.4.5 Data Analysis Co-authorship Statement 	11 12 17 17 17 19 21 22 22 24 25 25 26 29 30 32
ma	nagement decisions do the same?	33

9.1	Abstract	
9.2	Introduction	
9.3	Study area	
9.4	Methods	
9.5	Results	
9.5.	1 Exploring attitudes descriptively	41
9.5.2	2 Exploring attitudes analytically	
9.5.	3 Exploring knowledge	
9.5.4	4 Building explanatory models to better understand attitudes and its complexities	50
9.6	Discussion	
9.7	Literature cited	61
10. N	Aonitoring and documenting changes in Croatian attitudes toward wolv	es 65
10.1	Abstract	65
10.2	Introduction	66
10.3	Methods	72
10.3	3.1 Sampling and data collection	
10.3	8.2 Research instrument	
10.3	B.3 Data analysis	73
10.4	Results	76
10.4	1.1 Respondents' characteristics	
10.4	Preparatory analysis	
10.4	L3 Change in attitudes or a cohort effect?	
10.5	Discussion	
10.6	Literature cited	
11. S	ummary	89
12. E	Bibliography	94
13. A	Appendices	100

13.1	Appendix 1: Questionnaire 1999	.101
13.2	Appendix 2: Questionnaire 2003	.109

4. List of Tables

Table 9-1: Individual attitudinal items, results of Mann-Whitney U test (^{aa bb cc} indicate a significant difference between groups, p<0.05)
Table 9-2: Principal components analysis with varimax rotation of the attitudinal items (n =1086). Only loadings >0.30 are displayed in the table; * Items included in scores
Table 9-3: Attitude scores by region, results of ANOVA (aa bb cc indicate a significant difference between groups (Tukey's Post Hoc test, P<0.05).
Table 9-4: Knowledge items: share of correct answers by zones. Correct answers are underlined 49
Table 9-5: Correlation coefficients and significance levels among pro-wolf attitudes, fear, knowledge and the socio-demographic variables: ** = correlation is significant at the 0.01 level; *= correlation is significant at the 0.05 level; X = not applicable; -= not significant
Table 9-6: Standardized regression coefficients (β) and adjusted R squares for variables predicting pro-wolf attitudes, fear of wolves and knowledge about wolves (*=p < 0.05; **=p < 0.01; ***=p < 0.001; x = not included in the regression; - = not significant)
Table 10-1: The data was partitioned into 5 birth cohort categories by using respondent's age75
Table 10-2: Percentages of females (F) and males (M) in the sample and weights used in the analysis.
Table 10-3: Additional characteristics of the sample with regards to the respondents' experiences with wolves and association with an interest group
Table 10-4: Results of the principal components analysis (PCA) of the combined 1999 and 2003 data: Two factors were extracted and used in further analyses: Factor 1 - Support for wolf conservation, Factor 2: Support to control wolf numbers. Only loadings > 0.30 are shown in the table
Table 10-5: Results of the Independent sample T tests. The data were weighted by gender 79
Table 10-6: Results of the Independents sample T tests by cohort groups on Factor 1 (support for wolf conservation). The data were weighted by gender. 80
Table 10-7: Results of the Independents sample T tests by cohort groups on Factor 2 (support for wolf control). The data were weighted by gender. 81

5. List of Figures

Figure 7-1: Number of wolves killed in Croatia, annually since 1986 (from: Štrbenac et al. 2005) 13
Figure 7-2: Wolf presence area in 2001 (from Štrbenac et al. 2005)
Figure 7-3: Shaded area represents the wolf distribution area of Croatia. It was divided in three study zones: Gorski Kotar (1), Lika (2) and Dalmatia (3)
Figure 9-1: Entire permanent wolf range of Croatia was divided into three regions: 1=Gorski Kotar, 2=Lika, and 3=Dalmatia
Figure 9-2: Hypothetical causal model of attitudes, fear and knowledge with β values of the significant socio-demographic characteristics
Figure 10-1: Mean values of the two analyzed factors (support to wolf conservation and support to wolf control) across the regions (Gorski Kotar = GK, Lika = LK and Dalmatia = DA) and the two measurements (1999 and 2003)

6. List of Abbreviations and Symbols

β (beta)	standardized regression coefficient
ANOVA	Analysis of variance
DA	Dalmatia
F	female
GK	Gorski Kotar
HD	human dimensions
HSD	honestly significant difference
kg	kilogram
km2	square kilometres
LK	Lika
М	male
PI	public involvement
WWII	Second World War

7. List of Appendices

13.	Appendices	100
13.1	Appendix 1: Questionnaire 1999	
13.2	Appendix 2: Questionnaire 2003	109

8. Introduction and Overview

Content wise, the thesis is organized into three main sections. The first section, 7.Introduction and Overview, will present the reader with the background information on the issue of wolf management in Croatia, the purpose and justification of the study and methodological issues, namely descriptions of the study area, sampling and data collection. The next section consists of scientific papers entitled: 9. Croatian public attitudes toward wolves vary over space and thus should management decisions do the same? and 10. Monitoring and documenting changes in Croatian attitudes toward wolves. Finally, chapter 11.Summary includes a general discussion and conclusions with an emphasis on the key findings and their implications for wolf management in Croatia.

8.1 Geographical Approach to Human Dimensions Research

Human dimensions of wildlife is about how people value wildlife, how they want wildlife to be managed, and how they affect or are affected by wildlife and wildlife management decisions (Decker *et al.* 2001). Mitchell (1989) has observed that it is necessary to be aware of the variety of dimensions in natural resource analysis. His framework proposes that resource analysis should incorporate both temporal and spatial dimensions and different perspectives, such as biophysical, economic, social, political, legal, institutional and technological. The research methodology presented here combines quantitative spatial and temporal analyses of different sets of human dimensions in wolf management data. Many of the perspectives mentioned by Mitchell (1989) are in fact aspects of human dimensions research. For this study most of the focus is upon the social perspective, an understanding of public attitudes and beliefs toward wolves and their management in Croatia. In addition, as pointed out by Mitchell (1989), the theme of spatial analysis has been developed in many ways, but all have been concerned with "understanding of the evolution of space content as it is influenced by the physical, biotic and cultural processes" (Ackerman, 1958 as cited in Mitchell, 1989).

In this research, the "space content" is made of the collected human dimensions information, more precisely – attitudes toward wolves, beliefs about wolves, attitudes toward different wolf management options, respondent's personal experience with wolves, importance of wolf management to the respondent, and socio-demographic information about the respondents. However, prior to collecting the abovementioned data, various biophysical and social characteristics of the space (study area) had been examined (Bath & Majić 2000) and based on that, study zones defined. It was hypothesized that the attitudes toward wolves would vary across space (the study zones) and across time (two surveys of attitudes). The differences in attitudes across space could possibly be due to regional differences in biophysical characteristics, such as natural prey availability as well as socio-economic, such as levels of wolf-livestock conflict. Changes in attitudes over time could possibly be due to humans learning to live with the recently increased number of wolves or due to the recent government's efforts to mitigate wolf-livestock conflicts by subsidizing damage prevention measures.

8.2 Wolf Management in Croatia

The history of wolf (*Canis lupus*) management in Croatia is similar to that seen in many other European countries. Up until 1894 the wolf was present in all parts of Croatia. During that year at least one wolf was killed in each of the former municipalities of Croatia (Frković and Huber 1992). After WWII, a major effort was made to exterminate wolves in Croatia (Huber *et al.* 1999). The wolf was listed as an unprotected game species allowing it to be hunted "by all ways and means of hunting". An "Order for the extinction of wolves" was issued in 1948 by the government and a bounty was paid for each wolf killed. Between 1946 and 1986, approximately 540 wolves were killed in Gorski Kotar, our northern most region of the study area, alone (Frković *et al.* 1992). Between 1954 and 1972, approximately 5 206 wolves were killed in Croatia resulting in an average of 274 dead wolves per year.



Figure 8-1: Number of wolves killed in Croatia, annually since 1986 (from: Štrbenac *et al.* 2005).

Between 1960 and 1961, wolf mortality numbers decreased to 50, and further decreased in 1980-1981 to 32 animals (Štrbenac *et al.* 2005). Wolf mortality following that period of time is shown in Figure 8-1.

The change in the number of wolves killed could be attributed partly to a change in attitudes toward the species, but predominately this is a reflection of fewer wolves in the country to kill. In Gorski Kotar, the mean number of wolves killed per year dropped from 15 to 9, and then to one, in the periods 1945-1976, 1977-1986, and 1987-1993 respectively (Frković et al. 1992). While no scientific studies estimating the Croatian wolf population have been completed, based upon the size of available habitat and on the hunting statistics, the wolf population between 1954 and 1972 may have been as high as 600 to 1000 individuals (Frković et al. 1992). While the legal status of the wolf did not change until the mid 1990s, over time various extermination methods became less popular. Poisoning was abandoned for the most part in 1972 and traps and bounties were removed shortly after in 1976. In 1984, the municipality of Vrbovsko in Gorski Kotar took steps to ensure wolf numbers would not be completely eliminated; a decision was made to not kill wolves in the municipality unless there was more than one breeding pair (Frković et al. 1992). By the end of the 1980s the wolf population in Croatia had been reduced significantly; the total population was estimated at approximately 20 (Frković and Huber 1992) to 50 (Huber et al. 1999) animals. These remaining individuals survived in Gorski Kotar and in Lika regions; the wolf was believed to have been exterminated from Dalmatia (Frković and Huber 1992). After many years of significantly reducing wolf numbers in the country, wolf numbers began increasing during the early 1990s (Strbenac et al. 2005). Today, the wolf population for Croatia is estimated at 130 to 170 individuals and wolves occupy areas of Gorski Kotar, Lika and Dalmatia. Wolves occupy 32.4% of the total land area of the country or 17 468 km² (Figure 8-2) and in an addition, wolves are occasionally present in 17.7% of the country's land area (9 543 km²) (Strbenac *et al.* 2005). The area of occasional presence can be defined as the area where a wolf pack does not have an established home range, and where only dispersing individuals are recorded.



Figure 8-2: Wolf presence area in 2001 (from Štrbenac et al. 2005).

At the beginning of the 1990s, Croatia was undergoing considerable social and political changes in its struggle for independence and we can assume that wolf conservation was not generally considered to be among the country's top priorities, however following a short and successful campaign for legal protection of wolves led by a group of concerned scientists, wolves became completely protected in 1995 and government started paying for the damages caused by wolf-livestock depredation (Parliament of the Republic of Croatia 1995). Unlike in

North America, where attitudes toward wolves probably changed prior to much of the human dimensions research that has been completed there (Williams *et al.* 2002) and changed to the positive, in Croatia, it appears attitudes may have become more negative after the protective legislation of 1995. Evidence from a content analysis of 156 newspaper articles published during the time period from1994 until 1999 (Bath and Majić 2000) and an increase in documented illegal killings (Huber *et al.* 1999) would tend to support this view. The documented illegal killings of wolves, which may have increased at least 5 times and perhaps as much as 11 times during the first three years of legal protection (Huber *et al.* 1999), suggests that the public was not consulted or supportive of the change in legislation. There was a growing controversy over the complete legal protection and the increasing wolf-livestock conflict (Bath and Majić 2000), however an accurate representation of existing attitudes toward wolves and wolf management had not been done, nor any work towards building partnerships among interest groups, such as hunters, foresters, environmental NGOs and livestock breeders.

The first human dimensions (HD) in wolf management study (Bath and Majić 2000) came as a response to the rising controversy in 1998. This study provided baseline data for understanding public attitudes toward wolves in wolf-inhabited areas, including the attitudes of hunters, foresters and high school students toward wolves. Presentation of the results of this first HD study to the various interest groups and the government was a first step towards joint planning to create the wolf management plan in Croatia. With the documented strong opposition by the public to the complete legal protection status of wolves, the government decided to revisit the decision (Štrbenac *et al.* 2005). Besides paying compensation for damages caused by wolves, the government also took a more pro-active role in mitigating the conflicts with wolves by donating electric fences and livestock guarding dogs to sheep farmers in wolf areas (Štrbenac *et al.* 2005) and by preparing and submitting a wolf management project proposal to the European Commission in 2002. The second HD study analyzed in this thesis was carried out in 2003 as a part of that project in an attempt to initiate monitoring of public attitudes and evaluate the success of public information activities completed as part of that project.

There has been very little human dimensions research completed in Croatia. All previous attempts to investigate public opinions about wolves in Croatia (Gyorgy 1984; Morić and Huber 1989; Huber *et al.* 1992; Radišić *et al.* 1994) were carried out by large carnivore biologists and came as a response to a shrinking wolf population. These studies suffered from small sample sizes and non-random sampling, however the studies did suggest that there was a change in public attitudes during the 1980s. The overall percentage of people considering the wolf a harmful species dropped from 42% in 1983 (Gyorgy 1984) to 25% in 1993 (Radišić *et al.* 1994) and 21% of the respondents in 1983 wanted to exterminate wolves (Gyorgy 1984), while only 8% of the respondents agreed with the statement in 1993 (Radišić *et al.* 1994). As the number of wolves decreased (Frković and Huber 1992) over time, the attitudes toward the species seemed to become more positive (Radišić *et al.* 1994).

8.3 Rationale

Wolf management seems to be more socio-political in nature than biological (Bath 1996). For some individuals and interest groups, the presence of wolves provides increased opportunities for eco-tourism; for others, more wolves represent fear for human safety and a threat to livestock (Bath and Majić 2000; Fritts *et al.* 2003). Wildlife managers and government officials need scientific data describing the spectrum of opinions to allow them to balance views and choose the fairest paths that will lead them to the management goals (Chase *et al.* 2001). Most of the public attitude surveys are cross-sectional in nature and often crisis management driven (Bath 1998) and as such fail to capture change in attitudes over time (Williams *et al.* 2002). At the same time, many scientific papers call for longitudinal studies of human dimensions in natural resources management (Bath 1998; McComas and Scherer 1999; Kaczensky *et al.* 2001; Enck and Bath 2001) which can allow an evaluation and adaptation of management activities.

8.3.1 First Study (1998-2000)

The first HD project started in 1998. The project "Human Dimensions in Wolf Management in Croatia" (1998-2000) was initiated and funded by "*The Large Carnivore Initiative for Europe*". The descriptive analysis of the data collected during that project can be found in Bath and Majić (2000). The study documents how attitudes and beliefs differ between interest groups, and also within interest groups across space, thus providing managers with information that should allow flexibility in management options by region.

The specific goals of the study were:

• Baseline assessment of attitudes toward wolves and wolf management and beliefs about wolves among different groups (general public, foresters, hunters

and high school students) in the three wolf – inhabited regions of Croatia (Gorski Kotar, Lika and Dalmatia).

- Identification of areas of support and disagreement over management options, thus providing an assessment of the feasibility of management approaches that could be implemented successfully.
- Building partnerships among interest groups, which traditionally have not communicated or worked together by bringing them physically and mentally together around a common set of data and toward a common vision.
- Working toward understanding the issues of a variety of interest groups, building trust, and initiating the first steps toward conflict resolution.
- Opposition to the complete protection legislation was documented across the three regions. At the same time the majority of residents in all three regions supported the idea of conserving wolves for future generations. Overall the most positive attitudes toward wolves were held by high school students, followed by foresters and hunters. The general public had the least positive attitudes toward wolves of all the groups (Bath and Majić, 2000).

8.3.2 Second Study (2003-2005)

The follow up study was a part of a project called "Protection and Management of Wolves in Croatia" (2003-2005). The State Institute for Nature Protection coordinated the project. Financial support was provided by the European Commission's "Life – Third Countries" programme. The descriptive analysis of the collected data can be found in Majić Skrbinšek and Bath (2004) and Majić Skrbinšek and Bath (2005). The study was more concerned with possible changes in attitudes and beliefs over time, and discussed the value of continuous monitoring of public opinions about wolves and wolf management.

The specific goals of the second study were:

- Replication of the attitude and knowledge survey among the general public of the three wolf-inhabited regions, thus creating a directly comparable set of data that could permit attitudinal and belief monitoring.
- Document attitudes of a new interest group the Zagreb urban public attitudes toward wolves and wolf management and their knowledge and beliefs about wolves.
- Identification of areas of support and disagreement over management options, thus providing an assessment of the feasibility of management approaches that could be implemented successfully.
- Evaluation of the project'spublic information activities.

This thesis uses data only collected in the wolf areas. The data collected from the urban population of Zagreb was not included in this thesis. It was important to understand the attitudes and beliefs of residents directly affected or who could affect decisions regarding wolf management, hence the focus on understanding the attitudes of these rural residents living in wolf areas.

8.3.3 Purpose of the Thesis

It is important to understand the context of this thesis research within the broader objectives of the human dimensions aspects of the project. While the overall goal of this thesis is to understand the nature of attitudes toward wolves and wolf management, it is possible to talk about several specific aspects of this goal. To help understand how attitudes differ across space, the analysis was done for the three geographical and cultural regions within the wolf range of Croatia. Those regions are Gorski Kotar, Lika and Dalmatia. Socio-demographic characteristics were also used in regression models in order to assess their relationship to attitudes. A secondary goal was to examine whether attitudes toward wolves had changed over the four years between the two measurements of attitudes (1999 - 2003) and, if they did, what was the nature of the change. Finally, the purpose of this research was to provide wolf managers, as well as other interest groups involved in wolf management in Croatia, with information to improve the quality of their decisions. Such research was designed to be able to be easily integrated in the development of a national management plan as an indirect technique of public involvement. The data, based on representative samples of residents of the wolf-inhabited regions of Croatia, provide insights to managers considering a variety of wolf management options.

8.4 Methods

8.4.1 Study Area

Human dimensions (HD) research is interdisciplinary in nature and is most effective when information can be collected and blended directly with biophysical data over the same geographic space (Bath and Majić 2000). In an effort to be most relevant for management decision-making concerning the wolf in Croatia, the HD study area included the entire wolf range in Croatia. Presently, wolves in Croatia are distributed over the entire Dinara Mountain Range, from the Slovenian border to the borders with Bosnia and Herzegovina and Montenegro. This includes an area of approximately 17 468 km² (Štrbenac *et al.* 2005).

It was hypothesized that attitudes and beliefs toward wolves and their management may differ across the entire wolf range, thus making it necessary to divide the wolf range into smaller areas that could be used to compare attitudes and beliefs. In evaluating how to identify the HD study zones, Bath and this author (2000) considered several biophysical and human factors within the Croatian wolf range. These factors were: human population densities, livestock densities, carnivore damage occurrences, densities of wolves, and habitat, especially vegetation cover. As a result, the HD study area within the Croatian wolf range was divided into three zones (Figure 8-3). Information on human population and livestock densities was taken from national census data (Korenčić 1979; Central Bureau of Statistics -Republic of Croatia 1992; Central Bureau of Statistics - Republic of Croatia 2001), carnivore damage numbers were based on compensation claims, obtained from a central database at the State Institute of Nature Protection, biological information on the wolf population and their habitat was obtained through literature review of published texts (Frković *et al.* 1992; Frković and Huber 1992; Huber *et al.* 1999; Kusak 2002; Štrbenac *et al.* 2005) and direct consultation with large carnivore biologists, namely Josip Kusak and Đuro Huber from the University of Zagreb. The following text summarizes the description of the HD study area. For more information on the determination of the study zones consult Bath and Majić (2000).



Figure 8-3: Shaded area represents the wolf distribution area of Croatia. It was divided in three study zones: Gorski Kotar (1), Lika (2) and Dalmatia (3).

8.4.1.1 Gorski Kotar

The first zone, Gorski Kotar, is the most northern and mountainous zone and includes the entire region of Gorski Kotar and the north-western parts of Lika. The size of the zone is approximately 5 245 km² with a human population of 85 690 and a human population density of 16.33 people per km². Forestry provides the main source of income for the region. The northwest border of the zone is defined by the state border to Slovenia, and towards the Istrian peninsula by the presence of wolves. The west border of the zone is defined by the permanent presence of wolves. The north border of the zone is defined by the state border with Bosnia and Herzegovina while the southern border to zone two is defined by biophysical and demographic characteristics (rivers, different vegetation, change in the number of livestock, and higher rates of attacks to livestock by wolves).

This region is the most densely forested of the three zones (beech, silver fir, spruce and pine mixed forest dominate) and of Croatia. Gorski Kotar is about 60-70% forested and therefore represents the best wolf habitat in the country. Wild ungulates are relatively abundant: red deer, roe deer, and wild boar are present. The number of registered sheep in the region is relatively low (23 787 sheep, density of 4.5 sheep per km²). In 2001, there were 4 livestock damage compensation claims in this region. According to scat analysis, wild prey is the predominant wolf food (Pavlović, Kusak & Huber, unpublished data).

8.4.1.2 Lika

The second zone within the HD study area includes the remaining parts of Lika and is approximately 4 396 km². The human population in Lika is 88 767 people at a population density of 20.19 people per km². The eastern border of the zone is the state border with Bosnia – Herzegovina while the western border spreads along the Adriatic Sea coast (defined by permanent wolf presence). The southern border of this study zone is with Dalmatia and is defined by different biophysical and demographic characteristics.

Lika is less forested than Gorski Kotar. Beech forest dominates, with large, open valleys, which have been turned to grazing land. The number of registered sheep was considerably higher than in Gorski Kotar at 93 262 resulting in a density of 21.21 sheep per km². In spite of the relatively high density of sheep, only 31 wolf damage to livestock claims were recorded in 2001. Wild prey forms the majority of the diet of wolves in this zone (Pavlović, Kusak & Huber, unpublished data).

8.4.1.3 Dalmatia

Zone 3 includes the inland parts of Dalmatia and is 6 170 km² in size. The human population is the highest of the three zones at 236 943 people with a human population density of 38.40 people per km². The coastal, very densely populated areas of Dalmatia are excluded from the study area as they are not in wolf range. The eastern border of the zone is the state border with Bosnia and Herzegovina. The Neretva River forms the southern border.

Poor Mediterranean vegetation and a rocky countryside make raising livestock challenging in this zone. Only hare and wild boar are present. Scat analysis reveals that 86% of the wolf's food is livestock (Pavlović, Kusak & Huber, unpublished data). There were 235 838 registered sheep in Dalmatia (density of 41.14 sheep per km²) and wolf damages are quite high in this region. In 2001 alone, there were 852 damage claims just from this region. Although the numbers of sheep are relatively high, sheep owners usually own small flocks of sheep (average 30 sheep) that they use as a form of secondary income, thus losses of even a few sheep can be considerable to the individual sheep owner.

8.4.2 Questionnaire

An answer given to a survey question is of no intrinsic interest. It is valuable to the extent that it can be shown to have a predictable relationship to subjective states that are of interest (Fowler 2002). In this case, of interest were attitudes toward wolves and wolf management. The design of the questionnaire began in 1998 with a facilitated workshop with biologists, veterinarians, foresters and hunters. Potential questions and issues that should be included in the questionnaire were discussed. Subsequently, a questionnaire was drafted and once again discussed in a meeting.

The questionnaire consisted of five sections:

- Attitudes toward wolves,
- Beliefs about wolves and a knowledge section made up of factual questions,
- Attitudes toward various management approaches,

- Personal experience with wolves and assessments of the importance of the issue to the respondent, and
- Socio-demographic information about each respondent.

Several of the attitudinal and belief items had been tested before in HD studies on wolf management in Yellowstone National Park (Bath 1989), Poland (Bath and Okarma, unpublished data) and Spain (Bath, unpublished data). Previous studies had revealed high reliability estimates for the attitude scale, meaning that the attitudinal items when combined consistently were good measures of attitudes toward wolves. Several of the belief items and attitudes toward management options had also been pre-tested in previous questionnaires with positive results. A copy of the questionnaire used in 1999 can be found in Appendix 1.

The questionnaire used in 2003 (Appendix 2) consisted of the same attitudinal and belief items as the previous one. Several items on the respondents' experiences with wolves and wolf related issues were added.

8.4.3 Sampling

The quantitative methodological issues for this HD study are discussed within a framework suggested by Fowler (2002). Besides the questionnaire design, which was discussed in the previous section, the key issues are: the sampling frame and chance of selection, the sampling procedure, the interview process, field results and quality control checking.

It was important to obtain data representative of each region independently. Obtaining representative data that could be generalized to the entire population of each of the regions (Gorski Kotar, Lika and Dalmatia) would offer managers a true understanding of the entire resource constituency and provide the opportunity to consider different management options for each region, understanding that the public would be supportive of the chosen management option.

A sampling frame "is the set of people who have a chance to be selected, given the sampling approach that is chosen" (Fowler 2002). Residents over 14 years of age were eligible to participate in the study. While typically respondents over 18 are selected for such social science research in North America, in Croatia the census divided people into the age category 14-20 so sampling was done to be consistent with the census age class. Residents from the large urban centres (e.g. Split) along the coast were omitted from the sampling frame. Random sampling proportional to community populations was carried out to ensure a sample representative of each region. The number of completed questionnaires required by each community was calculated by taking the population numbers (over 14 years old) for the community multiplied by the percentage of the total population to obtain an overall sample size of 400 respondents per zone. A sample size of 400 was chosen per zone to allow for results to be accurate 19 times out of 20, plus or minus five percent. Such a sample size results in a 95% confidence level and a 5% confidence interval, an acceptable standard in social science research. To achieve this level of accuracy a minimum sample of 384 is actually needed but "in practice most researchers attempt to obtain about 400 completed responses as usually a few questionnaires must be discarded during analysis" (Sheskin 1985). The population numbers for each of the communities were obtained from the most recent national census data. For the 1999 study data from the 1991 census were used (Central Bureau of Statistics - Republic of Croatia 1992), while for the 2003 study the samples were calculated based on the 2001 census (Central Bureau of Statistics - Republic of Croatia 2001).

We tried to apply the next birthday rule (Sheskin 1985) for choosing a person in a household, however that was not always possible, so most of the interviewed respondents were the first adult contacted in a household. In larger areas a grid system was set up over the village and random streets and households were chosen. The questionnaire was administered as a personal structured interview to respondents. While the length of the interview varied amongst respondents usually due to their different levels of interest, most interviews were completed within 30 minutes.

8.4.4 Data Collection

The interviews with the general public respondents were carried out in person at the respondent's place of residence. Data from Gorski Kotar, Lika and Dalmatia residents were collected between May 1999 and October 1999 and during May and June of 2003. Data collection in September and October of 1999 included only data collection from the interest groups (hunters, foresters and high school students). These data were not analysed for the purposes of this thesis. A team of five interviewers was used during both data collection periods, but a maximum of three were working at one time. I was always present during the data collection phase. Fowler (2002) discusses how during the interview process, interviewers can affect the data. Interviewer bias becomes more of a problem when conducting unstructured interviews that require large amounts of probing; in this study most of the items were closed-ended reducing the chances of interviewer bias. The interviewers were trained

and informed about the nature of the study, the importance of being objective, and the importance of reading the questions exactly as worded. All interviewers used in this study received a training session.

Personal interviewing can yield the highest response rate of any survey technique (Fowler 2002). In this study the overall response rate for the general public was higher than 80% in both measurements (1999 and 2003). Refusal rates were low in this study and those who did refuse to participate tended to be women and elderly men.

Quality control and checking procedures were used during the data entry and analysis stages of this study. A random 10% of all questionnaires were checked for data entry errors and any errors found corrected. Only a few errors were found and these were corrected before conducting any analysis.

8.4.5 Data Analysis

Descriptive, exploratory screening of data, univariate and multivariate statistical techniques were used in data analysis. In order to check the accuracy of the data, descriptive screening was used following the guidelines recommended by Tabachnick and Fidell (2001). I checked whether all values were in range and mean scores and standard deviations were reasonable. Cases with missing data, univariate and multivariate outliers, and multicollinear variables were excluded from the further analysis.

Principal components analysis (PCA) with a varimax rotation was used as an exploratory technique for identifying the types of attitudes measured by the questionnaires. Extracted

regression factor scores were saved and used in further analysis. In addition, by summing up the results of the attitudinal items with high loadings on an individual principal component, attitude scores (AS) were calculated. In order to avoid inflated correlations (Tabachnick & Fidell 2001), an individual item could only be used for calculation of only one AS. Items with negative loadings on the PCA were recoded in order to adjust their tendencies. Furthermore, Cronbach's alpha reliability estimate was used to test for the internal consistency of the attitudinal items. The results of the knowledge items were recoded so that each correct answer was given 1 and summed the correct answers to achieve knowledge score (KS).

Depending on the data characteristics, Mann-Whitney U test, Independent sample T test or analysis of variance (ANOVA) were used to compare attitude scores and knowledge score by groups. Tukey's honestly significant difference (Tukey's HSD) test was used for pairwise comparisons.

Regressions were used to determine whether socio-demographic and attitudinal variables had an effect on attitudes and knowledge. SPSS 11.5.0 (SPSS Inc. 2002) was used for the data analysis.

9. Co-authorship Statement

In my thesis I have used the data collected during two separate projects and my responsibilities as a researcher varied in the two projects. In the first project (1998-2000) I was a site project coordinator, not directly responsible for the planning and design of the project. The responsible person was my supervisor, Dr. Alistair J. Bath. Nevertheless, I have participated in all the phases of the project planning and implementation. I was directly responsible for the data collection and the descriptive analysis of the data for the final report of the project (Bath and Majić, 2000).

The second study (2002-2005) was a part of a much bigger project of the State Institute for Nature Protection "Protection and Management of Wolves in Croatia" (LIFE Third Countries project). I have independently prepared the sections of the project proposal related to the human dimensions study and I was directly responsible for all the phases of implementation of the human dimensions study (Majić Skrbinšek and Bath 2004; Majić Skrbinšek and Bath 2005). I have however consulted Dr. Bath on the key aspects of the study.

The manuscripts presented in the next section of the thesis came as a result of the data analysis that I have carried out independently. During the data analysis and the preparation of the manuscripts, I have consulted Dr. Alvin Simms on the statistical techniques and procedures, as well as Dr. Bath on the kinds of research questions I should attempt to answer in the manuscripts.

PAPER 1

10. Croatian public attitudes toward wolves vary over space and thus should management decisions do the same?

10.1 Abstract

Many human dimension studies have focused on how attitudes and beliefs vary across different interest groups, but fewer studies have considered how such attitudes and beliefs of the same interest group vary over space. With issues where management can be flexible enough to vary over space, such information is essential to creating more local and effective solutions. We carried out personal structured interviews with 1172 rural citizens in wolfinhabited regions of Croatia in order to assess public attitudes toward wolves and wolf management alternatives. Specifically, we tested whether residents of three regions also defined as management units by the national wolf management plan differed in their opinions and beliefs about wolves and wolf management in Croatia. We found that amongst the Croatian general public living in wolf range, attitudes are more positive in the north (Gorski Kotar) where wolves have always been present than in the southern regions. Fear of wolves is the strongest predictor of attitudes toward wolves. Age and gender are also important variables in understanding fear and public attitudes toward wolves. Knowledge about wolves, contrary to what managers and environmental educators might hope, is not important in predicting attitudes but does influence fear. Understanding that support and opposition for certain wolf management alternatives varies over space allows resource managers to be more adaptive and innovative in their management solutions.

Key words:

Croatia, management policy, public attitudes, spatial differences, wolf conservation

10.2 Introduction

Wolf (*Canis lupus*) management in Croatia like in many parts of the world historically meant reducing or eliminating wolves whenever and wherever possible. Numbers continued to decline until the early 1990s. Estimates of the wolf population at this time were as low as 20 to 50 individuals (Frković and Huber 1992; Huber *et al.* 1999). Similar to other parts of the world, wolves managed to survive in small isolated regions of the country; these remaining individuals in Croatia survived in Gorski Kotar and in Lika regions but the wolf was likely exterminated from Dalmatia (Frković and Huber 1992).

At the beginning of the 1990s, Croatia was undergoing considerable social and political changes in its struggle for independence and we can assume that wolf conservation was not generally considered to be among the top public priorities. It was at this time, however, that a small group of concerned scientists effectively lobbied government for complete legal protection of wolves. Wolves became completely protected in 1995 and the government started paying compensation to farmers who experienced livestock damage due to wolves

(Parliament of the Republic of Croatia 1995). At the same time, the wolf population, as similarly documented in other parts of Europe (Breitenmoser 1998; Breitenmoser and Landry 1998; Boitani 2000; Linnell *et al.* 2001), started to recover and returned to temporarily unoccupied areas of inland Dalmatia (Štrbenac *et al.* 2005). The number of claims for damage compensation started to increase dramatically particularly in this region, and wolves became a topic increasingly discussed in the national media (Bath and Majić 2000). Currently the wolf population size is estimated at 130 - 170 individuals and the number is believed to be stable (Kusak 2002; Štrbenac *et al.* 2005).

While Croatian biologists continued to understand ecological issues regarding the wolf, it was quickly becoming apparent that wolf management was becoming highly socio-political in nature and that solutions to the issue did not lie in better biophysical research but in an understanding of the human dimension of the issue. With the increased interest in carnivores, their management may become more contentious (Mech 1996). Indeed, since the change in legislation in 1995, attitudes toward wolves appear to have become more negative, based upon newspaper articles content analysis (Bath and Majić 2000) and a significant increase in documented illegal killings of wolves (Huber *et al.* 1999). Illegal killings of wolves are considered to be the main threat to the wolf population in Croatia (Štrbenac *et al.* 2005). As a result of the arising controversy, Bath and Majić (2000) conducted the first quantitative study of public attitudes toward wolves and wolf management in Croatia. The descriptive results of that study were used by the government in the process of developing a national strategy for wolf management (Štrbenac *et al.* 2005) and as the baseline information for the planning and implementation of this study.

We believed that attitudes of the general public would vary across the three distinct wolfinhabited regions of Croatia - Gorski Kotar, Lika and Dalmatia; thus we set out to identify and document public attitudes and beliefs of a random and representative sample of each of these regions. While we did collect data on the interest group membership (hunter/nonhunter, sheep/goat ownership, etc.), the main purpose of this paper is to look at the general public attitudes and beliefs. Such analysis is directed towards providing insights to managers and decision-makers of an entire constituency. In addition, based on our literature review and in order to better understand general public attitudes, we hypothesized that attitudes toward wolves would be more negative among less educated people, among women (Kellert 1985; Ericsson and Heberlein 2003; Kleiven *et al.* 2004), among people with more experience with wolves (Ericsson and Heberlein 2003), among sheep farmers (Bath and Buchanan 1989; Vittersø *et al.* 1999; Bjerke *et al.* 2000), and among elderly people (Kellert 1985; McNaught 1987; Ericsson and Heberlein 2003; Kleiven *et al.* 2004). Many of the studies cited above have also found that attitudes were more positive amongst more educated people, younger people, residents of urban areas, and people with more knowledge about wolves.

10.3 Study area

Presently, wolves in Croatia are distributed over the entire Dinara Mountain Range, from the Slovenian border to the borders with Bosnia and Herzegovina and Montenegro. This includes an area of approximately 20,000 km² (Štrbenac *et al.* 2005). The human dimensions study area included the entire permanent wolf range of Croatia and was divided into three regions defined as management units in the Wolf Management Plan for Croatia (Štrbenac *et al.* 2005) labelled Gorski Kotar, Lika and Dalmatia (Figure 10-1).


Figure 10-1: Entire permanent wolf range of Croatia was divided into three regions: 1=Gorski Kotar, 2=Lika, and 3=Dalmatia.

The northern region – Gorski Kotar (GK) is the most forested one with relatively abundant wolf prey and very little sheep farming (Kusak 2002). There is also a long tradition of hunting in Gorski Kotar. We have hypothesized that because of the absence of wolf depredation conflicts and due to historically uninterrupted coexistence with wolves, the residents of this region will have the most positive attitudes toward wolves and the highest knowledge about wolf biology and status of the wolf population in Croatia. Located centrally is Lika (LK), a region with substantial sheep farming where losses to wolves occur, however the conflict seems to be lower than in the most southern region – Dalmatia (DA) where wolves were temporarily absent and have returned at the beginning of the 1990s. According to scat analysis and stomach content analysis, domestic animals make up the largest part of

the wolf's diet in Dalmatia at 73.4% (Pavlović, Kusak and Huber, unpublished data). The highest level of damages on livestock occurs in Dalmatia. In 2001, of 939 wolf – livestock damage claims, 904 came from Dalmatia. In Lika, there were 31 damage claims and 2 in Gorski Kotar (2 were out of our study area) (Štrbenac *et al.* 2005). Our hypothesis stated that Dalmatians will have the most negative attitudes as found in other parts of Europe where wolves have reclaimed their territories (Linnell *et al.* 1999; Zimmermann *et al.* 2001; Ericsson and Heberlein 2003).

10.4 Methods

We designed a questionnaire (Appendix 2) that consisted of 84 items, covering general attitudes toward wolves, attitudes toward different management options, knowledge and beliefs about wolves, experiences with wolves and demographic information about the respondents. All except one of the attitudinal items were measured using a 5-point Likert scale where items ranged from strongly disagree to strongly agree; one item was a 3-point scale (i.e. bad, indifferent, good). Knowledge items included a "not sure" response to reduce guessing. This research instrument was a modified version of the questionnaire designed by Bath and Majić (2000) (Appendix 1).

Data were collected using personal interviews during May and June of 2003. Within each household, we tried to apply the next birthday rule (Sheskin 1985) for choosing a person in a household, however that was not always possible, so most of the interviewed respondents were the first adult contacted within the household. Five different interviewers conducted the interviews; all of them received training and guidelines on the interviewing process prior

to the interviews. We sampled to be representative of each region, and randomly sampled residents proportional to population within each zone at a community level. The sampling was based on the most recent national census data (Central Bureau of Statistics - Republic of Croatia 2001). The sampling frame (Fowler 2002) included all residents of the three regions 14 years and older. Response rates were >80% in all three regions. Obtained sample sizes were 406, 384 and 382 for GK, LK and DA, respectively.

We used descriptive screening of the data in order to check the accuracy of the data following the guidelines recommended by Tabachnick and Fidell (2001). We checked whether all values were in range and mean scores and standard deviations were reasonable. Cases with missing data, univariate and multivariate outliers, and multicollinear variables were excluded from the analysis. We used principal components analysis (PCA) with a varimax rotation as an exploratory technique for identifying the types of attitudes measured by the questionnaire. By summing up the results of the items with high loadings on the individual components we calculated attitude scores (AS). In order to avoid inflated correlations (Tabachnick and Fidell 2001), an individual item could only be used for calculation of only one AS. Items with negative loadings on the PCA were recoded in order to adjust their tendencies. In addition, we used Cronbach's alpha (α) reliability estimate to test for the internal consistency of our attitudinal items. We recoded the results of the knowledge items so that each correct answer was given 1 and summed the correct answers to achieve a knowledge score (KS). We coded the place of residence from north to south (i.e. GK = 1, LK = 2, DA = 3).

We used Mann-Whitney U test and where data characteristics permitted, analysis of variance (ANOVA) to compare attitude scores and knowledge score by groups. We used Tukey's honestly significant difference (Tukey's HSD) test for pairwise comparisons. We used regressions to determine whether socio-demographic and attitudinal variables had an effect on attitudes and knowledge. We constructed a hypothetical causal model with standardized regression coefficients (β) as indicators of the effect of the predictor variables. We used SPSS 11.5.0 (SPSS Inc. 2002) for the data analysis.

10.5 Results

While the census suggests that there are approximately an equal number of males and females in each region, most of our respondents were male (62.4% in GK, 53.5% in LK and 62.2% in DA), probably due to males having a greater interest in wolves than females and the nature of the sampling technique. The average age of the respondents was 41.5, 47.7 and 48.2 for GK, LK and DA, respectively. Most of the respondents in all three regions had high school education level (72.9%, 56.5% and 63.2% for GK, LK and DA, respectively). Approximately 26% of respondents from Dalmatia owned sheep and/or goats compared to slightly less in Lika (21.9%) and Gorski Kotar (15.4%). In GK, 10.5% of respondents were hunters compared to 7.2% in LK and 10.1% in DA; all of these hunters were male. Many respondents reported that they had seen a wolf in captivity (84.3%, 80.4% and 81.4% for GK, LK and DA, respectively) and also in the wild (59.5%, 59.9% and 53.1% for GK, LK and DA, respectively). Only a few respondents reported they had killed a wolf in their lifetime (n=13, n=15 and n=6 for GK, LK and DA, respectively); which was be an illegal activity after 1995.

10.5.1 Exploring attitudes descriptively

We first explored public attitudes toward wolves across the three regions using the individual attitudinal items listed in Table 10-1. Among the three groups, respondents from GK expressed the most liking for wolves, but they also had the highest amount of neutral attitudes (49.4%). Most of the respondents from GK (68.8%) and LK (50.5%) felt it was good to have wolves in Croatia, while 45% of Dalmatians felt it was bad to have wolves in Croatia. A majority of respondents from GK and LK agreed that we should maintain wolf populations for future generations; Dalmatians were split in their opinion with 44.1% in agreement and 42.5% disagreeing. Items focused on exploring existence value (e.g., "We should assure there is an abundant wolf population for the next generations", and "Whether I had a chance to see a wolf or not, it is important to me that wolves exist in Croatia"), resulted in the same pattern where most agreement came from GK and least agreement from DA. Most Dalmatians agreed that there is no need to have wolves in their region, while respondents from GK mostly opposed this statement. Most of the respondents from all three regions disagreed with the statement that there is no need to have wolves in Croatia.

In terms of management alternatives, only respondents from GK (44%) supported the idea of completely protecting wolves, the current government policy. In DA, 40.3% of respondents agreed that wolves should be allowed to be hunted year round; respondents from GK and LK mostly opposed the idea. The majority of respondents in all three regions, however, supported hunting of wolves in a hunting season. The majority of respondents from all three regions disagreed with the idea of allowing wolves to be killed by all possible means. Most respondents from LK and DA disagreed with increasing the number of wolves in Croatia; those from GK were split into thirds among agreeing, disagreeing and not having an opinion. This result was consistent with documented agreement to "we already have enough wolves" from the two southern regions.

Table 10-1: Individual attitudinal items, results of Mann-Whitney U	test (^{aa bb cc} indicate a
significant difference between groups, p<0.05).	

Item (direct translation from Croatian)		GK	LK	DA
Which of the following would best describe your feelings toward wolves: $(1 - Completely against 5 - Completely in favour)$	Mean	3.07 ^{ab}	2.76 ^{ac}	2.38 ^{bc}
worves: (1– Completely against, 5– Completely in favour)	Liking	30.1%	20.8%	12.2%
	Neutral	49.4%	42.4%	37.0%
To have wolves in Croatia is: (bad =1, indifferent=2, good=3)		2.51 ^{ab}	2.16 ^{ac}	1.91 ^{bc}
	Good	68.8%	50.5%	36.1%
	Indifferent	13.9%	14.9%	18.9%
It is important to maintain wolf population in Croatia for future	Mean	3.63 ^{ab}	3.37 ^{ac}	2.99 ^{bc}
generations. (1– strongly disagree, 5–strongly agree)	Agree	67.3%	59.4%	44.1%
	Neutral	16.9%	13.5%	13.4%
We should assure abundant wolf population for the next generations. $(1 - \text{strongly disagree}, 5 - \text{strongly agree})$	Mean	3.15 ^{ab}	2.66 ^{ac}	2.49 ^{bc}
(1- strongly disagree, 3-strongly agree)	Agree	43.5%	25.4%	19.0%
	Neutral	23.3%	20.8%	14.2%
Whether I had a chance to see a wolf or not, it is important to me that wolves exist in Croatia (1= strongly disagree 5=strongly agree)	Mean	3.55 ^{ab}	3.26 ^{ac}	2.98 ^{bc}
worves exist in Croatia. (1– strongly disagree, 3–strongly agree)	Agree	68.1%	59.2%	46.3%
	Neutral	10.5%	8.6%	8.7%
There is no need to have wolves in GK/ LK/ DA (depending on the	Mean	2.46 ^{ab}	2.87ac	3.25 ^{bc}
respondent's region), since wolves already exist in other parts of – Croatia. (1= strongly disagree, 5=strongly agree)	Agree	20.3%	38.4%	55.5%
	Neutral	12.4%	10.0%	9.7%
	Neutral	15.3%	7.1%	6.2%

Table 9-1 cont.				
There is no need to have wolves in Croatia, since wolves already exist	Mean	2.26 ^{ab}	2.57 ^{ac}	2.83 ^{bc}
in other European countries. (1– strongly disagree, 3–strongly agree)	Agree	12.2%	26.2%	36.2%
	Neutral	14.4%	7.3%	8.1%
Wolves should be completely protected in Croatia. (1= strongly	Mean	3.13 ^{ab}	2.80ª	2.71 ^b
uisagree, 5-suongry agree)	Agree	44.3%	34.9%	28.6%
	Neutral	17.6%	15.1%	17.8%
Wolves should be allowed to be hunted year round. (1= strongly disagree 5=strongly agree)	Mean	2.37 ^{ab}	2.62 ^{ac}	2.97 ^{bc}
uisagree, 5-suongry agree)	Agree	18.1%	29.0%	40.3%
	Neutral	11.0%	7.0%	11.7%
Wolves should be allowed to be killed with all possible means, including poisons and killing pups in dens. (1= strongly disagree, 5=strongly agree)	Mean	1.77 ^{ab}	2.16 ^{ac}	2.57 ^{bc}
	Agree	8.1%	12.7%	24.5%
	Neutral	5.4%	7.6%	10.3%
I would agree with increasing wolf numbers in Croatia. (1= strongly disagree 5=strongly agree)	Mean	2.82 ^{ab}	2.47ª	2.33 ^b
uisagree, 5-suongry agree)	Agree	29.9%	19.8%	14.2%
	Neutral	25.9%	19.6%	16.7%
We already have enough wolves in Croatia. $(1 = \text{strongly disagree}, 5 = \text{strongly agree})$	Mean	3.21 ^{ab}	3.61ª	3.69 ^b
5-strongly agree)	Agree	45.5%	64.0%	67.2%
	Neutral	25.9%	21.1%	20.3%
Farmers should receive compensations for the damages that wolves	Mean	4.38	4.36	4.44
cause on their livestock. (1= strongly disagree, 5=strongly agree)	Agree	96.4%	97.6%	98.0%
	Neutral	2.5%	1,1%	1.9%

Table 9-1 cont.				
State should pay for those damages. (1= strongly disagree, 5=strongly	Mean	4.31 ^b	4.35	4.43 ^b
agree)	Agree	95.7%	96.9%	95.8%
	Neutral	2.3%	2.5%	2.5%
State should help in paying the insurance of the livestock against wolf	Mean	3.93 ^b	4.03c	4.21 ^{bc}
attacks. (1- strongly disagree, 5-strongly agree)	Agree	78.5%	87.6%	89.7%
Opinions of hunters were considered when making wolf management decisions (1 = strongly disagree 5=strongly agree)	Mean	3.12 ^b	3.25°	2.78 ^{bc}
decisions. (1– strongly disagree, 3–strongly agree)	Agree	33.6%	37.4%	24.7%
	Neutral	46.2%	49.1%	33.1%
Opinions of livestock raisers were considered when making wolf management decisions. (1= strongly disagree, 5=strongly agree)	Mean	2.84 ^b	2.82 ^c	2.56 ^{bc}
	Agree	20.9%	23.3%	18.1%
	Neutral	45.8%	38.5%	26.7%
Opinions of environmental NGOs were considered when making	Mean	3.00 ^{ab}	3.27ª	3.15 ^b
won management decisions. (1– strongly disagree, 3–strongly agree)	Agree	23.7%	38.2%	40.1%
	Neutral	56.1%	48.5%	35.7%
In areas where wolves live close to people, attacks on humans are	Mean	2.35 ^{ab}	2.61 ^{ac}	2.92 ^{bc}
common. (1– strongly disagree, 5–strongly agree)	Agree	16.2%	26.9%	37.3%
	Neutral	20.5%	15.2%	17.8%
I would be afraid to walk in woods where wolves are present. (1=	Mean	2.73 ^{ab}	3.16 ^{ac}	3.44 ^{bc}
stongly disagree, 5-strongly agree)	Agree	36.1%	53.0%	63.9%
	Neutral	10.2%	8.7%	6.4%
Wolves should be allowed to be hunted in a specific hunting seasons in $CK/LK/DA$ (depending on the respondent's region) (1=	Mean	3.45	3.52	3.38
in GK/ LK/ DA (depending on the respondent's region). (1= - strongly disagree, 5=strongly agree)	Agree	62.9%	68.1%	61.9%
	Neutral	15.5%	10.8%	11.1%

Currently the Croatian government pays compensation for livestock losses caused by wolves because the species is completely protected. Public support remains strong for this practice from all areas. There was no significant difference among the three regions in their strong support for farmers to receive compensation for damages caused by wolves. Also, the vast majority of respondents in all three regions agreed that the government should pay the compensation, and that government should help in paying insurance against wolf attacks.

Public involvement on wildlife issues in Croatia is a relatively new concept as evident by the beliefs of many respondents regarding this topic. Nearly half of the respondents from GK and LK were neutral when asked whether the opinions of hunters were considered when making past wolf management decisions, while most Dalmatians disagreed with the statement. Similarly, the respondents from DA least agreed that the opinions of livestock breeders were considered when making wolf management decisions, but 40% of them agreed that the opinions of environmental NGOs were considered.

Fear of wolves remains an important item in understanding public attitudes. Agreement to a belief item saying that wolves commonly attack people was highest (37.3%) in DA and lowest (16.2%) in GK. More than half of the respondents from LK and DA said they would be afraid to hike in the forest if wolves were present.

10.5.2 Exploring attitudes analytically

A principal component analysis using the 21 attitudinal items resulted in 5 interpretable components with eigenvalues >1 (Table 10-2). The first component consisted of pro-wolf attitude items. The 12 items that loaded the highest on this component were included in

"pro-wolf AS" (Cronbach's $\alpha = 0.95$). The second component represented procompensation for wolf-livestock damages attitudes; these 3 variables are labelled as the "procompensation AS" (Cronbach's $\alpha = 0.72$). The third component was interpreted as a public involvement (PI) score (Cronbach's $\alpha = 0.62$), and the fourth one as a fear score (Cronbach's $\alpha = 0.65$). For the fifth component we used only the variable hunting during specific seasons. No variable was used more than once in developing attitudinal scores.

There was a significant difference in pro-wolf AS (Table 10-3) among all three groups with the respondents from GK being the most positive toward wolves and the respondents from DA being the least positive. The respondents from LK scored the highest on the PI score, while those from DA scored the lowest. Dalmatians were the most afraid of wolves and respondents from GK were the least afraid of wolves. There was no significant difference between the three regions on the pro-compensation AS among the groups.

	Components				
Items	1	2	3	4	5
Eigenvalues	8.3	2.0	1.7	1.2	1.0
% of Variance	39.3	9.7	8.1	5.6	4.9
Feelings about wolves	0.79*				
Having wolves is bad-good	0.84*				
Wolves for future generations	0.88*				
Abundant wolf population	0.69*				-0.35

Table 10-2: Principal components analysis with varimax rotation of the attitudinal items (n =1086). Only loadings >0.30 are displayed in the table; * Items included in scores.

Table 9-2 cont.					
Important that wolves exist	0.85*				
No need to have wolves in region	-0.82*				
No need to have wolves in Croatia	-0.83*				
Should be completely protected	0.68*				-0.42
Hunting year round	-0.77*				
Killing with all possible means	-0.66*			0.39	
Increase in wolf number	0.70*				-0.44
Have enough wolves	-0.59*				0.49
Should receive compensations		0.83*			
State should pay compensations		0.89*			
State should pay insurance		0.71*			
Opinions of hunters			0.79*		
Opinions of livestock raisers			0.78*		
Opinions of environmental NGOs			0.66*		
Attacks on humans	-0.37			0.76*	
Afraid to walk in woods				0.77*	
Hunting of wolves in season					0.79*

Attitude Scores		GK	LK	DA
Pro-wolf AS (12-60)	Mean	39.52 ^{ab}	35.39 ^{ac}	32.07 ^{bc}
Pro-compensations AS (3-15)	Mean	12.66	12.80	12.93
PI Score (3-15)	Mean	9.01 ^{ab}	9.34 ^{ac}	8.49 ^{bc}
Fear Score (2-10)	Mean	5.05 ^{ab}	5.76 ^{ac}	6.36 ^{bc}

Table 10-3: Attitude scores by region, results of ANOVA (^{aa bb cc} indicate a significant difference between groups (Tukey's Post Hoc test, P<0.05).

10.5.3 Exploring knowledge

We computed knowledge scores (KS) that ranged from 0 (no responses correct) to 7 (all items answered correctly). Mean KS were 3.2, 3.1, and 3.0 for Gorski Kotar, Lika, and Dalmatia respectively indicating public knowledge is generally low across all parts of Croatian wolf range. Mean KS were not statistically significantly different among the three groups (F=2.02, p<0.133). On 5 of the 7 individual items GK respondents scored the highest but not statistically significantly higher than the other regions (Table 10-4). Even though Dalmatian respondents scored the lowest on the KS of the three groups, responses to individual knowledge items indicate that they have a higher knowledge about the legal status of the wolf population in Croatia and on issues of livestock damage by wolves.

Table 10-4: Knowledge items: share of correct answers by zones. Correct answers are underlined.

Knowledge Item	GK	LK	DA
Which of the following animals is the most dangerous to humans? (wolf, lynx, <u>brown bear</u> , all are equally dangerous, none is dangerous)	21.1%	11.1%	13.9%
What is the average weight of an adult male wolf in Croatia? (21-40 kg)	33.4%	30.0%	29.2%
Wolves were historically present in GK /LK /DA (depending on the respondent's region). (<u>true</u> , false, not sure)	93.3%	92.7%	82.5%
Wolves are completely protected in Croatia. (true, false, not sure)	50.3%	64.1%	69.2%
Wolves kill sheep and goats only if there is not enough of red deer and other wildlife. (true, <u>false</u> , not sure)	29.5%	33.5%	36.9%
Generally, how often are wolves successful in hunting wild prey? (<u>1 in 10 attempts</u>)	25.8%	12.7%	10.6%
What is the average size of a wolf pack in Croatia? (<u>1-10 wolves</u>)	68.5%	61.6%	61.9%

10.5.4 Building explanatory models to better understand attitudes and its

complexities

As a first step we created a correlation matrix of the attitudinal, knowledge and sociodemographic variables (Table 10-5).

	Pro-wolf AS	Fear Score	KS
Pro-wolf AS	X	-0.551**	-
Fear Score	-0.551**	Х	-0.194**
KS	-	-0.194**	Х
Age	-0.370**	0.080**	0.133**
Gender (F=1, M=2)	-	-0.323**	0.235**
Education	0.320**	-0.217**	0.105**
Residence (1=GK, 2=LK 3=DA)	-0.309**	0.266**	-
Owns sheep/ goats (No= 1, Yes =2)	-0.185**	-	-
Seen wolf in wild (No= 1, Yes =2)	-0.095**	-0.214**	0.221**
Seen wolf in captivity (No= 1, Yes =2)	0.123**	-0.128**	0.182**
Pro-compensation Score	-0.189**	-	-
Hunting in season	-0.184**	0.121**	0.078*
PI Score	0.191**	-0.090**	-

Table 10-5: Correlation coefficients and significance levels among pro-wolf attitudes, fear, knowledge and the socio-demographic variables: ** = correlation is significant at the 0.01 level; *= correlation is significant at the 0.05 level; X = not applicable; -= not significant.

Table 10-6 illustrates the relationship between selected socio-demographic characteristics and attitude scores on pro-wolf attitudes, fear of wolves and knowledge about wolves based on the regression analysis. Fear score was the strongest predictor of pro-wolf attitudes ($\beta = -0.498$, R square change = 0.29), while knowledge score did not load as significant in predicting pro-wolf attitudes. Women, more educated people, younger people, those that have seen a wolf in captivity and those scoring higher on the PI score tended to have more positive attitudes, while those that supported hunting of wolves, scored higher on the procompensation score, had seen a wolf in the wild, owned sheep and/or goats, and lived in the southern regions of the country tended to score lower on the pro-wolf AS.

Gender was the strongest predictor of fear of wolves; women tended to be more afraid of wolves. In addition, respondents from the southern regions of Croatia, older people, and those supporting hunting of wolves tended to have higher fear scores. Those individuals who were better educated, who scored higher on the PI score, had more knowledge about wolves, and who had seen a wolf in the wild tended to score lower on the fear score.

Knowledge about wolves was a significant predictor of fear but not of general attitudes toward wolves. The strongest predictor of knowledge about wolves was gender (men tended to be more knowledgeable about wolves) and experience with wolves (i.e. seeing a wolf in wild and seeing a wolf in captivity). Individuals with higher education levels, older, and those living in the northern regions tended to have more knowledge about wolves.

PREDICTORS	Pro-wolf AS	Fear Score	KS
Age	-0.210***	0.085**	0.122***
Gender (F=1, M=2)	-0.087**	-0.287***	0.139***
Education	0.126***	-0.110**	0.126***
Residence (1=GK, 2=LK 3=DA)	-0.096***	0.211***	-0.076*
Owns sheep/ goats (No= 1, Yes =2)	-0.127***	-	-
Seen wolf in wild (No= 1, Yes =2)	-0.107***	-0.113***	0.153***
Seen wolf in captivity (No= 1, Yes =2)	0.059*	-	0.131***
Pro-compensation Score	-0.098***	-	-
Hunting in season	-0.060*	0.147***	-
PI Score	0.123***	-0.059*	-
Knowledge score	-	-0.105**	Х
Fear Score	-0.498***	Х	Х
F value	76.27***	28.18***	14.48***
Adjusted R Square	0.503	0.245	0.127

Table 10-6: Standardized regression coefficients (β) and adjusted R squares for variables predicting pro-wolf attitudes, fear of wolves and knowledge about wolves (*=p < 0.05; **=p < 0.01; ***=p < 0.001; x = not included in the regression; - = not significant).



Figure 10-2: Hypothetical causal model of attitudes, fear and knowledge with β values of the significant socio-demographic characteristics.

Figure 10-2 illustrates the complex interrelationships among the analyzed variables: pro-wolf attitudes, fear, and knowledge and the effects of socio-demographic characteristics on those variables. Women tended to fear more, but also to have more positive attitudes toward wolves then men. At the same time, a lower fear score predicted the positive attitudes toward wolves. The experience of seeing a wolf in wild had a negative effect on the positive attitudes toward wolves, as did seeing a wolf in captivity. Older respondents tended to score lower on the pro-wolf attitudes, had more fear of wolves but also more knowledge about wolves. Knowledge, on the other hand, was decreasing the level of fear.

10.6 Discussion

Human dimensions research as applied in this study has acted as a form of public involvement where managers now have information representative of their entire resource constituency within each region in Croatia where wolves now permanently exist. Within Europe and for countries like Croatia aspiring to become part of the EU, decision-makers increasingly recognize the importance of incorporating viewpoints of different interest groups and a representative general public in wildlife conservation planning. In fact, the legislative framework (Council of Europe 1979; Aarhus Convention 1998; Boitani 2000) now requires countries to actively engage various publics so that better and fairer decisions can occur. Traditionally, public viewpoints have been incorporated into decisions through public meetings, consultations and workshops. There is, however, proof that such meetings are not representative of the entire constituency (Johnston et al. 1993). The so- called "silent majority" is often not present in such meetings (Bath 1996), hence the need for a more quantitative and representative human dimensions research approach. With these data, the Croatian government did change their policy regarding full protection of wolves and did consider the differences in public attitudes toward wolves in the three regions when allocating a small quota of wolves to be killed.

While many researchers have found that attitudes toward large carnivores tend to be extreme, both in a positive and a negative direction (Kellert 1985; Bath 1996; Scarce 1998), our findings of high percentages of neutral attitudes agree with what has been found by Williams and others (2002) and by Ericsson and Heberlein (2003). The share of neutral

attitudes indicates that, although often controversial, carnivore conservation has its "silent majority", opinions of which need to be actively sought.

Ericsson and Heberlein (2003) indicate the importance of studying the people who are most directly affected by wolves to promote wolf recovery. The actual costs of having these animals fall on a minority of individuals in rural areas that lose livestock or pets to carnivores (Naughton-Treves et al. 2003). With the incidence of illegal killings of wolves in Croatia, we emphasize the recommendation of Ericsson and Heberlein (2003). It is the people that live with wolves that ultimately decide about the wolves' destiny. We have, however, found significant differences among the publics of the three wolf-inhabited rural regions where attitudes and opinions ranged from considerable support of the complete protection of wolves in Gorski Kotar to support of hunting wolves year round in Dalmatia. As a result, the division of the Croatian wolf range into three management units seems appropriate, not only from the biophysical, but also from the social viewpoint. On the other hand, the entire wolf range in Croatia is approximately 20,000 km² (Štrbenac et al. 2005) and the Croatian wolf population is only a part of the much bigger population which is spreading from Slovenia in the north to the south of the Balkan Peninsula. If zoning is used as a management tool, this means that a single wolf could travel from an area of complete protection to areas with no legal limits on wolf hunting. Thus, the challenge for the manager, as well as for the researcher who is trying to provide the most relevant scientific information, is to understand, prioritize and consider all of the human dimensions of wolf management, on a local, regional, national and even international scale. Especially in Europe, where many of the large carnivore populations are shared among several countries, we must not focus only on geographically limited, narrow interest groups or regions.

Mech (1995) warns of the inevitability of lethal control of wolves in light of the recovering populations of wolves. Most of the general public respondents from all three regions unanimously supported a control of wolf numbers through hunting (agreement to allowing hunting of wolves in a specific hunting season). This information was used as an argument in a facilitated applied human dimensions workshop process between various interest groups. This resulted in the government, for the first time since the protection in 1995, allowing some hunting of wolves in the season of 2006. The total wolf mortality was set at 10% of the estimated population size. This 10% included the hunting quota and all other mortality (Štrbenac et al. 2005). The intervention is expected to mitigate various conflicts that are more perceptual in nature than real. The allowance of some wolves to be killed should increase trust between the government and local interest groups (e.g., hunters and sheep farmers), thus addressing behavioural conflicts, further increase public support for wolf conservation, and result in fewer illegal killings of wolves (Štrbenac et al. 2005). Upon reaching consensus on allowing limited wolf control, the main discussion has moved to the issue of spatial distribution of the quota. It was decided to prioritize the areas with higher livestock depredation conflicts (Dalmatia) over those with hunters - wolves' competition for game (Gorski Kotar) in setting the quota, thus allocating higher quotas to Dalmatia. The question that beckons is whether this kind of straightforward preferential treatment will result in a decrease in public acceptance of wolves in Gorski Kotar, the region that was found to be the

most supportive of the conservation of wolves, and thus end up being counterproductive to successful wolf conservation?

Many previous studies have found that women are more negative toward wolves than men (Kellert 1985; Kellert and Berry 1987; Bath 1989; Kaltenborn et al. 1999; Enck and Brown 2002; Ericsson and Heberlein 2003; Rodriguez et al. 2003). Our prediction that women would have more negative attitudes was not confirmed. Kellert and Berry (1987) stress that gender is among the most important demographic factors influencing attitudes; their findings that men have more knowledge about animals and management issues, while women have more fear agree with our findings, however, on our general attitudes toward wolves score women tended to be more positive than their male counterparts. Kellert and Berry (1987) have also found that women tend to have stronger emotional attachments for individual animals, especially pets and that women are more likely to reveal anthropomorphic feelings toward animals, especially large and aesthetically attractive species. McNaught (1987) found that women respond more often with "no opinion", thus neutral on an attitude scale when confronted with wolf sentiment questions. This trend reverses on fear items, meaning that women have stronger opinions related to fear items. Women also exhibit stronger interest than men in the ecological value of large carnivores (Kaltenborn et al. 1999). In our study, gender was the strongest predictor of fear, while fear was the strongest predictor of attitudes toward wolves. Whether females will score more positive or negative most likely depends on the fear component of the attitude. If the fear component is incorporated in the general attitude score, as it was, for example, in Ericsson and Heberlein's (2003) study, one could expect females scoring lower on such a score. Principal component analysis of our data clearly indicated that the fear of wolves should be looked at as a separate attitudinal construct.

Knowledge about wolves seems intuitively that it should be a good predictor of attitude and while it has been confirmed by other researchers (Bath 1991; Ericsson and Heberlein 2003), the relationship between knowledge and attitude is often very weak (Ericsson and Heberlein 2003). In our study, knowledge predicted fear of wolves, but not the general attitude toward wolves, thus only partially confirming the premise of the importance of factual information about wolves for the acceptance of wolves. Ericsson and Heberlein (2003) state that the major barrier to a successful education program in Sweden is the large amount of neutral attitudes toward wolves, since people that are neutral are less likely to seek information about wolves. Attitudes toward groups of animals are formed early in life, and seem to be relatively durable over time (Kaltenborn et al. 1999), we see the large amount of neutral attitudes as an opportunity for the managers, since neutral attitudes are more likely to be influenced by factual-knowledge information. The challenge for managers is twofold: choosing the right pieces of information that could affect the fear component of attitude toward wolves, and finding ways to reach the uninterested public. In terms of reaching the public, Ericsson and Heberlein (2003) single out widely publicized events as successful. We believe that in Croatia such an event was complete protection of wolves in 1995, when public attitudes became more negative (Bath and Majić 2000).

Croatian society, being a young democracy, is facing a new concept of public involvement. We believe that this is reflected also in our results as many of our respondents selected neutral answers when asked about public involvement issues. There were, however, significant differences among the three groups on the PI score. The least neutral region were the respondents from Dalmatia expressing disagreement with the statement that opinions of hunters and livestock owners were taken into account when making wolf management decisions. They also expressed most agreement with the statement that opinions of the environmental NGOs were considered. Overall, respondents from Lika scored highest on the PI score, which indicates the strongest beliefs that the government is actually considering the opinions of the different interest groups. The lowest score was documented among the respondents from the most negative group toward the wolves – the respondents from Dalmatia. Interestingly, most of the government's activities related to public involvement to date (e.g., focus group meetings, consultations) and mitigation efforts (donations of livestock-guarding dogs and electric fences) (Štrbenac *et al.* 2005) has occurred in the two "extreme" regions, Lika and Dalmatia.

Over 50% of respondents in all three regions claimed they had seen a live wolf in the wild. Considering the wolf's secretive nature, we evaluate these percentages as extremely high. For comparisons, 17% of the non-hunting population, and 26% of hunters in wolf areas of Sweden claimed to have seen a wild wolf (Ericsson and Heberlein 2003). In France, where only a few wolves exist, in the province of Des Alpes Maritimes 17% of the general public respondents claimed they had seen a wild wolf (Bath 2000). While the experience of seeing a wild wolf can certainly be a positive one (i.e. visitors to Yellowstone National Park), our findings suggest that seeing a wild wolf will tend to have a negative effect on attitudes toward wolves among the inhabitants of wolf areas. At the same time, this experience tended to decrease the level of fear of wolves and increase the knowledge about wolves, thus, according to the hypothetical causal model, it should indirectly also influence the general attitudes toward wolves. As a result we hypothesize that seeing a wild wolf in the context of living in an area where carnivore attacks to livestock occur, will probably reinforce already existing negative attitudes toward the large carnivore. Seeing a captive wolf (in a zoo, for example) has a positive effect on both attitudes toward wolves and knowledge about wolves, but not on fear of wolves. Hence, seeing a captive wolf could be seen as a "shortcut" to increased knowledge about wolves and more positive attitudes toward wolves, but it can not replace the actual experience of living with wolves (and seeing them in wild) in decreasing the fear of wolves.

The fact that ownership of livestock was negatively associated with positive attitudes toward wolves indicates that this group probably has a different hierarchy of values since they need to consider costs and benefits of the potential of damage happening versus maintaining wolf populations. Kleiven and others (2004) and Vittersø and others (1999) found that people who are anticipating economic losses from large carnivores tend to have lower acceptability scores and hold more negative attitudes than other groups. In fact, farmers are often a group who hold the most negative attitudes toward carnivores (Bath and Buchanan 1989; Kaltenborn *et al.* 1999; Vittersø *et al.* 1999; Bjerke *et al.* 2000). Additionally, wolves are often seen by rural people and people living in wolf areas as a part of governmental or urban control over them (Scarce 1998; Kleiven *et al.* 2004). Wolves in Croatia may be seen the same way as a governmental initiative from urban Zagreb. Although the ownership of livestock varied from 15% in Gorski Kotar to 26% in Dalmatia, most respondents unanimously

supported the idea of livestock compensation and the government being responsible for paying compensation, therefore equally expressing sympathy with farmers who experience damages. Support for compensation was also a predictor of more negative attitudes toward wolves.

10.7 Literature cited

- Aarhus Convention. 1998. "Convention on access to information, public participation in decision-making and access to justice in environmental matters". Aarhus, Denmark. pp. 1-25.
- Bath, A. J. 1989. "The public and wolf reintroduction in Yellowstone National Park". *Society* and Natural Resources 2: 297-306.
- Bath, A. J. 1991. "Public attitudes in Wyoming, Montana and Idaho toward wolf restoration in Yellowstone National Park". *Transactions of the North American Wildlife and Natural Resources Conference* 56: 91-95.
- Bath, A. J. 1996. "Increasing the applicability of human dimensions research to large predators". *Journal of Wildlife Research* 1: 215 -220.
- Bath, A. J. 2000. "Human Dimensions in Wolf Management in Savoie and Des Alpes Maritimes", France. Large Carnivore Initiative for Europe.
- Bath, A. J. and Buchanan, T. 1989. "Attitudes of interest groups in Wyoming toward wolf restoration in Yellowstone National Park". *Wildlife Society Bulletin* 17: 519-525.
- Bath, A. J. and Majić, A. 2000. "Human Dimensions in Wolf Management in Croatia". Large Carnivore Initiative for Europe.
- Bjerke, T., Vittersø, J., and Kaltenborn, B. P. 2000. "Locus of control and attitudes toward large carnivores". *Psychological Reports* 86: 37-46.
- Boitani, L. 2000. "Action Plan for the conservation of the wolves (*Canis lupus*) in Europe". Accepted by: Convention on the Conservation of European Wildlife and Natural Habitats, Strasbourg.
- Breitenmoser, U. 1998. "Large predators in the Alps: The fall and rise of man's competitors". *Biological Conservation* 83: 279-289.

- Breitenmoser, U. and Landry, J.-M. 1998. "The return of the wolf to Switzerland: Workshop on human dimension in large carnivore conservation". *Edited by*: D. Strahm. KORA, Muri Bern. pp. 8.
- Central Bureau of Statistics Republic of Croatia 2001. "Census of Population, Households and Dwellings", 31st March 2001. Republic of Croatia.
- Council of Europe 1979. "Convention on the Conservation of European Wildlife and Natural Habitats". 19. IX.1979 ed.
- Enck, J. W. and Brown, T. L. 2002. "New Yorkers' attitudes toward restoring wolves to the Adirondack Park". *Wildlife Society Bulletin* 30: 16-28.
- Ericsson, G. and Heberlein, T. A. 2003. "Attitudes of hunters, locals, and the general public in Sweden now that the wolves are back". *Biological Conservation* 111: 149-159.
- Fowler, F. J. 2002. "Survey Research Methods". *Applied Social Research Methods*. Sage Publications, Newbury Park.
- Frković, A. and Huber, D. 1992. "Wolves in Croatia: Baseline data". Proceedings of the workshop: Wolves in Europe - current status and prospects. Edited by C.Promberger and W.Schröder Munich Wildlife Society, Oberammergau, Germany 67-69.
- Huber, Đ., Kusak, J., Kovačić, D., Frković, A., Radović, J., and Štahan, Ž. 1999. "Privremeni plan gospodarenja vukom u Hrvatskoj" [Temporary wolf management plan for Croatia]. Državna uprava za zaštitu prirode i okoliša, Zagreb. (in Croatian)
- Johnston, K. N., Johnson, R. L., Edwards, D. K., and Wheaton, C. A. 1993. "Public participation in wildlife management: opinions from public meetings and random surveys". *Wildlife Society Bulletin* 21: 218-225.
- Kaltenborn, B. P., Bjerke, T., and Vittersø, J. 1999. "Attitudes toward large carnivores among sheep farmers, wildlife managers, and research biologists in Norway". *Human Dimensions of Wildlife* 4: 57-73.
- Kellert, S. R. 1985. "Public perceptions of predators, particularly the wolf and coyote". *Biological Conservation* 31: 167-189.
- Kellert, S. R. and Berry, J. K. 1987. "Attitudes, knowledge, and behaviours toward wildlife as affected by gender". *Wildlife Society Bulletin* 15: 363-371.
- Kleiven, J., Bjerke, T., and Kaltenborn, B. P. 2004. "Factors influencing the social acceptability of large carnivore behaviours". *Biodiversity and Conservation* 13: 1647-1658.
- Kusak, J. 2002. "Analysis of living conditions for wolves in Croatia". University of Zagreb, Faculty of Science, Department of Biology, pp. 1-247.

- Linnell, J. D. C., Odden, J., Smith, M. E., Aanes, R., and Swenson, J. E. 1999. "Large carnivores that kill livestock: do "problem individuals" really exist?" Wildlife Society Bulletin 27: 698-705.
- Linnell, J. D. C., Swenson, J. E., and Andersen, R. 2001. "Predators and people: conservation of large carnivores is possible at high human densities if management policy is favourable". *Animal Conservation* 4: 345-349.
- McNaught, D. 1987. "Wolves in Yellowstone? Park visitors respond". Wildlife Society Bulletin 15: 518-521.
- Mech, L. D. 1995. "The Challenge and Opportunity of Recovering Wolf Populations". *Conservation Biology* 9: 1-9.
- Mech, L. D. 1996. "A new era for carnivore conservation". Wildlife Society Bulletin 24: 397-401.
- Naughton-Treves, L., Grossberg, R., and Treves, A. 2003. "Paying for Tolerance: Rural Citizens' Attitudes toward Wolf Depredation and Compensation". *Conservation Biology* 17: 1500-1511.
- Parliament of the Republic of Croatia 1995. "Pravilnik o zaštiti pojedinih vrsta sisavaca" [Book of rules on protection of some species of mammals]. *Official Gazette* 31: 968. (in Croatian)
- Rodriguez, M., Krausman, P. R., Ballard, W. B., Villalobos, C., and Shaw, W. W. 2003. "Attitudes of Mexican citizens about wolf translocation in Mexico". *Wildlife Society Bulletin* 31: 971-979.
- Scarce, R. 1998. "What do wolves mean? Conflicting social construction of *Canis lupus* in "Bordertown"". *Human Dimensions of Wildlife* 3: 26-45.
- Sheskin, I. M. 1985. "Survey Research for Geographers". Association of American Geographers, Washington, DC.
- SPSS Inc. 2002. SPSS for Windows. 11.5.0 ed.
- Štrbenac, A., Huber, Đ., Kusak, J., Majić, A., Frković, A., Štahan, Ž., Jeremić-Martinko, J., Desnica, S., and Štrbenac, P. 2005. "Wolf Management Plan for Croatia". State Institute for Nature Protection. Zagreb, Croatia.
- Tabachnick, B. G. and Fidell, L. S. 2001. "Using Multivariate Statistics". Allyn and Bacon. Toronto. Canada.

- Vittersø, J., Bjerke, T., and Kaltenborn, B. P. 1999. "Attitudes toward large carnivores among sheep farmers experiencing different degrees of depredation". *Human Dimensions of Wildlife* 4: 20-35.
- Williams, C. K., Ericsson, G., and Heberlein, T. A. 2002. "A quantitative summary of attitudes toward wolves and their reintroduction (1972-2000)". *Wildlife Society Bulletin* 30: 575-584.
- Zimmermann, B., Wabakken, P., and Dötterer, M. 2001. "Human-carnivore interactions in Norway: How does the re-appearance of large carnivores affect people's attitudes and levels of fear?" *Forest Snow and Landscape Research* 76: 137-153.

PAPER 2

11. Monitoring and documenting changes in Croatian attitudes toward wolves

11.1 Abstract

Most of human dimensions studies can be classified as one-shot case studies. As such they fail to allow direct comparisons of data, evaluations of implemented activities and documentation of changes over time, and consequently fail to fairly inform conservation as a dynamic and goal-driven process. We carried out personal structured interviews with the residents of three regions within the Croatian wolf range in 1999 (n=1209) and repeated the study, using the same methodology and research instrument in 2003 (n=1172). We found that there was a change in public support for wolf conservation and support for control of wolf numbers. The documented change was a result of a real change in attitudes and not of a change in the structure of the sampled population (e.g. younger generations which tend to have more positive opinions about wolves enter the sampling frame over time, while older generations exit the sampling frame as they die). The changes were documented in the two southern regions, Lika and Dalmatia, with attitudes shifting towards a more neutral position as there was a decrease in support for wolf conservation and support to control wolves. It

seems that different birth cohorts react differently to the conservation activities. In 1999, the younger cohort groups may have been influenced more by the legal protection campaign. The older cohorts reacted more sympathetically to livestock concerns and thus held stronger negative attitudes toward wolves. Using human dimensions research as an evaluative tool can help large carnivore managers to be more adaptive and thus effective in their management solutions.

11.2 Introduction

Most human dimensions in wildlife management research could be classified as one-shot case studies. Human dimensions research on large carnivores is no exception. As an applied and still relatively recent field of study, often driven by crisis management (Bath 1998), this is not surprising. Due to this traditional focus of human dimensions research, studies have rarely explored the subject of attitude change and rarely have been able to capture changes in attitudes over time (Williams *et al.* 2002). "Unfortunately, support from biologists and funding agencies for attitude monitoring over time and comparative data collection is limited, and attitude studies are episodic, usually accompanying some political crisis, such as the Yellowstone reintroduction" (Williams *et al.* 2002: pg 576). Many researchers (Bath 1998; Manfredo *et al.* 1998; McComas and Scherer 1999; Kaczensky *et al.* 2001; Enck and Bath 2001) have called for the need to conduct longitudinal research and begin attitudinal and belief monitoring; such research could permit an evaluation of the effectiveness of a specific education program, policy changes, or even the effect of changes in the status of the wildlife population being studied might have on attitudes. The latter would offer decision-makers an understanding of how wildlife acceptance capacity (Decker and Purdy 1988) may vary with

biological carrying capacity of the population. With such attitudinal and belief monitoring, human dimensions as a research field would move from isolated studies driven by key management issues to an integrated key component of any wildlife management decisionmaking process.

In North America, after years of persecution of all large carnivores, positive attitudes toward large carnivores and interest in wolves, brown bears and mountain lions have grown (Kellert et al. 1996), and these attitudes have become positive over a short period of time. Consider that in the 1930s, poison campaigns for large carnivores (especially wolves) were occurring in Yellowstone National Park, USA, and as early as 40 years later talks of reintroducing wolves back into the park began, with successful reintroduction of wolves occurring only 60 years later in the mid 1990s. Similarly, wolf bounties were offered in Ontario, Canada until 1972 and today wolf howling programs in some of the same areas draw thousands of visitors for a chance to hear a wild wolf howl. Kellert et al. (1996) have suggested that an understanding of public attitudes and attitude change toward large carnivores can be indicators of broader shifts in attitudes toward wildlife and nature in North America. Manfredo et al. (2003), by looking at public values toward wildlife in the North American context, found that a utilitarian orientation toward wildlife is strongly and inversely related to income, urbanization, and education, and positively related to residential stability. Theoretically, value orientations should strongly influence attitudes (Fishbein and Ajzen 1975), thus we could assume that changes in society such as increased affluence and education, and declining residential stability, as discussed by Manfredo et al. (2003), would drive not only changes in wildlife value orientations but also changes in attitudes toward wildlife. The challenge in documenting these changes in attitudes toward wildlife and more specifically toward large carnivores is that the attitude shift may have occurred before human dimension researchers began conducting scientific surveys. Williams *et al.* (2002) think it likely that positive changes in attitudes toward wolves occurred before social scientists began conducting scientific surveys in the 1970s because of the consistency in attitudes in the studies between 1972 and 2000.

Within Europe, where large carnivores are increasing in numbers and range, and returning to previous areas where they were once exterminated, opportunities exist for scientists to document existing attitudes toward such large carnivores and document attitude change as carnivore-livestock conflicts increase, policy changes occur from complete protection policies to limited harvest policies, awareness campaigns are delivered, and carnivore-livestock damage prevention programs are implemented. Large carnivores in many European countries are protected or carefully regulated through national laws and international conventions. However, as such carnivore populations (particularly of wolves), begin to increase, there is growing pressure from certain interest groups and the public to engage in new management plans and reemploy reduction measures of these species. For example, Zimmermann *et al.* (2001) found by reviewing attitude surveys in Norway that the proportion of people with negative attitudes continues to increase to its maximum with the arrival of large carnivores, and then decreases with experience over time. Similarly, they found that the proportion of people afraid of large carnivores was relatively high before carnivore arrival but also decreased with experience. It appears that people can learn to coexist with large

carnivores and change their views. Modern European attitudes toward wolves have generally improved during the past two decades, especially in urban areas (Fritts *et al.* 2003).

Few human dimension research studies have been completed in Croatia, thus providing a fertile ground to learn about public attitudes and beliefs. The first attempts to investigate public opinion about wolves in Croatia (Gyorgy 1984; Morić and Huber 1989; Huber et al. 1992; Radišić et al. 1994) came as a response to a shrinking wolf population and the human dimensions research completed at that time suffered from small sample sizes and nonrandom sampling. This being said, the results from those few studies implied that there had been a change in public attitudes during the 1980s, much later than attitude shifts that occurred in North America toward wolves. The overall percentage of Croatians considering the wolf a harmful species dropped from 42% in 1983 (Gyorgy, 1984) to 25% in 1993 (Radišić et al. 1994). In addition, 21% of respondents in 1983 wanted to exterminate wolves (Gyorgy, 1984), while only 8% of the respondents expressed the same view in 1993 (Radišić et al. 1994). Similar to what has been observed in North America, as the number of wolves decreased (Frković and Huber 1992) over time, the attitude toward the species seemed to become more positive (Radišić et al. 1994). This would support the traditional view of natural resources where, as a resource becomes scarce, it gains value. It was at this time, in the early 1990s, a campaign to completely protect the wolf began in Croatia, and full protection nationwide was declared for the wolf in 1995 (Parliament of the Republic of Croatia, 1995).

With improvements in habitat condition, wolf numbers began to increase throughout the country and return to areas where they were once absent. An increase in illegal killings was

also documented during this period (Štrbenac *et al.*, 2005) suggesting attitudes were perhaps shifting once again back to the previous negative viewpoints. A content analysis of newspaper articles seemed to support this hypothesis that attitudes had indeed shifted to more negative due to the complete protection of wolves (Bath and Majić, 2000). As part of this study that examined newspaper articles, data were also collected in 1999 from a representative sample of residents in three regions (Gorski Kotar, Lika and Dalmatia) within wolf range in Croatia. We found that attitudes toward wolves were positive in the northern region of Gorski Kotar, largely neutral in the central region of Lika, and mainly negative in the southern region of Dalmatia (Bath and Majić, 2000). An opportunity to reassess attitudes four years later, in 2003, provided the basis for this paper and the chance to assess whether attitudes have changed. Understanding the strength and direction of attitude change toward wolves in Croatia will allow the Croatian government to more effectively implement their adaptive management approach to wolf management in the country.

According to Eagly and Chaiken (1993), those individuals that already have favourable or unfavourable thoughts predominating their attitudes about an issue will be more susceptible to cognitive structure change and thus to attitude change. For example, those with existing negative attitudes would reinforce these views and become more negative. Their attitudes will be relatively enduring, resistant and predictive of behaviour. Those that hold neutral attitudes, when exposed to new information, might experience peripheral attitude shift and form attitudes which are relatively temporary, susceptible and not predictive of behaviour. If we follow this mode of thinking, we would assume that the residents of Lika with neutral attitudes should be least susceptible to attitude change, while Dalmatians with predominant negative attitudes and those from Gorski Kotar with predominant positive attitudes toward wolves should be more susceptible to change.

However, in the period between the two studies (1999 – 2003) the Croatian government implemented a programme of mitigating the effects of the damages caused by wolves on livestock. All of the activities, such as donations of electric fences and livestock guarding dogs as well as lectures and seminars, were carried out in Lika and Dalmatia (Štrbenac *et al.*, 2005). From that perspective, we would expect an attitude change among the respondents coming from those two regions.

Many researchers have found that socio-demographic characteristics of respondents influence the attitudes toward wolves, thus elderly, less educated people, women and sheep farmers tended to have more negative attitudes toward wolves (e.g. Kellert, 1985; Bath and Buchanan, 1989; Bjerke *et al.*, 2000; Ericsson and Heberlein, 2003; Kleiven *et al.*, 2004). Knowing this, and having in mind that the sampled populations of residents are open systems with people immigrating, emigrating, dying and entering our sampling frame as they get older, means that any potentially detected attitude change could merely be a reflection of the change in the structure of the sampled population and not an actual attitude change. The distinction between the actual attitude change and the attitude change influenced by the change in the structure of the population is important for understanding the nature of the attitudes and their formation. On the other hand, wildlife managers are interested in public opinions as such, and for them a shift in attitudes resulting from a change in the structure of the population represents a real change in attitudes that managers should address.

Previous analyses of the data collected in 2003 (Paper 1 of this thesis) revealed that, among the measured socio-demographic variables, age and gender were the most important variables in understanding public attitudes toward wolves. Indeed, Kellert and Berry (1987) stress that gender is among the most important demographic factors influencing attitudes, while Williams *et al.* (2002) in their review of 38 surveys of attitudes toward wolves, suggest that the constantly found more negative attitudes toward wolves among the older persons are the effect of the cohort influences. Cohorts, as used in social scientific research, usually consist of people who experienced a common significant life event within a period of from one to 10 years (Glenn 1977). In the case of studies regarding attitudes toward wolves, the "significant life event" is birth. By controlling for the two important socio-demographic variables of age and gender, we identify and describe the potential change in attitudes toward wolves among the general public in the wolf-inhabited regions of Croatia.

11.3 Methods

11.3.1 Sampling and data collection

The target populations for both studies were identical. The general public within the Croatian wolf range was divided into three regions defined as management units in the Wolf Management Plan for Croatia (Štrbenac *et al.*, 2005) and labelled Gorski Kotar (GK), Lika (LK) and Dalmatia (DA). In both measurements we used a stratified random sampling at a community level in order to get samples representative of each of the three regions. The sampling was based on the most recent national census data, which was 1991 census for the 1999 study (Central Bureau of Statistics - Republic of Croatia 1992) and 2001 census for the
2003 study (Central Bureau of Statistics - Republic of Croatia 2001). The sample frame (Fowler 2002) included all residents of the three regions older then 14 years. While typically respondents over 18 are selected for such social science research, in Croatia the census divided people into the age category 15-20 so sampling was done to be consistent with the census age class. The target sample was 400 per region ensuring a 95% confidence level and a 5% confidence interval (Sheskin, 1985). We carried out all the interviews in person at the respondent's place of residence. A team of five different interviewers conducted the interviews during each data collection period. All of them received interviewer training prior to implementing the interviews.

11.3.2 Research instrument

The questionnaire used in 1999 was designed by Bath and Majić (2000). It included items covering general attitudes toward wolves, attitudes toward different management options, knowledge and beliefs about wolves, experiences with wolves and demographic information about the respondents. The second questionnaire (Majić Skrbinšek and Bath 2005) was a modified version of the earlier one. All attitudinal and belief items included in the analysis were based on a 5-point Likert scale ranging from strongly disagree to strongly agree.

11.3.3 Data analysis

We used descriptive screening of the data in order to check the accuracy of the data. We followed the guidelines given by Tabachnick and Fidell (2001), and checked whether all values were in range and mean scores and standard deviations were reasonable. Cases with

missing data were excluded from the analysis, as well as the univariate and multivariate outlier cases, and multicollinear variables.

We used principal components analysis (PCA) with a varimax rotation as an exploratory technique for identifying the types of attitudes measured by the questionnaire. Following several repetitions with adjusting the number of factors extracted (Tabachnick and Fidell, 2001), regression factor scores were saved as variables and entered in the following analysis. We used a series of univariate analyses (Independent sample T test and Man Whitney U test) to identify whether there was a change in attitudes and knowledge between the two measurements of the same population. With the analysis of the set of data from 2003 (Paper 1 of this thesis) it was found that age was the most important socio-demographic variable predicting pro-wolf attitudes. While most public attitude studies examine intercohort comparisons, thus are concerned with differences among cohorts in one measurement, this paper focuses on intracohort comparisons across time (1999 - 2003). In order to control for age we partitioned the data into 5 birth cohort categories (Table 11-1), following the guidelines given by Glenn (1977). The same study revealed that gender was the most important socio-demographic variable predicting fear of wolves, hence during the analysis, the data from both measurements were weighted by gender according to the national census data from 2001 (Central Bureau of Statistics, 2001), as it was the census which was the closest in time to the both of the data collection periods (Table 11-2).

Cohorts	1999 age groups	2003 age groups
1	15-28	19-32
2	29-40	33-44
3	41-52	45-56
4	53-64	57-68
5	>64	>68

Table 11-1: The data was partitioned into 5 birth cohort categories by using respondent's age.

Table 11-2: Percentages	of females (F) and males	(M) in the	sample and	weights u	sed in the
analysis.						

Group	Gender	Sample%	Census%	Weights
GK/1999	F	37.8	51.8	1.370
	М	62.2	48.2	0.775
GK/2003	F	41	51.8	1.263
	М	59	48.2	0.817
LK/1999	F	39.6	50.7	1.280
	М	60.4	49.3	0.816
LK/2003	F	47	50.7	1.079
	М	53	49.3	0.930
DA/1999	F	47.1	51.2	1.087
	М	52.9	48.8	0.922
DA/2003	F	37.5	51.2	1.365
	М	62.5	48.8	0.781

11.4 Results

11.4.1 Respondents' characteristics

We obtained sample sizes of 402, 401 and 406 in 1999 and 406, 384 and 382 in 2003, for Gorski Kotar, Lika and Dalmatia, respectively. Response rates were above 80% in all 6 samples. There were more males than females among the survey respondents (Table 11-2), with an average of 50.3 (range 15-93, SD 17.6) years of age in 1999, and 45.6 (range 15-93, SD 17.7) years in 2003. The difference in age between the two measurements was significant (t test, p < 0.001).

Measurement		1999			2003		
Region		GK	LK	DA	GK	LK	DA
Seen wolf in captivity	Ν	279	233	246	253	295	296
	%	79.3	76.1	74.3	85.5	80.6	82.2
Seen wolf in wild	N	234	196	192	174	217	194
	%	66.5	63.6	58	58.6	59	53.9
Killed a wolf	Ν	14	11	3	8	16	10
	%	4	3.6	0.9	2.7	4.3	2.8
Hunter	Ν	46	25	34	26	27	39
	%	13.1	8.1	10.3	8.8	7.5	10.9
Owns sheep/goats	Ν	48	80	103	53	83	95
	%	13.6	26	31.1	17.8	22.6	26.4

Table 11-3: Additional characteristics of the sample with regards to the respondents' experiences with wolves and association with an interest group.

There were only two other items where respondents were significantly different over the two measurements. Most of the respondents reported seeing a wolf in captivity (Table 11-3) but significantly more saw wolves in 2003 (Man Whitney U, Z = -3.31, p= 0.001). Similarly, there was a significant difference among the two samples in number of respondents reporting seeing a wolf in the wild with less people reporting seeing a wolf in the wild in 2003 (Man Whitney U, Z = -2.61, p= 0.009). No significant difference was found among the two samples in number of respondents reporting they had killed a wolf, own sheep and / or goats and are hunters.

11.4.2 Preparatory analysis

Exploratory principal components analysis of the attitudinal items resulted in the extraction of three factors (Table 11-4). The first factor explained 23.8% of the variance and was interpreted as "support for wolf conservation". The strongest items of this factor were importance of maintaining wolves in Croatia for future generations (loading 0.79), followed by importance that wolves exist in Croatia, and opposition to hunting of wolves (loadings 0.73 and -0.72, respectively). Factor 2 explained 23.4% of the variance and was interpreted as "support to control wolf numbers". The variable with the strongest loading on this factor was opposition to complete protection of wolves (-0.72). The third factor, explaining 11% of the variance was not used in further analysis as it was based on only two items.

Table 11-4: Results of the principal components analysis (PCA) of the combined 1999 and 2003 data: Two factors were extracted and used in further analyses: Factor 1 - Support for wolf conservation, Factor 2: Support to control wolf numbers. Only loadings > 0.30 are shown in the table.

Factor	1	2
Rotation sums of squared loadings - % of variance	23.8	23.4
Eigenvalues	6.66	1.70
Attitudinal items	·	
We should assure abundant populations of wolves for the future generations.	0.40	-0.60
Whether I had a chance to see a wolf or not, it is important to me that wolves exist in Croatia.	0.73	-0.39
There is no need to have wolves in Gorski Kotar / Lika / Dalmatia (respectively to the respondent's region) since they already exist in other parts of Croatia.	-0.72	
Wolves should be completely protected in Gorski Kotar / Lika / Dalmatia (respectively to the respondent's region).	0.41	-0.72
Wolves should be allowed to be hunted year round.	-0.70	0.38
Wolves should be allowed to be killed with all possible means, including poisons and killing pups in dens.	-0.65	
Wolves keep roe deer populations in balance	0.59	
In areas where wolves live close to the communities, attacks on humans are common.	-0.31	
I would be afraid to walk in woods where wolves are present.		
I would agree with increasing wolf numbers in Croatia.	0.46	-0.63
It is important to maintain wolf population in Croatia for future generations.	0.79	
Wolves should be allowed to be hunted in a specific hunting season in Gorski Kotar / Lika / Dalmatia (respectively to the respondent's region).		0.68
Wolves cause a lot of damage to livestock.		0.58
If a wolf killed livestock, I would agree with killing of that problem animal.		0.69

Table 10-4 cont.	
We already have enough wolves in Croatia.	0.68
Farmers should receive compensations for the damages that wolves cause on their livestock.	0.54

11.4.3 Change in attitudes or a cohort effect?

We then examined the differences in the two factors between years for the two measurements for each of the zones (Table 11-5). The data were weighted by gender. Independent sample T tests revealed that there was a significant difference on Factor 1 (support for wolf conservation) in Lika, where the respondents in 2003 scored significantly lower than those in 1999 indicating decrease in public support for wolf conservation. Similar change, although at lower significance (p=0.086) was documented in Dalmatia. On Factor 2 (support for wolf control), significant differences in all three regions indicated a decrease in support to control wolf numbers.

	Fact	or 1	Factor 2			
Region	1999	1999 2003		2003		
	N, Mea	n score	N, Mean score			
Gorski Kotar	352, 0.09	295, 0.18	352, -0.18 ^a	295, -0.51ª		
Lika	308, 0.31ª	368, -0.03 ^a	308, 0.48ª	368, -0.25 ^a		
Dalmatia	331, -0.19	360, -0.32	331, 0.64ª	360, -0.25 ^a		

Table 11-5: Results of the Independent sample T tests. The data were weighted by gender.

aa =p<0.001 bb=p<0.010 cc=p<0.050

The next step was to conduct a cohort analysis of the extracted factors with the purpose of controlling for age. On the "support for wolf conservation" factor (Table 11-6), significant differences between years were recorded in the southern regions, Lika and Dalmatia, however not across all cohort groups. In Lika and Dalmatia there was a decrease in support for wolf conservation. Consistently across all regions, only the oldest cohort group (number 5) was not significantly different on Factor 1.

Factor 1	Gorski Kotar		Lika		Dalmatia	
	1999	2003	1999	2003	1999	2003
Cohort	N, Mean score		N, Mean score		N, Mean score	
1	56, 0.24	96, 0.21	48, 0.61ª	71, 0.03ª	36, 0.63	52, 0.28
2	62, 0.11	53, 0.37	58, 0.92ª	96, 0.17ª	59, 0.23 ^b	103, -0.21 ^b
3	65, 0.15	59, 0.18	59, 0.42	64, 0.20	70, -0.02 ^c	74, -0.41°
4	88, 0.10	35, -0.04	58, 0.29 ^b	62, -0.25 ^b	70, -0.60	60, -0.74
5	81, -0.11	25, -0.36	80, -0.35	58, -0.52	90, -0.62	56, -0.20

Table 11-6: Results of the Independents sample T tests by cohort groups on Factor 1 (support for wolf conservation). The data were weighted by gender.

^{aa} =p<0.001 ^{bb}=p<0.010 ^{cc}=p<0.050

On the "support for wolf control" factor (Table 11-7) significant differences were also found in the two southern regions and across all cohort groups, except the youngest one (p=0.403and p=0.096, for Lika and Dalmatia respectively). These results indicated a decrease in support for wolf control.

Factor 2	Gorski Kotar		L	ika	Dalmatia		
	1999	2003	1999	2003	1999	2003	
Cohort	N, Mean score		N, Mean score		N, Mean score		
1	56, -0.60	96, -0.79	48, -0.65	71, -0.47	36, -0.11	52, -0.49	
2	62, -0.35	53, -0.49	58, 0.47ª	96, -0.28ª	59, 0.55ª	103, -0.21ª	
3	65, -0.19	59, -0.33	59, 0.54ª	64, -0.25ª	70, 0.71ª	74, -0.15ª	
4	88, -0.01	35, -0.03	58, 0.86ª	62, -0.09ª	70, 0.79ª	60, -0.10 ^a	
5	81, 0.06	25, 0.01	80, 0.93ª	58, 0.04ª	90, 0.84ª	56, -0.20ª	

Table 11-7: Results of the Independents sample T tests by cohort groups on Factor 2 (support for wolf control). The data were weighted by gender.

^{aa} =p<0.001 ^{bb}=p<0.010 ^{cc}=p<0.050

Plots of mean values across the cohort groups, regions and the two measurements (Figure 8-1) illustrate the effect of cohorts on attitudes toward wolves. Support for control of wolf numbers increases with age, while support for wolf conservation decreases. Visual examination of the plots allows for comparisons among the regions across the cohort groups. By looking at the intersection points of the attitudinal factors' plots across the cohorts, it is possible to single out the cohort group in which the presumed shift in attitudes toward wolves from negative to more positive occurred in each of the three regions. Our results suggest that this shift first took place in Gorski Kotar as the intersection point lies over the cohort group 4, followed by Lika (cohort group 2 in 1999 and 3 in 2003) and lastly Dalmatia (cohort group 1 in 1999 and 2 in 2003). Also notable are extreme differences across the cohort groups in Lika and Dalmatia in 1999, where the younger cohort groups were

strongly supporting wolf conservation and opposing wolf control, while the older cohort groups expressed the almost exact opposite extreme opinions.



Figure 11-1: Mean values of the two analyzed factors (support to wolf conservation and support to wolf control) across the regions (Gorski Kotar = GK, Lika = LK and Dalmatia = DA) and the two measurements (1999 and 2003).

11.5 Discussion

It is difficult to document a real change in attitudes over time because we tend to sample populations at different time periods rather than directly tracking individuals over time. Thus a perceived shift in attitude could really be due to a change in the structure of the population rather than a real attitude change. By controlling for a variety of factors including age, we can determine whether the observed change in attitudes is simply a function of changing sociodemographic characteristics or a real attitude change.

We have documented a real change in attitudes toward wolves in Croatia. While Williams *et al.* (2002) in their quantitative meta-analysis found that public attitudes toward wolves have been stable over the last 30 years, our results clearly indicate that considerable changes in attitudes toward wolves can occur, even over a relatively short period of time. The changes were documented in the two southern regions, Lika and Dalmatia, with attitudes shifting towards a more neutral position as there was a decrease in support for wolf conservation and support to control wolves. Furthermore, the differences in attitudes among cohort groups in Lika and in Dalmatia have become smaller. The hypothesis that Lika, as the most neutral region, should be the most susceptible for changes in attitudes was rejected as soon as we partitioned the data into the cohort categories. Examining the cohort data for Lika in 1999 revealed that the "neutral" group was actually composed of the "extreme" cohorts with the younger cohorts supporting wolf conservation and opposing wolf control more than the most positive group, the Gorski Kotar respondents. On the other hand, the older cohorts

strongly opposed conservation of wolves and strongly supported control of the wolf population. A similar pattern across the cohort groups was found also in Dalmatia, the most negative toward wolves among the three regions. In 1999, the younger cohort groups may have been influenced more by the legal protection campaign than older cohort groups. At this time, the older cohorts seemed more sympathetic to livestock concerns and thus held stronger negative attitudes toward wolves. Attitudes in Gorski Kotar seem to have remained stable across the two measurements. One explanation for this could be the absence of sheep farming in this region, thus the absence of wolf-livestock conflicts and as a result less public interest in wolf management.

From an analytical perspective, the change in attitudes in Lika and Dalmatia can be seen as a verification of our hypothesis in which the government's measures for mitigating damage to livestock conflicts in those two regions would also reflect on the attitudes toward wolves as there was a decrease in support to control wolves. However, the support for wolf conservation has also decreased significantly in those two regions, indicating that there was a decrease in overall public interest for wolf management. This interpretation is consistent with a fading of anger-driven negative attitudes which were caused by the change in policy to initial legal protection (Bath and Majić, 2000). We suggest that over time living with wolves within this new framework could have led towards more tolerance and coexistence.

For managers who realize that attitudinal monitoring is important but challenging to implement in a way to document true shifts in attitude, this approach of assessing attitude change by cohorts is a useful first step toward a more comprehensive program of understanding attitudinal change. The movement from extreme viewpoints toward more neutral attitudes creates greater possibilities for compromise between all groups, thus suggesting that extreme positive attitudes toward wolves can be just as "problematic" as extreme negative ones in working towards effective solutions in wolf management.

Traditionally we have focused on documenting attitudes and if we determine they are negative, the objective becomes one of changing them towards more positive attitudes. In fact, finding neutral attitudes has traditionally been seen as an opportunity to influence those views toward more positive viewpoints. Our research results would suggest this is not necessary, and in fact more polarized attitudes can be more problematic in resolving issues. Attitudes should therefore be considered more as indicators of the current situation rather than objects to try to directly influence through awareness campaigns. We need to use attitudinal studies to identify the nature of conflicts, but focus further attention not on changing attitudes but on conflict resolution.

While most of the applied human dimensions research is focused on documenting public attitudes towards proposed management options usually during the planning stage of the decision-making process, we believe that the effects of the implemented management decisions on public attitudes should be addressed more often in human dimensions research. Thus human dimensions research can play a more important role as an evaluation technique. Research questions focused on evaluation require integrating human dimensions on a regular basis in the decision-making process. Such longitudinal studies allow for documenting changes in attitudes over time. If we follow the recommendations by Glenn (1977), cohort analysis that would allow an assessment of whether or not aspects of the aging process tend to influence people to be more negative towards wolves will require additional analyses of cohorts and data collected from more than two measurements in time.

11.6 Literature cited

- Bath, A. 1998. "The role of human dimensions in wildlife resource research in wildlife management". Ursus 10: 349-355.
- Bath, A. J. and Buchanan, T. 1989. "Attitudes of interest groups in Wyoming toward wolf restoration in Yellowstone National Park". *Wildlife Society Bulletin* 17: 519-525.
- Bath, A. J. and Majić, A. 2000. "Human Dimensions in Wolf Management in Croatia". Large Carnivore Initiative for Europe. Zagreb
- Bjerke, T., Vittersø, J., and Kaltenborn, B. P. 2000. "Locus of control and attitudes toward large carnivores". *Psychological Reports* 86: 37-46.
- Central Bureau of Statistics Republic of Croatia 1992. "Popis stanovništva, domaćinstava, stanova i poljoprivrednih gospodarstava, 31. ožujak 1991: Stanovništvo prema spolu i starosti, po naseljima". Republic of Croatia.
- Central Bureau of Statistics Republic of Croatia 2001. "Census of Population, Households and Dwellings, 31st March 2001". Republic of Croatia.
- Decker, D. J. and Purdy, K. G. 1988. "Toward a concept of wildlife acceptance capacity in wildlife management". *Wildlife Society Bulletin* 16: 53-57.
- Eagly, A. H. and Chaiken, S. 1993. "The Psychology of Attitudes". Harcourt Brace Jovanovich, Inc., Orlando.
- Enck, J. W. and Bath, A. J. 2001. "Restoration of wildlife species". *In:* Human Dimensions of Wildlife Management in North America. 1 ed. The Wildlife Society, Berhesda, Maryland. pp. 307-328.
- Ericsson, G. and Heberlein, T. A. 2003. "Attitudes of hunters, locals, and the general public in Sweden now that the wolves are back". *Biological Conservation* 111: 149-159.
- Fishbein, M. and Ajzen, I. 1975. "Belief, attitude, intention and behaviour: An introduction to theory and research". Addison-Wesley Publishing Company. Boston, MA

- Fowler, F. J. 2002. "Survey Research Methods". *Applied Social Research Methods Series*. Sage Publications, Newbury Park. CA.
- Fritts, S. H., Stephenson, R. O., Hayes, R. D., and Boitani, L. 2003. "Wolves and humans". *In*: Wolves: behavior, ecology and conservation. The University of Chicago, Chicago. pp. 289-316.
- Frković, A. and Huber, D. 1992. "Wolves in Croatia: Baseline data". Proceedings of the workshop: Wolves in Europe - current status and prospects. Edited by C. Promberger and W. Schröder Munich Wildlife Society, Oberammergau, Germany 67-69.
- Glenn, N. D. 1977. "Cohort Analysis". Sage Publications, Beverly Hills, CA.
- Gyorgy, J. 1984. "Istraživanje javnog mnijenja o vukovima u Hrvatskoj" [Study of public opinion about wolves in Croatia]. Zadar, Croatia. pp. 116-117. (in Croatian)
- Huber, D., Mitevski, S., and Kuhar, D. 1992. "Questionnaire on wolves in Croatia and Macedonia: Comparison of public attitudes". *Proceedings of the workshop: Wolves in Europe current status and prospects*. Edited by C.Promberger and W.Schröder. Munich Wildlife Society, Oberammergau, Germany. pp. 124-125.
- Kaczensky, P., Blazic, M., and Gossow, H. 2001. "Content analysis of articles on brown bears in the Slovenian press, 1991-1998". Forest Snow and Landscape Research 76: 121-135.
- Kellert, S. R. 1985. "Public perceptions of predators, particularly the wolf and coyote". *Biological Conservation* 31: 167-189.
- Kellert, S. R. and Berry, J. K. 1987. "Attitudes, knowledge, and behaviours toward wildlife as affected by gender". *Wildlife Society Bulletin* 15: 363-371.
- Kellert, S. R., Black, M., Rush, C. R., and Bath, A. J. 1996. "Human Culture and Large Carnivore Conservation in North America". *Conservation Biology* 10: 977-990.
- Kleiven, J., Bjerke, T., and Kaltenborn, B. P. 2004. "Factors influencing the social acceptability of large carnivore behaviours". *Biodiversity and Conservation* 13: 1647-1658.
- Majić Skrbinšek, A. and Bath, A. J. 2005. "Attitudes of rural and urban public toward wolves in Croatia: Final report". State Institute for Nature Protection. Zagreb, Croatia.
- Manfredo, M. J., Decker, D. J., and Duda, M. D. 1998. "What is the future for human dimensions of wildlife?" *Transactions of the North American Wildlife and Natural Resources Conference* 64: 278-292.
- Manfredo, M. J., Teel, T. L., and Bright, A. D. 2003. "Why are public values toward wildlife changing?" *Human Dimensions of Wildlife* 8: 287-306.

- McComas, K. A. and Scherer, C. W. 1999. "Providing balanced risk information in surveys used as citizen participation mechanisms". *Society and Natural Resources* 12: 107-119.
- Morić, S. and Huber, Đ. 1989. "Istraživanje mnijenja stranih posjetilaca Nacionalnog parka Plitvička jezera o medvjedima i vukovima" [Study of opinions of foreign visitors to the Plitvice Lakes National Park about bears and wolves]. *Ekologija* 24: 21-33. (in Croatian)
- Parliament of the Republic of Croatia 1995. "Pravilnik o zaštiti pojedinih vrsta sisavaca". [Book of rules on protection of some species of mammals]. *Official Gazette* 31: 968. (in Croatian)
- Sheskin, I. M. 1985. "Survey Research for Geographers". Association of American Geographers, Washington, DC.
- Štrbenac, A., Huber, D., Kusak, J., Majić, A., Frković, A., Štahan, Ž., Jeremić-Martinko, J., Desnica, S., and Štrbenac, P. 2005. "Wolf Management Plan for Croatia". State Institute for Nature Protection. Zagreb, Croatia.
- Tabachnick, B. G. and Fidell, L. S. 2001. "Using Multivariate Statistics". Allyn and Bacon. Toronto. Canada.
- Williams, C. K., Ericsson, G., and Heberlein, T. A. 2002. "A quantitative summary of attitudes toward wolves and their reintroduction (1972-2000)". Wildlife Society Bulletin 30: 575-584.
- Zimmermann, B., Wabakken, P., and Dötterer, M. 2001. "Human-carnivore interactions in Norway: How does the re-appearance of large carnivores affect people's attitudes and levels of fear?" *Forest Snow and Landscape Research* 76: 137-153.

12.Summary

Large carnivore survival in a human-dominated landscape predominantly depends on an interdisciplinary approach to management and conservation where a combination of biophysical and socio-economic disciplines provides relevant information to the decisionmakers. Among large carnivores, wolves seem to be the most demanding with respect to the socio-economic information contribution to their management. The wolf is often viewed as a symbol of wilderness and, as such, carries a value which needs to be preserved the future generations. On the other hand, wolves regularly kill livestock and pets causing not only economic but also emotional and psychological "damage" to the owners. Because of this controversial nature of wolf management, they have been exterminated in many parts of the world. In areas where wolves still exist, their survival depends on the level of tolerance of the coexisting public. Measuring different aspects of the tolerance, such as general attitudes towards the species, attitudes towards different management options, fear of wolves and so forth, provides the necessary sociological input to the wolf management decision-making processes.

There are challenges in measuring and interpreting the abovementioned aspects. The public is not homogenous, there are many publics and their attitudes are not stable, they can change relatively quickly. The general public can be partitioned in the two main groups, rural and urban public. There is a general agreement among the human dimensions researchers that the opinions of people which live in wolf areas are the most important in wolf management because they can be directly affected by the wolf management decisions and they are in the position to directly influence the status of the local wolf population. Within this group, it is possible to distinguish rural residents in areas with continuous presence of wolves and those in areas where wolves are returning after being absent, usually for several decades. In Croatia, Gorski Kotar and Lika are the areas with continuous wolf presence while Dalmatia was for the most part absent of wolves during the 1970s and 1980s. Furthermore, wolves live in areas with sheep farming (Lika and Dalmatia) and in areas without this main source of conflict (Gorski Kotar). On the other hand, most countries regulate wolf management on a national and even international level, making the wolf management a matter of national and international importance. Subsequently, the residents of areas non-inhabited by wolves and urban public should also have a say in wolf management decision-making. In Croatia, wolf management is regulated through the national legislation with The Nature Protection Act (Parliament of the Republic of Croatia 2005), as well as the international – Bern Convention (Council of Europe 1979), among others. The different groups hold different opinions about wolf management. How to balance those opinions remains a challenge for the wolf managers and wolf management decision-makers. The role of human dimensions researchers is to provide the most relevant information for the wolf management process on the publics' opinions and attitudes.

In Croatia, the documented significant differences among the publics' attitudes of the three wolf-inhabited rural regions ranged from considerable support of the complete protection of wolves in Gorski Kotar to support of hunting wolves year round in Dalmatia. As a result, the division of the Croatian wolf range into three management units seems correct from the social viewpoint. But in the bigger context, the context of the entire Dinaric wolf population which is shared by different countries, this approach becomes questionable since each of the countries traditionally considers and deals only with its own section of the population. Transboundary cooperation in management as well as in research thus represents a prerequisite if a more spatially refined approach to management, such as zoning, is to be taken. Clear vision for the future and harmonized management goals at the level of the whole Dinaric wolf population would allow for local adjustments and interventions, such as local control of wolf numbers, without jeopardizing the survival of the entire population.

Knowledge about wolves seems intuitively that it should be a good predictor of attitude and while it has been confirmed by other researchers (Bath 1991; Ericsson and Heberlein 2003), the relationship between knowledge and attitude is often very weak (Ericsson and Heberlein 2003). In this study, knowledge predicted fear of wolves, but not the general attitude toward wolves, thus only partially confirming the premise of the importance of factual information about wolves for the acceptance of wolves. The challenge for the managers that whish to utilize this correlation is twofold: choosing the right pieces of information that could affect the fear component of attitude toward wolves, and finding ways to reach the uninterested public. In terms of reaching the public, Ericsson and Heberlein (2003) single out widely publicized events as successful.

The experience of seeing a wild wolf was negatively correlated with pro-wolf attitudes. As a result we hypothesize that seeing a wild wolf in the context of living in an area where carnivore attacks to livestock occur, will probably reinforce already existing negative attitudes

toward the large carnivore. Seeing a captive wolf (in a zoo, for example) had a positive effect on both attitudes toward wolves and knowledge about wolves, but not on fear of wolves. Hence, seeing a captive wolf could be seen as a "shortcut" to increased knowledge about wolves and more positive attitudes toward wolves, but it can not replace the actual experience of living with wolves (and seeing them in wild) in decreasing the fear of wolves.

Association with an interest group plays an important role in defining the attitudes toward wolves. The fact that ownership of livestock was negatively associated with positive attitudes toward wolves indicates that this group probably has a different hierarchy of values since they need to consider costs and benefits of the potential of damage happening versus maintaining wolf populations. Livestock owners therefore form an interest group which needs special attention in addressing the wolf management issues within their scope of interest.

Traditionally we have focused on documenting attitudes and if we determine they are negative, the objective becomes one of changing them towards more positive attitudes. In fact, finding neutral attitudes has traditionally been seen as an opportunity to influence those views toward more positive viewpoints. This research results would suggest this is not necessary, and in fact more polarized attitudes can be more problematic in resolving issues. Attitudes should therefore be considered more as indicators of the current situation rather than objects to try to directly influence through awareness campaigns. We need to use attitudinal studies to identify the nature of conflicts, but focus further attention not on changing attitudes but on conflict resolution. The documented change in attitudes toward wolves indicates that considerable changes can occur, even over a relatively short period of time. The changes were documented in the two southern regions, Lika and Dalmatia, with attitudes shifting towards a more neutral position as there was a decrease in support for wolf conservation and support to control wolves. This loss of interest for wolf management among the publics of Lika and Dalmatia can be interpreted as a process of learning to live with wolves under the new framework of legally protected wolves. The act of legal protection of wolves on a national level in 1995 was marked with a lot of anger-driven opposition in those two regions. The future monitoring of public attitudes toward wolves and wolf management will allow a better assessment of the effectiveness of current efforts of the government to mitigate the negative effects of the wolf presence to sheep farming.

13. Bibliography

- Aarhus Convention. 1998. "Convention on access to information, public participation in decision-making and access to justice in environmental matters". Aarhus, Denmark. pp. 1-25.
- Bath, A. 1996. "Increasing the applicability of human dimensions research to large predators". *Journal of Wildlife Research* 1: 215-220.
- Bath, A. 1998. "The role of human dimensions in wildlife resource research in wildlife management". Ursus 10: 349-355.
- Bath, A. J. 1989. "The public and wolf reintroduction in Yellowstone National Park". *Society* and Natural Resources 2: 297-306.
- Bath, A. J. 1991. "Public attitudes in Wyoming, Montana and Idaho toward wolf restoration in Yellowstone National Park". *Transactions of the North American Wildlife and Natural Resources Conference* 56: 91-95.
- Bath, A. J. 1996. "Increasing the applicability of human dimensions research to large predators". *Journal of Wildlife Research* 1: 215 -220.
- Bath, A. J. 2000. "Human Dimensions in Wolf Management in Savoie and Des Alpes Maritimes", France. Large Carnivore Initiative for Europe.
- Bath, A. J. and Buchanan, T. 1989. "Attitudes of interest groups in Wyoming toward wolf restoration in Yellowstone National Park". *Wildlife Society Bulletin* 17: 519-525.
- Bath, A. J. and Majić, A. 2000. "Human Dimensions in Wolf Management in Croatia". Large Carnivore Initiative for Europe. Zagreb. Croatia.
- Bjerke, T., Vittersø, J., and Kaltenborn, B. P. 2000. "Locus of control and attitudes toward large carnivores". *Psychological Reports* 86: 37-46.
- Boitani, L. 2000. "Action Plan for the conservation of the wolves (*Canis lupus*) in Europe". *Accepted by:* Convention on the Conservation of European Wildlife and Natural Habitats, Strasbourg.
- Breitenmoser, U. 1998. "Large predators in the Alps: The fall and rise of man's competitors". *Biological Conservation* 83: 279-289.

- Breitenmoser, U. and Landry, J.-M. 1998. "The return of the wolf to Switzerland: Workshop on human dimension in large carnivore conservation". *Edited by*: D. Strahm. KORA, Muri Bern. pp. 8.
- Central Bureau of Statistics Republic of Croatia 1992. "Popis stanovništva, domaćinstava, stanova i poljoprivrednih gospodarstava, 31. ožujak 1991: Stanovništvo prema spolu i starosti, po naseljima". [Census of residents, households, apartments and agricultural lands, 31. March 1991: Residents by gender and age, by communities]. Republički zavod za statistiku. Zagreb. Republic of Croatia (in Croatian)
- Central Bureau of Statistics Republic of Croatia 2001. "Census of Population, Households and Dwellings, 31st March 2001". Republic of Croatia.
- Chase, L. C., Lauber, T. B., and Decker, D. J. 2001. "Citizen Participation in Wildlife Management Decisions". *In*: Human Dimensions of Wildlife Management in North America. The Wildlife Society, Bethesda. pp. 153-170.
- Council of Europe 1979. "Convention on the Conservation of European Wildlife and Natural Habitats". 19. IX.1979 ed.
- Decker, D. J. and Purdy, K. G. 1988. "Toward a concept of wildlife acceptance capacity in wildlife management". *Wildlife Society Bulletin* 16: 53-57.
- Decker, D. J., Brown, T. L., and Siemer, W. F. 2001. "Evolution of People-Wildlife Relations". *In*: Human Dimensions of Wildlife Management in North America. The Wildlife Society, Bethesda. pp. 3-22.
- Eagly, A. H. and Chaiken, S. 1993. "The Psychology of Attitudes". Harcourt Brace Jovanovich, Inc., Orlando. FL.
- Enck, J. W. and Bath, A. J. 2001. "Restoration of wildlife species". In: Human Dimensions of Wildlife Management in North America. 1 ed. The Wildlife Society, Berhesda, Maryland. pp. 307-328.
- Enck, J. W. and Brown, T. L. 2002. "New Yorkers' attitudes toward restoring wolves to the Adirondack Park". *Wildlife Society Bulletin* 30: 16-28.
- Ericsson, G. and Heberlein, T. A. 2003. "Attitudes of hunters, locals, and the general public in Sweden now that the wolves are back". *Biological Conservation* 111: 149-159.
- Fishbein, M. and Ajzen, I. 1975. "Belief, attitude, intention and behaviour: An introduction to theory and research". Addison-Wesley Publishing Company. Boston, MA
- Fowler, F. J. 2002. "Survey Research Methods". *Applied Social Research Methods Series*. Sage Publications, Newbury Park. CA.

- Fritts, S. H., Stephenson, R. O., Hayes, R. D., and Boitani, L. 2003. "Wolves and humans". *In:* Wolves: behavior, ecology and conservation. The University of Chicago, Chicago. pp. 289-316.
- Frković, A. and Huber, D. 1992. "Wolves in Croatia: Baseline data". Proceedings of the workshop: Wolves in Europe - current status and prospects. Edited by C. Promberger and W. Schröder Munich Wildlife Society, Oberammergau, Germany 67-69.
- Frković, A., Ruff, R. L., Cicnjak, L., and Huber, D. 1992. "Wolf mortality during 1945-86 in Gorski Kotar of Croatia, Yugoslavia". *Global Trends in Wildlife Management* 2: 353-358.
- Glenn ,N. D. 1977. "Cohort Analysis". Sage Publications, Beverly Hills, CA.
- Gyorgy, J. 1984. "Istraživanje javnog mnijenja o vukovima u Hrvatskoj" [Study of public opinion about wolves in Croatia]. Zadar, Croatia. pp. 116-117. (in Croatian)
- Huber, Đ., Kusak, J., Kovačić, D., Frković, A., Radović, J., and Štahan, Ž. 1999. "Privremeni plan gospodarenja vukom u Hrvatskoj" [Temporary wolf management plan for Croatia]. Državna uprava za zaštitu prirode i okoliša, Zagreb. (in Croatian)
- Huber, D., Mitevski, S., and Kuhar, D. 1992. "Questionnaire on wolves in Croatia and Macedonia: Comparison of public attitudes". *Proceedings of the workshop: Wolves in Europe current status and prospects*. Edited by C. Promberger and W. Schröder. Munich Wildlife Society, Oberammergau, Germany. pp. 124-125.
- Johnston, K. N., Johnson, R. L., Edwards, D. K., and Wheaton, C. A. 1993. "Public participation in wildlife management: opinions from public meetings and random surveys". *Wildlife Society Bulletin* 21: 218-225.
- Kaczensky, P., Blazic, M., and Gossow, H. 2001. "Content analysis of articles on brown bears in the Slovenian press, 1991-1998". *Forest Snow and Landscape Research* 76: 121-135.
- Kaltenborn, B. P., Bjerke, T., and Vittersø, J. 1999. "Attitudes toward large carnivores among sheep farmers, wildlife managers, and research biologists in Norway". *Human Dimensions of Wildlife* 4: 57-73.
- Kellert, S. R. 1985. "Public perceptions of predators, particularly the wolf and coyote". *Biological Conservation* 31: 167-189.
- Kellert, S. R. and Berry, J. K. 1987. "Attitudes, knowledge, and behaviours toward wildlife as affected by gender". *Wildlife Society Bulletin* 15: 363-371.
- Kellert, S. R., Black, M., Rush, C. R., and Bath, A. J. 1996. "Human Culture and Large Carnivore Conservation in North America". *Conservation Biology* 10: 977-990.

- Kleiven, J., Bjerke, T., and Kaltenborn, B. P. 2004. "Factors influencing the social acceptability of large carnivore behaviours". *Biodiversity and Conservation* 13: 1647-1658.
- Korenčić, M. 1979. "Naselja i stanovništvo SR Hrvatske 1857-1971". [Communities and residents of SR Croatia 1857 1971]. SR Croatia (in Croatian)
- Kusak, J. 2002. "Analysis of living conditions for wolves in Croatia". University of Zagreb, Faculty of Science, Department of Biology, pp. 1-247.
- Linnell, J. D. C., Odden, J., Smith, M. E., Aanes, R., and Swenson, J. E. 1999. "Large carnivores that kill livestock: do "problem individuals" really exist?" Wildlife Society Bulletin 27: 698-705.
- Linnell, J. D. C., Swenson, J. E., and Andersen, R. 2001. "Predators and people: conservation of large carnivores is possible at high human densities if management policy is favourable". *Animal Conservation* 4: 345-349.
- Majić Skrbinšek, A. and Bath, A. J. 2004. "Attitudes of rural and urban public toward wolves in Croatia: Preliminary report". State Institute for Nature Protection. Zagreb, Croatia.
- Majić Skrbinšek, A. and Bath, A. J. 2005. "Attitudes of rural and urban public toward wolves in Croatia: Final report". State Institute for Nature Protection. Zagreb, Croatia.
- Manfredo, M. J., Decker, D. J., and Duda, M. D. 1998. "What is the future for human dimensions of wildlife?" *Transactions of the North American Wildlife and Natural Resources Conference* 64: 278-292.
- Manfredo, M. J., Teel, T. L., and Bright, A. D. 2003. "Why are public values toward wildlife changing?" *Human Dimensions of Wildlife* 8: 287-306.
- Manfredo, M. J., Vaske, J. J., and Teel, T. L. 2003. "The potential for conflict index: A graphic approach to practical significance of human dimensions research". *Human Dimensions of Wildlife* 8: 219-228.
- Manfredo, M. J., Zinn, H. C., Sikorowski, L., and Jones, J. 1998. "Public acceptance of mountain lion management: a case study of Denver, Colorado, and nearby foothills areas". Wildlife Society Bulletin 26: 964-970.
- McComas, K. A. and Scherer, C. W. 1999. "Providing balanced risk information in surveys used as citizen participation mechanisms". *Society and Natural Resources* 12: 107-119.
- McNaught, D. 1987. "Wolves in Yellowstone? Park visitors respond". Wildlife Society Bulletin 15: 518-521.
- Mech, L. D. 1995. "The Challenge and Opportunity of Recovering Wolf Populations". *Conservation Biology* 9: 1-9.

- Mech, L. D. 1996. "A new era for carnivore conservation". Wildlife Society Bulletin 24: 397-401.
- Mitchell, B. 1989. "Geography and resource analysis". John Wiley and Sons, New York.
- Morić, S. and Huber, Đ. 1989. "Istraživanje mnijenja stranih posjetilaca Nacionalnog parka Plitvička jezera o medvjedima i vukovima" [Study of opinions of foreign visitors to the Plitvice Lakes National Park about bears and wolves]. *Ekologija* 24: 21-33. (in Croatian)
- Naughton-Treves, L., Grossberg, R., and Treves, A. 2003. "Paying for Tolerance: Rural Citizens' Attitudes toward Wolf Depredation and Compensation". *Conservation Biology* 17: 1500-1511.
- Parliament of the Republic of Croatia 1995. "Pravilnik o zaštiti pojedinih vrsta sisavaca". [Book of rules on protection of some species of mammals]. Official Gazette 31: 968. (in Croatian)
- Parliament of the Republic of Croatia 2005. "Nature Protection Act." Official Gazette 70/05.
- Radišić, B., Novosel, D., Huber, D., and Frković, A. 1994. "Study of public attitudes towards wolves in Croatia / Istraživanje javnog mnjenja o vukovima u Hrvatskoj". Pula. Croatia. pp. 395.
- Rodriguez, M., Krausman, P. R., Ballard, W. B., Villalobos, C., and Shaw, W. W. 2003. "Attitudes of Mexican citizens about wolf translocation in Mexico". *Wildlife Society Bulletin* 31: 971-979.
- Scarce, R. 1998. "What do wolves mean? Conflicting social construction of *Canis lupus* in "Bordertown"". *Human Dimensions of Wildlife* 3: 26-45.
- Sheskin, I. M. 1985. "Survey Research for Geographers". Association of American Geographers, Washington, DC.
- SPSS Inc. 2002. SPSS for Windows. 11.5.0 ed.
- Štrbenac, A., Huber ,D., Kusak, J., Majić, A., Frković, A., Štahan, Ž., Jeremić-Martinko, J., Desnica ,S., and Štrbenac, P. 2005. "Wolf Management Plan for Croatia". State Institute for Nature Protection. Zagreb. Croatia.
- Tabachnick, B. G. and Fidell, L. S. 2001. "Using Multivariate Statistics". Allyn and Bacon. Toronto. Canada.
- Vittersø, J., Bjerke, T., and Kaltenborn, B. P. 1999. "Attitudes toward large carnivores among sheep farmers experiencing different degrees of depredation". *Human Dimensions of Wildlife* 4: 20-35.

- Williams, C. K., Ericsson, G., and Heberlein, T. A. 2002. "A quantitative summary of attitudes toward wolves and their reintroduction (1972-2000)". *Wildlife Society Bulletin* 30: 575-584.
- Zimmermann, B., Wabakken, P., and Dötterer, M. 2001. "Human-carnivore interactions in Norway: How does the re-appearance of large carnivores affect people's attitudes and levels of fear?" *Forest Snow and Landscape Research* 76: 137-153.

14. Appendices

14.1 Appendix 1: Questionnaire 1999



ATTITUDES TOWARD THE WOLF IN CROATIA

Memorial University of Canada in cooperation with the Large Carnivore Initiative for Europe and various groups and organization in Croatia is developing a project to try and learn more about wolf area residents' attitudes toward wolves in Croatia. Thank you for agreeing to take a few minutes to answer the following questions about your feelings and beliefs about and behaviour toward wolves. Your answers, combined with those of other respondents, will provide valuable insights into the way people of Croatia feel about wolves and how the wolf should be managed. Each of your responses, whether against, in favour, or neutral, is valuable, and we encourage you to answer all of the questions. Your individual answers will be grouped with those of others, and individual responses will be kept strictly confidential. This questionnaire is totally anonymous. Please answer the questions openly and do not write your name. Thank you in advance for your help with this important program.

Sincerely,

Dr. Alistair Bath Project Director

Aleksandra Majić Project Coordinator

A. lugic

SECTION A: The first few questions ask about your feelings toward wolves. Please circle the response that best describes your opinion.

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

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

2. To have wolves in Croatia is:

- a) good.
- b) bad.
- 3. To have wolves in Gorski kotar / Lika / Dalmacija (in regard to respondent's

c) indifferent.

- region) is: a) good.
 - b) bad.

c) indifferent.

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.

4.	It is important to maintain wolf populations in Croatia so that future generations can enjoy them	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5
5.	It is important to maintain wolf populations in region of Gorski kotar / Lika / Dalmacija (in regard to respondent's region) so that future generations can enjoy them.	1	2	3	4	5
6.	It is important to have healthy populations of wolves in region of Gorski kotar / Lika / Dalmacija (in regard to respondent's region).	1	2	3	4	5
7.	We should assure that future generations have an abundant wolf population.	1	2	3	4	5
8.	Whether or not I would get to see a wolf, it is important to me that they exist in region of Gorski kotar / Lika / Dalmacija (in regard to respondent's region).	1	2	3	4	5
9.	Wolves have a significant impact on big game.	1	2	3	4	5
10.	Wolves have a significant impact on small game.	1	2	3	4	5

 Wolves reduce populations of roe deer, red deer and wild boar to unacceptable levels. 	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5
12. It is unnecessary to have wolves in region of Gorski kotar / Lika / Dalmacija (in regard to respondent's region) because abundant populations of wolves already exist in other parts of Croatia.	1	2 3	3 4	5	
13. It is unnecessary to have wolves in Croatia because abundant populations already exist in other European countries.	1	2 3	3 4	5	
14. Wolves should be completely protected in region of Gorski kotar / Lika / Dalmacija (in regard to respondent's region).	1	2 3	3 4	5	
15. Wolves should be completely protected in Croatia.	1	2 3	3 4	5	
16. Wolves should be allowed to be hunted in specific hunting seasons in region of Gorski kotar / Lika / Dalmacija (in regard to respondent's region).	1	2 3	3 4	5	
17. Wolves should be allowed to be hunted year round in region of Gorski kotar / Lika / Dalmacija (in regard to respondent's region).	1	2 3	3 4	5	
18. Wolves should be killed by all means including killing pups in dens and the use of poison in region of Gorski kotar / Lika / Dalmacija (in regard to respondent's region).	1	2 3	8 4	5	
19. Wolves keep roe deer populations in balance.	1	2 3	3 4	5	
20. Having wolves in region of Gorski kotar / Lika / Dalmacija (in regard to respondent's region) increases tourism in Gorski kotar / Lika / Dalmacija.	1	2 3	8 4	5	
21. Wolves cause abundant damages to livestock.	1	2 3	3 4	5	

22. In areas where wolves live in close proximity to humans, wolf attacks on humans are common.	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5			
23. In areas where wolves live near livestock, their primary food is livestock.	1	2 3	3 4		5			
24. I would be afraid to hike in the woods if wolves were present.	1	2 3	3 4		5			
 25. In your opinion, which animal is most dangerous to humans? a) Wolves. b) Bears. c) Lynx. 								
SECTION B: The next few questions a wolf. Please circle the response that you	sk about you feel best ans	ır general k swers the q	nowledge uestion.	of the				
1. How many wolves do you believe curre	ntly exist in (Croatia?	w	olves.				
 2. Do you believe wolf numbers in Croatia a) increasing. b) decreasing. 	are:	c) rem	naining the	same.				
 How many wolves do you believe curre (in regard to respondent's region). 	ntly exist in (wolves.	Gorski kota	r / Lika / I	Dalmacija	ı			
 4. Do you believe wolf numbers in region to respondent's region) are: a) increasing. 	of Gorski ko	tar / Lika / c) ren	Dalmacija naining the	(in regai same.	d			
b) decreasing.								
 5. How much does the average adult male a) 1-20 kg b) 21-40 kg c) 41-60 kg 	wolf weigh i	n Croatia? d) mo: e) I do	re than 60 l on't know.	cg				
 6. There used to be wolves throughout the Dalmacija (in regard to respondent's re a) yes 	e entire region egion). b) no	n of Gorski	kotar / Li	ka /) not sur	e			
7. Wolves are completely protected in Cro	oatia.							
a) yes	b) no		c) not sur	e			
8. It is generally true that only two memb one year?	oers (one pair	r) of a wolf	pack breed	l in any				
a) yes	b) no		c) not sur	e			
9. How many sheep and goats do you think were killed by wolves last year in region of Gorski kotar / Lika / Dalmacija (in regard to respondent's region)?								

10.	Wolves	wil	l kill sheep an	d goats only	if theı	re are	not enoug	h deer and	other wi	ild
	game.	a)	truth		b)	false			c) no	t sure
11.	How of	f ten a) b) c)	is a wolf gener in every case one in two ch one in ten cha	rally able to b ances ances	kill su	ccessf	ully wild _I d) e)	orey? one in twe not sure	nty chano	ces
12.	. What i	s the a) b) c)	e average pack 1-10 wolves 11-20 wolves 21-30 wolves	size of wolv	es in (Croati	a? d) e)	more than not sure	30 wolve	es
SI m re 1	ECTIO anagem sponse t = Stror	N C ent j ihat ngly	: These last for practices and best describes Disagree; 2	ew questions your behavio your opinic = Disagree;	ask a our toy n, usi 3 = N	bout y ward y ng the eutra	vour feelin volves. Pl following l; 4 = Agi	egs toward ease, put a g scale: ree; 5 = St	various circle in rongly A	i the Agree.
1.	I would numbe	l agi rs in	ree with increa 1 Croatia.	asing wolf	Stroi Disa	ngly gree	Disagree	Neutral	Agree	Strongly Agree
If y num 	you disag mbers to you agree rease in t	e or s	or strongly disa ease in Croatia strongly agree, atia?	ngree, what is ? what is your	your j	primar Ty reas	y reason fo	r not wanti	ng wolf	
2.	I would numbe Lika / I respon	l agı rs in Daln dent	ree with increa 1 region of Go nacija (in rega 2's region).	asing wolf rski kotar / rd to		1	2	3	4	5
3.	If a wo agree v animal	lf ki vith	lled livestock, killing this pr	I would oblem	1	1	2	3	4	5
4.	I would money progra to wolv	l be tow m fo res.	willing to con ard a compen or farmers for	tribute sation losses due	1	1	2	3	4	5
5.	We alr Croatia	eady 1.	have enough	wolves in	1	1	2	3	4	5

6.	We already have enough wolves in region of Gorski kotar / Lika / Dalmacija (in regard to respondent's region).	Strongly Disagree 1	Disagree 2	e Neutra 3	l Agree	Strongly Agree 5	
7.	Livestock owners should receive money for living in a zone where there are wolves instead of receiving compensation for losses that wolf causes.	1	2	3	4	5	
8.	Livestock owners should not receive compensation for damages caused by wolves if they do not use methods to prevent damages, for example, guard dogs.	1	2	3	4	5	
9.	Livestock owners that lose livestock due to wolf attacks should be compensated.	1	2	3	4	5	
If you <i>agree</i> or <i>strongly agree</i> with #9 , please answer the following questions a) to e). If you <i>disagree</i> or <i>strongly disagree</i> or are <i>neutral</i> , please answer questions in SECTION D . Thank you.							
a)	I would like my taxes to be used toward paying compensation for damages caused by wolves.	1	2	3	4	5	
b)	Administration should pay compensation to livestock owners who lose livestock to wolves.	1	2	3	4	5	
c)	Livestock owners should be required to buy insurance for protection against wolf attacks.	1	2	3	4	5	
d)	Administration should pay for this insurance for livestock owners.	1	2	3	4	5	
e)	There should be authorized wolf hunts in region of Gorski kotar / Lika / Dalmacija (in regard to respondent's region).	1	2	3	4	5	

SECTION D: Your experience, if any, with wolves	:
 Have you ever seen alive wolf in the wild? a) yes 	b) no
 Have you ever seen a wolf in captivity? a) yes 	b) no
 Have you ever killed a wolf? a) yes 	b) no

4. On a scale from 1 to 10, how important is the issue of wolf management in Croatia to you personally?

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

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

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

SECTION E: With respect to you:

I

1.					
a) .	Female				
b)	Male				
II. Age:					
III. Place of reside Place of birth	nce (name of	village or city)			
IV. Occupation?					
V. Did you hunt in	1998?	a) yes	b) no		
VI. If you are a liv	estock owner	, what type of li	vestock do you h	ave?	,
a)	Sheep			c)	Cows
b)	Goats			d)	Horses

Thank you for your co-operation. If you have other comments on this subject or with respect to the questionnaire, please write them here.
14.2 Appendix 2: Questionnaire 2003

Dear madam / sir!

Ministry of environmental protection and physical planning in cooperation with Memorial University of Newfoundland and various groups and organization from Croatia is developing a project to try and learn more about wolf area residents' attitudes toward wolves in Croatia.

We hope that you will be willing to take **a few minutes** to answer the following questions about your feelings and beliefs about wolves and wolf management. Your answers, combined with those of other respondents, will provide valuable insights into the way people of Croatia feel about wolves and how wolves should be managed.

Each of your responses, whether against, in favour, or neutral, is valuable, and we encourage you to answer all of the questions. Regardless of how much you know about wolves and wolf management, it is important that we document your opinion too. Your individual answers will be grouped with those of others, and individual responses will be kept strictly confidential. This questionnaire is **completely anonymous**. Please answer the questions openly.

Thank you in advance for your help in this important study.

Sincerely,

Alistair J. Bath Project Director Aleksandra Majić Project Coordinator



2

SECTION A: The first few questions ask about your feelings toward wolves. Please circle the response that best describes your opinion.

Which of the following best describes your feelings toward wolves? a) Completely against. b) Against. c) Neither in favour nor against. (b) Against. c) Neither in favour nor against.

To have wolves in Croatia is: a) Bad.

b) Indifferen c) Good. t.

 To have wolves in Gorski kotar/Lika/Dalmacija (in regard to respondent's region) is:

a) Bad. b) Indifferen c) Good. t.

- 4. Has your attitude toward wolves changed over the last two years?
 - a) No.

b) Yes.

- 5. If yes, have you become:
 - a) More b) Neutral. negative c) More . positive.
- 6. Why has your attitude changed or why has it not changed?

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.

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7.	It is important to maintain wolf population in Croatia for the future generations.	1	2	3	4	5
8.	It is important to maintain wolf population in Gorski kotar/Lika/Dalmacija (in regard to respondent's region) for the future generations.	1	2	3	4	5
9.	We should assure that future generations have an abundant wolf population.	1	2	3	4	5
10.	Whether or not I would get to see a wolf, it is important to me that they exist in Croatia.	1	2	3	4	5
11.	Wolves reduce populations of roe deer, red deer and wild boar to unacceptable levels.	1	2	3	4	5

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
12. It is unnecessary to have wolves in region of Gorski kotar/Lika/ Dalmacija (in regar to respondent's region) because abundant populations of wolves already exis in other parts of Croatia.	d 1 it	2	3	4	5
13. It is unnecessary to have wolves in Croatia because abundant populations of wolves already exis in other European countries.) it	2	3	4	5
14. Wolves should be completely protecto in region of Gorski kotar/ Lika/ Dalmacija (in regar to respondent's region).	ed d ¹	2	3	4	5
15. Wolves should be completely protecto in Croatia.	ed 1	2	3	4	5

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
16. Wolves should be allowed to be hunted in specific hunting seasons in region of Gorski kotar/ Lika/ Dalmacija (in regard to respondent's region).	1	2	3	4	5
17. Wolves should be allowed to be hunted year round in region of Gorski kotar/ Lika/ Dalmacija (in regard to respondent's region).	1	2	3	4	5
18. Wolves should be killed by all means including killing pups in dens and the use of poison in region of Gorski kotar/ Lika/ Dalmacija (in regard to respondent's region).	1	2	3	4	5
19. Wolves keep roe deer populations in balance.	1	2	3	4	5
20. There is less roe deer and red deer today than two years ago.	1	2	3	4	5

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
21. Having wolves in region of Gorski kotar/ Lika/ Dalmacija (in regard to respondent's region) increases tourism in Gorski kotar/ Lika/ Dalmacija.	1	2	3	4	5
22. Wolves cause abundant damages to livestock.	1	2	3	4	5
23. In areas where wolves live in close proximity to people, wolf attacks on humans are common.	1	2	3	4	5
24. In areas where wolves live near livestock, their primary food is livestock.	1	2	3	4	5
25. I would be afraid to hike in the woods if wolves were present.	1	2	3	4	5

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

a) Wolves.

d) Equally dangerous.

e) None is dangerous.

b) Bears. c) Lynx.

27. Over the past two years media articles about wolves have become:

- a) More negative toward wolves.
- b) Have not changed.
- c) More positive toward wolves.

7

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

28. My knowledge of wolves in comparison to two years ago has:

a) Decreased.

- c) Increased.
- b) Remained the same. d) Not sure.
- 29. How many wolves do you believe currently exist in Croatia? wolves.

30. Do you believe wolf numbers in Croatia since two years ago have:

a) Decreased.

- c) Increased.
- b) Remained the same. d) Not sure.

31. How many wolves do you believe currently exist in Gorski kotar/ Lika/ Dalmacija (in regard to respondent's region)? wolves

32. Do you believe wolf numbers in Gorski kotar/ Lika/ Dalmacija (in regard to respondent's region) since two years ago have:

a) Decreased.

- c) Increased.
- b) Remained the same. d) Not sure.

33. How much does the average adult male wolf weigh in Croatia?

- a) 1-20 kg.
- b) 21-40 kg.
- c) 41-60 kg.

34. There used to be wolves throughout the entire region of Gorski kotar/ Lika/ Dalmacija (in regard to respondent's region).

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

35. Wolves are completely protected in Croatia?

a) True.

b) False.

c) Not sure.

- d) More than 60 kg.
- e) Not sure.

36. Livestock losses due to wolves in comparison to two years ago have: a) Decreased. c) Increased. b) Remained the same. d) Not sure. 37. Why? _____ 38. Wolves kill sheep and goats only if there are not enough deer and other wild game. a) True. b) False. c) Not sure. 39. How often is a wolf generally able to kill successfully wild prey? a) In every case. d) One in twenty chances. e) Not sure. b) One in two chances. c) One in ten chances. 40. What is the average pack size of wolves in Croatia? a) 1-10 wolves. d) More than 30 wolves. b) 11-20 wolves. e) Not sure. c) 21-30 wolves. 41. Have you ever heard about EU Life a) Yes b) No c) Not sure project focused on wolves in Croatia? 42. Have you seen "SOS Vuk" poster? a) Yes b) No c) Not sure 43. Have you seen EU Life project leaflet a) Yes b) No c) Not sure about wolves in Croatia? 44. Have you ever seen a lecture about a) Yes b) No c) Not sure wolves in Croatia? 45. Have you ever seen HRT a) Yes b) No c) Not sure documentary film about wolves in Croatia?

8

46.	Have you ever seen brochures about guarding dogs and livestock preventative measures?	a) Yes	b) No	c) Not sure
47.	Have you ever heard about local offices in Dalmatia and Lika which have the purpose to help people with damage prevention issues?	a) Yes	b) No	c) Not sure
48.	Have you ever been to one?	a) Yes	b) No	c) Not sure
49.	If yes, which one?	In		
50.	Where did you get most of your informat	ion abo	ut wolv	es?

SECTION C: These last few questions ask about your feelings toward various management practices and your behaviour toward wolves. 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.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
51. I would agree with increasing wolf numbers in Croatia.	1	2	3	4	5

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

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

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
52.	I would agree with increasing wolf numbers in Gorski kotar/ Lika/ Dalmacija (in regard to respondent's region).	1	2	3	4	5
53.	If a wolf killed livestock, I would agree with killing this problem animal.	1	2	3	4	5
54.	We already have enough wolves in Croatia.	1	2	3	4	5
55.	We already have enough wolves in region of Gorski kotar/ Lika/ Dalmacija (in regard to respondent's region).	1	2	3	4	5
56.	Livestock owners that lose livestock due to wolf attacks should be compensated.	1	2	3	4	5

If you *agree* or *strongly agree* with question number 56, please answer the following questions a) to c). If you *disagree* or *strongly disagree* or are *neutral*, please continue with the question number 57.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
a) Administration should pay compensation to livestock owners who lose livestock to wolves.	1	2	3	4	5
b) Livestock owners should be required to buy insurance for protection against wolf attacks.	1	2	3	4	5
c) Administration should help paying for this insurance.	1	2	3	4	5

If you *agree* or *strongly agree* with question *c*), please answer the following question *d*). If you *disagree* or *strongly disagree* or are *neutral*, please continue with the question number 57. Thank you.

d) How much of the total insurance should be paid by administration? Please circle the percentage below.

								1		
0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
57. Livestock owners should not receive compensation for damages caused by wolves if they do not use methods to prevent damages, for example, guard dogs.	1	2	3	4	5
58. Livestock owners should receive money for living in a zone where there are wolves, instead of receiving compensation for losses that wolf causes.	1	2	3	4	5
59. In areas where wolf attacks to livestock are frequent, protection from the wolves should be removed even if it means that compensations for losses that wolves cause would not be paid.	1	2	3	4	5
60. Views of hunters are being taken into account when government makes decisions concerning wolf management.	1	2	3	4	5

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
61. Views of livestock owners are being taken into account when government makes decisions concerning wolf management.	1	2	3	4	5
62. Views of environmental NGC are being taken int account when government makes decisions concernin wolf management.	Ds :o 1 s ng	2	3	4	5

63. I feel my views regarding wolves are listened to by government:

- a) Not at all.
- b) Less than before.

e) Significantly more than before.

- c) Same as before.
- d) More than before.

SECTION D: Your experience, if you have any, with wolves:

64. Have you ever seen a live wolf in the wild?

- a) No.
- b) Yes.

65. Have you ever seen a wolf in captivity?

- a) No.
- b) Yes.

66. Have you ever killed a killed?

- a) No.
- b) Yes.
- 67. On a scale from 1 to 10, how important is the issue of wolf management to you personally (circle the number)?

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

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

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

69. Do you have livestock, and which species?

a)	Sheep.	c) Cattle.
b)) Goats.	d) Horses.

70. Have you ever lost any of your livestock due to wolves?

- a) No.
- b) Yes.

If you have ansewered *Yes* on the question **67**., please answer the questions from A) to C). If you have answered *No*, go to the SECTION E. Thank you!

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

- a) No.
- b) Yes.

B) Have you ever received the compensation?

- a) No.
- b) Yes.

C) If yes, was the compensation sufficient?

- a) No.
- b) Yes.

SECTION E: With respect to you:

I. Gender:

- a) Female.
- b) Male.
- II. Age: _____ years.

III. Place of residence (name of the community):

IV. Education:

- a) None.
- b) Elementary school.
- c) Secondary school.
- d) University degree.

V. Did you hunt in 2002?

- a) No.
- b) Yes.

Thank you for your co-operation!

If you have any other comments on this subject or with respect to the questionnaire, please write them here.