HUMAN DIMENSIONS IN IBERIAN WOLF MANAGEMENT IN PORTUGAL: ATTITUDES AND BELIEFS OF INTEREST GROUPS AND THE PUBLIC TOWARD A FRAGMENTED WOLF POPULATION

CLARA ESPIRITO-SANTO

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ATTITUDES AND BELIEFS OF INTEREST GROUPS AND THE PUBLIC TOWARD A FRAGMENTED WOLF POPULATION

BY

© CLARA ESPIRITO-SANTO

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Geography Department, Memorial University of Newfoundland

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ABSTRACT

Most studies on wolves in Portugal have focused on biological issues although wolf management tends to be more socio-political in nature than biological. This is the first study of human dimensions in wolf management in Portugal. Understanding attitudes and knowledge about wolves and identifying the key issues of wolf management in the opinion of some interest groups (livestock owners, hunters, students, local residents, biologists, environmental NGOs, and members of the governmental Institute for the Conservation of Nature) that may have an important role in wolf management in Portugal were the main goals of this study. Attitudes of most groups are neutral but local residents are either negative or positive; knowledge is consistently low. All groups are willing to participate in wolf management decision-making, and they mention the presence of feral dogs, wolf poaching, poor wolf habitat, lack of environmental education programs, and lack of biological data as the most important issues. This study sets the direction for future public involvement processes at both the regional and national scale.

Key Words: *Canis lupus signatus*, Iberian wolf, Portugal, wildlife management, human dimensions, public involvement, public attitudes, knowledge, wolf conservation

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LIST OF ABBREVIATIONS

CAP – Common Agricultural Policy

CGM – Common Ground Matrix

ESA – Endangered Species Act

EU – European Union

HD – Human Dimensions

ICN – Institute for the Conservation of Nature

KMO – Kaiser-Meyer-Olkin

LCIE – Large Carnivore Initiative for Europe

NGOs – Non-Governmental Organizations

PCA – Principal Component Analysis

WWF – World Wide Fund for Nature

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Appendix 1 - Questionnaire

Chapter 1 - INTRODUCTION

1.1 Geography and Wildlife Management

One of the domains of geographical research is resource analysis which focuses upon comprehending the features of natural resources and the processes through which they are allocated (Mitchell 1989). Natural resources are defined by human perceptions and attitudes, wants, technological skills, legal, financial and institutional arrangements, as well as by political customs (Mitchell 1989). In the context of natural resources management, wildlife emerges as a resource like any other, since people put a value on it. An understanding of wildlife management incorporates many disciplines, including biology, geography, and political science (Gauthier 1991). There is a clear need for integrated skills, and geographers can play a key role in the interdisciplinary wildlife management process through an understanding of both human and biophysical components.

1.2 The Nature of Human Dimensions Research

Our treatment of wildlife is subject to value judgements that are affected by cultural biases and preconceptions (Gauthier 1991). There are a diversity of viewpoints on wildlife issues in Portugal and these different perspectives on what is or is not important result in numerous conflict situations for those faced with the challenge of managing the wildlife. Wildlife management is one of the most complex disciplines in natural resource management because of our need to understand ecosystems and population dynamics while integrating human needs and wants. It involves not only an understanding of the biology of the species and their habitats, but also an understanding of public attitudes toward and knowledge of the species, and attitudes toward possible management approaches (Bath and Majic 2001). Wildlife management is, at its core, the management of people. Successful management from a human perspective largely rests on the ability to listen to and incorporate differing interest group values, attitudes, and beliefs in the

decision-making process, reaching consensus and gaining public acceptance of the final decision. The human dimensions of wildlife resource management is particularly important when managing large carnivores, which often arouse conflicting emotions among various sectors of society. Frequently, issues of large carnivore management tend to be more socio-political in nature than biological (Bath 1998); this seems to be the case of the wolf in Portugal.

1.3 Overview: Wolf in Portugal and in Human Dimensions' Perspectives

The Iberian wolf (*Canis lupus signatus* Cabrera, 1907), a subspecies of the grey wolf, is endemic to the Iberian Peninsula (Figures 1.1). With 200-300 individuals in Portugal (2000 in Spain), the population is now stable after centuries of decline due to persecution. Nevertheless, the subspecies is considered threatened with extinction and is listed on the Red List of endangered species in Portugal (Cabral et al. 2006).

Figures 1.1 – a) Iberian wolf ; b) Wolf pack (Photos: Grupo Lobo/Iberian Wolf Recovery Centre)

Although legally protected in Portugal since 1988 (Assembleia da República 1988), poaching still occurs mainly as the result of conflicts with livestock. Depletion of wild prey, dependence on livestock as a food resource, loss of habitat, myths, and

misunderstandings about the species appear to be the driving factors in whether the wolf survives in Portugal. Humans often perceive wolves as competitors and a threat to personal safety, and throughout history, human-wolf interactions have involved conflict and misunderstanding. In general, wolves are fearful of humans and prefer to avoid them. Although there are no documented cases of healthy wolves causing human deaths in Portugal, wolves are still widely and irrationally feared. The main cause of conflict is competition for resources, whether this is for land, people's domestic animals or for prey species. All these human related factors represent threats to the Portuguese wolf population, thus confirming the need for a Human Dimensions (HD) study of wolf management in Portugal.

While biophysical scientists have examined several aspects of wolf biology in Portugal mainly since the 1990s (Alexandre et al. 2000, Álvares et al. 2000b, Carreira and Petrucci-Fonseca 2000, Grilo et al. 2002b, ICN 1997, Oliveira and Carmo 2000, Petrucci-Fonseca 1990, Vos 2000), the human component has largely been neglected, with only a few studies done so far in the country (Espírito-Santo et al. 2000, Espírito-Santo and Petrucci-Fonseca 2003). Pereira (1997), Álvares *et al.* (2000a), and Galhano-Alves (2000) have studied some aspects of the relationship between humans and wolves in the north of Portugal, however, no attempts have been made to involve the public in the discussion of key issues and solutions for wolf management.

The nature of the problems surrounding wolf management in Portugal involves conflicts between wolves and humans, and among groups of society in many situations. Understanding public attitudes toward, and knowledge about, the species are key elements for successful wolf management and, ultimately, wolf conservation. Listening to all the interest groups that may affect or be affected by any management action is one of the first steps of a human dimensions study. Some of the interest groups that may have an important role in wolf management in Portugal are considered in this study and include livestock owners, hunters, students (future decision-makers in wolf management), local residents, biologists, environmental non-governmental organizations (NGOs), and members of the governmental Institute for the Conservation of Nature (ICN).

1.4 Justification for the Research (applied perspective)

The social role of attitude and perception studies is to provide input into the planning process and to serve as a vehicle for public participation in decision-making (Burton 1971). This study helps in understanding the need for including a human component on wolf conservation in Portugal, and at the same time it has an applied contribution to the wolf management process. The research itself is an act of public involvement in the wolf management decision-making process. Implementing a HD approach can improve the quality of decisions by adding the human aspects to the biophysical component, which is typically the primary focus of natural resource management, and by creating a better understanding of the social component of the decision space. The research involves several interest groups and the general public, through the understanding of their views, concerns, and solutions to wolf management. Identifying the nature of issues behind interest groups' opinions toward wolves and wolf management is a major step toward conflict resolution. Livestock owners' economic losses caused by wolf predation on livestock, hunters' dissatisfaction due to depletion of wild prey, or environmentalists concern with loss of biodiversity, are examples of key issues that distinguish the interest groups. It is important to fully understand the different characteristics and sets of issues (e.g. economic, social, biological, ethical) that are relevant to each interest group, and to promote the debate of those issues with all the players, to achieve consensual decision-making.

The key findings from this first HD study are focused on a specific region of Portugal, but they also have implications at a national and European level. Human dimensions research and the involvement of the public in wildlife resources management has a long tradition in North America (e.g. Arthur et al. 1977, Bath 1989, Manfredo et al. 1998, 1999, Stout et al. 1996, Todd 1995), but in Europe such research is still in its infancy (Bath 2000, Bath and Majic 2001). This study provides an overview of the willingness of the Portuguese population to participate in wolf management and sets the direction for future public involvement processes at both the regional and national scale.

1.5 Purpose of the Research (objectives and hypotheses)

The present research is the first quantitative and qualitative study of human dimensions in wolf management in Portugal. The study area is a specific region in the central part of northern Portugal, south of the Douro River (Figure 1.2). This region hosts a wolf subpopulation fragmented from the main population in the north. Within the study area, wolf population is highest in northwest, decreases in northeast and is absent in the south.

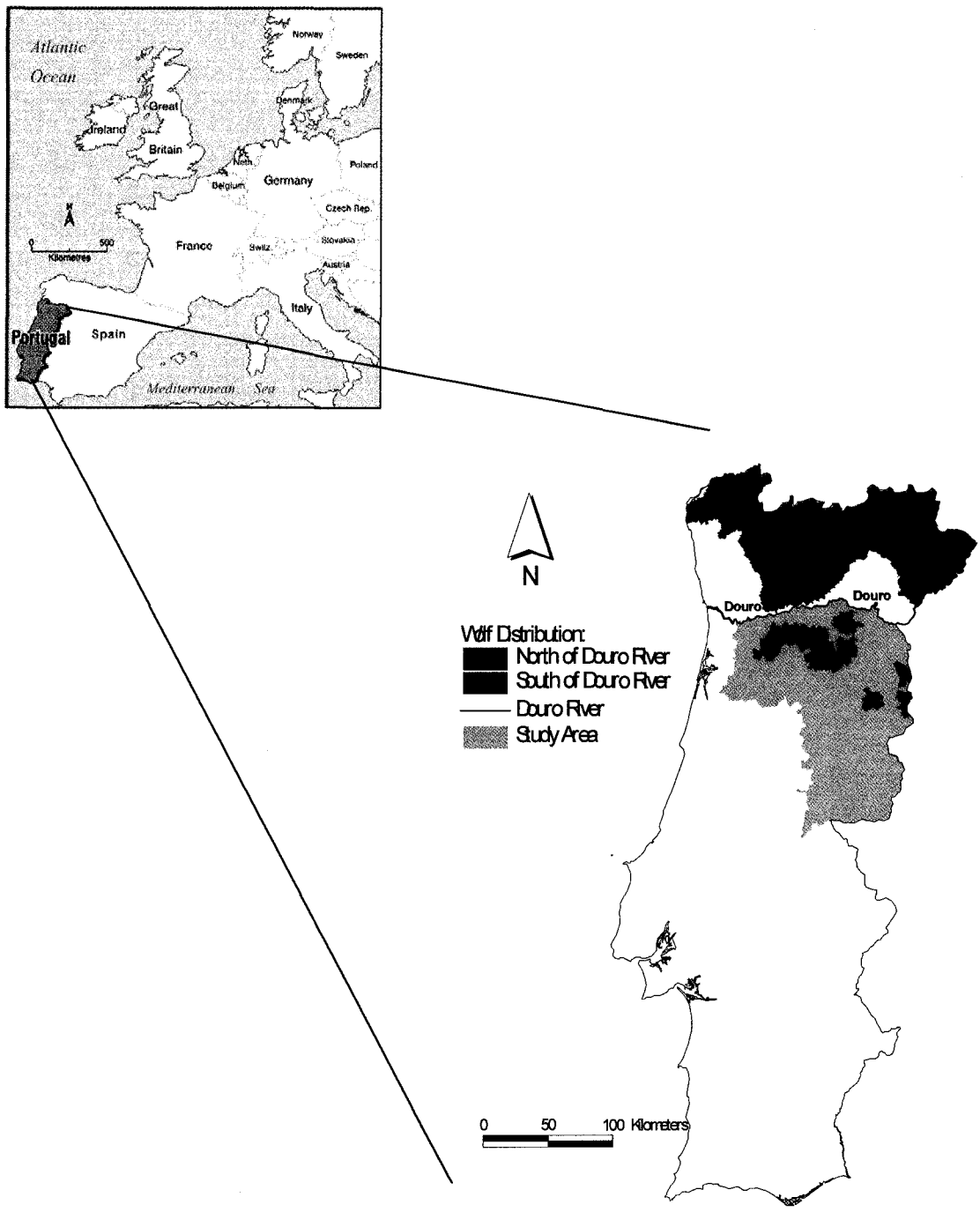


Figure 1.2 – Wolf distribution in Portugal, and location of the study area – central-north part of Portugal (Grupo Lobo/ICN 2003, ICN 1997).

The main goal is to understand public attitudes and knowledge toward wolves and wolf management in Portugal, and to test whether these attitudes and knowledge vary among interest groups and across space. Clearly, identifying the factors affecting those attitudes and knowledge will further contribute to the overall goal. The predictions are: attitudes and knowledge vary among interest groups and zones; attitudes are correlated with knowledge; and, attitudes and knowledge are affected by various socio-demographic factors, past experiences with wolves and interest in wolf management issues.

More specific objectives and null hypotheses tested in this research are as follows:

- to understand how attitudes and knowledge toward wolves and wolf management differ among interest groups.

Ho1 and Ho2: there are no significant differences in attitudes (Ho1) and knowledge (Ho2) among interest groups.

- to understand how attitudes and knowledge toward wolves and wolf management differ among zones with different wolf population densities and human populations (counties of Aveiro/Viseu, Guarda, and Castelo Branco).

Ho3 and Ho4: there are no significant differences in attitudes (Ho3) and knowledge (Ho4) among zones.

- to understand the relationship between attitudes toward wolves and wolf management and knowledge levels about the species.

Ho5: attitudes are not correlated with knowledge about wolves.

- to identify the factors affecting attitudes and beliefs toward wolves and wolf management.

Ho6: attitudes and beliefs are not affected by respondent's age, gender, occupation, education, location of residence (rural/urban), past experiences with wolves (having seen a wolf in the wild or in captivity), opinion about the importance of wolf management issues, and interest on keeping up to date on wolf management issues.

- to identify common issues and solutions toward wolf management among various interest groups (livestock owner associations, hunting associations, members of ICN, biologists, and environmental NGOs).

A baseline assessment of attitudes and knowledge toward wolves and wolf management in Portugal allows an evaluation of the effect of any future communication and public awareness efforts. It will also provide an understanding of how attitudes and knowledge change in relation to changes in the biological population, number of livestock killed by wolves, number of eco-tourism and economic opportunities, changes in legislation relating to the wolf, and other social and economic conditions within different zones.

1.6 Thesis Structure

This report is divided in seven main chapters. The second chapter provides an overview of the importance of Human Dimensions research in wildlife management and presents its development as an emerging field of research in Portugal and Europe. The chapter provides the broader context within which this study focuses on a case study of wolf management in Portugal. The importance of understanding people's attitudes and knowledge toward wildlife and its management is also presented in the second chapter and reference is made to previous attitudinal studies toward wolves completed in Portugal. The third chapter presents the criteria for the delimitation of the study area and its division in different regions. This chapter focuses on the description of these regions using several human and biophysical characteristics. The methodology applied for collecting quantitative data on people's attitudes and knowledge toward wolves and wolf management, and qualitative data on key issues and solutions facing wolf management is described in the fourth chapter. The methods section also includes the criteria for selecting the interest groups. The procedures utilized for exploratory analysis of data and preparation steps for later statistical analysis are also described. Chapter Five includes a descriptive section on the characteristics of the sample, and results from exploratory analysis. The main findings of both the quantitative and qualitative research are presented and organized by objective and hypothesis as previously listed. In the discussion chapter, key findings are highlighted and explored in the context of attitudinal and Human Dimensions studies toward wolves carried out in other countries. As a conclusion, the dissertation finishes with several recommendations and directions for future research and

possible management options for future wolf management, as well as some suggestions for future public involvement in the wolf management process in Portugal.

Chapter 2 - LITERATURE REVIEW

The purpose of this chapter is to first explore the concept and evolution of HD in wildlife management, and how this field of research is linked to wolf management. Examples are then provided on the nature of conflicts between humans and carnivores, emphasizing those examples involving the wolf. The nature of attitudinal studies in wildlife management is discussed, and theoretical issues on attitude theory and relationships among attitudes, knowledge and behaviour are briefly examined. In addition, an overview on general attitudes toward wolves in the world and how they have been changing over time is included. The chapter ends with a review on the attitudinal studies that have beed done in Portugal.

2.1 Human Dimensions as a Field

2.1.1 Definition

Decker, Brown, and Siemer (2001) defined Human Dimensions of wildlife management as identifying how people value wildlife, how they want wildlife to be managed, and how they affect or are affected by wildlife and wildlife management decisions. HD researchers seek to understand what people think and do regarding wildlife and explore ways to incorporate that insight into wildlife management policy, wildlife decision-making processes and programs. The term *Human Dimensions* covers "a broad set of ideas and practices, including economic and social values, individual and social behaviour, public involvement in management decision making, and communication" (Decker et al. 2001: 3).

2.1.2 Focus of HD research

Human Dimensions research focuses on the public's knowledge levels, expectations, attitudes and activities concerning wildlife resources and associated

habitats. Vaske *et al.* (2001) describe how the HD research can be used at different stages of the wildlife management process:

- *Defining goals*: when planning for the future, managers should include an assessment of public values toward wildlife and of how those values may change, because this will have implications for the priorities for wildlife;
- *Determining objectives and standards*: definition of appropriate and acceptable environmental and social conditions. HD research can help define those conditions by establishing standards for specific measurable indicators of objective achievement;
- *Identifying problems and opportunities*: this can be done through an inventory and assessment of current management conditions, including social conditions of the wildlife management environment;
- *Developing and selecting action alternatives*: any management measure has consequences for people and wildlife. HD research can be used to assess public acceptance of management alternatives and help predict the effects of the alternatives;
- *Implementing and evaluating actions*: the indicators and standards developed early in the planning process facilitate monitoring of the consequences of actions, to determine whether the desired outcome has been achieved.

There is a close tie between HD and conservation education research (Adams 1988). A HD project or research can address several questions concerning the public(s)':

- knowledge levels: What do people know?How accurate is their knowledge about wolves?
- expectations: What do people anticipate? Why?
- attitudes: What do people think about an issue or a species? How will the public respond to various management options?
- activities: What are people doing? Where? How often?

The aim of this study is to provide an answer to some of these questions regarding wolves and wolf management in Portugal, but also to understand the reasons behind those answers. Why do people think in a specific way, and why do different groups in the

society think in different ways? Comprehending those reasons can be a useful in increasing the quality and effectiveness of future management practices.

2.1.3 Applicability of HD research; HD research and Public Involvement

From an applied perspective, Bath (2000) states that HD research provides:

- a baseline assessment of attitudes and beliefs, which helps with monitoring the effects of an educational program or a management policy;
- insights on people's beliefs about an issue that are more likely to affect their attitudes toward that issue; this helps to design more effective educational materials;
- a starting point for building trust among a variety of interest groups and bringing those groups to work together around a common data set of key issues;
- an identification of areas of support and disagreement over management options;
- an identification of types of conflict (cognitive, values, costs/benefits, and behavioural conflicts) – the first step toward conflict resolution.

In this sense, HD research is itself a form of public involvement. The process of understanding and working together with various interest groups across an attitudinal spectrum toward a species or a set of issues is one of the main advantages of HD research.

The question now is: "What is an interest group?". Various definitions appear in the literature, but Borrini-Feyerabend (1996) provides one of the most complete definitions. The author defines interest groups (or *stakeholders*) as "social actors who (1) have a direct, significant and specific interest in an area's natural resources, (2) are aware of their own interest in management of the resources, (3) possess specific capacity (skills, knowledge) and comparative advantages (proximity, mandate) for such management, and (4) are usually willing to invest specific resources (i.e. money, time, authority) toward some form of management". For the survey, every social group or individual who matched these criteria formed a potential interest group. Different positions of the various interest groups along the attitudinal spectrum allowed the inclusion of differing points of view and interests in the wolf management debate.

The quantitative and qualitative approaches of the HD research conducted in this study correspond to a specific degree of public involvement. In a general way, degrees of public involvement can range from *public information*, where the goal is to inform the public about a decision, to inviting the public to be heard before a decision is made, to approaches where the public can influence a decision directly or be given the latitude to determine the decision in partnership with the managers (Praxis 1988). The approaches that characterize most of the ways wildlife managers address public involvement are: *Public Information*, *Information Feedback*, *Consultation*, *Extended Involvement*, and *Joint Planning* (Praxis 1988). The HD research reported here corresponds to an *Information Feedback* approach of public involvement, because the public is invited to respond and provide an opinion to a specific set of questions about wolves and wolf management issues, and to differing proposals for wolf management. This level of HD research is the beginning of a long and desirably in-depth process of public involvement to be developed in future wolf management in Portugal. Higher degrees of public involvement (such as *Extended Involvement* and *Joint Planning*) are essential for successful wolf management processes, but are rarely achieved (e.g. Bath and Majic 2001, Todd 1995). Results from this study attempt to provide a baseline assessment on the willingness of the various interest groups to work together in more participative approaches towards wolf management in Portugal.

2.1.4 Evolution of HD research

Historically, decisions regarding how to best manage natural resources have centred around information from the natural sciences (Bright and Manfredo 1995). In the late 1940s, King (1948) identified a need for research into the HD of wildlife management, particularly with the aim of studying humans' relationship with game management problems. But it was not until the mid-1960s that HD in wildlife research started (Manfredo 1989), with most studies being done in North America (Hendee and Potter 1971). In many countries HD remained an unknown field of research. According to Filion (1980), an increasing willingness of the public to participate in natural resource decision-

making initiated a trend in which many resource managers felt the need to understand the values, needs, perceptions, and actions of their constituency. HD research provides the means to achieve this understanding through surveys and other methods to collect quantitative and qualitative data on the desired population (Bath 1998). This change from a conventional approach of resource management based on the biophysical component to a wider range of factors represented a significant change from traditional practise.

HD research traditionally focused on game management issues (e.g. Peterle 1961, Peterle 1967), then in the 1970s on nonconsumptive wildlife issues (e.g. Kellert 1980, Lime 1976, Shaw and Gilbert 1974, Witter and Shaw 1979), and in the 1990s interest shifted to large carnivores, mostly endangered species (e.g. Bath 1991, Bath 1994, Bjerke et al. 1998c, Bright and Manfredo 1996, Kellert 1991, Kellert et al. 1996, Manfredo et al. 1997, Manfredo et al. 1998, Manfredo et al. 1999).

HD research started dealing with economic aspects, such as trade-offs and payment of damage caused by predators. The reintroduction of wolves in Yellowstone, for example, raised all kinds of conflicts and topics for discussion. Results of HD research around this topic showed the polarity of opinions and the complexity of understanding people's responses toward large predators (Bangs and Fritts 1993, Bath 1989, Bath 1991, Bath and Buchanan 1989, Wilson 1997). Wildlife managers faced many situations marked by an urgent, growing demand to reduce conflicts between people and wildlife (Decker and Chase 1997). Many conflicts emerged not only with large carnivores but between people and urban wildlife. The deer is a case of a species that reached what people perceived to be a state of overabundance when the animals invaded and damaged human property (e.g. Curtis and Hauber 1997, McAninch and Parker 1991, Stout et al. 1993, Swihart and DeNicola 1997). However, these HD studies were mainly site specific and problem-solving oriented, particularly when occasional situations of real or potential conflict emerged. Only later, would the HD component be integrated better into the strategic level of the wildlife management process (e.g. Hofer and Promberger 1998) and developed more built on theory.

A new journal purely targeted to HD research was created in 1996 – "Human Dimensions of Wildlife". The awareness that researchers on HD of wildlife resources

have a role in conservation issues resulted in several articles being published in scientific journals which, until that time, had just focused on biological issues (e.g. Conservation Biology and Biological Conservation). Large-scale issues and ethics are discussed in the HD of wildlife resources publications. Ecosystem concepts have become more important as the new mandate for the management of wildlife changes to conservation and ecological integrity. The Large Carnivore Initiative for Europe (LCIE) is a practical example of integration of biological and HD approaches in the management of wildlife.

HD research outside of North America has been limited. Only a few articles on attitudinal studies toward wildlife were published in Europe in the 1970s and in the 1980s (e.g. Andersson et al. 1977, Dahle 1987). The development of HD research outside North America began in the late 1990s, mainly in Scandinavia (Bjerke et al. 1998a, e.g. Bjerke et al. 1998b, Bjerke et al. 1998c, Kaltenborn et al. 1998, Kaltenborn et al. 1999, Karlsson et al. 1999, Lumiaro 1998). Wildlife management and conservation in Europe raise challenges that do not occur in North America. As Schröder (1998) stressed, "there is no such thing as a European system of wildlife management. On a national level there are some fine examples of wildlife management systems, but there is no authority on a Pan-European scale comparable to the U.S. Fish and Wildlife Service".

In Europe, differences in politics and legislation governing people and wildlife in more than fifty countries have implications for wildlife management. In addition, political boundaries do not represent an obstacle for wildlife. A wolf moving from Portugal, where it is fully protected by law, can be hunted in Spain where legislation allows specific hunting seasons in some provinces. Finally, there is no wilderness in Europe comparable to the large non-inhabited areas in North America. In a continent only slightly larger than the United States (10.5 million ha vs. 9 million ha), with three times more the number of people (718 million vs. 260 million), humans and wildlife have to coexist and are inevitably confronted with space as a limited resource (Schröder 1998). This being said, today in Europe there are almost 18,000 wolves where as in the United States the species is listed as endangered in most southern states, threatened in Minnesota and overall numbers in the lower 48 states may be approximately 3,000.

Europeans can learn little from U.S. management plans because in the U.S.A. the main strategy is to make use of large wilderness areas to segregate humans and wolves (Piechocki 1994). This approach of maintaining wildlife in the wilderness and keeping it far from human settlements is not possible in Europe. In rich cultural landscapes that still sustain viable populations of large carnivores, like the Carpathian Mountains in eastern Europe and the Mediterranean basin in southern Europe, carnivores and humans interact on a daily basis. Europe still sustains 15,500-18,000 grey wolves and 14,000 brown bears (Farmer et al. 1999), but people's minds are often not focused on wildlife conservation; economic development is the primary goal.

All European countries deal with wildlife issues, in one way or another, and wildlife agencies, where they exist, differ greatly from country to country in their missions, capacities, and competence (Schröder 1998). Political developments in Europe, particularly within the European Union, with the partial disintegration of national borders and more unified legal and planning requirements, have created new and promising opportunities for managing large carnivore populations (Farmer et al. 1999). Agencies have recognized the need to build strong partnerships with land managers, researchers, citizens, government officials and international organizations. As a result, the first effort to develop a conservation strategy for wolves at a European level occurred in 1992 (Promberger and Schröder 1992). The European Wolf Network realized that the change in people's attitudes toward wolves and the change in politics that promoted cooperation and coordination throughout all of Europe provided the opportunity to plan for the future of an increasing population of wolves (Promberger and Schröder 1992). The two first goals of this new strategy were "to achieve ways of coexistence between humans and wolves within different regional and cultural contexts in Europe" and "to increase public awareness and acceptance of wolf conservation throughout Europe" (Promberger and Schröder 1992). Researchers understood that the key to the wolf's future lay in human perceptions of this animal, because human perceptions and actions will influence the legal status of the species, the willingness to protect habitat, the tolerance level for damage and the kind of wolf control exercised when considered necessary (Promberger and Schröder

1992). Consequently the need for HD research has gained importance, as the involvement of the public has become an essential component of the wolf management process.

In 1995, the World Wide Fund for Nature (WWF-International) and partner organizations in 17 European countries took the first steps towards the establishment of the LCIE, with the overall goal of maintaining and restoring, in coexistence with people, viable populations of large carnivores as an integral part of ecosystems and landscapes across Europe. The concern with the human component and the importance of having people and wildlife cohabiting the same place is well reflected in LCIE's mandate. Following this trend, Hofer and Promberger (1998) produced the document entitled "Guidelines for the Development of Large Carnivore Management Plans" as a basis for the establishment of guidelines at the European level for implementing a large carnivore conservation strategy. This manual provides recommendations that can be adapted to the specific policy and ecological and socio-economic situation of each country or region. In terms of HD research development in Europe, this document made significant recommendations targeted at the analysis of all "stakeholders'" points of view and the involvement of the public(s) from the early stages of the management process (Hofer and Promberger 1998).

Later, Boitani (2000) compiled the "Action Plan for the Conservation of Wolves in Europe" which includes adapted management plans for each country. One of the main issues discussed in this document is the lack of a comprehensive review of public opinion toward wolves at a European level and its stratification by social and economic groups. Even local attitudes are known only from "expert" opinion rather from appropriate scientific research (Boitani 2000). According to Boitani (2000), several conservation organizations have wrongly decided that conservation can be achieved by selling the wolf as an innocent victim of human ferocity. This image does as much harm to rational wolf conservation planning as the bad image built on traditional folklore (Boitani 2000). Public opinion management needs to be based on a sound understanding of the attitudes of various social and economic segments of the population. The aim of this study is to partially fulfil this lack of HD research in wolf management in Europe, by providing

insights on public(s) opinions and beliefs about the species and its management in Portugal.

In the last few years an increasing number of publications on the attitudes of different interest groups and the general public toward wolves and wolf management have started to appear in European countries (Andersone and Ozolins 2002, Balciauskas 2001, Bath 2000, Bath and Farmer 2000, Bath and Majic 2001, Bjerke et al. 1998a, Bjerke et al. 1998b, Bjerke et al. 1998c, Blanco and Cortés 2002, Espírito-Santo et al. 2000, Espírito-Santo and Petrucci-Fonseca 2003, Kaltenborn et al. 1999, Pereira 1997, Randveer 2001, Vitterso et al. 1999, Volodka et al. 2003). Some of these reports illustrate strong involvement by the public in wolf management processes (e.g. Bath and Majic 2001) which reflects a growing integration of HD research in wildlife resource management in Europe. As the public continues to become more aware and informed on wildlife management issues, the need for a social science and HD component in the interdisciplinary process of natural resource management will continue to grow.

2.1.5 Types of conflict

HD research integrated with traditional biological considerations can provide managers with information to address people-wildlife problems. But what exactly is a people-wildlife problem? Decker and Chase (1997) argue that it is potentially any situation where: (1) the behaviour of people negatively impacts wildlife; (2) the behaviour of wildlife creates a negative impact for some interest groups, or is perceived by some groups to impact themselves or others adversely; or (3) the wildlife-focused behaviour of some people creates a negative interaction with other people, often in the form of a values clash. Thus, a people-wildlife problem can involve a people-wildlife interaction or a people-people interaction (*i.e.* a controversy), or both (Decker and Chase 1997). In Portugal, the poaching of wolves, the predation of wolves on livestock, the hunting pressure on wild species in some parts of the country, and the disagreements between livestock owners and the government, are illustrative examples of the existence of a people-wolf and people-people problem in the country needing some HD research. A

people-wildlife interaction involves scientific research based upon theoretical approaches; a people-people interaction depends on a more practical public-involvement process (Bath and Enck 2003). An HD approach can help in solving these problems by providing the tools to understand the types of conflicts occurring between humans and wildlife and the range of issues at play among interest groups. These are the first steps to achieve a good understanding of the nature of the problem and a successful wildlife management process. For the successful resolution of people-wildlife conflicts it is important to distinguish among at least four types of conflicts:

- cognitive: based on differing beliefs of what may or may not be true;
- value: based on differences in importance of wildlife in comparison with other aspects of society;
- interest or cost/benefits: based on economic factors, such as who benefits and who pays;
- behavioural: based upon mistrust or on the credibility of an individual or particular institution (Bath and Enck 2003, Mitchell 1989).

Understanding the types of conflicts is part of the management process. Repeatedly, wildlife managers dealing with people-wildlife conflicts report that the human dimensions of such situations are the most difficult to understand and manage (Decker and Chase 1997). HD researchers can help managers identify the types of conflicts, thus providing the necessary first step toward conflict resolution (Bath and Enck 2003).

2.1.6 Limitations of HD research

Wildlife managers should keep in mind, however, the limitations of implementing a human dimensions approach into wildlife management (Vaske et al. 2001):

- "HD information is not a panacea. Effective planning also requires creativity, skill, and biological information;
- HD information should complement, not replace, biological information;
- HD information does not always make decisions easier. By increasing understanding, it may in fact result in greater complexity in decision-making;

- HD information may not show a clear solution. It may show that the social costs of all alternatives are high" (Decker et al. 1989).

One HD study cannot address all social science questions, just as one biological study cannot address all biological issues. The challenge is focusing the research and understanding the scope and limitations of it. From an applied perspective, a HD research is the beginning of a public involvement process, whose length is unknown. Nevertheless, HD offers promise by encouraging decisions that are more responsive to the public and that, in the long term, increase the effectiveness of decision-making (Decker et al. 1989).

2.2 Understanding attitudes

A prominent method of learning about the HD is the assessment of public attitudes toward natural resource issues (Bright and Manfredo 1995). Attitude is defined as "a summary evaluation of an object of thought" (Bohner and Wänke 2002) or as "a learned predisposition to respond in a consistently favourable or unfavourable manner with respect to a given object" (Fishbein and Ajzen 1975). Assessing attitudes of various interest groups toward wildlife species, interactions with those species, and management options to address the interactions can be useful for determining the extent to which the public will accept and support management practices (Bath and Enck 2003) and understanding the diverse sides to an issue (Barro & Manfredo 1991 in Bright and Manfredo 1995). Through a national study on attitudes toward wildlife, Kellert (1980) developed a typology of people's attitudes toward animals and the natural environment, which was used to describe fundamental values and meanings people attach to the nonhuman world (Table 2.1). The typology has helped resource managers understand the value differences behind Americans' increasing conflicts over wildlife issues (Brown and Decker 2001). Identifying and understanding competing values is the first step toward developing meaningful approaches to resolving issues in the policy arena (Brown and Decker 2001). Kellert's typology of attitudes is still widely used by many authors (e.g. Bjerke et al. 1998c, Kaltenborn et al. 1999, Peyton and Langenau 1985).

Table 2.1– Kellert's typology of attitudes toward animals (Kellert 1985).

Naturalistic:	*Primary interest and affection for wildlife and the outdoors.*
Ecologistic:	*Primary concern for the environment as a system, for interrelationships between wildlife species and natural habitats.*
Humanistic:	*Primary interest and strong affection for individual animals, principally pets; focus regarding wildlife is on large, attractive animals with strong anthropomorphic associations.*
Moralistic:	*Primary concern for the right and wrong treatment of animals, with strong apposition to exploitation or cruelty toward animals.*
Scientistic:	*Primary interest in the physical attributes and biological functioning of animals.*
Aesthetic:	*Primary interest in the artistic and symbolic characteristics of animals.*
Utilitarian:	*Primary concern for the practical and material value of animals or the animal's habitat.*
Dominionistic:	*Primary interest in the mastery and control of animals, typically in sporting situations.*
Negativistic:	*Primary orientation an active avoidance of animals due to dislike or fear.*
Neutralistic:	*Primary concern a passive avoidance of animals due to indifference or lack of interest.*

2.2.1 Attitudinal studies in wildlife management

Progressively, wildlife managers are undertaking human dimensions research in the areas of public knowledge and attitudes in an attempt to effectively address public issues and concerns. Bright and Manfredo (1995) indicate the need to deal with the lack of public knowledge and the need for education in order to gain cooperation for wildlife management initiatives from an informed public. HD research often purports to measure "preferences", "opinions", "perceptions", or "images", yet these studies employ methods that would more appropriate classify them as attitudinal investigations (Manfredo et al. 1995). Today, attitudinal studies are quite common in HD of wildlife management. Numerous studies on attitudes toward wolves and wolf management have been conducted worldwide (e.g. Anderson et al. 1995, Andersone and Ozolins 2002, Balciauskas 2001, Bath 1989, Bath 1991, Bath 2000, Bath and Buchanan 1989, Bath and Farmer 2000, Bath and Majic 2001, Bjerke et al. 1998a, Bjerke et al. 1998b, Bjerke et al. 1998c, Bjerke et al.

2001, Blanco and Cortés 2002, Enck and Brown 2002, Espírito-Santo et al. 2000, Espírito-Santo and Petrucci-Fonseca 2003, Hook and Robinson 1982, Huber et al. 1992, Kaltenborn et al. 1999, Kanzaki et al. 1996, Kellert 1985, Kellert 1986, Kellert 1991, Lohr et al. 1996, Mertig et al. 2003, Pate et al. 1996, Randveer 2001, Tucker and Pletscher 1989, Vitterso et al. 1998, Vitterso et al. 1999, Volodka et al. 2003, Williams et al. 2002). The utility of an HD approach and attitudinal studies ultimately rests on the quality of the information provided. One way of assessing the quality of attitudinal information is to examine the predictive validity of attitudes, that is, their ability to predict behaviour regarding natural resource issues (Bright and Manfredo 1995).

2.2.2 Knowledge, attitude, and behaviour

Fishbein and Ajzen (1975) have conceptualized attitude as consisting of four components – cognition, affective, conation, and behaviour. One purpose of this study is to establish a baseline assessment of attitudes and beliefs toward wolves and wolf management. The cognitive component refers to the beliefs and thoughts held about an object (which are wolf and various wolf management practices, in this study), and represents the information an individual possesses about an object which may or may not be true. The affective component is what is commonly called attitude, a feeling of liking or disliking the object. Conation or behavioural intention is an individual's intent to act in a certain way with respect to the object (in this case the wolf). It is not actual behaviour, but intended behaviour. In this case, this refers to the willingness to support management options. The intent to behave in a certain manner is a result of an individual's affective component (Fishbein and Ajzen 1975). The fourth component, behaviour, is a measure of observed behaviour – what people actually do. This study explores and tests the relationship among three of these four components of attitude, omitting actual behaviour.

Most social psychologists agree that attitudes have a cognitive basis. "People possess knowledge that may be right or wrong (...) but that knowledge serves as the basis for their attitude" (Manfredo et al. 1995). However, it can be difficult to make inferences about people's attitudes based on partial information about what they believe, or based on

related attitudinal positions (Manfredo et al. 1995). For example, a person may have a positive attitude toward wolves and be expected to support wolf total protection in a region. The person may actually oppose that level of protection, however, because his/her feelings toward wolves are outweighed by the belief that the protection status of the species would have a negative effect on livestock raising in the region. When studying a controversial natural resource issue, it is important not only to know a person's attitudinal position, but why they hold that position (Manfredo et al. 1995).

There is a need to understand causal relationships regarding attitudes and knowledge toward wolves and wolf management. As explained by Fishbein and Ajzen (1975), the relationship tested in this study is one of knowledge affecting attitudes. We can expect the attitude held by a person toward a given object to be a result of the interaction of what that individual believes and how that individual feels about or evaluates it. In this study, the attempt is to try to understand how cognition (knowledge about wolves and wolf management) is related to a person's attitude toward wolves and their management. For example, an individual may hold the belief that wolves have a significant impact on big game in Portugal. An evaluation of that belief may be a dislike of large ungulates being killed by wolves. The product of beliefs about the object and the evaluation of those attributes would result in a negative attitude toward wolves, and ultimately a negative behaviour (e.g. people shooting wolves). Studies have shown that, with careful conceptualization and implementation, attitudes are consistent with behaviour (Ajzen and Fishbein 1980, Fishbein and Ajzen 1975, Manfredo et al. 1995). Results from this study can help better understand the underlying beliefs affecting attitudes. Appropriate communication efforts can then be designed and targeted to modify those beliefs most strongly linked to negative attitudes.

2.3 History of Attitudes Toward Wolves

Since ancient times humans often conceived of the wolf as a dark and malign art creature. Wolves were long a symbol of the Devil in western societies. Myths of the wolf were commonly manufactured to serve specific ends. From its inception, the Christian church, for example, has portrayed the wolf in its scriptures and teachings as a symbol of

evil in order to teach morals (Rehnmark 2000). This was the widespread image of the wolf in Europe. Just as interesting as the mythology surrounding the wolf were the scientific texts and encyclopaedias dating from the Middle Ages (Rehnmark 2000), which laid the groundwork for attitudes toward the wolf (Boitani 1995). The Church increased its control over the people by providing "scientific proof" of its doctrine (Boitani 1995). Scientific information was found in the famous "Physiologus" books, which were written to perpetuate the popular image of the natural world; authors added little moral lessons and often changed biological facts into religious metaphors (Boitani 1995). For many centuries these manuscripts were the only sources of knowledge of natural history (Brezzi 1978 in Boitani 1995). The information offered about wolves in these books comprised little knowledge and a great deal of folklore (Figures 2.1).

Figures 2.1 a) and b) – Drawings of wolves killing people and livestock (La Chasse Illustrée, 1869 in Bernard 1982).

Before the arrival of the first European settlers, the North American continent literally teemed with wolves from Alaska to Mexico and from coast to coast (Palamar 1996). When Europeans colonized North America they brought with them their culture, religion, and traditions (Boitani 1995). As most immigrants were from north and central Europe, they carried with them the most negative attitudes toward the wolf, those of the Anglo-Saxon and Germanic world (Oakley 1986 in Boitani 1995). Pioneers identified wolves and Indians as their worst enemies, a threat to personal safety and livestock, and an impediment to progress and civilization (Dunlap 1988). In Europe and North America,

livestock owners often believed that their livelihoods could not survive in the presence of wolves. This conflict has been the primary reason that world wolf populations have been so drastically reduced – farmers' bounties and government-hired predator control agents have had a devastating effect (Rehnmark 2000). This perception of the wolf among stockmen may be an attitude historically ingrained (Kellert 1985). Lopez (1978) suggested: "It was against a backdrop of ... taming wilderness ... protection of property, an inalienable right to decide the fate of all animals without incurring moral responsibility, and the ... conception of man as the protector of defenceless creatures ... that the wolf became the enemy to cattle and sheep producers."

In Portugal, remains of unique wolf traps ("fojos") made of stones still symbolize the anger felt by local people against the predator. Until the nineteenth century, men from rural villages in the north of the country used to chase wolves on the mountains' slopes. The objective was to make wolves fall in a hole built at the end of V-shaped corridors formed by high walls up to 1.7 km long and 2 m high (Álvares et al. 2000b) (Figures 2.2 and 2.3). Each time a wolf was caught, it was reason to celebrate and those who persecuted the wolves were seen as heroes. These attitudes not withstanding, the wolf still survives in the region, although conflicts with livestock owners continue to occur.

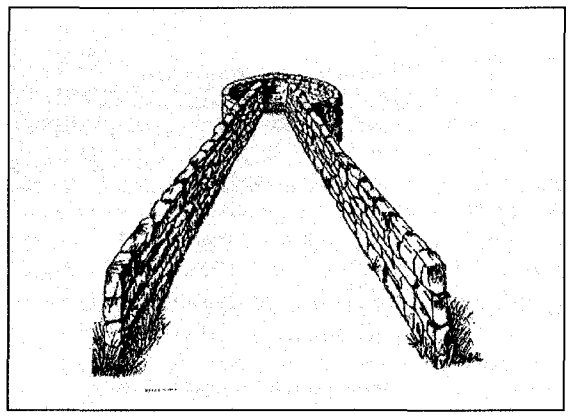
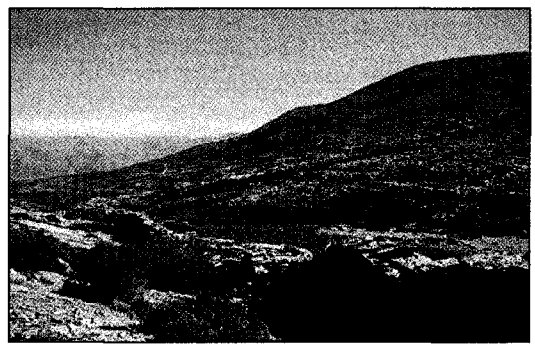


Figure 2.2 - Wolf trap ("Fojo de paredes convergentes") (Grande del Brío 1979 in Álvares et al. 2000b).



Figures 2.3 – Views from a wolf trap in the North of Portugal - "Fojo do Soajo": a) hole (photo: S. Freitas; b) walls (photo: C. Espirito-Santo).

In the seventeenth century wolves were already extirpated from England, and when explorers began to travel the American frontier and discovered "wolves without number" (Rehnmark 2000) continued the process of extirpation of wolves, bears, and most game animals. The European settlers' views of the wolf contrasted with the views held by several Pacific Northwest Native American tribes as evidenced in their mythology and rituals (Palamar 1996). European Americans continued taking the land from Natives and destroying wolves at the same time.

During World War II, the wolf population grew in Europe due to the result of the shift in the focus of people's attention. After the war ended, Europeans were again

encouraged to kill wolves by any means. In the mid-1950s, because of habitat destruction and relentless hunting, the last wolves were eliminated from most of western Europe (Rehnmark 2000). In southern countries around the Mediterranean basin, campaigns against the wolf were not as rigorous or well-organized as in central and northern European regions and, therefore, in the Iberian peninsula (Portugal and Spain), and Italy the wolf has survived (Boitani 1995). In North America, human settlement and persecution reduced the wolf population by ninety-five percent (Rehnmark 2000). Habitat destruction and the campaign against wolves have led to near extinction of the wolf throughout most of Europe, Asia, and the lower forty-eight United States.

A slowly increasing sense of human stewardship toward the environment paralleled the disappearance of the wolf (Palamar 1996). Prior to analyzing the change in attitudes toward wolves, is important to review the roots of the modern environmental movement and philosophies to comprehend the context within which wolf recovery took place. John Muir and Gifford Pinchot, founders of the modern environmental movement, began the slow replacement of what was once a religious imperative to dismantle and subordinate the natural environment with a limited but increasing sense of responsibility toward nature (Palamar 1996). This marked the beginning of the conservation and preservation movement and over time the public has started to support this new movement and to rethink its vision of the wild and the wilderness.

In the United States, governmental wolf bounties came to an end in 1935 in compliance with a newly established National Park Service Policy (Palamar 1996). Later, the preservation movement was temporarily defeated when preservationists such as John Muir did not agree with the compromise and wise use ideas of conservationists toward natural resources (Palamar 1996). Aldo Leopold (1949) was one of the first Americans to speak in defence of the wolf. In his essay "Thinking like a Mountain", Leopold showed his change of opinion on the need to eradicate wolves (Flader 1974 in Fritts et al. 2003).

The 1960s witnessed a remarkable transformation in public attitudes toward the wolf, especially among urban, young, and highly educated people (Dunlap 1988). Popular opinion began to shift as interest in the wolf grew. The next major environmental awakening came with the publication of Rachel Carson's *Silent Spring* in 1962 (Carson

1962). The book exposed the hidden and extreme uses of pesticides in the environment and provided the impetus for a series of strict environmental laws (Palamar 1996). By the 1960s, researchers such as Durward Allen, Douglas Pimlott, David Mech, and others were presenting more objective and balanced information about wolves and arguing for their conservation (Fritts et al. 2003). The book *Never Cry Wolf* (Mowat 1963), considered a mostly fictional work (Banfield 1964, Mech 1970, Pimlott 1966), was the first positive presentation of wolves in the popular literature, playing a greater role than any other in creating support for wolves (Fritts et al. 2003). Previous research however, suggests that the books' claims are more fictional than factual. Other books like *The World of the Wolf* (Rutter and Pimlott 1968) and *The Wolf: The Ecology and Behavior of an Endangered Species* (Mech 1970) followed this trend towards reshaping the wolf's image.

Legal protection of game animals was extended to various predators, bounties were gradually eliminated (Dunlap 1988), and during the 1970s, organizations with the sole mission of wolf conservation were formed (Fritts et al. 2003). In 1973, D.H. Pimlott formed the Wolf Specialist Group of the International Union for Conservation of Nature (IUCN) (Fritts et al. 2003). Later, the international protection of the wolf began with the drafting of the "Manifesto on Wolf Conservation" which was later revised to incorporate the changes in wolf status, public attitudes, and management techniques (Boitani 2000). In 1973, the U.S. government passed the Endangered Species Act (ESA), with the aim of protecting habitats and animals, and the U.S. Fish and Wildlife Service listed the Rocky Mountain Grey Wolf as an endangered species. In 1976 the Mexican wolf was listed as an endangered species under the ESA (USFWS 1982). The wolf became, for many, a symbol of human persecution and exploitation of wildlife, especially that of large predators.

The prevailing attitude toward wolves in Europe remained negative long after the animal was exterminated from most of the continent (Fritts et al. 2003). The Mediterranean countries were an exception (Boitani 1995). Able European spokespersons emerged, including Erkki Pulliainen (Finland), Dimitry Bibikov (USSR), Anders Bjärvall (Sweden), Luigi Boitani (Italy), Eric Zimen (Germany), and others (Fritts et al. 2003). In 1979, the wolf was listed in Appendix II ("Strictly Protected Species") of the Bern

Convention on the Conservation of European Wildlife and Natural Habitats (Boitani 2000). This listing allowed the wolf and its habitat full protection in Europe but the individual countries were responsible for enforcing the policy, though many participating countries obtained exemptions from the agreement to protect wolves. Negative attitudes toward wolves persisted in eastern Europe and in the former Soviet Union (Fritts et al. 2003), as well as among many groups in different parts of the world.

Erickson and Van Tuberger (1972) and Shaw (1975) found a wide concern about vanishing wildlife in the U.S. and strong opposition to bounty systems among the general public and surprisingly among some deer hunters (what Kellert (1977) called "nature hunters" in opposition to "meat hunters"). Later, Arthur (1977), Johnson (1974), and More (1978) found in North America a strong dislike of the wolf among children which can be due to some of the legends associated with childhood in western societies (e.g. *Little Red Riding Hood, The Three Little Pigs, Peter and the Wolf*) (Figure 2.4).

Figure 2.4 – Illustration of the childhood story of Little Red Riding Hood (Bernard 1982).

Llewellyn (1978) and Hook and Robinson (1982) were among the first authors to report differences in attitudes toward wolves among different demographic groups in American society. Less favourable attitudes toward wolves have been especially evident among non-educated, lower income groups, hunters, livestock producers, farmers and those residing in rural areas, particularly people living near wolf populations (Arthur et al.

1977, Bath and Buchanan 1989, Biggs 1988, Buys 1975, Hook and Robinson 1982, Kellert 1985, Kellert 1986, Llewellyn 1978, Tucker and Pletscher 1989) (Figures 2.5). However, controversy exists on how the proximity of place of residence to wolf areas is related to people's attitudes. Kellert (1985) found conflicting results when he realized that Alaskans had the most positive perceptions of the wolf among all Americans. Far more positive attitudes toward wolves have been revealed among urban residents, the highly educated, younger people, members of environmental organizations, and those in closer contact with nature (Bath and Buchanan 1989, Biggs 1988, Kellert 1985, Kellert 1986, Kellert 1991, Llewellyn 1978, McNaught 1987). The relevance of these variations is suggested by the unsuccessful wolf reintroduction effort in northern Michigan, as revealed by Hook and Robinson (1982) who found strong negative attitudes toward wolf reintroduction among rural, lower income, male hunters, as well as a general distrust of government wildlife programs.

Figures 2.5 a) and b) – Rural man and hunters after killing wolves in northern Portugal in the 1970s (photos from Grupo Lobo's archive).

Attitude surveys in the north-western States suggest ambivalence toward wolves (Bath 1991, Bath and Buchanan 1989, McNaught 1987, Tucker and Pletscher 1989), although they also show different attitudes being strongly related to special interest

groups (Boitani 1995). In the middle 1980s, Kellert (1985) published what would be the most widely cited national survey on American attitudes toward wildlife (Williams et al. 2002). Kellert revealed that nearly as many Americans had negative as had positive views towards the wolf. Despite the positive attention given to wolves and the favourable media treatment, the wolf still retained its status as among the least appreciated animals in America. Kellert (1985) suggested that negative perception of the wolf might be associated with fears regarding their dangerousness, threat to human property, predatory and carnivorous nature, wilderness association, and cultural and historical antipathies. On the other hand, the author argues that more positive impressions of wolves might derive from their large size, advanced intelligence, and complex social organization (Kellert 1985). Boitani (1995) hypothesizes that today's ambiguity in North American attitudes toward wolves is related to recent changes in opinion towards nature, not to historical background.

In Sweden, Andersson *et al.* (1977) conducted one of the first attitudinal studies toward wolves done in Europe. A majority of Swedish respondents supported efforts to maintain a wild population of wolves in the country, but reindeer owners and farmers were clearly opposed to this. Similar to Kellert (1985), Andersson *et al.* (1977) also tried to understand the differences in attitudes among several groups of the society which were perceived to be more affected or able to affect wolf management. The inclusion of an increasing number of interest groups (e.g. livestock owners, hunters, conservationists, and the general public) in attitudinal studies reflected a growing awareness that public understanding and support are essential in any potentially successful program, particularly in wolf restoration efforts (Zimen 1981).

Since 1977, many studies on attitudes toward wolf reintroduction have been published in the United States (e.g. Bath 1989, Bath 1991, Bath and Buchanan 1989, Biggs 1988, Bright and Manfredo 1996, Duda and Young 1995, Enck and Brown 2002, Hook and Robinson 1982, Kellert 1991, Mangun et al. 1996, Minn 1977, Pate et al. 1996, Rooney 1995, Scarce 1998, Schoenecker and Shaw 1997), in Europe (e.g. Zimen 1981), in Canada (e.g. Lohr et al. 1996), and in Japan (e.g. Kanzaki et al. 1996). Most of these authors noticed that effective wolf reintroduction programs depend not only on sound

biological understanding of the species, but also on knowledge and consideration of perceptions and attitudes of various interest groups. The authors consider the discussion on socio-political issues, an essential component of controversial initiatives of wildlife management, particularly those aimed at wolf restoration.

In Europe, a shift in attitudes toward wolves also occurred, although not uniformly in all European countries (Figures 2.6). Italian attitudes toward wolves are said to be a mixture of fear and respect, of both love and hate (Boitani 1992). The attitudes of Italians toward the wolf have been investigated only by a limited survey, carried out in 1975-76 in the Abruzzo region. The study revealed that fears and prejudices were strongly correlated with ignorance about the wolf (Serracchiani 1976 in Fritts et al. 2003). In recent years the general attitude of the overall Italian public has become more and more in favour of the wolf (Boitani and Ciucci 1992). In Poland, Okarma (1996) states that no widespread fear or hatred is harboured against wolves, although there is also a general ignorance concerning the biology and ecology of the species. Most of Polish society has an indifferent or positive attitude towards wolves (Okarma 1996). However, in some administrative provinces of Poland, wolf hunts still occur every year (Okarma 1993, Okarma 1996).

Figures 2.6 - a) English woman with a captive wolf in the Iberian-Wolf Recovery Centre – Portugal, in the 1990s (photo from Grupo Lobo's archives); b) Polish hunter in the 1970s (Bernard 1982).

Systematic and structured attitudinal studies toward wolves and wolf management done in Europe started in Scandinavia during the late 1970s (Andersson et al. 1977, Bjerke et al. 1998c, Bjerke and Kaltenborn 2000, Dahle et al. 1987, Ericsson and Heberlein 2003, Kaltenborn et al. 1999, Karlsson et al. 1999, Lumiaro 1998). Researchers from Sweden (Andersson et al. 1977, Ericsson and Heberlein 2003, Karlsson et al. 1999), Norway (Bjerke et al. 1998c, Bjerke and Kaltenborn 2000, Dahle et al. 1987, Kaltenborn et al. 1999), and Finland (Lumiaro 1998) have focused on the study of attitudes of different interest groups and socio-demographic groups (conservationists, reindeer owners, livestock farmers, hunters, urban residents, rural residents) before researchers from other European countries. In general, the Scandinavian residents show more positive attitudes toward wolves than citizens from western European countries (Williams et al. 2002). This is an interesting finding considering that the latest studies done, resulted from the urge to understand people's opinions toward wolves and wolf management at a time when the carnivore-livestock conflicts started increasing markedly. The management of carnivores became a political issue of high priority (Bjerke et al. 1998c). In Sweden, for

instance, there was an increase of eighty percent (Aanes et al. 1996 in Bjerke et al. 1998c) in the number of sheep reported killed by predators, from the early to the middle 1990s. Norway was considered by Kaczensky (1996 in Bjerke et al. 1998c) as having the highest annual per capita rates of predation of livestock by lynx, wolf, and bear among twelve European countries.

Around fifty-three percent of Spanish gamekeepers (in areas where damage to livestock is low) say wolves should be eradicated, and thirty-five percent favour wolf control (Blanco et al. 1992). Similar results were found in Macedonia, although attitudes about wolves in Croatia have changed from persecution to protection, probably due to a decline in both wolf numbers and the number of livestock killed (Huber et al. 1992). These and other studies started showing the diversity of opinions among European countries, regions and groups of the society. In Asia, the situation is quite different and difficult to analyse. Attitudinal studies are lacking, and the potential for natural or human-assisted recovery of the wolf is limited (Fritts et al. 2003). The prevailing view of the wolf is negative throughout most of Asia (Shahi 1983, Bibikov 1988, Fox & Chundawat 1995 in Fritts et al. 2003).

In Europe, the *Action Plan for the Conservation of Wolves in Europe* stresses that the negative image of the wolf is widespread, although there are many differences and complexities depending on local cultures and traditions (Boitani 2000). The document shows that more negative attitudes are found among residents from central European countries (in opposition to southern ones) and among people from the countryside, but local conditions can be quite different (Boitani 2000).

The year 2000 represented a landmark in terms of publications of these types of studies. Since 2000, several extensive quantitative surveys of attitudes toward wolves or wolf management have appeared throughout Europe: in France (Bath 2000); the United Kingdom (Bath and Farmer 2000); Croatia (Bath and Majic 2001); Lithuania (Balciauskas 2001, Balciauskienė and Balciauskas 2001, Volodka et al. 2003); Estonia (Randveer 2001); Portugal (Espírito-Santo et al. 2000, Espírito-Santo and Petrucci-Fonseca 2003); and Spain (Blanco and Cortés 2002). Boitani (1992b *in* (Boitani and Ciucci 1992)) supports the idea that the Mediterranean countries share a general

ambiguous and/or more positive attitude toward the wolf, as compared with central and northern European countries. Regional differences of attitudes toward wolves have been analyzed by many authors, but an almost complete absence of attitudinal studies in one region over time means that temporal analysis is not possible.

Through a literature review of attitudes toward wolves and their reintroduction between 1972 and 2000, Williams *et al.* (2002) concluded that attitudes in Europe are usually less positive than in North America, and that attitudes toward wolves have not become more positive over the time period surveyed by the authors. Williams et al. (2002) support the idea that changes in attitudes toward wolves came before social scientists began conducting scientific surveys in the 1970s. As the authors pointed out, attitude change over time is one prominent question raised by managers and debated in the literature (Bright and Manfredo 1996). The debate started early when Aldo Leopold, considered the founder of wildlife management in North America, changed his ideas from advocating extirpation of wolves before 1920 to supporting wolf preservation in the 1940s (Flader 1974, Meine 1988). The lack of research on attitudes over time is stressed by Williams *et al.* (2002). The measure of change in attitudes provides a good understanding of the impact and receptivity of wolf management measures by the interest groups and effectiveness of educational programs. The present study represents a baseline assessment of attitudes and beliefs toward wolves and wolf management in central-north Portugal. It allows a geographical comparison of attitudes and the measuring of attitude change in the future.

2.4 Portuguese Attitudes and Knowledge

In Portugal, only a few studies have focused on the attitudes of the general public and various interest groups toward wolves and wolf management. The first study was initiated in 1994, and it showed neutral to moderately positive opinions toward wolves, low knowledge levels, and low fear of the species, among all sampled groups (Espírito-Santo et al. 2000). Later, many students were sampled at a national scale using the same questionnaires in order to complement the former study (Espírito-Santo *et al.* unpublished). Overall, respondents expressed a moderately positive attitude, and only ten

percent of answers were negative (Espírito-Santo *et al.* unpublished). Whereas most research in other European countries has shown that views about large carnivores tend to be very positive or very negative, some indications exist that sometimes those views can be less polarized (e.g. UK teenagers - Bath and Farmer 2000). Portuguese people's attitudes are one of those cases. Other quantitative and qualitative studies were conducted by Pereira (1997) and Galhano-Alves (2000), respectively. In northern Portugal, a small sample of respondents with varying degrees of economic livestock losses due to wolf attacks revealed a polarity of opinions, with the majority of the respondents wanting the wolf to survive (Pereira 1997). Respondents who raised livestock as a main source of income, and who had complaints about delays in compensation payments for livestock damage, wanted the wolf to disappear (Pereira 1997). Galhano-Alves (2000) explored the relationship between local people and large carnivores, and described some beliefs and myths about wolves among rural people, and conflicting values people put on this carnivore. The author concludes that in the north of Portugal wolves and humans still coexist in a rare situation of equilibrium (Galhano-Alves 2000). None of the studies, so far, have been focused on the isolated wolf population on the central-north region of the country. A qualitative and quantitative approach for understanding the attitudes and knowledge of the general public and various interest groups toward wolves and wolf management is also lacking in Portugal. This study complements this gap by providing results from scientific research and simultaneously functioning as the basis for a practical process of public involvement in wolf management in the region.

Chapter 3 - STUDY AREA

This chapter first delimits the study area and discusses the criteria used for its division into several zones. Biophysical and human variables are used to describe the study area and the different zones within it. Examples of human and biophysical variables include human population, agriculture, roads, hunting grounds, forest cover, fire occurrence, wolf distribution, wild prey, livestock density, wolf attacks to livestock, feral and stray dogs, and protected areas. These themes constitute the basis for organizing the information provided and a brief summary of the main features of each zone allows a better understanding of the key differences and similarities among zones.

3.1 Delimitation of the Study Area

This study was included and partially funded by a research project financed by the Portuguese Foundation for Science and Technology (FCT). The three-year project targeted the study of a specific wolf sub-population living in a region south of the Douro River (central-north part of the country). The study area was pre-determined by this larger funding project.

In Portugal, a wolf population of 200-300 individuals appears to be fragmented into smaller groups separated by the Douro River (Figure 1.2). The sub-population living south of the river seems to be isolated from the main population and is thus more threatened with extinction according to wolf biologists and the governmental Institute for the Conservation of Nature. For this reason, the present study will focus on the region where this specific sub-population of wolves occurs and from where it has been disappearing since the 1970s (Figure 1.2).

3.2 Division of the Study Area

One of the main objectives of this study is to understand how attitudes and beliefs toward wolves and wolf management vary among regions with different wolf populations

and different demographics. To explore this, the study area was divided into three zones based on two criteria. First, the study area includes regions where wolves have disappeared since the 1970s (region of Castelo Branco), areas with sporadic occurrence of wolves (region of Guarda) and areas where numbers have remained relatively stable or are slightly decreasing (mainly north of Viseu, and the eastern part of Aveiro) (Figure 3.1). People living in areas with a stable wolf population probably have more experience with the species than those living in areas with sporadic occurrence or where wolves have been extirpated. Different levels of experience with this species can affect people's opinions and beliefs (Vitterso et al. 1999, Williams et al. 2002). Consequently, different types of management measures may have to be considered, for example, for areas with permanent compared with sporadic occurrence of wolves. The varying degree of wolf occurrence is, therefore, the first criterion used to delineate the several zones. Secondly, acknowledging the applied nature of this study, the division took into account the political boundaries of the counties included in the study area - Aveiro, Viseu, Guarda and Castelo Branco. Each county is dependent on the central Government but still has its own political authority. Findings from the research based on political units could allow each unit to consider different management scenarios. In other words, this approach makes it easier to apply different management measures if differences across regions are identified and the public wishes to consider varying degrees of wolf management.

In Chapter Five, where attitudes toward wolves are compared across zones (see section 5.2.2.1.), a brief discussion is presented on the implications of an alternative division of the study area in this case using only biological data on wolf distribution and not taking into account the administrative divisions of the country.

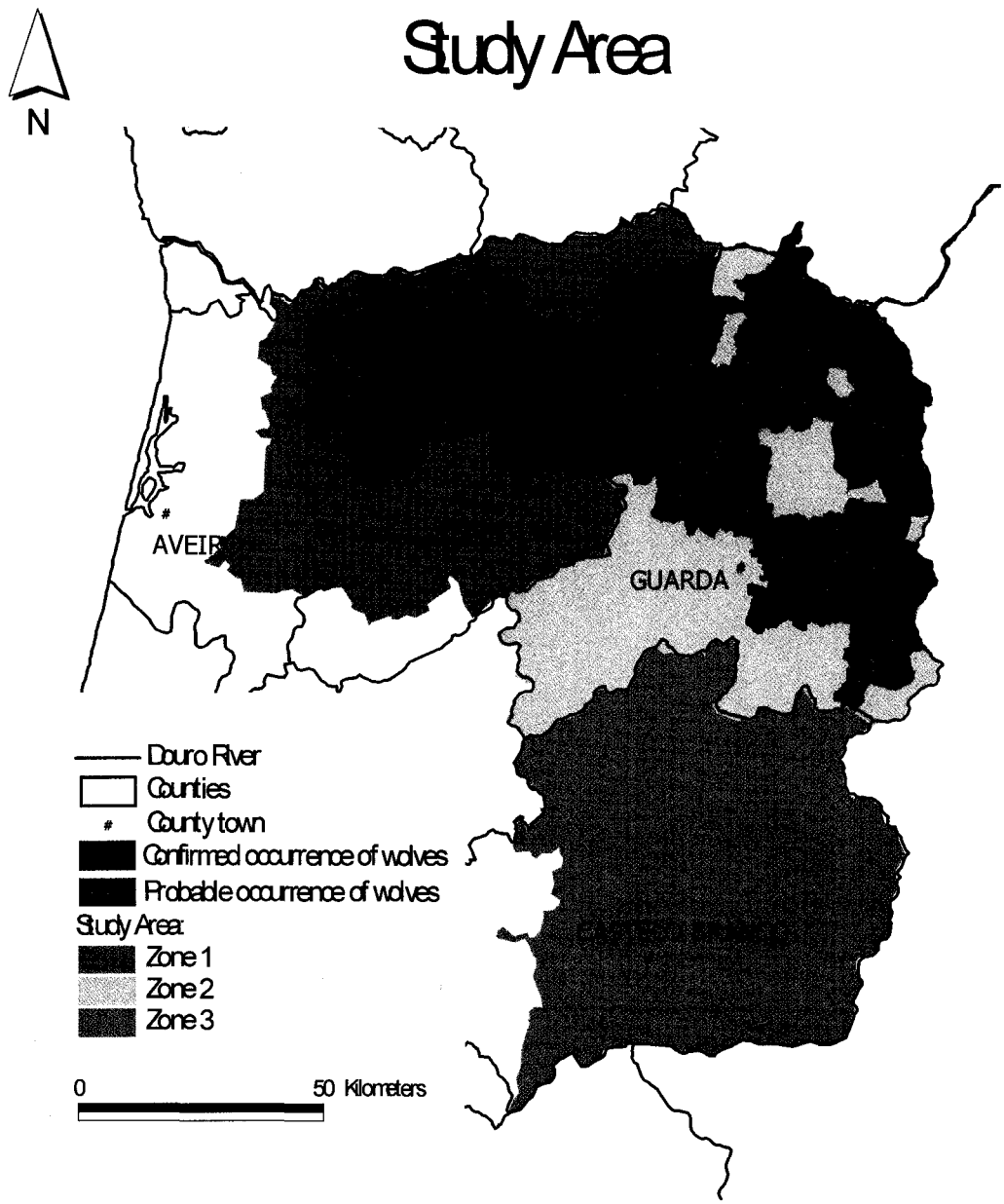


Figure 3.1 – Division of the study area in three zones.

3.3 Description of the Study Area

3.3.1 Human population

The study area includes part of the counties of Aveiro, Viseu and Castelo Branco, and the entire county of Guarda totalizing 16,045 km^2. A total of 852,965 inhabitants live in the study area, in 859 small villages included in 47 municipalities (INE 1991). The average human population density in areas with wolves is 34 people/km^2, while in the entire study area it is 53 people/km^2. The density reaches 3213 people/km^2 in the main urban centres (INE 1991) where the majority of the population is concentrated. There has been a tendency for people to move from rural to urban areas, mostly those located near the coast and these centres sustain approximately three quarters of the Portuguese population (Carrilho et al. 1993). Consequently, there has been an increase, since 1981, in the natural growth of the population in the littoral regions (a growth higher than 10% in some municipalities) and a negative growth (around –7% to –10%) in inland municipalities, mainly those in the centre and south of Portugal (Carrilho et al. 1993). According to the available data, since the late 1960s, an aging population and a continuous out-migration have also contributed to a negative demographic growth in the north and interior parts of the country (Carrilho et al. 1993). In Figure 3.2 is evident an increase in the elderly residents from coastal to inland counties (Aveiro to Castelo Branco) as well as a decrease in the younger portion of the population (INE 1991).

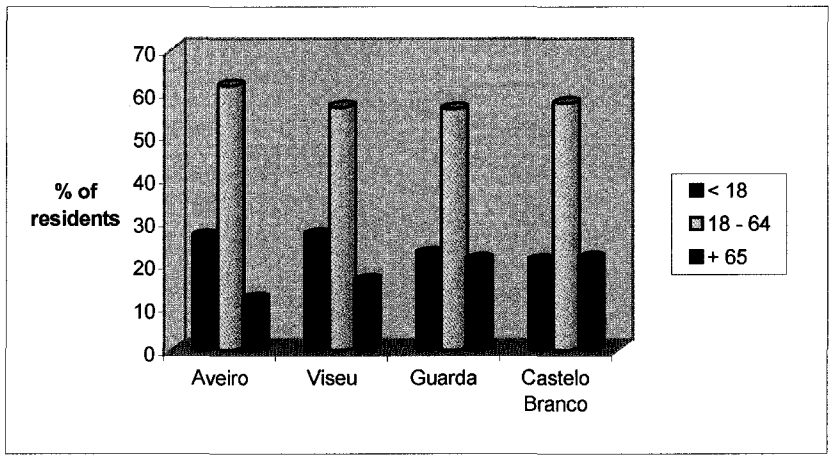


Figure 3.2 – Percentage of residents in each age category: young (<18), adults (18-64), and elderly (+65), in the counties included in the study area.

The two counties of Zone 1 (Aveiro and Viseu) have the highest density of human population in the study area – 87 inhabitants/km^2 – (INE 1991). A total of 481,193 residents of Zone 1 live in 402 villages grouped in 26 municipalities, over an area of 5526 km^2 (INE 1991). The county of Guarda (Zone 2) is approximately the size of Zone 1 (5556 km^2) but it only has 197,278 inhabitants thus making it a lightly populated area (36 people/km^2) (INE 1991). Zone 2 comprises 336 villages within 14 municipalities. A total of 174,494 inhabitants live in Castelo Branco (Zone 3) with a human population density of 35 residents/km^2 (INE 1991). This is the smallest zone of the study area (4963 km^2), and includes 7 municipalities and 121 villages. Near the border with Spain, both counties of Guarda and Castelo Branco contain some of the least populated areas of Portugal (Figure 3.3).

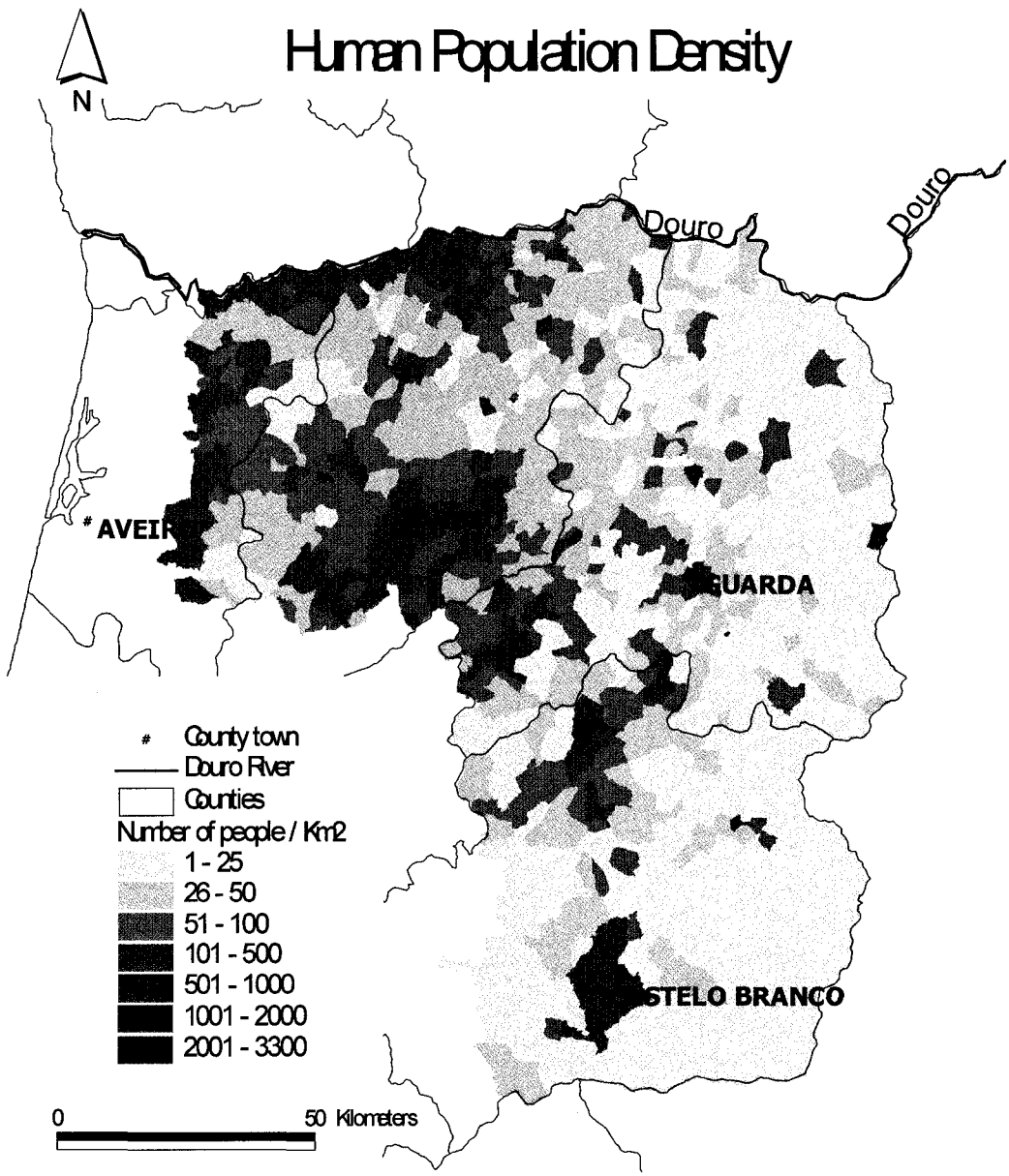


Figure 3.3 – Human population density (number of people/km^2) in the study area – central-north part of Portugal (INE 1991).

3.3.2 Agriculture

Agriculture in Portugal has a greater importance for the country than in all other member states of the European Union, although it is mainly a subsistence activity (DPP 2001). Nevertheless, agricultural production is decreasing throughout Portugal, with the number of *farming units*[1] having been reduced 30.5% between 1989 and 1999. Likewise the area used for agriculture has decreased 3.5% over the same period (INE 2000). This means that there are fewer units and larger areas per unit. Farmers usually do not entirely depend on agriculture for their living. Many farmers (44%) have other remunerated jobs, while 47% are elderly who also live off their pensions (INE 2000). The proportion of 65 year-old farmers (or older) increased in the 1990s, and today this represents the major age group amongst the agricultural population (INE 2000) (Figure 3.4).

Figure 3.4 – Most farmers in the study area are elderly (photo: C. Espirito-Santo)

[1] *Farming Unit* is defined by INE (2000) as a unit of production that uses a minimum of one hectare of agricultural land or that reaches a minimum limit of specialized production (e.g. 2000m^2 of vineyard).

Most farmers (57%) have a low education level (elementary school), and 34% do not have any education (INE 2000). In the study area, this situation is even more evident due to the aging of the population, and the migration of the rural population to coastal areas of the country. Most of the area is no longer cultivated or is not suitable for agriculture because of the poor quality of the soil (Figure 3.5). These facts have major implications for livestock production and husbandry methods, which indirectly affect the availability of livestock as a food source for wolves. In the study area, wolves depend on the abundance of livestock for their survival (ICN 1997).

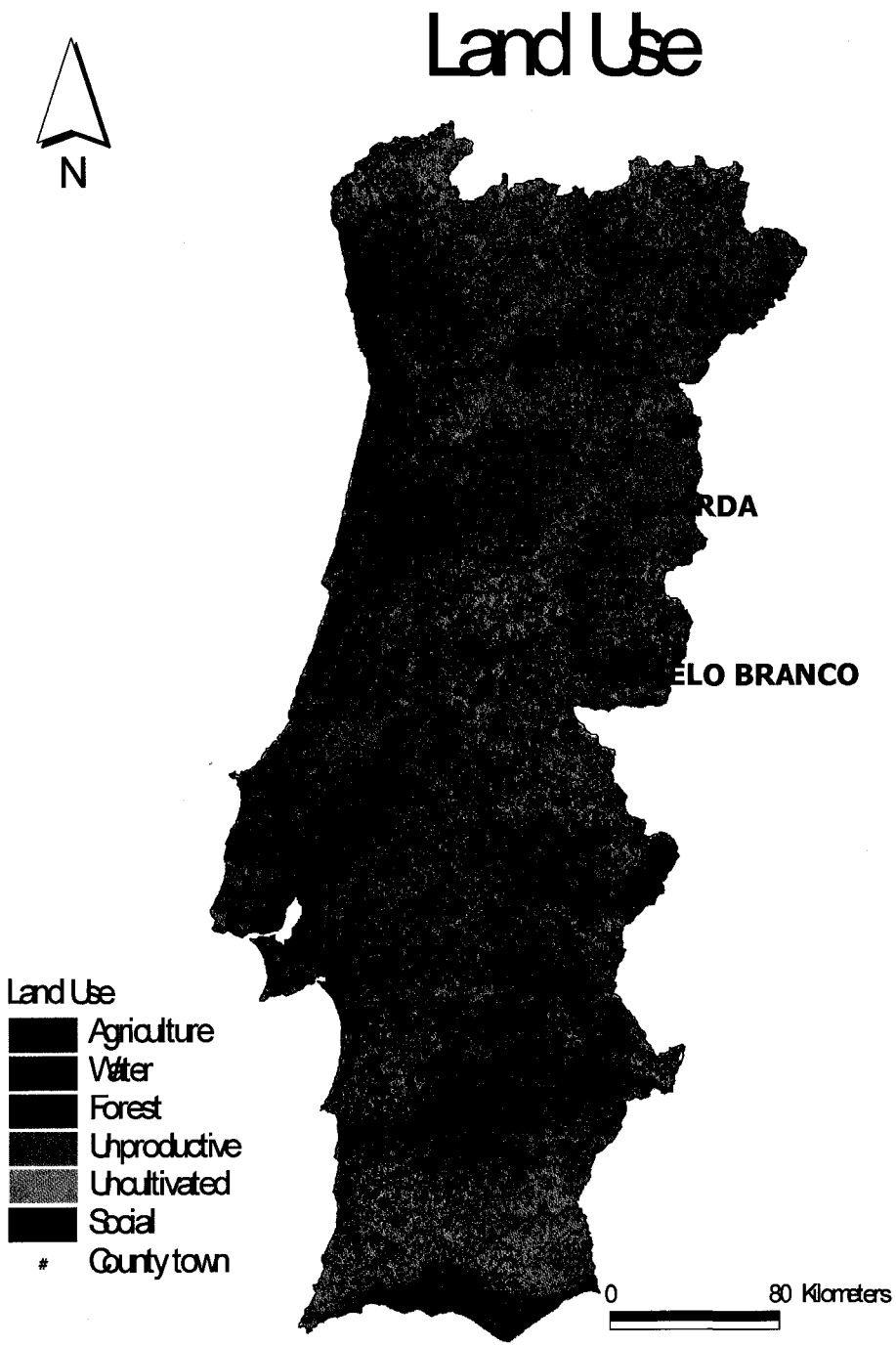


Figure 3.5 – Land Use in Portugal (DGF 2001; 1:1,000,000)

In terms of livestock production, the situation in rural areas of the European Union (EU) has been changing since the implementation of the Common Agricultural Policy (CAP). The CAP was developed 45 years ago to assure post-war Europe's food supply by raising farmer's incomes and pushing modern technologies (IUCN 2003). In the mid-1980s, the goal of high food production was achieved, but at the cost of negative landscape changes, biodiversity loss, and reduction in traditional agricultural practices. In Portugal, bigger farms with large herds grown in fenced areas have been heavily subsidized by the EU under the CAP and have been replacing the long-established methods of livestock husbandry. Changes in husbandry methods, such as pasture practices, corral characteristics, or even carcass disposal, can affect the rate of predation by predators (Robel et al. 1981), and thus change the accessibility of domestic animals to wolves.

3.3.3 Roads

The study area is not characterized by the high traffic roads that exist along the coast of Portugal but, nevertheless, it is still crossed by some of the principal highways connecting the south and the north of the country and these are also important connections with Spain. The counties of Viseu and Guarda are served by three major highways with intense traffic, some of them crossing important wolf habitat (Figure 3.6).

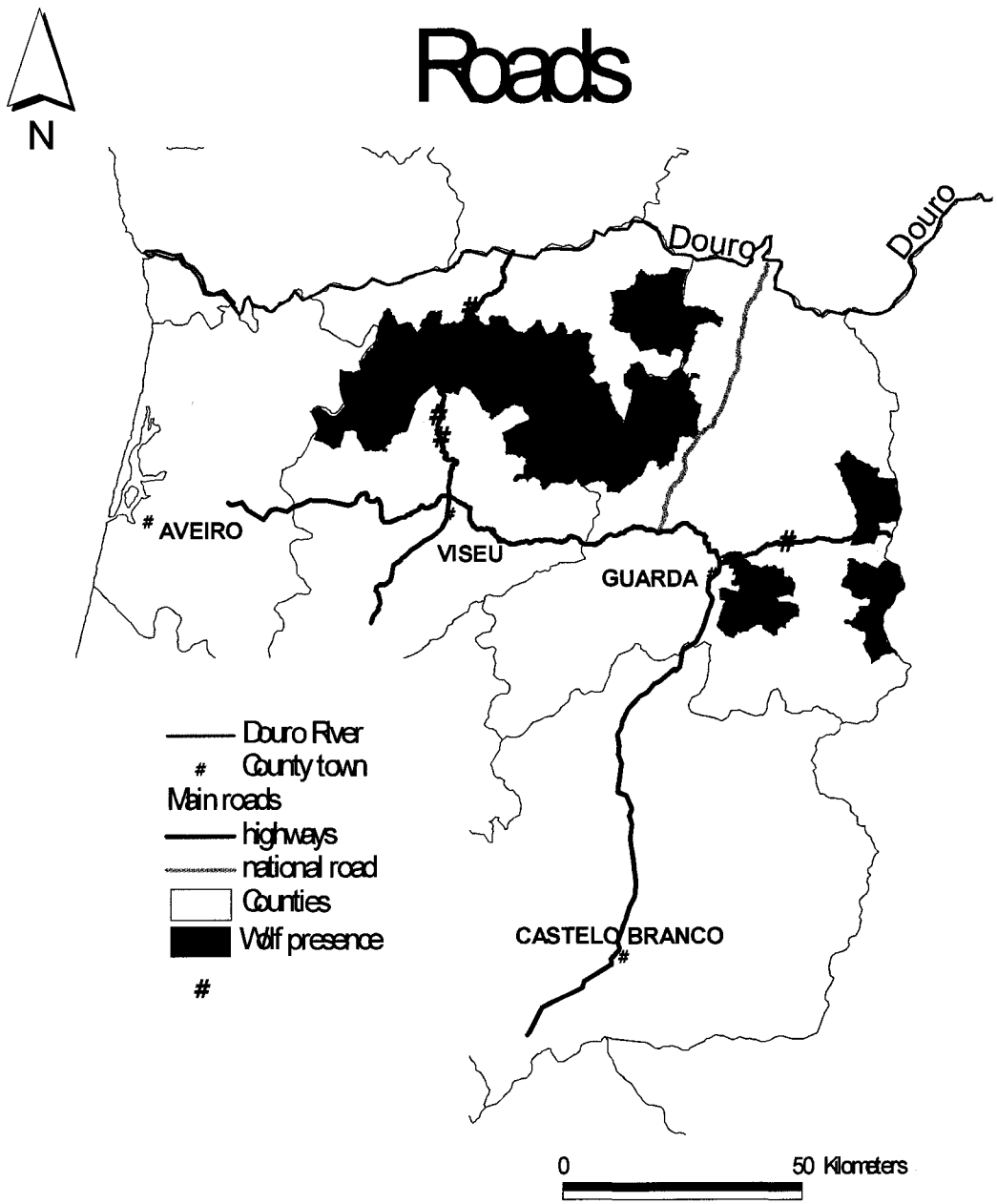


Figure 3.6 – Main roads crossing the study area – central-north part of Portugal. * (Alexandre et al. 2000).

Besides the fragmentation of the wolf population living south of the Douro River from the main population to the north, there is also fragmentation within the wolf range in the study area caused by roads (Alexandre et al. 2000, Petrucci-Fonseca 2000). For instance, a major highway (A24) crosses Zone 1 creating a barrier for wolves moving between the east and west part of the county of Viseu (Figure 3.7). Several authors have documented the adverse effect that roads have on wolves and other carnivores because they cause isolation and reduction of carnivore habitat and populations (Grilo et al. 2002a, Llaneza et al. 2004, Mech et al. 1988, Paquet 2000, Ruediger et al. 2000, Wydeven et al. 2000).

Between 1994 and 1996 a study of wolf biology in Portugal in the same region as the present study, showed that vehicle collisions were the second largest human cause of wolf mortality after shooting (Alexandre et al. 2000). An additional threat caused by roads comes from the accessibility they allow to humans who deliberately, accidentally, or incidentally kill wolves by shooting, snaring, or trapping (Berg and Kuehn 1982, Grilo et al. 2002a, Mech 1977). Castelo Branco has fewer roads and lower traffic volumes than Aveiro/Viseu and Guarda (Figure 3.6), which represents a lower threat to wolf habitat fragmentation and wolves moving to this area.

Figure 3.7 – Highway A24 crossing wolf habitat in the county of Viseu (photo: C. Espirito-Santo)

3.3.4 Hunting grounds

The hunting tradition in Portugal is deeply rooted in the culture of the local people. Hunting is carried out in a third of the Portuguese territory (islands excluded) (DGF 2003) where 294,000 people hunt every year (DGF 2003, unpubl. data). Around 14% of the Portuguese hunters live in the counties of Aveiro, Viseu, Guarda, and Castelo Branco (DGF 2003, unpubl. data). Unlike in North America, where the government manages wildlife, and landowners own and control wildlife habitats (Conover 2002), in Portugal, game species are managed by the government or, with special authorization, by public and private hunting associations (Assembleia da República 1999). ICN is the governmental management body responsible for issuing permits for the establishment of new hunting areas (Table 3.1).

Table 3.1 – Types of hunting areas in Portugal (Assembleia da República 1999).

Type of Hunting Area	Who is allowed to hunt	Who manages the area
Associative	Hunters with a membership in a Hunting Association; usually local hunters from surrounding villages.	Private Hunting Associations
Touristic	All hunters; hunting fees are usually high.	Private Hunting Associations
National	All hunters; priority is given to hunters owning land in the area, local hunters, and hunters without membership in private hunting associations.	Government (Ministry of Agriculture)
Municipal	All hunters; priority is given to hunters owning land in the area, local hunters, and hunters without membership in private hunting associations.	Government (Ministry of Agriculture)

Hunting grounds are management units, which cover different areas in different counties. Each year the government sells hunting permits and sets hunting quotas, which

allow hunters to hunt in "Municipal" and "National" hunting grounds. Hunting permits for "Associative" hunting grounds (created by groups of private landowners) require a membership in these private associations, which manage their own game species under the limits imposed by law. Different permits are issued for hunting small game (mainly rabbits, hares, and partridges) and big game animals (mainly wild boar, and red deer), but wolf hunting is never allowed in Portugal.

In the study area there are approximately 270 hunting grounds, mainly "Associative" grounds that are privately managed (DGF 2003). In comparison with Guarda and Castelo Branco, the counties of Aveiro and Viseu have few hunting grounds (Figure 3.8). Nevertheless, 24% of the territory of Aveiro/Viseu is designated for hunting (DGF 2002). Hunting may have two negative consequences on wolf populations: (1) reduction in natural prey base; (2) poaching. In 1995 and 1996, it was also known that managers of private hunting grounds put poisoned meat in the field before the opening of the hunting season, killing shepherds' dogs and foxes, and constituting an additional threat to wolves (ICN 1997). Guarda is the region with the highest concentration and percentage of hunting territory (44%) in the study area (DGF 2002). Some 41% of the territory in Castelo Branco is designated as hunting grounds (DGF 2002), where small game and big game hunting attracts hundreds of locals and people from the main urban centres of the country. The area also sustains the largest populations of red deer and wild boar in the study area (ICN 1997).

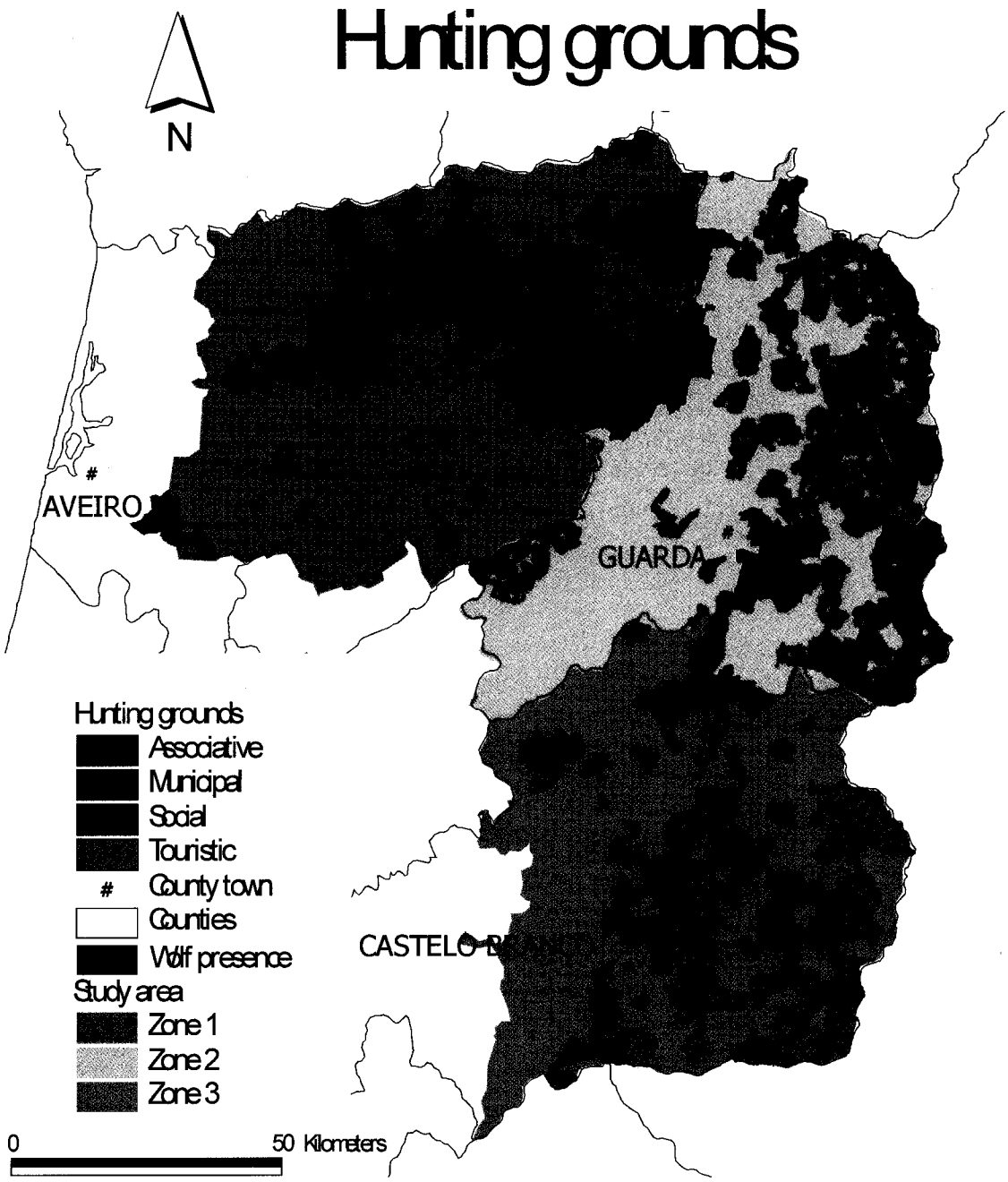


Figure 3.8 – Distribution of Hunting Grounds in the study area – central-north part of Portugal (DGF 2003).

3.3.5 Fires and Forest Cover

Fires occur in Portugal every year consuming large areas of forest, bushes and pasture, mainly during the hot and dry periods of the summer. The study area is amongst the most affected parts of the country (Figure 3.9). The majority of the forest fires consume pine tree (*Pinus pinaster*) forests (Figure 3.9), and because forests are not the main biotope in the area (Figure 3.5), these fires caused significant losses in the proportion of land covered by forests in this region.

Areas of oak and pine forests and bushes are the main habitat utilized by wolves for shelter, while pastures are mainly used for hunting (Grilo et al. 2002a) (Figures 3.10). The result of regular occurrence of fires can thus lead to an important loss of habitat for the wolf population in the study area (Figures 3.11). Most of the southern part of the counties of Aveiro and Viseu (Zone 1) are covered with eucalyptus (*Eucalyptus globulus*) and pine tree forests.

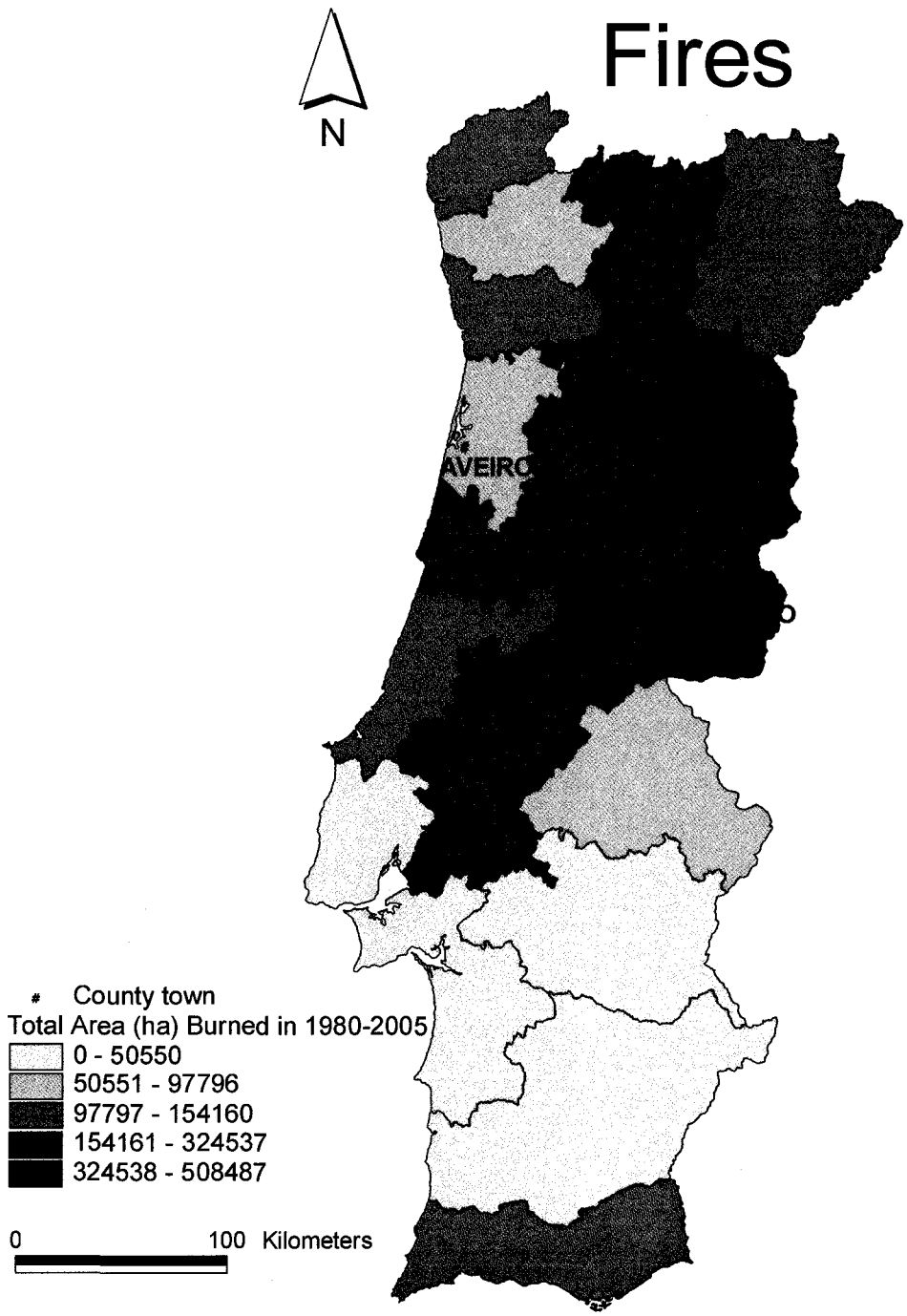
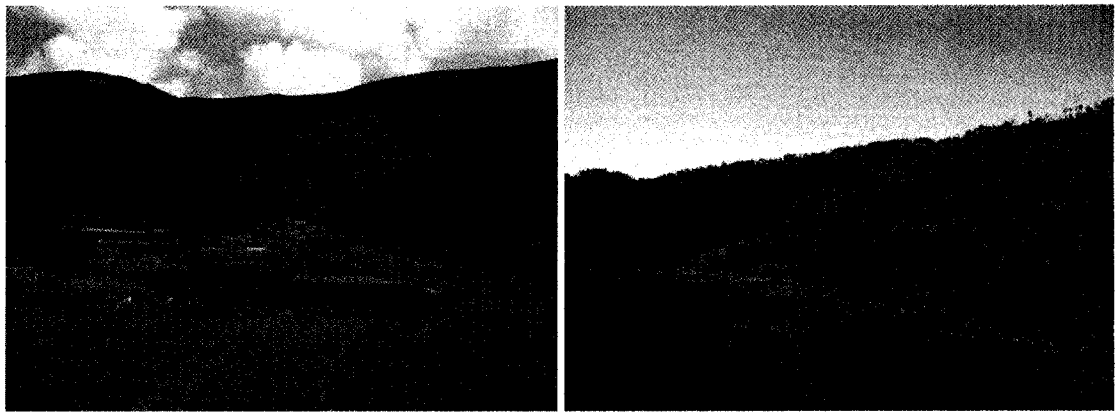
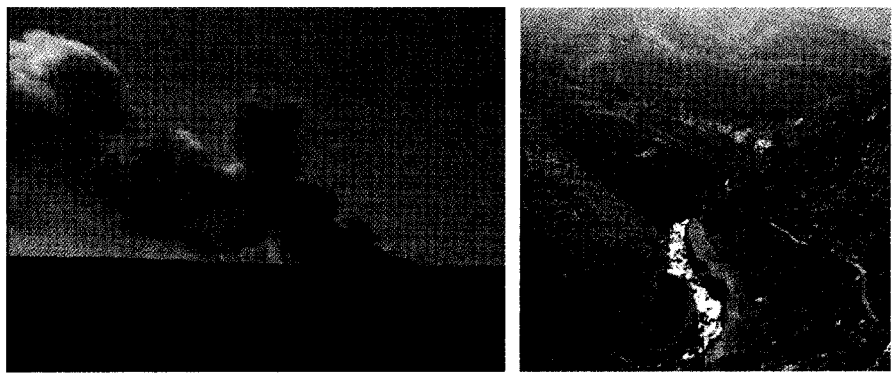


Figure 3.9 – Total Area (hectares) burned in Portugal between 1980 and 2005 (DGRF 2006).



Figures 3.10 – a) and b) Wolf habitat with pastures and forests, in the study area (photos: C. Espirito-Santo)



Figures 3.11 – a) Fires consuming forest areas in wolf territory; b) Wolf habitat destroyed by fire (photos: C. Espirito-Santo).

The northern part, where most of the wolf population exists, is characterized by areas of pastures and bushes (Figure 3.5), with patches of forest where wolves find refuge. This is also the preponderant landscape in the county of Guarda. This region also includes broadleaved forests, with oak trees (*Quercus spp.*), and European chestnut trees (*Castanea sativa*). Castelo Branco has a mixture of cork oak forest (*Quercus suber*), agricultural lands and pastures. Data from 2000-2005 show that the main reasons behind fire occurrence in Portugal are arson (35.4%) or are undetermined (27.4%), and only 2.2% are natural causes (DGRF 2006).

3.3.6 Wolf distribution

In 1863 the wolf was considered "very abundant in Portugal" (Bocage 1863), but forty years later Seabra (1910) noted that the species was becoming uncommon. In 1933 wolves still occupied about half of the Portuguese territory (Magalhães 1975). Since then, the distribution of wolves has been reduced both from south to north and from west to east in Portugal and today they are found in 20% of the original area (Petrucci-Fonseca 1990). The direct persecution by humans and the loss of habitat have been considered the principal causes of the decline (Petrucci-Fonseca 1990). The maps shown in Figure 3.12 clearly illustrate this reduction since the 1930s. Today the Portuguese wolf population is distributed over an area of approximately 20,000 km^2, divided into two groups by the Douro River (Moreira 1998). The group north of this river consists of approximately forty-three packs; this population is contiguous with the Spanish population (Grupo Lobo/ICN 2003). In contrast, the population in the south may consist only of eight packs (Grupo Lobo/ICN 2003) and there is no evidence of contact with the wolf population north of Douro River or the Spanish population. While studies have shown that the whole wolf population in Portugal seems to be stable today (Moreira 1998), the southern population needs to be better understood and carefully managed. The wolf population in Spain is the most significant one inside the EU. The present population is estimated to be around 1,500 to 2,000 individuals, the largest part of which can be found in the northwestern Spain (Fourli 1999). The populations north of the Douro River are relatively healthy, while those south of the river are extremely endangered (Fourli 1999), a similar situation to that in Portugal.

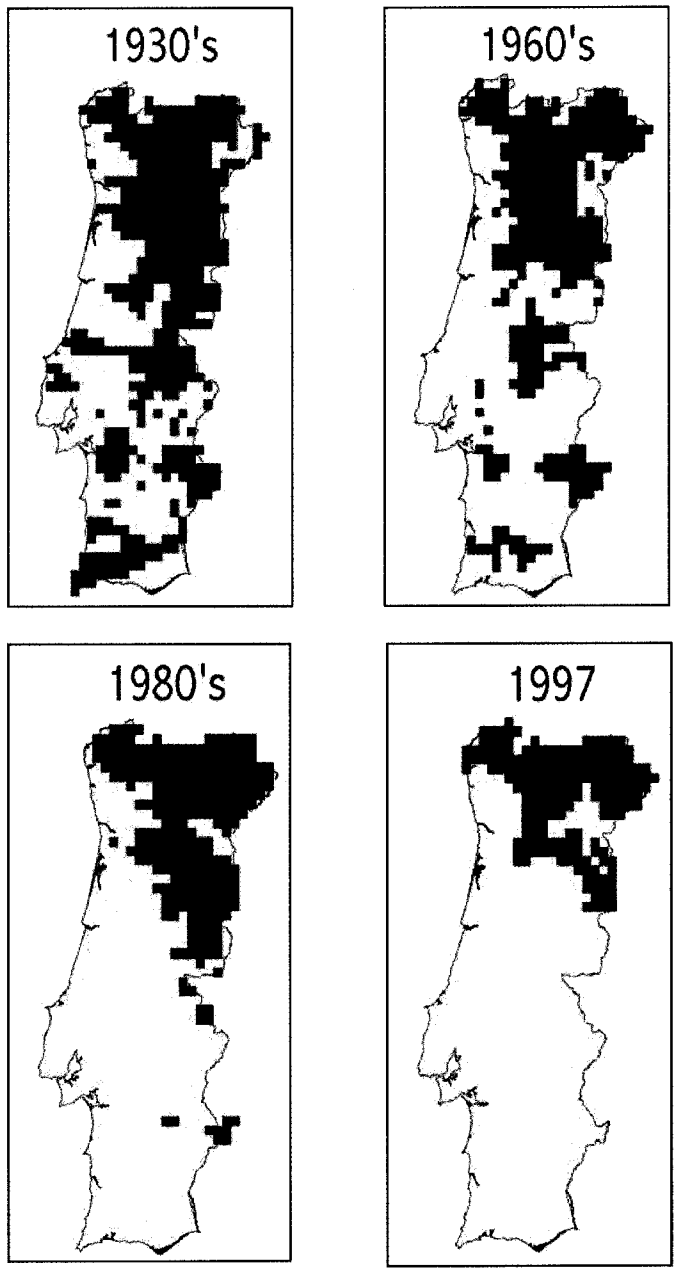


Figure 3.12 – Reduction of the wolf distribution (in blue) in Portugal since the 1930s (ICN 1997, Petrucci-Fonseca 1990, Petrucci-Fonseca and Álvares 1997).

The study area includes the counties where wolves are still found (south of Douro River) and surrounding areas where wolves have disappeared since the 1970s. Today, the wolf occurs mainly in the counties of Aveiro, Viseu and Guarda, an area of 7528 km2 (including areas with confirmed and probable occurrence) (Grupo Lobo/ICN 2003). In the counties of Aveiro and Viseu the wolf population has remained relatively stable, with wolf numbers either remaining the same or decreasing slightly (Grupo Lobo/ICN 2003). In contrast, the situation in Guarda has changed significantly, particularly within the last six years. One or two wolf packs, documented in 1997 near the border with Spain, were already isolated from the main population in Aveiro/Viseu (ICN 1997). Most of the county of Guarda is considered an area of sporadic occurrence of wolves, and no reproduction was confirmed in 2002 (Grupo Lobo/ICN 2003). In Castelo Branco wolves have not been present since the 1980s (ICN 1997, Petrucci-Fonseca 1990). Zone 3 does not include the entire county of Castelo Branco, just an area of 4963 km2, which corresponds to the wolf distribution in the 1970s in this county. The entire study area is illustrative of a gradient of wolf presence, from Castelo Branco (non-existence of wolves), to Guarda (sporadic occurrence of wolves), and then to Aveiro/Viseu (stable wolf population). This study explores whether the human dimension issues (attitudes, knowledge, and behaviour) vary across these zones.

3.3.7 Wild prey

The main wild prey for wolves in the study area are wild boar (*Sus scrofa*) and roe deer (*Capreolus capreolus*) (ICN 1997), although the relative importance varies among the three zones. The wild boar is the most common prey species occurring in most of the study area, followed by the roe deer which occurs mainly in Guarda's municipalities closer to the Spanish border (Figure 3.13). In comparison with other countries, such as Norway (Andersen and Linnel 2000), roe deer densities in Portugal, and particularly in the study area, are very low (ICN 1997). Previous research has shown that wolf distribution in Guarda coincides with the roe deer range, which suggests that trends in roe deer populations can influence wolf population size and areas of occurrence (ICN 1997).

Red deer (*Cervus elaphus*) represent an additional food source only if wolves were to disperse to the south into the Castelo Branco county. The general lack of wild prey together with a decrease in the number of small livestock flocks (consisting mainly of sheep and goat) has been compromising the survival of wolves living in the study area (Grilo et al. 2002a, ICN 1997). Reintroduction by ICN or by private hunting associations of roe deer and red deer has been done occasionally in the study area, with the aims of increasing the size of wolf prey population or game populations (ICN, 1997; C. Lourenço, pers. comm.). Wild boar numbers have been increasing, thus becoming a new game species for hunters and an additional food source for wolves (ICN 1997). However, the perceived damage caused by wild boars to crops has led farmers to set large numbers of snares on their lands. Some wolves have been found dead in these snares (Grilo et al. 2002a, ICN 1997). The poaching of wild boars with snares constitutes an additional and increasing threat to wolf survival in the study area.

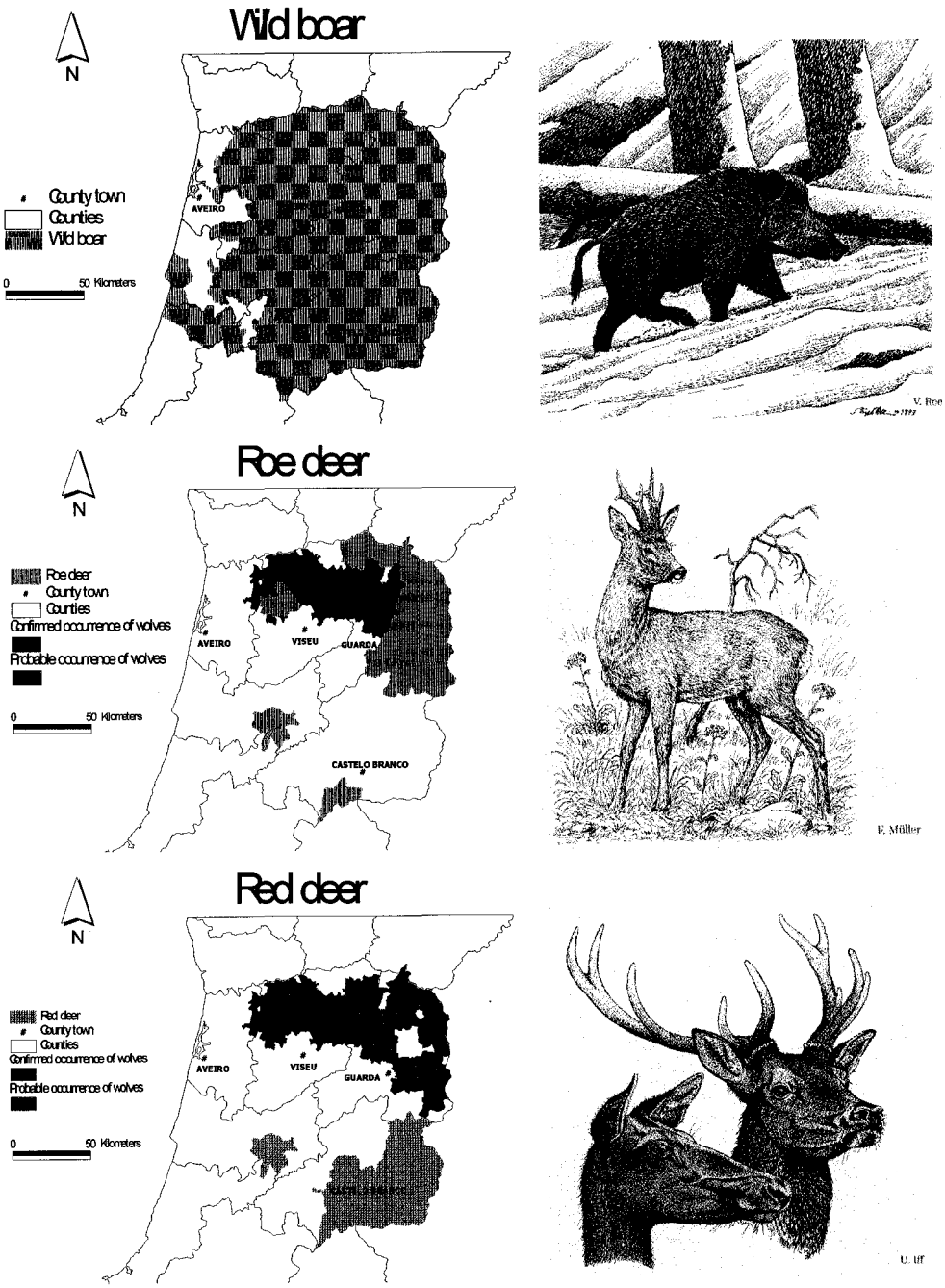


Figure 3.13 – Distribution of the main wild species of ungulates in the central-north part of Portugal (ICN 1997, Mitchell-Jones et al. 1999).

3.3.8 Livestock

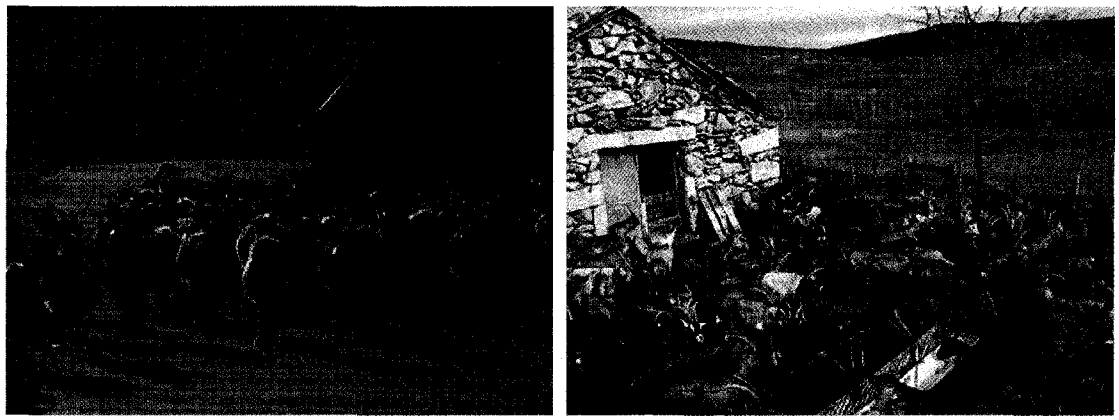
With the abandonment of agricultural practices, livestock production has been decreasing in Portugal (ICN 1997). Livestock production still is, however, a valuable source of income, as indicated by the number of animals raised annually in the study region (more than 10 million animals) (INE 2001) (Table 3.2). Chicken farms are one of the main agricultural activities with more than 9 million birds raised per year, followed by sheep production, and to a lesser extent goats and cattle (INE 2001). The highest densities of chicken farms exist in Aveiro/Viseu immediately adjacent to the wolf area (Figure 3.16). Although chicken do not represent the main source of food for wolves, data is presented on the density of chicken farms in the study area. In case there are dispersal movements on the wolf population, chicken may potentially represent an important source of food for wolves in the future.

Table 3.2 – Number of domestic animals grown in the study area in 1999 (INE 2001).

	Cattle	**Goats**	**Horses**	**Sheep**	**Chickens**	**Total**
Aveiro/Viseu	46,820	47,884	4,783	105,143	9,135,677	*9,340,307*
Guarda	32,361	33,508	11,024	204,976	623,671	*905,540*
Castelo Branco	21,877	47,691	4,384	254,437	186,284	*514,673*
Total	*101,058*	*129,083*	*20,191*	*564,556*	*9,945,632*	***10,760,520***

The main prey consumed by wolves in the study area is livestock (82.3%), with goats (32.3%) and sheep (24.2%) being the most important species (Grilo et al. 2002a). These domestic animals are usually raised in the mountains and guarded by a shepherd (**Figures 3.14**) and one or two dogs of Portuguese breeds (**Figures 3.15**). When staying in the valleys the flocks are frequently left unattended in small pastures near the villages or kept in corrals. Although sheep and goats are the main wolf prey, sheep are the least abundant domestic species in zones with wolves (Figures 3.17 and 3.18). Cattle, horses, and pigs are the least abundant types of livestock in the study area (e.g. Figure 3.19 shows

the main density of cattle in Aveiro/Viseu; other types are not shown). While livestock is not abundant in Guarda, a high density of sheep in large flocks exists mainly in the mountain areas of the county. Castelo Branco has the lowest total number of animals of all the regions in the study area.



Figures 3.14 – Flocks of goats raised in the mountains, inside wolf habitat: a) flocks are usually guarded by one shepherd and one or two dogs; b) livestock is kept in corrals during the night (photos: C. Espirito-Santo)

Figures 3.15 – Portuguese breeds of livestock guarding dogs: a) Short-hair Serra da Estrela's dog; b) Castro Laboreiro's dog (photos: S. Ribeiro, R. Simões)

In North America, wolves are characterized as symbols of wilderness and feed mainly on wild prey found in those wilderness areas. In contrast, the feeding habits of this Portuguese wolf population are very different; these wolves depend on carcass dumps.

Some wolf packs mainly survive on dead livestock such as cattle, donkeys, pigs, and sheep from livestock farms, and also on chicken from chicken farms (Quaresma 2002) which are particularly abundant in Aveiro/Viseu. Although improper carcass disposal is illegal, livestock owners continue to do this practice in order to save the costs of disposal; this way they provide an important source of food for the wolf population.

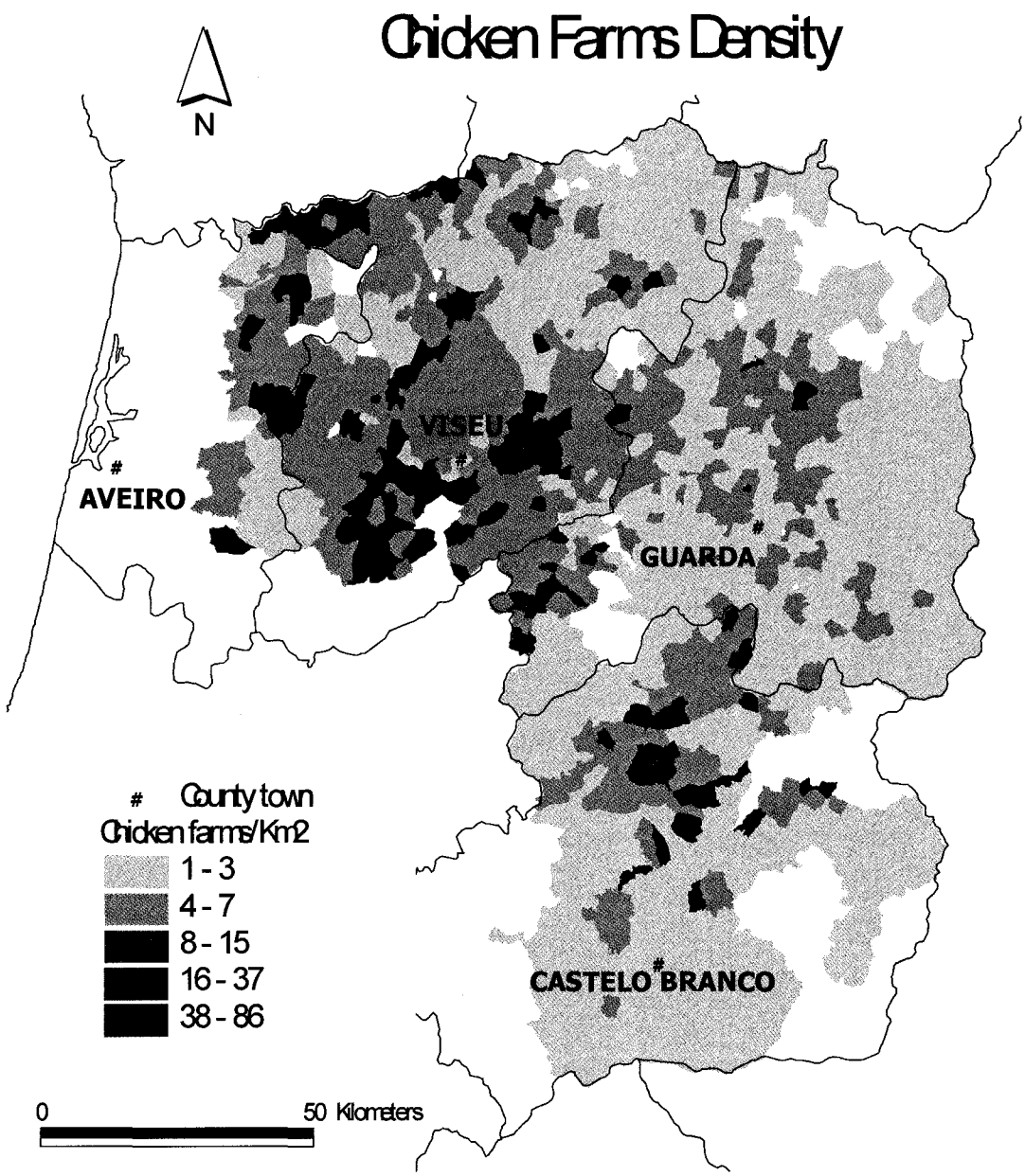


Figure 3.16 – Density of chicken farms (number of chicken farms/km^2) in the study area (INE 2001).

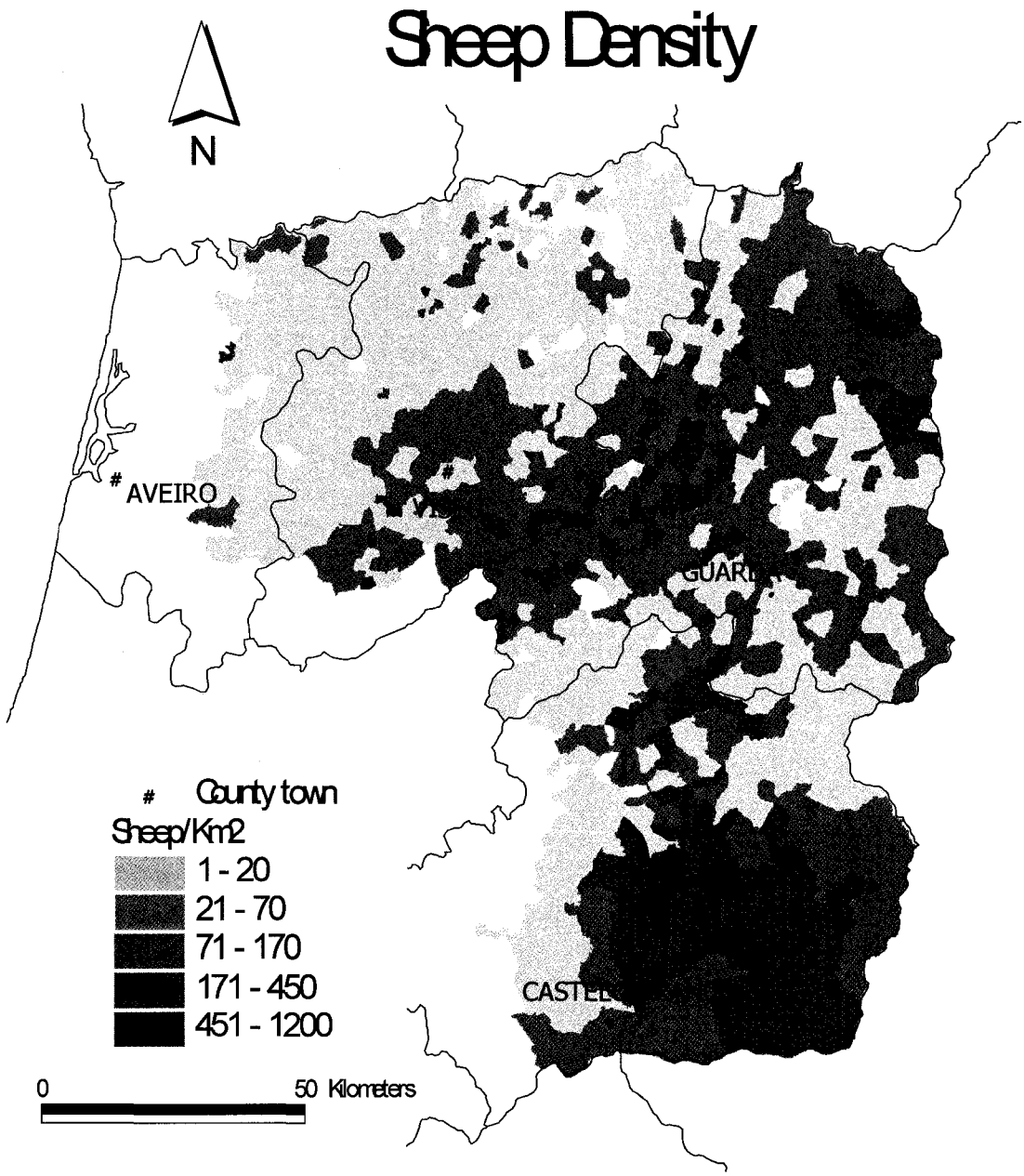


Figure 3.17 – Sheep density (number of animals/km^2) in the study area (INE 2001).

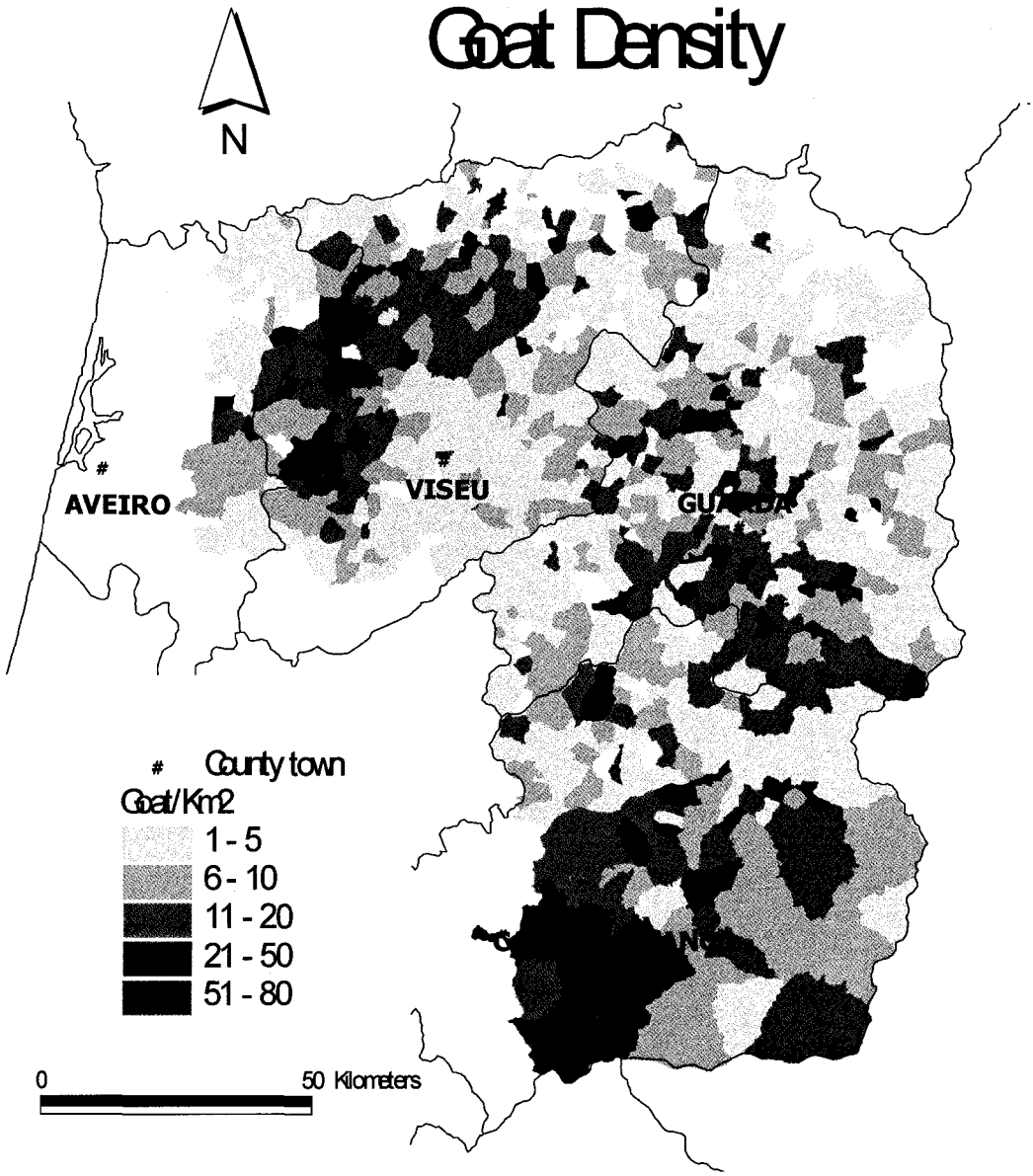


Figure 3.18 – Goat density (number of animals/km^2) in the study area (INE 2001).

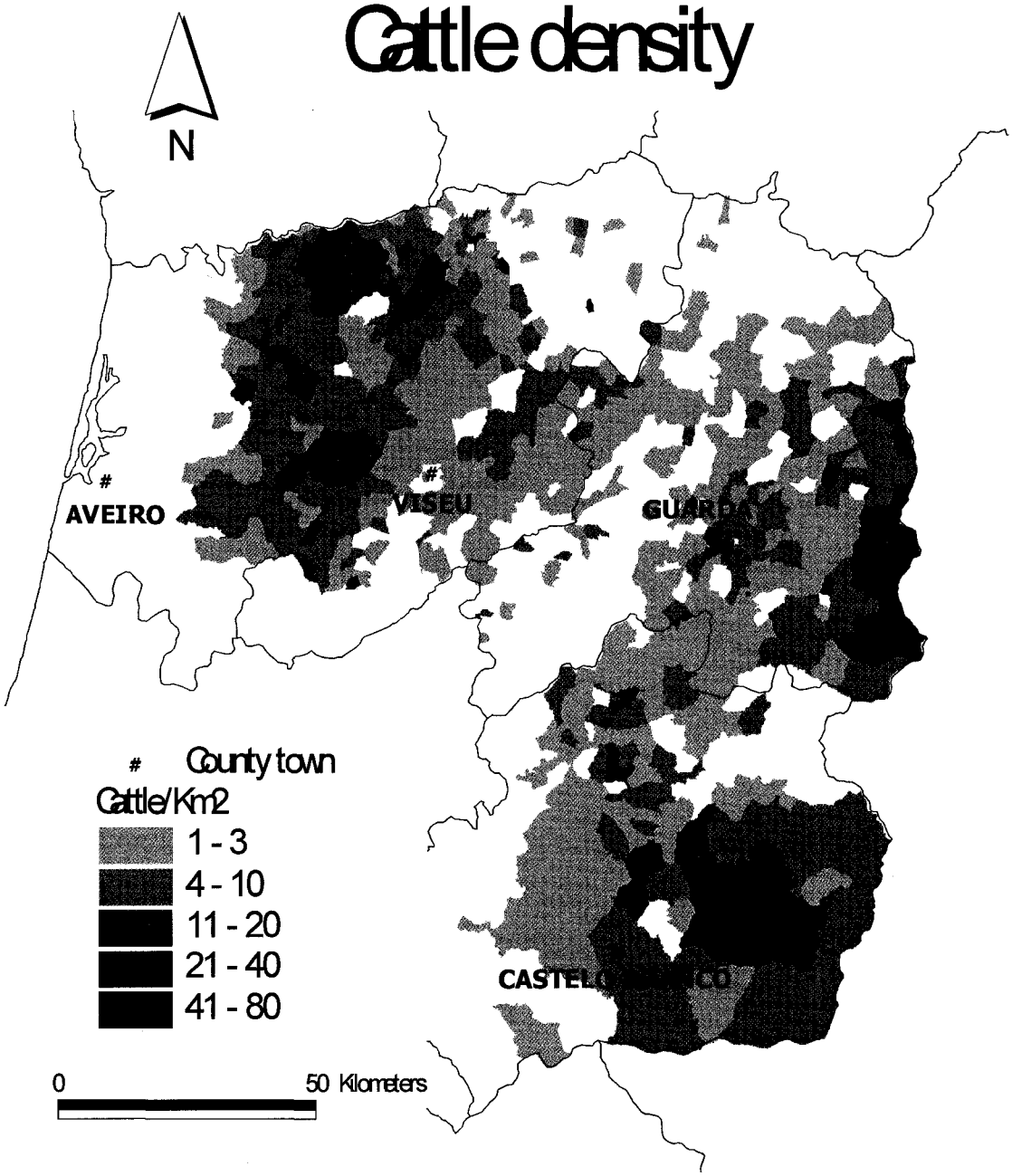


Figure 3.19 – Cattle density (number of animals/km^2) in the study area (INE 2001).

3.3.9 Wolf Predation on Livestock and the Damage Compensation System

Wolf-livestock conflicts have always occurred in every country where the two coexist (Fritts et al. 2003). In the Iberian Peninsula, the high level of livestock depredation by wolves has been the main problem facing conservation of the Iberian wolf (Vos 2000) (Figure 3.20). Research shows a high percentage of domestic ungulates in the diet of the Portuguese wolf population (Álvares 1996, Carreira and Petrucci-Fonseca 2000, Magalhães 1975, Moreira 1998, Petrucci-Fonseca 1990, Quaresma 2002, Roque et al. 2001, Vos 2000). Livestock depredation invariably occurs regardless of the presence or absence of wild prey (Kaczensky 1996), but livestock depredation generally decreases in areas with higher densities of wild prey (Cozza et al. 1996, Meriggi et al. 1996, Meriggi and Lovari 1996, Tellería and Sáez-Royuela 1989). Several studies done in southern Europe have shown that, in areas where wild prey is present, attacks on livestock decrease but continue to occur, especially if only one species of wild prey is present (Meriggi and Lovari 1996). The wolf generally selects the easiest prey available (Fourli 1999, Meriggi et al. 1996, Vos 2000). The low density of wild ungulates in the study area where wolves live results in a large number of wolf attacks on livestock (Grilo et al. 2002a, ICN 1997). This is similar to other parts of the country where wolves are found (Álvares et al. 2000b, Carreira and Petrucci-Fonseca 2000, Petrucci-Fonseca 1990).

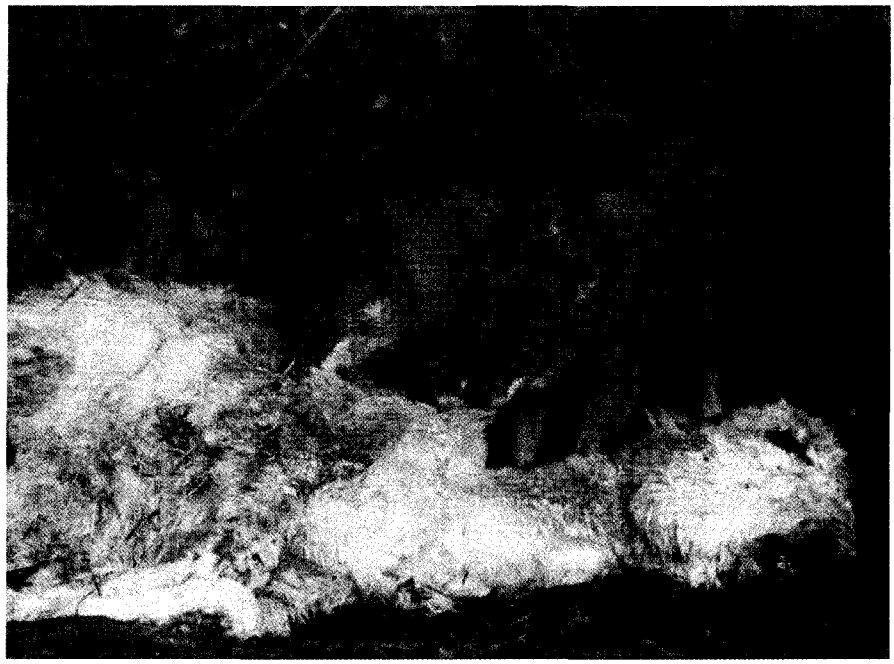


Figure 3.20 – Iberian wolves feeding on a donkey carcass (photo: F. Álvares).

A compensation program for damage caused by wolves exists in Portugal and legislation applies at the national level. A livestock owner with wolf-caused damage must contact the ICN (the governmental institution responsible for payment of compensation) through the staff of the nearest protected area. This contact must take place within 48 hours after the damage has been discovered. The inspection is conducted by rangers or technicians in the protected areas on behalf of the ICN either the same day that the damage has been declared or the following day. Officially, the compensation payment must be made within the two months following the decision of the ICN, but in reality it can take up to one year (Assembleia da República 1988, Fourli 1999). Portugal has been one of the countries of the European Union with longer delays in compensation payments (Figure 3.21) (Fourli 1999). This situation has changed since 1997 and today the payments are made more quickly (I. Barroso, pers. comm.).

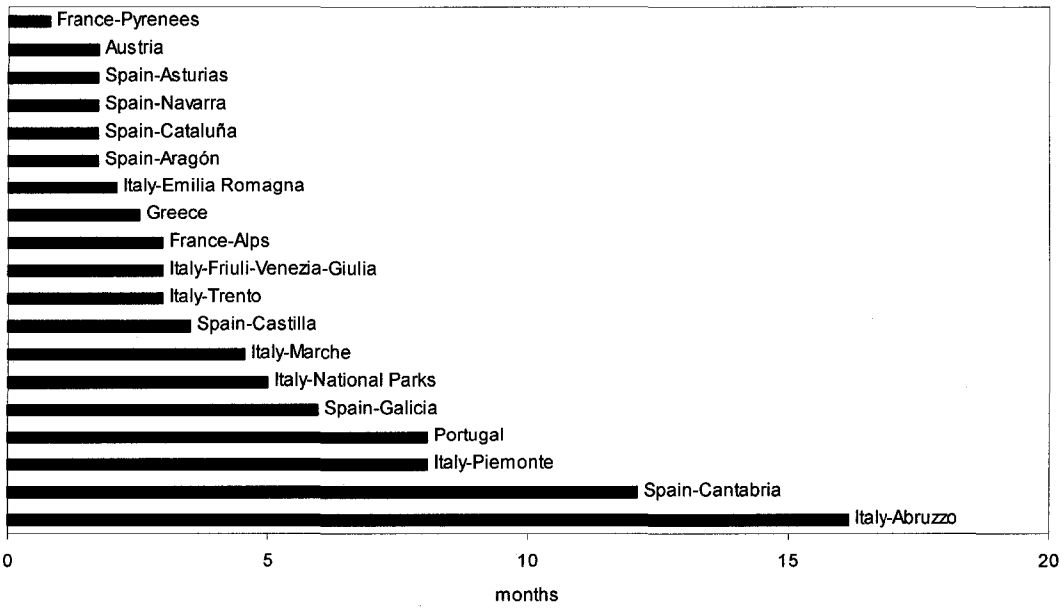


Figure 3.21 – Compensation payment delays in the 1990s in EU countries (Fourli 1999).

There has been some fluctuation in the number of attacks since 1992 which could be caused by fluctuations in the number of wolves, the density of wild prey and/or livestock, changes in husbandry methods, use of livestock guarding dogs, or availability of other food sources (e.g. livestock carcasses) (Figure 3.22). However, the most plausible reason behind the increase in the number of wolf attacks reported after 1997, might be the fact that most late compensation was paid this year. There was some under-reporting before 1997; many livestock owners decided to start reporting wolf attacks on livestock in the hope of receiving money faster than in previous years.

Overall, the instances of attacks on livestock appear to be increasing. Some villages in Aveiro/Viseu have suffered more than 300 wolf attacks during the last five years (ICN 2002). As noted in previous studies done in the same region (ICN 1997), the highest number of wolf attacks have occured in Aveiro and Viseu, which are areas of frequent presence of wolves (Figure 3.22). There have been fewer wolf attacks in Guarda than in Aveiro/Viseu probably due to the lower number of wolves and the presence of wild prey like wild boar and to a lesser extent roe deer. During the last decade, there were only a

few cases of livestock damage in Castelo Branco caused by some of the last wolves living in the region or caused by feral and stray dogs. Unlike Italy, the governmental compensation program for wolf-caused damage does not cover attacks caused by dogs, but compensation is usually paid in cases where it is not possible to identify which canid did the damage.

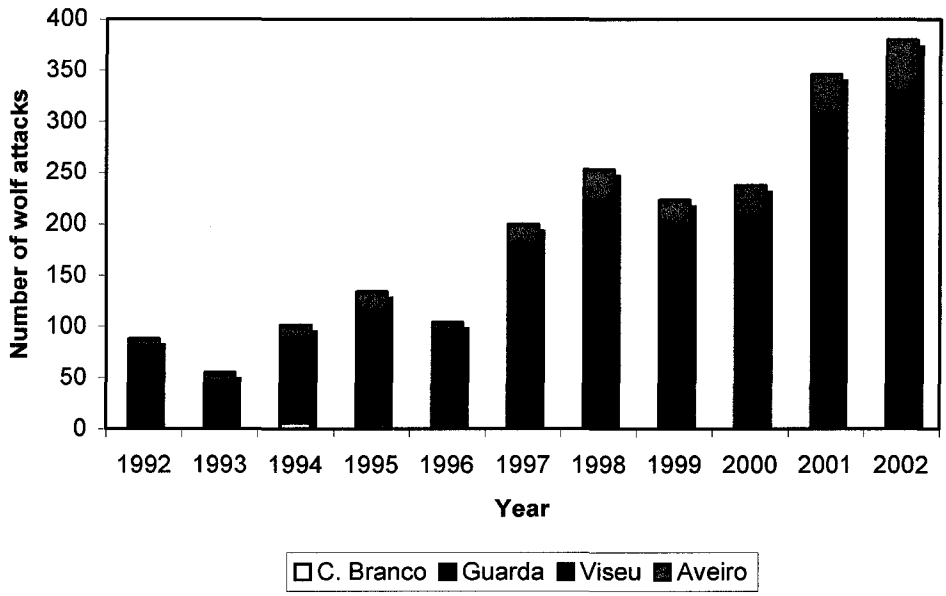


Figure 3.22 – Number of wolf attacks on livestock between 1992 and 2002, in the central-north part of Portugal (ICN 2002).

To date, compensation programs have been the principal means employed to manage wolf-livestock conflicts in Portugal. Although indemnity has been provided for by national legislation since 1988 (Assembleia da República 1988), knowledge about livestock losses, as well as costs, trends, and effectiveness of the compensation program is still limited in Portugal. One way of understanding the impact of wolf predation on livestock is through the analysis of the number of domestic animals affected by wolf attacks and the percentages of animals affected from all available livestock (Figure 3.23). These data are based on information provided by ICN and includes killed, wounded or missing domestic animals resulting from wolf attacks. However, payment of

compensation is provided only for killed and injured livestock, not for animals reported missing.

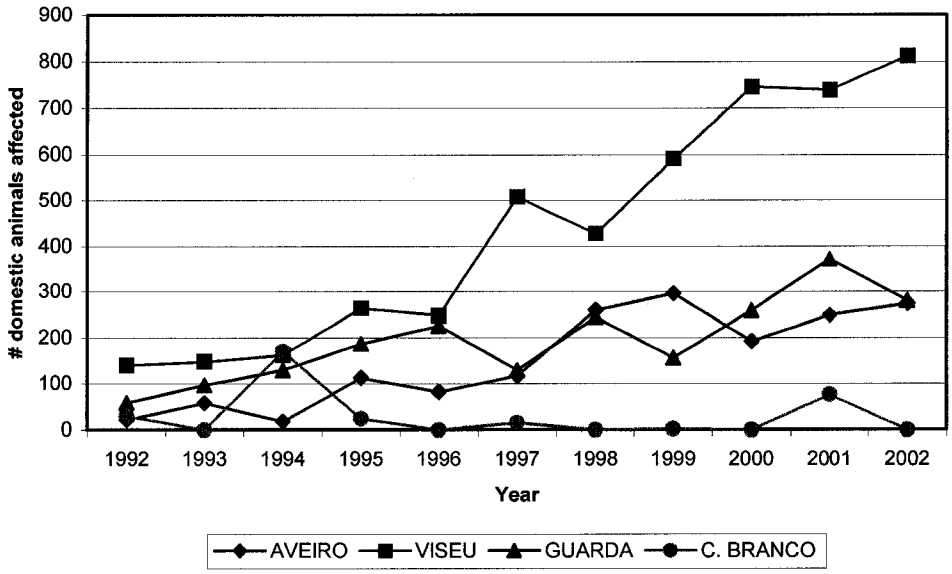


Figure 3.23 – Number of livestock killed, wounded or disappeared resulting from wolf attacks in the counties of the study area, between 1992 and 2002 (ICN 2002).

In the study area wolves cause economic damage mainly on sheep (50%) and goats (45%), followed by cattle (4%) (ICN 2002). The county of Viseu, which covers most of Zone 1, has the highest number of livestock affected by wolves every year. These numbers show an increasing trend over time, while in the other counties the situation is stable or only increasing moderately. The impact wolf predation has on livestock is also felt in the percentages of domestic animals killed from all the existing livestock. Although Aveiro has a relatively low number of wolf attacks and a slow increase in the trend, it holds the highest percentages of domestic animals killed by wolves of all the counties in the study area (Table 3.3). Data in Table 3.3 refers to the percentages of livestock killed of all the existing livestock in the municipalities where wolf attacks occur, and not in the entire county. The strongest impact of wolf predation on livestock occurs in Aveiro/Viseu, due to the number of wolf attacks that occur (Viseu) and the percentage of

animals killed (Aveiro). Nevertheless, the impact is low considering the low percentages of livestock affected in the four counties (ranging between 0.01 and 0.61 in Castelo Branco and Aveiro respectively).

Table 3.3 – Total numbers and percentages of livestock affected by wolf attacks in central-north part of Portugal, between 1992 and 2002 (ICN 2002).

County	**Aveiro**	**Viseu**	**Guarda**	**Castelo Branco**
Total livestock [1]	25,298	110,047	234,453	278,498
Livestock affected [2]	1,693	4,788	2,138	321
Average # of livestock affected per year	154	435	194	29
Minimum # of livestock affected *(Year)*	19 *(1994)*	141 *(1992)*	59 *(1992)*	0 *(93,96,98,2002)*
Maximum # of livestock affected *(Year)*	297 *(1999)*	812 *(2002)*	372 *(2001)*	171 *(1994)*
% of livestock affected [3]	0.61	0.40	0.08	0.01

[1] Total numbers of livestock present in the municipalities where wolf attacks occur (chicken not included) (INE 2001).
[2] Total numbers of livestock affected (killed, wounded, or disappeared) by wolf attacks, between 1992 and 2002 (chicken not included).
[3] Based on the average of livestock affected per year in each county.

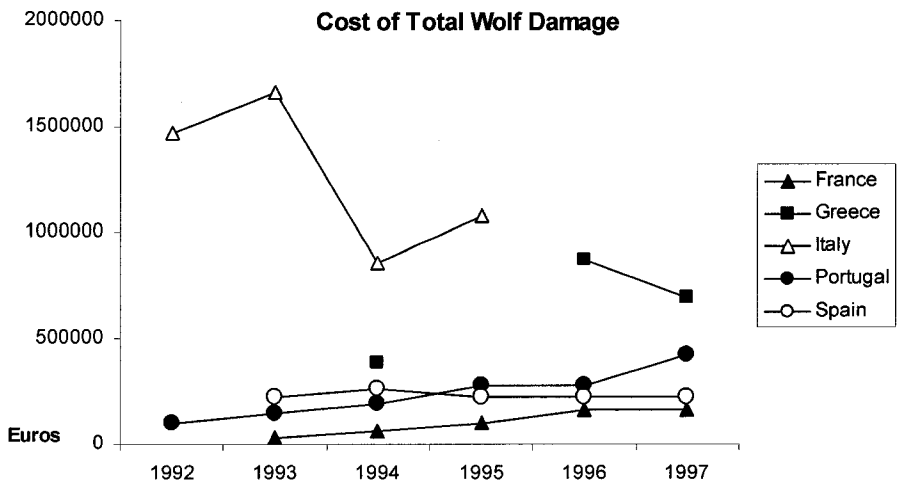
Another approach to understanding the impact of wolf predation on livestock is through analysis of damage costs. Portugal has one of the smallest populations of wolves in Europe (e.g. France=less than 50 wolves; Greece=200-300; Italy=400-500; Portugal=200-300; Spain=1500-2000), but spends a significant amount of money in compensation every year (Figures 3.24) (Fourli 1999). While an increase in the cost of damage can be observed in several countries, such increases may be due to three reasons (Fourli 1999):

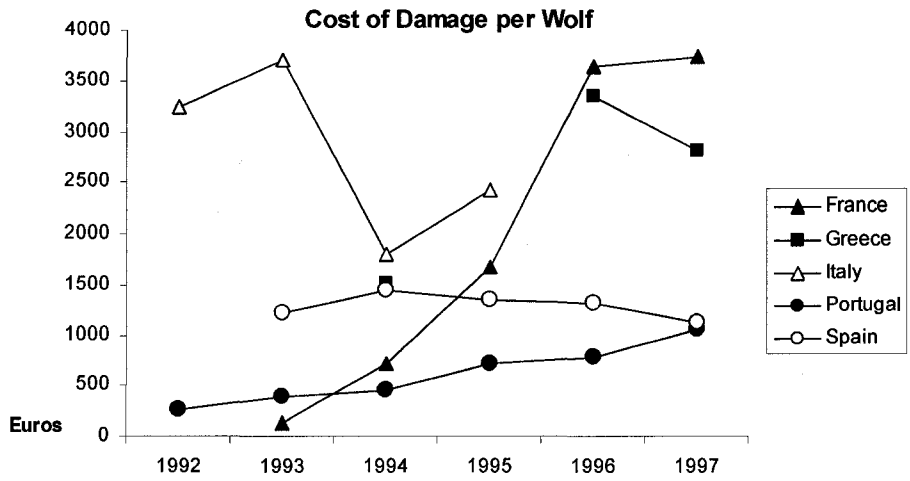
- increases in the prices of animals or in the other fees included in the compensation in some countries;

- increases in the damage declared, not the real damage, since usually not all damage is declared;

- increases in real damage resulting either from a change in the population or distribution of wolves, or from the presence of "problematic" situations, *i.e.* cases where abnormal and excessive damage occurs.

In Portugal, the cost of wolf damage steadily increased during the 1990s, from approximately 93,500 Euros (in 1992) to 407,010 Euros (in 1997), an increase of 4.4 times (Fourli 1999). This increase in wolf damage costs is due to a significant increase in animal prices in Portugal, which inflates the levels of damage. As mentioned before, this trend is also due to the fact that the number of declared damage incidents has increased with the improvement of the compensation system and the increasing awareness of its existence (Fourli 1999).





Figures 3.24 – a) and b) Level of damage caused by wolves in the 1990s in EU countries (Fourli 1999).

3.3.10 Feral and stray dogs

The presence of free-ranging domestic dogs in wolf areas represents a well-known problem in several countries (e.g. Andersone et al. 2002, Blanco et al. 1992, Boitani 1982, Ciucci and Boitani 1998, Denney 1974, Ovsyanikov and Poyarkov 1996, Robel et al. 1981, Schaefer et al. 1981). Wolf predation on dogs has been documented in previous research (Coppinger and Coppinger 1995, Fritts and Paul 1989, Kojola and Kuittinen 2002, Lopez 1978, Quaresma 2002, Roque et al. 2001, Treves et al. 2002, Vos 2000), thus showing that feral and stray dogs can be an additional food source for wolves. However, the presence of feral and stray dogs can be a threat to wolves for several reasons: (1) dogs can compete with wolves for habitat and food (Boitani 1983), and are able to attack wolves when grouped in packs with higher numbers of individuals than wolf packs (Grilo et al. 2002a); (2) mating between dogs and wolves can cause hybridization among the species (Andersone et al. 2002, Boitani 1982) and threaten the genetic diversity of wolves; (3) dogs cause damage to livestock (Ciucci and Boitani 1998, Denney 1974, Robel et al. 1981, Schaefer et al. 1981); and, (4) the difficulty of

distinguishing between damage caused by wolves and dogs increases wolf-livestock conflict perceptions and the implementation of compensation programs (Blanco et al. 1990, Boitani 1982, Ciucci and Boitani 1998, Cozza et al. 1996) .

Figure 3.25 – Feral/stray dog eating a goat (Photo: S. Ribeiro).

In Portugal, the presence of feral and stray dogs is constant throughout most of the territory. These dogs are usually abandoned by people for a myriad of reasons: they are no longer useful as guard dogs or pets; they become a problem when people want to go on holidays; they become too aggressive; they do not serve as good hunting dogs, etc. While doing the interviews for this study, and during informal conversations with representatives of various interest groups, people mentioned different reasons and points of view in terms of who is responsible for this phenomenon. The most common reason referred to was the abandonment of dogs by hunters after the hunting season. According to Portuguese legislation, it is illegal to abandon any animals used for hunting (Assembleia da República 1999) . When it can be shown that nobody owns them, the control of feral and stray dogs becomes the responsibility of the authorities (Assembleia da República 1985). There are no official data on the number of feral and stray dogs in the country, but in the study area these dogs occur in 87% of the municipalities (Ribeiro 1996). Figure 3.26 shows the results of one of the few studies done so far to estimate

areas of occurrence of feral and stray dogs in Portugal. The map shows the villages where feral and stray dogs are present, although it does not provide quantitative information on the number of animals.

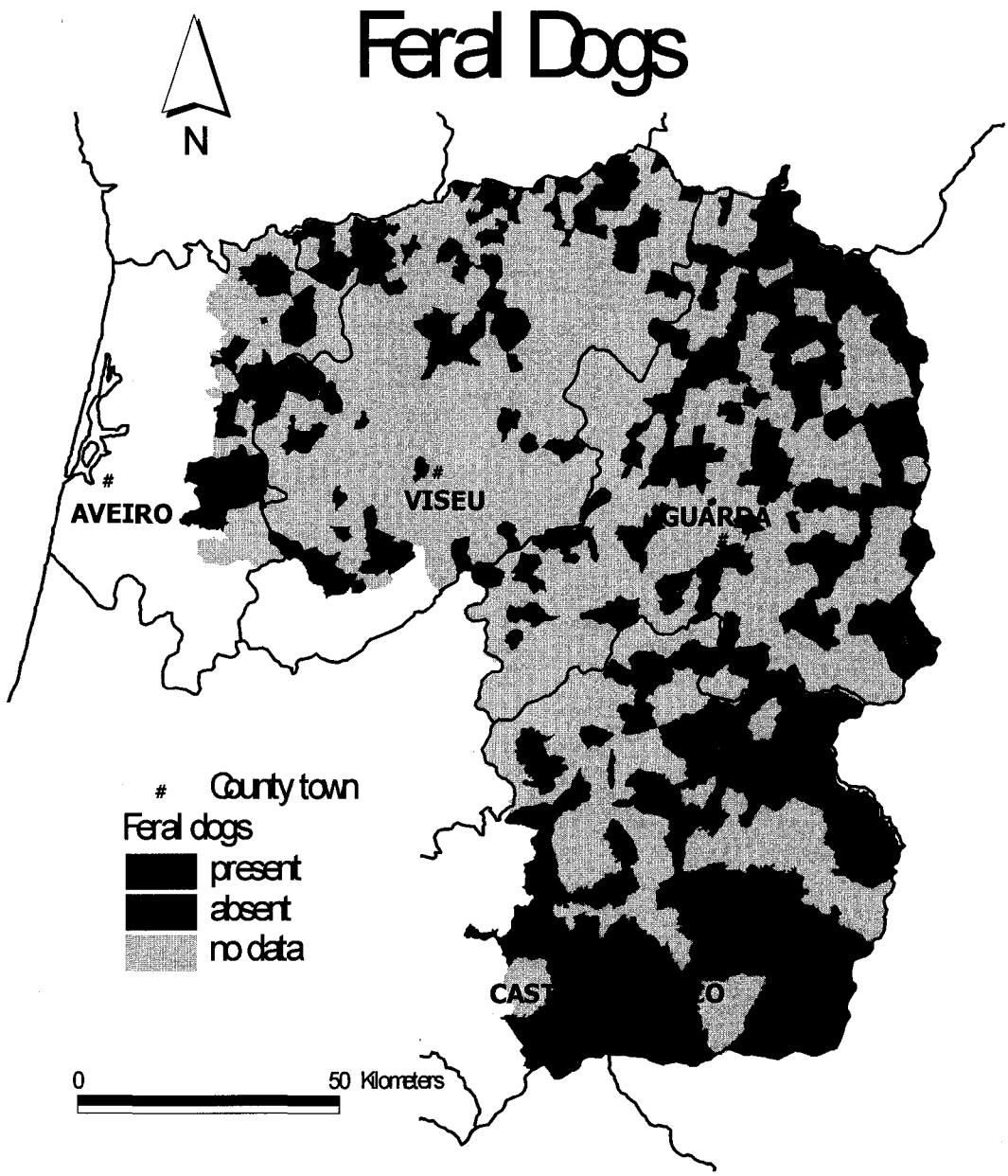


Figure 3.26– Villages with presence of feral and stray dogs in the study area (adapted from Ribeiro (1996)).

3.3.11 Protected areas

The main protected area of Portugal, the *Parque Natural da Serra da Estrela*, is located in the study area and mainly in the county of Guarda (Figure 3.27). With 101,060 hectares and altitudes above sea level between 300 and 1993 metres, this mountainous area is a high plateau carved by glacial valleys (ICN 2003). High amounts of precipitation allow for intensive agriculture inside the park up to 900 metres (ICN 2003). Above this altitude there are still some primitive oak tree forests and many pastures for livestock raising which is one of the main economic activities in the area. Until the late 1980s, when wolves disappeared from most of the park, this region was considered, by several authors and locals, as one of the "favourite" areas for wolves because of the food source provided by several livestock herds comprising thousands of animals (Cândido and Petrucci-Fonseca 2000). The disappearance of the wolf from the park is believed to be due to the reduction in the availability of wild prey and livestock (Cândido and Petrucci-Fonseca 2000).

The *Parque Natural do Douro Internacional* is the second protected area in the Guarda region. The main purpose of this park is the protection of birds of prey that breed in the deep valleys of the Douro river in a 122 km long area along the border with Spain (ICN 2003). Two main plateau areas, covered with oak tree forests and bushes, which are largely inaccessible to local people, offer good refuge to wildlife (ICN 2003). Wolves occur in most of the park north of the Douro River, but in the south there is no confirmed occurrence of wolf packs (Grupo Lobo/ICN 2003). Interestingly, the majority of the southern part of the park overlaps with private hunting grounds (Figures 3.8 and 3.27).

The third protected area is the *Reserva Natural da Serra da Malcata,* located in the south of Guarda county. It was created with the purpose of protecting good habitat for the recovery of the Iberian lynx (ICN 2003). For this reason the area has been the focus of various conservation projects for habitat improvement and increase of lynx prey populations. These conservation measures taken by the government may benefit other carnivores, including the wolf. The area does not have a resident human population (INE

1991), and only a few crop and livestock farms are found in the area. Part of the *Parque Natural da Serra da Estrela* and the *Reserva Natural da Serra da Malcata* are included in the county of Castelo Branco, but neither of these regions has wolves (Figure 3.27).

The fourth protected area, which is entirely within the county of Castelo Branco, is the *Parque Natural do Tejo Internacional*. With an area of 28,000 ha, this park was created in 2000 with the purpose of protecting a rich habitat particularly for several bird species (ICN 2003). This area was one of the last regions to have wolves in the county of Castelo Branco, according to unconfirmed information collected by Cândido and Petrucci-Fonseca (2000). The present occurrence of wolves is not confirmed in any of these protected areas, although they may exist in the southern part of the *Parque Natural do Douro Internacional* (Grupo Lobo/ICN 2003). Livestock production and agriculture is allowed in these four protected areas, and hunting is allowed in all areas excepting the *Parque Natural da Serra da Estrela.*

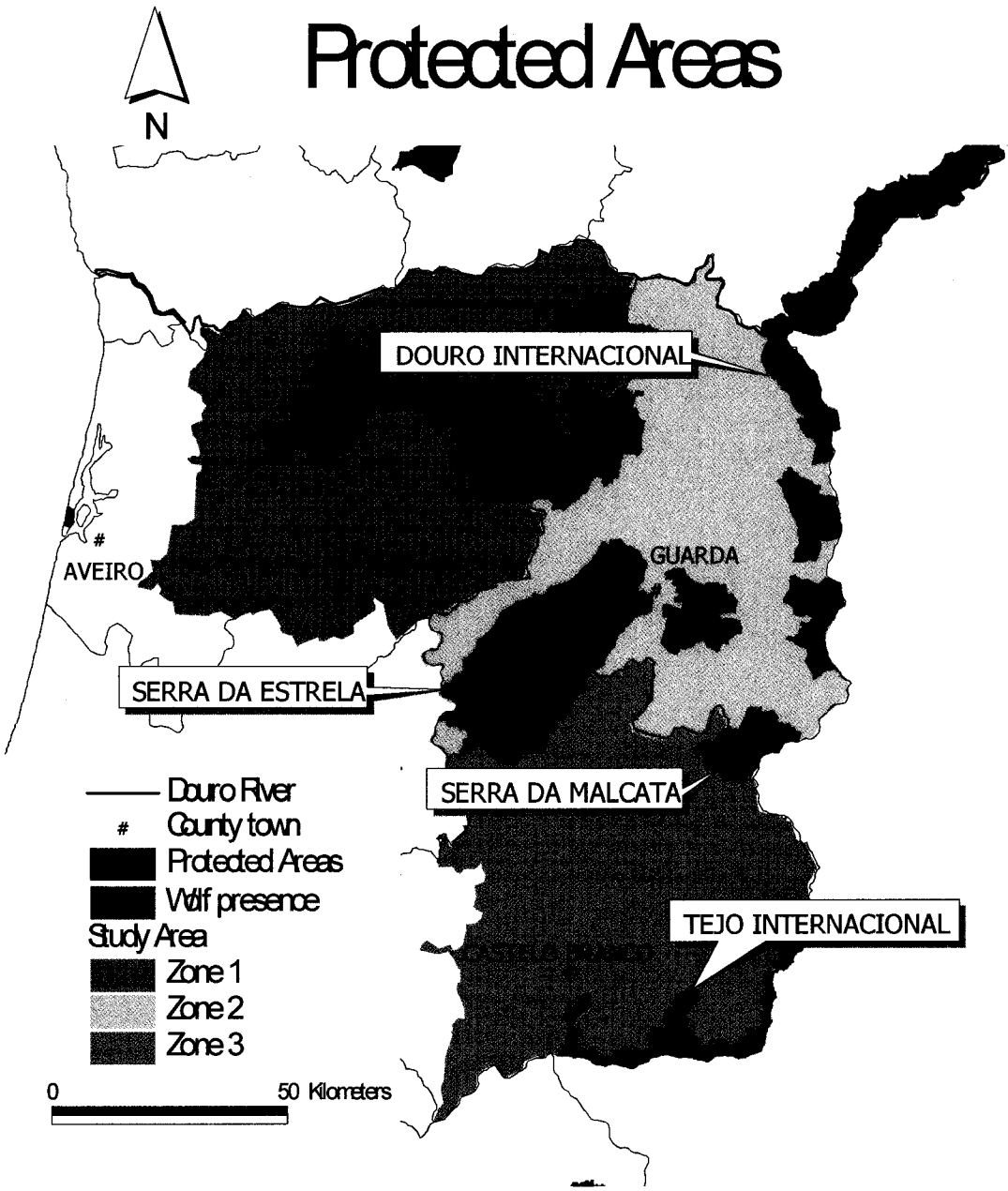


Figure 3.27 – Distribution of Protected Areas in the study area (ICN - NIG 2003).

In most of the variables used to characterize the study area, the three zones are significantly different (Table 3.4). To summarize, Zone 1 (Aveiro/Viseu) has the highest densities of human population, mainly in the urban centres, and several important highways. Although this is the area where most of the wolves live there are no protected areas. In terms of food sources for wolves, the wild boar is widespread in the entire study area, and most of the chicken farms are located in Aveiro/Viseu offering an important food source for these wolves. Many villages report the presence of feral and stray dogs in Aveiro/Viseu.

Most of Zone 2 (Guarda) does not have a stable occurrence of wolves. However, it contains the largest protected areas in the study area and the highest number of roe deer, one of the preferred wild prey species for wolves. The highest concentrations of hunting grounds and burned areas are also found in this zone. A rocky soil dominates the landscape and does not provide good conditions for agriculture. The county of Guarda stands in an intermediate position between Zones 1 and 3 in terms of human population density, number of highways, chicken farms and sheep density, and presence of feral and stray dogs.

Zone 3 (Castelo Branco) is an area usually affected by a large number of fires. It contains more agricultural land than the other zones, and also the largest densities of sheep, goats and cattle. While in Zones 1 and 2 flocks are usually small (around 20 or 30 animals), in Castelo Branco it is common to find herds of 500 to 1000 animals. One other aspect that differentiates this zone from the previous two is that livestock is raised on large farms with barbed wire fences. Livestock are not roaming freely in the mountains and are not usually accompanied by shepherds or guard dogs as happens in the other zones. Populations of wild ungulates like wild boar and red deer live in this region in forested areas of cork oaks mixed with pastures for livestock. While the zones differ physically and economically an assessment of attitudinal and belief differences across these zones will offer a better understanding of the key issues facing each region.

Table 3.4 – Comparison of the three zones of the study area in terms of human and biophysical variables.

		Zone 1 AVEIRO/VISEU	Zone 2 GUARDA	Zone 3 CASTELO BRANCO
Human population density		high	medium	low
Agriculture (area with crops)		low	medium	high
Roads		high	medium	low
Hunting grounds		low	high	medium
Fires (# of fires)		medium	high	medium
Wolf presence		high	medium	-
Wild prey	roe deer	medium	high	low
	wild boar	medium	medium	medium
	red deer	-	low	medium
Livestock	chicken farms	high	low	medium
	sheep	low	medium	high
	goats	high	low	medium
	cattle	high	low	medium
Wolf attacks on livestock		low	medium	high
Feral and stray dogs (# of villages with dogs)		high	medium	low
Protected areas		-	high	medium

Chapter 4 - METHODS

The use of survey research in geography and its applicability to this study is discussed in this chapter. Qualitative and quantitative approaches used for data collection of different interest groups' attitudes toward wolves and wolf management are then outlined. A description of the criteria for selecting the interest groups and defining the sample sizes needed for each group across the three study area zones is also provided. Using Fowler's framework, other methodological issues are then discussed (Fowler 2002). Results are thus provided in Chapter Five.

4.1 Survey Research in Geography

"Survey research is a long established method of geographic field research" (Sheskin 1985). Survey research is considered to be the primary data collection tool for understanding human characteristics (Sheskin 1985). Considering the nature of this HD study and the importance of understanding many people's opinions about a specific issue for the management of a natural resource, survey research was considered to be the most appropriate tool for this study. This approach seems compatible with Fowler's idea that " a full-scale probability survey should be undertaken only after it is certain that the information cannot be obtained in other ways and the need for information is significant" (Fowler 2002). In this study, a sample of the residents from the counties of Aveiro, Viseu, Guarda and Castelo Branco is used. Survey research allows inferences to be made about the larger population, in this case the entire population living in these counties.

4.2 Data collection

Social scientists usually take one of three approaches to collecting information and creating understanding (Siemer et al. 2001). Some researchers employ quantitative techniques almost exclusively. Others prefer qualitative approaches to understand the complexity of human behaviour, and to capture details and nuances about individuals and

groups. Still other researchers find it productive to use both quantitative and qualitative methods in sequence (Cook and Reichardt 1979). A qualitative and quantitative approach was used to collect data for this study.

Sheskin (1985) identified five different survey mechanisms: personal interviews, mail surveys, telephone surveys, intercept surveys and dual mechanisms. Personal interviewing was the method chosen for this study. Qualitative interviews were conducted with thirty-one members of five interest groups (e.g. environmental NGOs, livestock owner associations, hunting associations, and biologists) with the purpose of identifying key issues and possible solutions toward wolf management. This approach was chosen also with the aim of gauging interest and support for this HD study and building trust and a willingness to work together with all interest groups in the future. Non-structured face-to-face interviews are intended as a means for having people reveal – in their own words and way of expression – how they feel about an issue (Siemer et al. 2001). This method allows a good understanding of the issues, the dynamics between the interest groups, and the intensity of the interests. Informal interviews permit the exploration of a subject in some depth, and the exploration of the public's preferences, which help understand the motivations underlying these opinions (Praxis 1988). The issues discussed during the first qualitative interviews helped scope the issues and understand how interest groups perceived the content of the issues. Data gathered from those interviews were used in developing a questionnaire, the research tool used for gathering quantitative data. Many attitudinal and belief items used in previous HD studies (Bath 2000, Bath and Majic 2001) were also included in the questionnaire. The qualitative interviews then proceeded simultaneously with the quantitative data sampling.

A questionnaire was used to gather data from a set of residents randomly selected proportional to the population in each zone. This research instrument was implemented through face-to-face personal interviews, the main advantages of which are high item-response rate (because respondents usually answer every question), being able to include complex questions, and allowing the interviewer to clarify questions and probe for a more complete answer. However, this method requires highly trained interviewers, has the potential for interviewer bias, and for social desirability bias (when answers are socially

acceptable rather than truthful) (Siemer et al. 2001). Nevertheless, this method was considered to be the most suitable for collecting quantitative data for this study because of the number of people to be sampled, and the controversial nature of wolf management.

4.3 Qualitative Issues

Qualitative interviews were conducted individually with several interest groups identified as key players in the wolf management debate in Portugal. Interviews were carried out in July-August 2001, November-December 2002 and January 2003. These groups were selected according to the following criteria:

- expressed interest in the wolf management issue in Portugal;
- have a potential role in influencing decisions concerning wolf management;
- expressed interest in learning more about the nature of this HD study;
- expressed willingness to discuss issues openly; and
- expressed willingness to begin to work together toward finding common ground among all interest groups and addressing key issues.

The interest groups who participated in the qualitative sample of this study were:

- livestock owner associations;
- hunting associations;
- Institute for the Conservation of Nature;
- wolf biologists; and,
- environmental NGOs.

Due to the criteria considered for the selection of the interest groups, some of these groups may or may not have been located directly in the study area. While hunting associations and livestock owner associations were located in the study area defined by the three zones, the national environmental NGOs, and ICN, for instance, were based in Lisbon, where the interviews were conducted. Whenever possible, representatives of each group, usually members at the executive board level of the organization, were contacted and interviewed. Respondents were asked about key issues facing wolves and wolf

management in the study area and in the country as a whole, and possible solutions to address those issues. Similar questions were asked in all meetings, such as:

- What are the key issues in wolf management in Portugal?
- What are the key issues in wolf management in the study area?
- What are the most important key issues? Why?
- What are the solutions to address those issues?
- Why have these solutions not yet been implemented?
- What other interest groups should be considered in wolf management in Portugal? Why?

Table 4.1 is a list of the 31 associations, institutions and individuals from different interest groups interviewed for the identification of key issues and solutions in wolf management. The interviews lasted for one or two hours and provided information on many issues.

Table 4.1 – Interest groups interviewed for gathering qualitative data about wolf management in the counties of Aveiro, Viseu, Guarda and Castelo Branco; (# indicates Zone 1, 2 or 3).

Institution	Location
Livestock Owner associations	
Associação Nacional dos Criadores da Raça Arouquesa - ANCRA	Cinfães (Zone 1)
Cooperativa Agrícola de Arouca, C.R.L.	Arouca (1)
Cooperativa Agrícola de Castro Daire, C.R.L.	Castro Daire (1)
Cooperativa Agrícola do Alto Paiva, C.R.L.	Vila Nova de Paiva (1)
Cooperativa Agro-Pecuária de S. Pedro do Sul - CASSEPEDRO	São Pedro do Sul (1)
C.A.V. - Cooperativa Agrícola de Vouzela, C.R.L.	Vouzela (1)
Associação Nacional de Criadores de Ovinos da Serra da Estrela - ANCOSE	Oliveira do Hospital (1)
ADS de Moncorvo (abrange a zona de Vila Nova de Foz Côa)	Torre de Moncorvo (2)
Associação de Criadores de Ruminantes da Guarda - ACRIGUARDA	Guarda (2)
Associação de Criadores de Ruminantes do Sabugal - ACRISABUGAL	Sabugal (2)
ADS de Cova da Beira - SANICOBE	Fundão (3)
Associação de Produtores de Ovinos do Sul da Beira - OVIBEIRA	Castelo Branco (3)
Hunting associations	
Clube de Caça e Pesca de Vila Nova de Paiva	Vila Nova de Paiva (1)
Clube de Caça e Pesca da Beira	Viseu (1)
Associação de Caça e Pesca de Vale das Ferrarias	Marmeleiro (2)
Associação de Caçadores de Quintã de Pêro Martins	Pinhel (2)
Clube de Caça e Pesca de Figueira de Castelo Rodrigo	Fig. de Castelo Rodrigo (2)
Clube de Caça e Pesca de Vilar Formoso	Vilar Formoso (2)
Clube de Caça e Tiro de Aldeia de João Pires	AldeiaJ.Pires-Penamacor(3)
Associação de Caça e Pesca Arraiana	Castelo Branco (3)
Associação Recreativa do Bairro da Boa Esperança	Castelo Branco (3)
Associação de Caça "A Raíz"	Rosmaninhal – IDN (3)
Associação de Caça das Corgas	Malpica do Tejo (3)
Environmental NGOs	
Liga para a Protecção da Natureza - LPN	Lisbon
Grupo de Estudos de Ordenamento do Território e Ambiente-GEOTA	Lisbon
Associação de Defesa do Património Arouquense	Arouca (1)
ICN – Institute for the Conservation of Nature	
Department of Protected Species	Lisbon
Technician from the Natural Park of Serra da Estrela	Manteigas (2)
Wolf Biologists	
3 wolf biologists – Faculty of Sciences – University of Lisbon	Lisbon

Data gathered through these qualitative interviews were used in the development of a Common Ground Matrix (CGM). Basically, this is a matrix that illustrates the key issues and solutions from each group in a visual manner (Bath 2000). The result allows for an assessment of the common issues and solutions between groups, basically the common ground, hence its name. As part of the HD process a meeting is usually held with all the interest groups to present the CGM results. A meeting with all the representatives of the interest groups has not occurred yet. It goes beyond the purpose of the thesis and more into the HD approach to resolving issues of wolf management. However, the matrices produced in this report provide a safe starting place for future work with all groups as they see that there are issues of common concern. Understanding key issues is one of the strengths of applying the CGM process. It can also be used to identify from each interest group's perspective which groups should be involved in the decision-making process and what role or roles should they play in the management of wolves.

The CGM provides a starting point for working toward a common vision, a common set of objectives, and a means to achieve that end (Bath 2000). This technique was initially used by A. Bath in wildlife management in Nova Scotia (Bath 1996), and has been used by the same author with wolf management in Europe since then, for example in France (Bath 2000) and Croatia (Bath and Majic 2001). The advantage of using the same technique in Portugal will allow a comparison of issues and solutions in wolf management in different countries, at a European level. The qualitative interviews also provided an opportunity to inform the various interest groups about the nature of human dimensions in wolf management. In addition, the interviews acted as a means to open lines of communication and allowed the opportunity to begin building possible partners for future HD work and discussion concerning wolf management. This reflects the practical component and applicability of the study in wildlife management. Results of the qualitative interviews and presentation of the CGM are provided in the results section.

4.4 Quantitative Issues

In a quantitative summary of attitudinal studies on wolves and wolf reintroduction in North America and Europe between 1972 and 2000, Williams *et al.* (2002) reported that most studies focus on some of the following interest groups: environmental NGOs, city residents, residents from wolf areas, hunters/trappers, and ranchers/farmers. In this study, two of the five interest groups considered for the qualitative analysis were also sampled quantitatively – hunters and livestock owners. These two groups are usually the most affected by decisions regarding wolf management. Livestock owners must suffer the damage caused by wolves, while hunters and wolves often compete for the same prey. In the later case, hunters also have the ability to kill wolves illegally, thus being able to affect as well as be affected by decisions in wolf management.

Many attitudinal studies show that members from environmental NGOs are usually among the most positive interest groups toward wolves (e.g. Bath 1989, Hook and Robinson 1982, Lohr et al. 1996, Williams et al. 2002). The gathering of information among both negative and positive groups provided the opportunity to document the extreme viewpoints on either side of the wolf management issue, thus identifying a spectrum of attitudes and an understanding of how far apart the opposing sides are. Although qualitative interviews were conducted with the presidents of some environmental NGOs, it was not possible to quantitatively document the opinions of members of this group. Wolf biologists in Portugal and members of the Institute for the Conservation of Nature are represented by a relatively small number of people, and thus they were sampled only through qualitative interviews.

High school students' attitudes were also documented quantitatively. Students are not immediately recognized as a key group like hunters and livestock owners and are often missed as an interest group. Their opinions may be different from those of the other key groups, but as future decision-makers their attitudes need to be documented and well understood. Students will play an important role in wolf management in the short- and long-term and it is therefore important to understand their feelings and knowledge levels about the species.

Wildlife management is sometimes influenced by large and/or vocal interest groups whose opinions may not reflect the viewpoints of the entire constituency (Johnson et al. 1993). The silent majority is often not included in the wildlife decision-making process. Obtaining representative data from the general public for each of the three zones (Aveiro/Viseu, Guarda, and Castelo Branco) was an important part of this HD study. Upon identifying the attitudinal spectrum and the extreme viewpoints toward wolves, it was then possible to place the general public (silent majority) along that spectrum. The general public is one of several interest groups that may affect or be affected by wolf management decision-making. An accurate understanding of the public's attitudes and knowledge levels toward wolves and wolf management required the implementation of a quantitative questionnaire. More detailed discussion of the quantitative methodological issues for this HD study are discussed within a framework suggested by Fowler (2002). These issues involve the sampling frame and chance of selection, sampling procedure, questionnaire design and pre-testing, interview process, and quality control involved in data collection, entry and analysis (Fowler 2002). The issue of quality control in data entry and analysis is presented in the data screening/preparation section later in this chapter, which also includes the statistical methodology for this study.

4.4.1 Sampling Frame and Chance of Selection

Fowler (2002) defines a sampling frame as "the set of people that has the chance to be selected, given the sampling approach that is chosen". For the general public, residents 18 years of age or older were eligible to participate in the study. Residents from the large urban centres were omitted from the sampling frame. In Portugal, each county (Aveiro and Viseu in Zone 1; Guarda in Zone 2; and Castelo Branco in Zone 3) consists of several municipalities. Random sampling proportional to municipality populations ensured a sample representative of the entire zone. The number of completed questionnaires required for each municipality was calculated by taking the population numbers (18 years old or older) for the municipality multiplied by the percentage of the total population to obtain an overall sample size of 400 respondents per zone. Sheskin (1985) has identified

five factors in the determination of the sample size of a survey: cost, time, geography, level of accuracy and subgroup analysis. Of these factors, the level of accuracy and the geographic area were the prevailing factors in this study. A sample size of 400 per zone allows results to be interpreted within a 95% confidence level and a 5% confidence interval (Sheskin 1985). 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). Tables 4.2, 4.3 and 4.4 show the sample sizes needed and obtained from the various municipalities within each zone.

Table 4.2 - Zone 1 (Aveiro/Viseu): Sampling frame based upon 1991 census.

Municipality	#18 and older	Sample size	Actual #
AVEIRO:			
ÁGUEDA	18000	23	24
AROUCA	14802	19	19
CASTELO DE PAIVA	11597	15	15
SEVER DO VOUGA	10218	13	13
VALE DE CAMBRA	15283	20	20
VISEU:			
ARMAMAR	6330	8	8
CASTRO DAIRE	13386	17	17
CINFÃES	16747	22	22
LAMEGO	16695	21	22
MANGUALDE	16202	21	21
MOIMENTA DA BEIRA	8783	11	11
NELAS	8997	12	12
OLIVEIRA DE FRADES	7691	10	10
PENALVA DO CASTELO	6704	9	9
PENEDONO	2784	4	4
RESENDE	9831	13	13
S. JOÃO PESQUEIRA	6793	9	9
SÃO PEDRO DO SUL	14955	19	20
SÁTÃO	9607	12	12
SERNANCELHE	5060	6	7
TABUAÇO	5641	7	7
TAROUCA	6698	9	9
TONDELA	23889	31	31
VILA NOVA DE PAIVA	4352	6	6
VISEU	40095	52	52
VOUZELA	8366	11	11
TOTAL	**309506**	**400**	**404**

Table 4.3 - Zone 2 (Guarda): Sampling frame based upon 1991 census.

Municipality	#18 and older	Sample size	Actual #
AGUIAR DA BEIRA	4950	14	14
ALMEIDA	8024	23	24
CELORICO DA BEIRA	6764	19	19
FIG.CASTELO RODRIGO	6470	19	19
FORNOS DE ALGODRES	4860	14	14
GOUVEIA	13666	39	39
GUARDA	23432	67	67
MANTEIGAS	3181	9	9
MEDA	5764	17	17
PINHEL	9924	29	28
SABUGAL	13989	40	40
SEIA	22777	65	65
TRANCOSO	8749	25	25
V. NOVA DE FOZ CÔA	6954	20	20
TOTAL	**139504**	**400**	**400**

Table 4.4 - Zone 3 (Castelo Branco): Sampling frame based upon 1991 census.

Municipality	#18 and older	Sample size	Actual #
BELMONTE	3513	12	12
CASTELO BRANCO	43064	142	142
COVILHÃ	29094	96	96
FUNDÃO	24127	79	79
IDANHA-A-NOVA	11540	38	38
PENAMACOR	6781	22	22
VILA VELHA DE RÓDÃO	3350	11	11
TOTAL	**121469**	**400**	**400**

In Portugal, each municipality consists of one or more villages, thus also requiring sample sizes to be selected randomly proportional to the population size of villages within each municipality (Table 4.5). In Zone 1, twenty-six municipalities including 265 villages were visited. In Zone 2, respondents were interviewed in 256 villages from fourteen municipalities, and in Zone 3 a total of seven municipalities and 116 villages were included in the sample. In the end, 1200 individuals from the general public living in 637 villages were interviewed.

Table 4.5 - Example: Municipality of Oliveira de Frades from Zone 1 consists of 12 villages.

Village	# people	# 18 and older	sample size
Arca	442	344	0
Arcozelo das Maias	1742	1239	2
Destriz	480	366	0
Oliveira de Frades	2040	1440	2
Pinheiro	1333	988	1
Reigoso	390	291	0
Ribeiradio	1287	954	1
São João da Serra	719	542	1
S. Vicente de Lafões	747	525	1
Sejães	259	185	0
Souto de Lafões	627	442	1
Varzielas	518	375	1
Total	**10584**	**7691**	**10**

All livestock owners living in Aveiro/Viseu, Guarda or Castelo Branco for more than one year, and 18 years of age or older, were eligible to participate in this study. Inside the study area, different types of livestock husbandry are used. Some livestock owners go to the mountains every day with their herds, others go to pastures in the valleys nearby their hometowns, and some others keep their flocks in fenced areas close to their home, sometimes raising livestock as a hobby or as a second source of income. Studies have shown that livestock damage caused by wolf attacks are correlated with specific husbandry practices (Ciucci and Boitani 1998, Kojola and Kuittinen 2002, Mech et al. 2000). Assuming that different levels of livestock depredation can cause changes in farmers' attitudes, livestock owner associations were contacted to obtain lists of names and addresses of farmers practicing different types of husbandry. In this way, it was possible to document attitudes of livestock owners experiencing different degrees of depredation caused by wolves and avoid a biased sample of opinions from a particular group of farmers.

Hunters, 18 and older, who had lived in one of the three regions for more than one year, and who had hunted in the county where they currently live were eligible to participate in the study. Basically there are two types of hunters, small game (rabbit, hare, pheasant, and partridge) and big game (wild boar, red deer, roe deer, and fallow deer)

hunters, although some of them carry out both types of activities. The type of hunting grounds in which the respondent usually hunts was not taken into consideration.

High school students who were currently studying in one of the upper three grades (10^{th}, 11^{th}, or 12^{th} grade) were eligible to participate. Two schools from each zone were randomly selected, one from an urban centre and one from a rural area. In each school a minimum of fifty students were interviewed in their classes. These classes were chosen with the cooperation of the executive board of the school. A class from a science program and a class from any of the other programs were chosen to avoid biased samples of students more familiar with environmental subjects.

4.4.2 Sampling Procedure

Due to the large geographic area to cover (16,045 km^2) and the small numbers of interviews required in many small villages (three or less interviews in 92% of the villages), the selection of the potential respondents followed a simple criterion. After arriving into the village the interviewers approached the first person they saw in the street. Eligibility of the potential respondent was assessed, ensuring that the respondent was 18 years of age or older, and that he/she had lived in the village for more than one year. The questionnaire was then administered as a personal structured interview. The second respondent was selected using the 'next to pass rule', and so on. Interviews were done from Monday to Sunday, from 8 a.m. to 8 p.m.. This temporal frame allowed the sampling of employed residents, housewives, unemployed or retired people, students, etc. In urban centres, interviewers stayed in one spot in the centre of the town and used the same rule as for smaller villages, by selecting the immediate available person who passed in that spot. While such a method does bias toward people walking in the street during daylight hours and has the potential for interviewer bias (selecting people if the 'first person rule' is not strictly applied) for efficiency of data collection and due to the small numbers required from each village, it was not considered a major problem.

Figure 4.1 – Interviewing members of the general public in the county of Viseu (central-north Portugal).

Most farmers (57%) living in the study area have a low education level and 34% are considered illiterate (INE 2000). Therefore, personal interviews were thought to be the best method for sampling livestock owners' attitudes and knowledge. Due to the difficulty in finding livestock owners in the study area, different approaches were adopted to interview members of this interest group. Most of them were interviewed while grazing their herds, either in the mountains or in the valleys. This was done while interviewers were driving across the study area to interview the general public, thus covering most of the villages and towns from the three regions. In addition, contacts were made with livestock owner associations in order to collect names and addresses of farmers practicing different husbandry methods. These approaches ensured that livestock owners using different types of husbandry were interviewed. The sample size for livestock owners (n=111) was smaller than the one obtained within the general public (n=1204), within the three regions: Aveiro/Viseu (n=33), Guarda (n=46), and Castelo Branco (n=32).

Figure 4.2 – Interviewing a livestock owner in the county of Castelo Branco (central Portugal).

Hunters were sampled through personal interviews during the hunting season from October to December 2002. Small game hunters were interviewed all across the study area during hunting days (every Thursday and Sunday of the week). Big game hunters could only be interviewed on specific days when wild boar and red deer hunts were organized for a particular area. This was done in collaboration with local hunting associations, the National Hunters Federation, and the General Forest Administration (from the Ministry of Agriculture, Rural Development and Fisheries). A total of 105 hunters were interviewed in the study area with 36 hunters from Aveiro/Viseu, 34 from Guarda, and 35 from Castelo Branco. Sample sizes are much smaller for the hunters and livestock owners and may not be fully representative of the respective groups, but it does provide some insight into how these interest groups feel about wolves and wolf management.

Data from high school students were gathered through self-administered questionnaires in the classrooms. Students were asked to fill out the questionnaire in the presence of an interviewer. This method allowed for the clarification of questions and avoided biased data collection resulting from teachers' assistance or students' intercommunication. This way it was possible to better understand students' opinions and levels of knowledge about wolves. In total 328 students completed the self-administered questionnaire, 102 from Aveiro/Viseu, 104 from Guarda, and 122 from Castelo Branco.

4.4.3 Questionnaire Design and Pre-Testing

The questionnaire used in this study was designed taking into account the issues raised during the qualitative interviews with some interest groups, but was mainly based on the attitudinal and belief items used in questionnaires from previous HD studies. The questionnaire consisted of five sections which attempted to address each of the four components of attitude – affective, cognitive, behavioural intention, and behaviour (Fishbein and Ajzen 1975):

- attitudes toward wolves;
- beliefs about wolves or 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;
- socio-demographic information about each respondent (e.g. gender, age, residence, occupation, education).

Regarding the affective component of attitude, there were questions designed to address attitudes toward wolves (Table 4.6). Knowledge (*i.e.,* the cognitive component of attitude) was addressed through several questions about the perceived size and trends of the wolf population, biological features, and livestock issues (Table 4.7). Table 4.8 outlines items used to focus on management issues regarding wolf-livestock conflicts and to obtain behavioural intention information from respondents (*i.e.*, what do residents support and/or oppose in terms of wolf management and what should and should not be done in future to manage the species). According to Bath (1987) and Kellert (1986) some interest groups' attitudes toward wolves are correlated with the level of experiences they have had with wolves; therefore, one part of the questionnaire (Table 4.9) contained items to document some of those experiences with this species. Considering the randomness of the sampling procedure, people who had an interest in this subject were as eligible to participate in the study as those who had no interest in wolves. The quantitative interviews have the limitation of giving equal weight to all respondents. To partially address this issue, there were items about the respondent's interest in the wolf

management issue (Table 4.9). Exploring whether differences exist in opinions among people who are really interested in the issue and those who are not, is presented in the results section. At the end of the questionnaire there were several items designed to collect socio-demographic data from respondents. Williams *et al.* (2002) reported many studies where attitudes differ greatly with socio-demographic characteristics of respondents. This study provides insights on which (if any) of these factors tend to affect attitudes and knowledge about wolves in Portugal. A copy of the questionnaire is provided in Appendix II.

Most of the attitudinal and belief items had been tested and used before in HD studies on wolf management in Yellowstone National Park (Bath and Buchanan 1989), Poland (A. Bath, unpubl. data), Spain (A. Bath, unpubl. data), France (Bath 2000), and Croatia (Bath and Majic 2001). Some items were changed, added or eliminated according to the results of the qualitative interviews with the interest groups. Previous studies had revealed high reliability estimates for the attitudinal scale, meaning that the attitudinal items when combined consistently were good measures of attitudes toward wolves (Bath 2000, Bath and Majic 2001). Several of the belief items and attitude toward management option items had also been pre-tested in previous questionnaires with positive results.

Table 4.6 – Items on attitudes toward wolves used in the questionnaire for the quantitative survey on attitudes and knowledge toward wolves and wolf management in the study area.

	ATTITUDES TOWARD WOLVES
A1	Which of the following best describes your opinion about wolves? [1]
A2	To have wolves in Portugal is: [2]
A3	To have wolves in the county of *Aveiro-Viseu /Guarda / Castelo Branco* is: [2]
A4	It is important to maintain wolf populations in Portugal for future generations. [3]
A5	It is important to maintain wolf population in the county of *Aveiro-Viseu /Guarda / Castelo Branco* for future generations. [3]
A6	It is important to have a healthy population of wolves in the county of *Aveiro-Viseu /Guarda / Castelo Branco.* [3]
A7	We should ensure that future generations have an abundant wolf population. [3]
A8	Whether or not I see a wolf, it is important to me that they exist in the county of

	Aveiro-Viseu /Guarda / Castelo Branco. [3]
A9	Whether or not I see a wolf, it is important to me that they exist in Portugal. [3]
A10	Wolves have a big impact on big game. [3]
A11	Wolves have a big impact on small game. [3]
A12	Wolves reduce populations of roe deer and wild boar to unacceptable levels. [3]
A13	It is unnecessary to have wolves in the county of *Aveiro-Viseu /Guarda / Castelo Branco* because abundant populations of wolves already exist in other parts of Portugal. [3]
A14	It is unnecessary to have wolves in Portugal because abundant populations already exist in other European countries. [3]
A15	Wolves should be completely protected in Portugal. [3]
A16	Wolves should be completely protected in the county of *Aveiro-Viseu /Guarda / Castelo Branco.* [3]
A17	Wolves should be allowed to be hunted in specific hunting seasons in the county of *Aveiro-Viseu /Guarda / Castelo Branco.* [3]
A18	Wolves should be allowed to be hunted year round in the county of *Aveiro-Viseu /Guarda / Castelo Branco.* [3]
A19	Wolves should be killed by all means including the use of snares and poison in the county of *Aveiro-Viseu /Guarda / Castelo Branco.* [3]
A20	Wolves keep roe deer and wild boar populations in balance. [3]
A21	Having wolves in the county of *Aveiro-Viseu /Guarda / Castelo Branco* may increase tourism in this region. [3]
A22	Wolves cause abundant damage to livestock. [3]
A23	In areas where wolves live in close proximity to humans, wolf attacks on humans are common. [3]
A24	In areas where wolves live near livestock, their primary food is livestock. [3]
A25	I would be afraid to hike in the woods if wolves were present. [3]
A26	Wolves have the right to exist as any other species. [3]
A27	In your opinion, which animal is most dangerous to humans? [4]

Notes: [1] Response set: (1) strongly dislike; (2) moderately dislike; (3) neither like or dislike; (4) moderately like; (5) strongly like.
[2] Response set: (1) good; (2) bad; (3) indifferent.
[3] Response set: (1) strongly disagree; (2) moderately disagree; (3) no opinion; (4) moderately agree; (5) strongly agree.
[4] (a) wolf; (b) lynx; (c) wild boar; (d) feral dogs; (e) equally dangerous; (f) none are dangerous.

Table 4.7 – Belief items of the questionnaire used in the quantitative survey on attitudes and knowledge toward wolves and wolf management in the study area.

	KNOWLEDGE ABOUT WOLVES
B1	How many wolves do you believe currently exist in Portugal?
B2	Do you believe wolf numbers in Portugal are: increasing, decreasing, remaining the same.
B3	How many wolves do you believe currently exist in the county of *Aveiro-Viseu /Guarda / Castelo Branco*?
B4	Do you believe wolf numbers in the county of *Aveiro-Viseu /Guarda / Castelo Branco* are: increasing, decreasing, remaining the same.
B5	How much does the average adult male wolf weigh in Portugal?
B6	There used to be wolves throughout the entire county of *Aveiro-Viseu /Guarda / Castelo Branco.*
B7	Wolves are completely protected in Portugal.
B8	Is it generally true that only two members of a wolf pack breed in any one year?
B9	How many sheep and goats do you think were killed by wolves last year in the county of *Aveiro-Viseu /Guarda / Castelo Branco*?
B10	Wolves kill sheep and goats only if there is not enough wild game.
B11	How often is a wolf generally able to kill wild prey?
B12	What is the average pack size of wolves in Portugal?

Table 4.8 - Items on attitudes toward wolf management and behavioural intention, used in the questionnaire for the quantitative survey on attitudes and knowledge toward wolves and wolf management in the study area.

	MANAGEMENT ISSUES [1]
C1	I would agree with increasing wolf numbers in Portugal.
C2	I would agree with increasing wolf numbers in the county of *Aveiro-Viseu /Guarda / Castelo Branco* (in regard to respondent's region).
C3	If a wolf killed livestock, I would agree with killing that wolf.
C4	I would be willing to contribute money toward a compensation program for livestock owners for losses due to wolves.
C5	There are enough wolves in Portugal.
C6	There are enough wolves in the county of *Aveiro-Viseu /Guarda / Castelo Branco* (in regard to respondent's region).
C7	Livestock owners should receive money for living in a zone where there are wolves instead of receiving compensation for losses that wolf causes.
C8	Livestock owners should receive compensation for damage caused by wolves only if they do use methods to prevent damage, for example, guard dogs.
C9	Livestock owners that lose livestock due to wolf attacks should be compensated.
C9a	I would like part of my taxes to be used toward paying compensation for damage caused by wolves.
C9b	The Government should pay compensation to livestock owners who lose livestock to wolves.
C9c	Livestock owners should be required to buy insurance for protection against wolf attacks.
C9d	The Government should pay for this insurance for livestock owners.
C9e	There should be authorized wolf hunts in the county of *Aveiro-Viseu /Guarda / Castelo Branco* (in regard to respondent's region).
C9f	The Government should help livestock owners to implement methods for preventing damage, for example, good guard dogs and fences.

Note: [1] Response set: (1) strongly disagree; (2) moderately disagree; (3) no opinion; (4) moderately agree; (5) strongly agree.

Table 4.9 - Items on the level of experience with wolves and importance of wolf management issues, used in the questionnaire for the quantitative survey on attitudes and knowledge toward wolves and wolf management in the study area.

	EXPERIENCES WITH WOLVES AND INTEREST ON WOLF MANAGEMENT ISSUES
D1	Have you ever seen a wolf in captivity?
D2	Have you ever seen a live wolf in the wild?
D3	When was the last time you saw wolves in the county of *Aveiro-Viseu /Guarda / Castelo Branco* (in regard to respondent's region)?
D4	Have you ever killed a wolf?
D5	On a scale from 1 to 10, how important is the issue of wolf management in Portugal to you personally?
D6	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 Portugal?

4.4.4 Interview Process

Data from the general public and livestock owners were collected between July and December 2002, and data from students and hunters were collected between September and December 2002. All data were gathered through personal structured interviews conducted by a research assistant and myself. The interviewer team consisted always of females; female interviewers tend to be seen as less threatening when approaching potential respondents thus being more likely to obtain a higher response rate (Fowler and Mangione 1990). Fowler (2002) suggests that during the interview process, interviewers can affect the data, especially when conducting unstructured interviews that require large amounts of probing. To minimize the chances of interviewer bias, most of the items included in the questionnaire were close-ended (*i.e.* a range of possible answers was written in the questionnaire and the interviewer would have to check the one given by the respondent). Additionally, the research assistant received a training session about the nature of the study, the importance of being objective, and the importance of reading the questions exactly as worded. Except for students who completed a self-administered

questionnaire (identical to the personal interview questionnaire), respondents in all groups were personally interviewed.

4.5 Statistical Methods

One purpose of the study is to understand attitudes and knowledge toward wolves and wolf management in the study area. More specifically, the objective is to explore how attitudes and knowledge differ among the general public, livestock owners, hunters and students, and among zones. This section describes the statistical procedures for the characterization of the sample, and for the identification of differences in attitudes and knowledge among groups and zones. In addition, this study looks for explanations for those differences. It tries to identify the factors affecting those attitudes and knowledge, to examine linkages among variables, and to test several hypotheses. But before such analyses can take place, preliminary steps of data preparation and screening must be taken. The statistical procedures for data analyses are described in order to answer the objectives and hypotheses listed in the Introduction chapter. All the statistical analyses were done using the software SPSS version 12 (SPSS Inc. 2003).

4.5.1 Data Screening and Preparation

Data Accuracy

Quality control and checking procedures were used during coding, data entry and data preparation for analysis. Some of the procedures suggested by Sheskin (1985) to ensure quality control and checking were conducted:

- to check survey data validity. A random sample of 10% of all questionnaires were checked for data entry errors and the few errors (around 1%) that were found were corrected before conducting any analysis;
- to examine the possible effects of nonresponse bias (the lower response rate, the greater the likelihood of nonresponse bias). Personal interviewing can yield a high

response rate. In this study, refusal rates were consistently low in all the three zones and among all interest groups (2%). As in other similar studies (e.g. Bath 2000, Bath and Majic 2001) the high responses rates obtained suggest that non-response bias is not an issue of concern in this study.

In addition, when data files are large, the method of screening for accuracy involves the examination of the descriptive statistics for the variables (Tabachnick and Fidell 2001). The authors suggest checking if all the values are in range, if the means and standard deviations are reasonable, if the discrete variables have out-of-range numbers, and if the researcher has accurately programmed the codes for missing values. Quality control and checking procedures did not reveal any significant problems with the data. Results on the descriptive statistics for the variables are presented in the Results Chapter, when appropriate, to illustrate some of the points.

Univariate Outliers

The presence of univariate outliers (identifyied according to the methodology suggested by Tabachnick and Fidell, 2001) was checked through descriptive statistics for all the variables included in the questionnaire. This procedure was conducted for each interest group independently. Univariate outliers were excluded from analyses.

Missing Data

Sheskin (1985) points out the importance of making decisions concerning item nonresponse, which occurs when respondents refuse to answer a question, do not know the answer, or overlook a question. In those cases where there is no answer, the item was assigned a missing value (-1) and excluded from analysis. Tabachnick and Fidell (2001) state that the pattern of missing data is more important than the amount missing. In this study, the missing data appeared to occur at random through the data matrix thus posing no serious problems. Around 0.6% of data (n=10), on average, is missing for each variable. In this research the small amount of missing data is excluded from analysis.

Data Transformation

In this study, the variables associated with attitudes toward wolves and wolf management were not transformed to obtain normal distributions. The reason for not normalizing the attitudinal data lies in the fact that for most variables respondents consistently chose "disagree" or "agree" statements, and did not show a neutral position. This results in bimodal distributions in which transformation to a natural curve was not desirable. Bimodal distributions do not represent a major problem when running principal component analyses (PCA). As long as PCA is used descriptively as a convenient way to summarize the relationships in a large set of observed variables, assumptions regarding the distributions of variables are not an issue (Tabachnick and Fidell 2001). In the case of regression analyses, the dependent variables do not have bimodal distributions. Answers to items A2 and A3 (questions 2 and 3 from section A) were recoded as ranging from 1 to 5 as the other items. This scale of responses simplifies the analyses and allows an easier interpretation of the results. The recoded items were given the same name followed by the letter *"x"* (e.g. *A2* is now called *A2x*), and are listed in Table 4.10.

Table 4.10 – New codes for attitudinal items A2 and A3, ranging from 1 (negative attitude) to 5 (positive attitude).

Item	Question	New codes for answers
A2x	To have wolves in Portugal is:	1 – bad 3 – indifferent 5 – good
A3x	To have wolves in the county of *Aveiro-Viseu /Guarda / Castelo Branco* is:	

In the case of independent variables considered as possible factors that may affect attitudes, such as the socio-demographic characteristics, transformations had to be conducted before using multivariate techniques (Multiple Regression, in this case). Variables D1, D2, E1, and E5 were coded as *dummy* variables. Among dichotomous

variables, the cases on the "wrong" side of a very uneven split are likely univariate outliers. Dichotomous variables with 90-10 splits between categories, or more, were excluded from analyses, both because the correlation coefficients among these variables and others are truncated and because the scores for the cases in the small category are more influential that those in the category with numerous cases (Rummel 1970, Tabachnick and Fidell 2001). This was the case for the variable D4 (*"Have you ever killed a wolf?"*), in which only 1% of the respondents (n=18) answered *Yes*. New variables, not included in the questionnaire, were added to the analysis (LIVEDOUT, WOLFPRES, SCHOOL, and PROGRAM), in order to evaluate their effect on respondents' attitudes and knowledge toward wolves and wolf management. These variables are coded as *dummy* variables and are described in Table 4.11.

Descriptive analyses were used to characterize respondents from the various interest groups, with negative, neutral and positive attitudes, in terms of socio-demographic data, and to help support findings from regression analyses. For the purpose of descriptive univariate statistics, the independent variables were not transformed. Table 4.11 summarizes the independent variables considered as possible factors affecting attitudes and knowledge, and the answers' coding after transformations.

Table 4.11 - Variables that may affect attitudes and knowledge about wolves and wolf management.

ID	Name	Meaning	New Codes
D1	CAPTIVIT	Have you ever seen a wolf in captivity?	1) yes 0) no / not sure
D2	WILD	Have you ever seen a live wolf in the wild?	1) yes 0) no / not sure
D5	ISSUE	Importance of the wolf management issue in Portugal	1 (not important) – 10 (very important)
D6	UPDATED	Importance of keeping up to date with the issue of wolf management in Portugal	1 (not important) – 10 (very important)
E1	GENDER	Gender	1) female 0) male

E2	AGE	Age	age mentioned by the respondent
E3	RESIDENC	Location of residence	1) rural: < 50 residents /km^2 & < 500 residents in one village 2) semi-rural: ≥ 50 residents /km^2 & ≥ 500 residents in one village 3) semi-urban: ≥ 100 residents /km^2 & ≥ 2000 residents in one village 4) urban: ≥ 500 residents /km^2 & ≥ 5000 residents in one village
-	LIVEDOUT	Respondents who lived out of Aveiro/Viseu, Guarda or Castelo Branco	1) lived out of the county sometime 0) always lived in the county
E5	OCCUPAT	Occupation	1) farmers, foresters, loggers 0) other
E6	EDUCAT	Education Level	1) no scholar education 2) elementary (1st-4th grade) 3) college (5th-6th grade) 4) college (7th-9th grade) 5) high school (10th-12th grade) 6) university (bachelor or major) 7) university (graduation)
-	WOLFPRES[1]	Wolf presence in respondent's residential area (*freguesia*)	1) yes 0) no
-	SCHOOL[2]	School's location	1) urban area 0) rural area
-	PROGRAM[2]	Student's current program in high school	1) sciences program 0) other

[1] According to the most recent data on wolf distribution (Grupo Lobo/ICN 2003).
[2] Variables used only during analysis of Students' data.

Multivariate Outliers

Multivariate outliers are cases with an unusual combination of scores on two or more variables (Tabachnick and Fidell 2001). The search for multivariate outliers was conducted first among the attitudinal items, and then among the socio-demographic and other independent factors used in the Regression analyses. In both cases, the statistic used to identify the multivariate outliers was the Mahalanobis distance (Tabachnick and Fidell

2001). This distance was evaluated for each case using the Chi-square distribution. Tabachnick and Fidell (2001) suggest a probability estimate for a case to be an outlier of $p<.001$ for the Chi-square.

For the attitudinal data, 61 respondents from the general public (about 5%) were identified as multivariate outliers; no outliers were detected among livestock owners; 2 cases were found in hunters (around 2%), and 18 high-school students (around 5%) were identified as outliers. No multivariate outliers were found in the independent variables. All multivariate outliers were excluded from analyses.

Multicollinearity and Singularity

Multicollinearity and singularity occur when variables are, respectively, too highly correlated, or redundant, *i.e.*, one of the variables is a combination of two or more of the other variables (Tabachnick and Fidell 2001). When variables are multicollinear or singular, they contain redundant information and they are not all needed in the same analysis (Tabachnick and Fidell 2001); including those variables reduces the reliability of results from further analyses. The *Pearson correlation coefficient* and the *Variance Inflation Factor – VIF* (*1/Tolerance*) were used to check for multicollinearity and singularity among attitudinal items, for each interest group separately. Pairs of variables with correlation coefficients higher than .90 (Tabachnick and Fidell 2001) or *VIF* higher than 10 (Pestana and Gageiro 2000) were considered multicollinear and one of the variables was omitted from analyses.

The variables A5, A16, C2, and C6 were found to be correlated with variables A4, A15, C1, and C5 respectively, and were excluded from data analyses of data from the general public respondents. The same was found to be the case among the livestock owners, and an additional variable (A8) was excluded for this interest group because of a *VIF* of 10.29. The same was also found to be true for data from hunters, and the variable A6, with a *VIF* of 17.24, was also excluded from the analyses. Among students no variables had high correlations between each other or high values of *VIF*, which indicates an absence of multicollinearity or singularity. All variables were included in further

analyses of data from high-school students. Most pairs of variables considered as multicollinear or singular deal with the same issues, but at a national or regional scale. This means that the answer given by respondents to one question at a national scale (for the country) was the same as for a regional scale (for the county), *i.e.* opinions do not seem to differ spatially. This apparent lack of a NIMBY ("Not In My Back Yard") effect is discussed in more detail in Chapter Six.

4.5.2 Data Analysis

Several characteristics of the sample (e.g. age, gender, education, residence, occupation) were examined before analysing results from the quantitative interviews with the general public, livestock owners, hunters and high school students in the three-zone area. Analysing these variables can help set the societal context of the study and allow for a more detailed discussion of resident (general public) and interest group responses to attitudinal and belief items. This analysis was done through descriptive statistics (such as frequency tables) and is presented in the Results chapter.

The first paragraphs of this section describe the methodology for the construction of belief (or knowledge) scores, and also the scores of attitudes toward wolves and wolf management for each respondent. The scores allow the simplification and summarization of data and are then used in the subsequent statistical analyses. Descriptive statistics were used to get an overview of the attitudinal and belief scores among interest groups and zones. Due to the fact that different statistical methodologies are needed for testing the several hypotheses raised in this study, this section is then divided according to the methodology used for each hypothesis.

Knowledge Score

A knowledge score for each respondent was used for summarizing the information of the twelve belief items of the questionnaire. Knowledge questions are multiple-choice and include the response "I'm not sure" to eliminate guessing and missing information. Each correct answer received a score of 1, with incorrect answers and "I'm not sure"

responses (both coded as 0) indicating lack of correct information held by the respondent, as used by Bath (1989, 1993). For each respondent, all the correct answers (coded as 1) were summed, and the resulting value represents the knowledge score. This score varies between zero, if none of the questions was answered correctly, and twelve, the maximum score that corresponds to all questions being answered correctly.

Attitudinal Scores

The questionnaire used for interviewing the public contains a large set of items targeted at understanding people's attitudes toward wolves and wolf management. Principal Component Analysis was chosen as the statistical technique able to help discovering which variables in the set form coherent subsets that are relatively independent of one another (Tabachnick and Fidell 2001). PCA uses the correlations among the variables to develop a small set of components that are thought to reflect underlying processes that have created the correlations among the variables (Tabachnick and Fidell 2001). When running the PCA, a new variable is created for each component. These variables represent the attitudinal scores toward wolves and wolf management issues that respondents would have received if they had been measured directly. When scores on components are estimated for each respondent, they are often more reliable than scores on individual observed variables (Tabachnick and Fidell 2001).

Once the data were investigated for univariate and multivariate outliers, missing data, multicollinearity and singularity, as described in the previous section, the steps for the PCA followed the framework suggested by Tabachnick & Fidell (2001):

Sample Sizes

It is important that sample sizes be large enough that correlation coefficients are reliably estimated. In this study, the sample size for the general public after excluding outliers is 1148, for the livestock owners is 111, for hunters is 103, and for high school students 310. Comrey and Lee (1992) suggest that sample sizes of 1000 are excellent, 500 are very good, 300 are good, 200 are fair, 100 are poor, and 50 are very poor. In this case,

only the livestock owners and hunters have sample sizes smaller than 200. The small sample sizes of livestock owners and hunters are due to the difficulty in finding people from these interest groups in the field. However, PCA solutions that have several high loading marker variables (>.80) do not require such large sample sizes (about 150 cases should be sufficient) as solutions with lower loadings and/or few fewer marker variables (Tabachnick and Fidell 2001). In this study, this criterion is met, which suggests that samples of 111 and 103 cases are still large enough to produce reliable results.

Factorability of the Correlation Matrices

A matrix that is factorable should include several sizable correlations (r >.30) (Tabachnick and Fidell 2001). The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) tests whether the partial correlations among variables are small. Large values for the KMO measure indicate that the strength of the relationship among variables is high and that a PCA of the variables is a good procedure.The KMO requires high values (>.60) for good PCA (Tabachnick and Fidell 2001). In this study, the KMO reached values of 0.952 for the general public, 0.858 for the livestock owners, 0.832 for the hunters, and 0.872 for the high school students, which are consistently good.

Number of Factors

The inclusion of more components in a solution improves the fit between observed and reproduced correlation matrices, and increases the percent of variance in the data "explained" by the component solution (Tabachnick and Fidell 2001). However, the more factors extracted, the less parsimonious the solution. In order to know the number of factors needed to summarize the pattern of correlations in the correlation matrix, the Scree test was used. A scree plot is a plot of the eigenvalues associated with each factor extracted, against each factor. The point where a line drawn through the points changes slope helped identify the number of components to be extracted.

Type of Rotation

The interpretation of the extracted components was done after a Varimax rotation, aimed at maximizing the variance of factor loadings by making high loadings higher and low ones lower for each factor (Tabachnick and Fidell 2001).

Nature and Importance of Components

Each component was interpreted using the variables loading higher on that component. The issue or set of issues from those items was used to characterize and assign a name to the component. The greater the loading, the more the variable is a pure measure of the factor (Tabachnick and Fidell 2001). Loadings in excess of .45 (20% overlapping variance) are considered fair by Comrey and Lee (1992), but the choice of the cutoff for size of loading to be interpreted is a matter of researcher preference (Tabachnick and Fidell 2001). In this study, only variables with loadings of .40 or higher are interpreted to avoid the exclusion of items that might be helpful in interpreting the results; the same cutoff value was used by Hook and Robinson (1982). The importance of the components was evaluated by the proportion of variance accounted for by the component after the Varimax rotation.

4.5.2.1 Comparison of attitudes and knowledge toward wolves and wolf management among the general public and several interest groups

Different components might be created for each interest group, as each group may perceive different issues to be important. In addition, the items and respective loadings included in each component might be different for each interest group. Comparing the components, the items, and the loadings, allows the identification of differences in attitudes toward various issues among the groups.

In order to identify differences in the knowledge levels among interest groups, knowledge scores were compared by means of analysis of variance (one-way ANOVA)

among the general public and other interest groups (livestock owners, hunters, and students). Tukey's HSD *post hoc* procedure was used to determine which pair of groups differed significantly. Analysis of variance is a common statistical technique in attitudinal studies to detect differences among sample groups (e.g. Bath 1987, Bjerke et al. 1998c, Kaltenborn et al. 1999, Pate et al. 1996). A probability level of .05 was used in evaluating the statistical significance of the results.

4.5.2.2 Comparison of attitudes and knowledge toward wolves and wolf management among different zones

The comparison of attitudes (attitudinal components) and knowledge levels among regions (Aveiro/Viseu, Guarda, and Castelo Branco) was done through one-way ANOVA, for each interest group separately. Tukey's HSD *post hoc* procedure was used to determine which pair of groups differed significantly. A probability level of .05 was used in evaluating the statistical significance of the results.

4.5.2.3 Relationship between attitudes and knowledge toward wolves and wolf management

Pearson's Product Moment Correlation Coefficient was calculated to determine whether correlations existed among attitudes and knowledge about wolves. For all statistical tests, $p \leq .05$ was required for significance.

4.5.2.4 Factors affecting attitudes and knowledge toward wolves and wolf management

The relationship of socio-demographic characteristics (age, gender, education, occupation, location of residence, and permanence/absence in the county as a residence location) or other factors (e.g. importance of wolf management issues, experience of

wolves) on attitudes and knowledge about wolves were assessed through a series of multiple regression analyses.

A regression technique was used because the independent variables might be correlated with one another and with the dependent variables to varying degrees (Tabachnick and Fidell 2001). In these analyses, socio-demographic characteristics and other factors are treated as independent variables and the several attitudinal components toward wolves and wolf management, and knowledge scores as dependent variables. All the variables were checked for evaluation of assumptions and independent variables entered as listed in Table 4.11. Standard multiple regression was used because all the independent variables enter into the regression equation at once; each one is evaluated in terms of what it adds to prediction of the dependent variable that is different from the predictability afforded by all the other independent variables (Tabachnick and Fidell 2001). The value of adjusted R^2 was examined to evaluate the goodness-of-fit of the model. The significance value of the F-statistics helped in assessing if the independent variables explained most of the variance of the dependent variable. A p-value of .05 was required for significance of the tests. When the regression analyses were not conclusive, descriptive statistics (e.g. frequency tables) were used to analyse the socio-demographic characteristics of the respondents along the spectrum of attitudes.

4.5.2.5 Common Ground Matrix (CGM)

Qualitative interviews were conducted with several interest groups identified as key players in the wolf management debate in Portugal. Key issues and solutions identified during these interviews are presented in two CGMs in the Results Section. In the matrix issues are listed down the left hand side and interest groups across the top. Check marks are used to point out the issues mentioned by each interest group. By summing the number of check marks across the CGM, it is possible to identify the issues that all groups believe are important. By summing the check marks down the columns, it is possible to identify how narrow or broadly focused a group is. A CGM is also used to present the solutions mentioned by the interest groups in the same way as for the key

issues. The applicability of the CGM method is in the presentation of the results of the matrix back to the interest groups with the key issues and only numbers (no group labels) across the CGM. At each presentation session, each group within the room is asked to try to find itself on the CGM. As each group examines the CGM in an effort to locate his/her group, they realize that this is not an easy task as many concerns are shared. Because most issues are of common concern, the presentation of the CGM' results back to the individual groups is one of the first steps towards getting all interest groups to work together on wolf management in Portugal.

The groups that each interest group feels should be participating in wolf management are presented in simple schemes. The roles played by the interest groups in the perspective of each group are presented in diagrams in the end of the Results chapter. This presentation of the results allows a visual interpretation of the most commonly mentioned interest groups, their most important roles, and groups with the highest and lowest number of responsibilities. If shown to the interest groups who participated in this study, these diagrams also have the potential of showing each group how its roles can overlap with those of other groups.

Chapter 5 - RESULTS

5.1 Characterizing the Sample

For the collection of quantitative data, a total of 1209 respondents from the general public were sampled in this study: 402 in Aveiro/Viseu, 406 in Guarda, and 401 in Castelo Branco (Table 5.1). In addition, 328 students were interviewed in six high schools in the study area. Smaller samples of livestock owners (n=111) and hunters (105) were achieved in each zone. Overall, the sample sizes allow statistically meaningful comparisons of attitudes and knowledge toward wolves and wolf management among interest groups and zones.

Table 5.1 – Sample sizes for each interest group by zone (quantitative data).

	Sample Sizes			
	Zone 1	Zone 2	Zone 3	
	Aveiro / Viseu	**Guarda**	**Castelo Branco**	***Total***
General Public	402	406	401	**1209**
Livestock Owners	33	46	32	**111**
Hunters	36	34	35	**105**
High School	102	104	122	**328**
Total	**573**	**590**	**590**	**1753**

In the three regions,the majority of the respondents were males: 56%, 57%, and 58%, respectively in Zones 1, 2, and 3 (Table 5.2). The smaller sample of livestock owners (n=111) included mostly males, the most disproportioned ratio being found in Castelo Branco, with 84% of males. Among hunters (n=105), no women were interviewed. In fact, during the interview period of this study, no female hunters were found in the study area. Among students the majority of respondents were females: 60% in Aveiro/Viseu, 53% in Guarda, and 54% in Castelo Branco.

Table 5.2 – Interest Groups (IG) by zone and gender.

Zone	Gender	Statistics	Interest Groups: General Public	Livestock Owners	Hunters	Students	Total
Aveiro Viseu (1)	male	n	224	26	36	41	327
		% within IG	55.7%	78.8%	100.0%	40.2%	57.1%
	female	n	178	7		61	246
		% within IG	44.3%	21.2%		59.8%	42.9%
	Total	n	402	33	36	102	573
		% within IG	100.0%	100.0%	100.0%	100.0%	100.0%
Guarda (2)	male	n	231	34	34	48	347
		% within IG	56.9%	73.9%	100.0%	46.6%	58.9%
	female	n	175	12		55	242
		% within IG	43.1%	26.1%		53.4%	41.1%
	Total	n	406	46	34	103	589
		% within IG	100.0%	100.0%	100.0%	100.0%	100.0%
Castelo Branco (3)	male	n	234	27	35	56	352
		% within IG	58.4%	84.4%	100.0%	45.9%	59.7%
	female	n	167	5		66	238
		% within IG	41.6%	15.6%		54.1%	40.3%
	Total	n	401	32	35	122	590
		% within IG	100.0%	100.0%	100.0%	100.0%	100.0%

The analyses of age categories of respondents by interest group and zone show that among the general public, livestock owners, and hunters, there is an increasing number of elderly people from Aveiro/Viseu to Castelo Branco, following the regional differences of population from coastal to inland areas of Portugal. Fewer young people live in central inland regions of the country than near the coast, and that is evident in the age structure of respondents sampled in this study. The most frequent age group found in the study area in all regions is 45-64 years old in all regions, followed by young adults between 30 and 44 years. Excepting students, no respondents fall in the age class below 18 years old, because that was the criterion established at the beginning of the study. The mean age of the general public respondents was 49 years old: 46 in the case of Aveiro/Viseu, 50 in Guarda, and 52 in Castelo Branco. The mean age of livestock owners was 52 years old, hunters was 47, and high school students was 17 years old. A breakdown of interest groups by zone and age classes can be found in Figure 5.1.

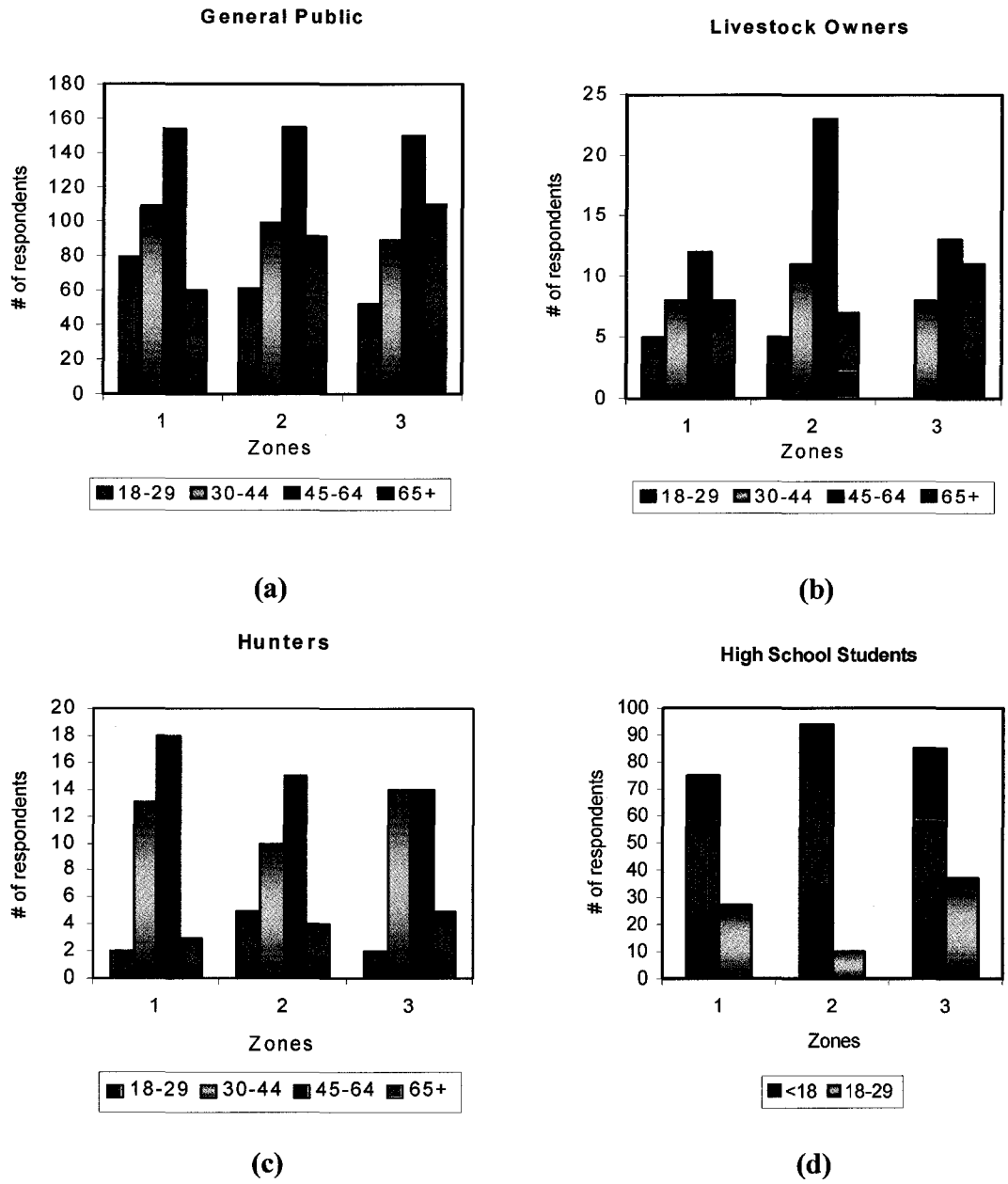


Figure 5.1 – Age categories of respondents from the (a) General Public (n=1209), (b) Livestock Owners (n=111), (c) Hunters (n=105), and (d) High School Students (n=328).

Around 27% of all respondents live in "wolf areas", *i.e.* they live in villages surrounded by areas with sporadic or frequent occurrence of wolves. Around 25% of the sampled general public live in areas with wolves. This percentage increases in the case of livestock owners; 44% of them live in proximity to wolves. Among the interviewed hunters and students, respectively 36% and 26% of them live in the wolf distribution range within the study area. The majority of respondents from the general public, livestock owners and students (respectively 64%, 71%, 71%) have always lived in the county were they live now. The remaining respondents either lived out of the county for some years, but still in Portugal, or had lived in other countries. A slight majority of hunters (52%) lived in a different place from where they now live at some point in time. In general, the reason that a large number of people in the study area had moved out of the county or the country during their lifetime was the search for better jobs. Most people mentioned they had lived in big urban centres.

The kind of experiences and the information people get when living elsewhere may well have influenced their opinions toward wildlife. The influence of this factor on people's attitudes and knowledge levels is presented later in this chapter. Most respondents live in rural (46%) and semi-rural (27%) areas, and only 4% live in big urban centres. Respondents from the general public living in Aveiro/Viseu are mainly from semi-rural areas, while respondents from Guarda or Castelo Branco are mostly from rural areas (**Table 5.3**). In the three zones, the percentage of livestock owners sampled in rural areas is always higher than in semi-rural or semi-urban areas, and increases from Aveiro/Viseu to Castelo Branco. Almost none of the livestock owner respondents are from urban areas. The same was true for hunters. The initial criterion for sampling students was to select an urban and a rural high school in each zone of the study area. However even those students studying in urban schools mostly lived in rural and semi-rural villages. In Guarda and Castelo Branco, more than half of the respondents from all interest groups live in rural villages, while in Aveiro/Viseu the majority lives in semi-rural areas. This is due to the high population density that characterizes Zone 1.

Table 5.3 – Interest groups (IG) by Zone and place of residence.

Zone	Residence	Statistics	Interest Groups: General Public	Livestock Owners	Hunters	Students	Total
Aveiro Viseu (1)	rural[1]	n	83	23	19	45	170
		% within IG	20.6%	69.7%	52.8%	44.1%	29.7%
	semi-rural[2]	n	180	10	3	30	223
		% within IG	44.8%	30.3%	8.3%	29.4%	38.9%
	semi-urban[3]	n	137		7	12	156
		% within IG	34.1%		19.4%	11.8%	27.2%
	urban[4]	n	2		7	15	24
		% within IG	.5%		19.4%	14.7%	4.2%
	Total	n	402	33	36	102	573
		% within IG	100.0%	100.0%	100.0%	100.0%	100.0%
Guarda (2)	rural	n	241	37	19	39	336
		% within IG	59.4%	80.4%	55.9%	37.5%	56.9%
	semi-rural	n	113	5	8	35	161
		% within IG	27.8%	10.9%	23.5%	33.7%	27.3%
	semi-urban	n	30	2	5	11	48
		% within IG	7.4%	4.3%	14.7%	10.6%	8.1%
	urban	n	22	2	2	19	45
		% within IG	5.4%	4.3%	5.9%	18.3%	7.6%
	Total	n	406	46	34	104	590
		% within IG	100.0%	100.0%	100.0%	100.0%	100.0%
Castelo Branco (3)	rural	n	186	28	22	72	308
		% within IG	46.4%	87.5%	62.9%	59.0%	52.2%
	semi-rural	n	75	1	5	4	85
		% within IG	18.7%	3.1%	14.3%	3.3%	14.4%
	semi-urban	n	139	3	6	46	194
		% within IG	34.7%	9.4%	17.1%	37.7%	32.9%
	urban	n	1		2		3
		% within IG	.2%		5.7%		.5%
	Total	n	401	32	35	122	590
		% within IG	100.0%	100.0%	100.0%	100.0%	100.0%

[1]rural→ <50 residents/km^2 and <500 residents in one village
[2]semi-rural→ ≥ 50 residents/km^2 and ≥500 residents in one village
[3]semi-urban→ ≥100 residents/km^2 and ≥2000 residents in one village
[4]urban→ ≥500 residents/km^2 and ≥5000 residents in one village

The majority of respondents from the general public have jobs related to security, police and social work (24%) or mining, industry, and machinery (20%) (Figure 5.2). A high percentage of respondents are unemployed or retired (21%), which reflects the situation in the inland parts of Portugal (Guarda and Castelo Branco in this case). Only 8% of the sampled general public have jobs related to agriculture. A small minority of people have high-income jobs including work as governmental employees, scientific

researchers, technicians, or in commerce or insurance. Most livestock owners interviewed in the study area have jobs related to agriculture as their main source of income (Figure 5.3). However, around one third of the livestock owners raise livestock as a second source of income or as a hobby. These facts may have consequences for the financial impacts caused by wolf predation on livestock and/or the attitudes of this interest group toward wolves and wolf management. Some 29% of hunters interviewed work in the mining, industry and machinery sector (Figure 5.4). The remaining hunters are equally distributed through the other main jobs categories: scientific, technical, arts, agriculture, government, commerce and insurance. Hunters in the study area come from various social classes and have varying degrees of income. Students are assumed to fall into this single category.

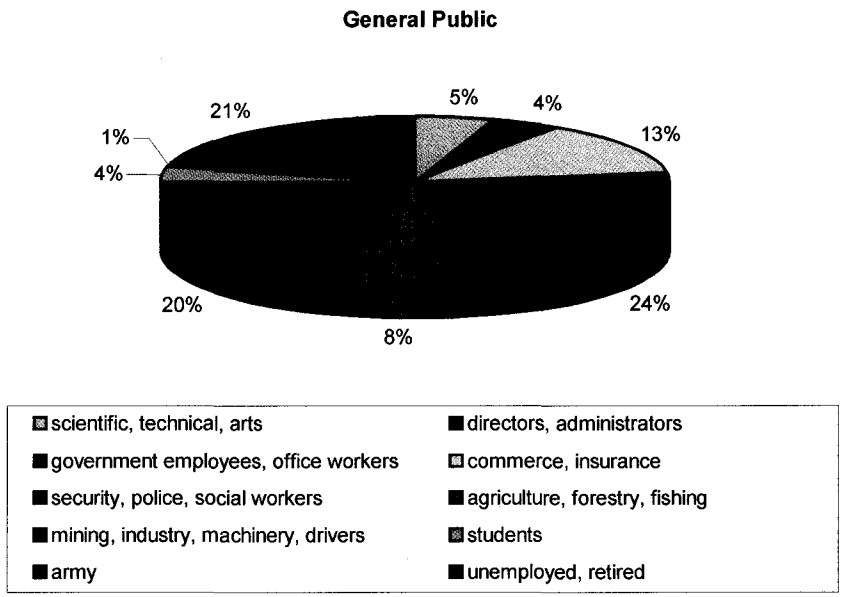


Figure 5.2 – Occupations of respondents from the general public interviewed in the study area.

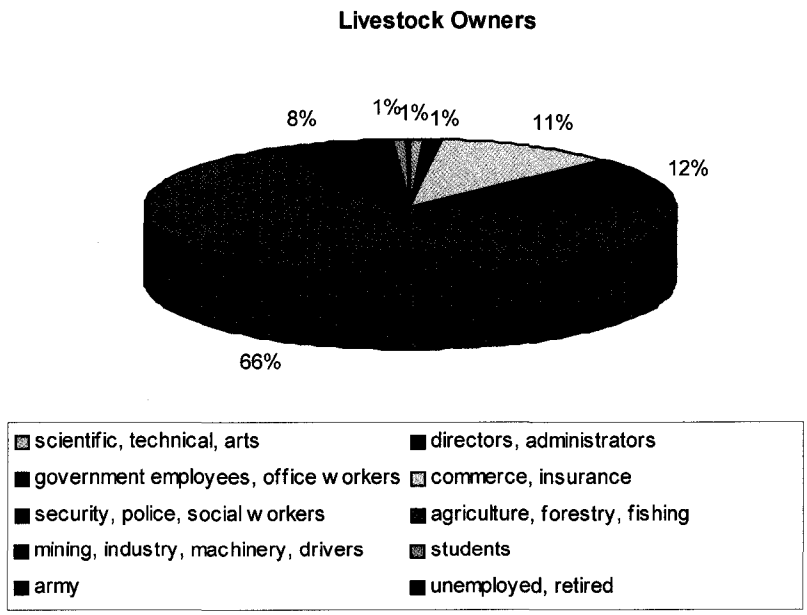


Figure 5.3 – Main occupation of livestock owners interviewed in the study area.

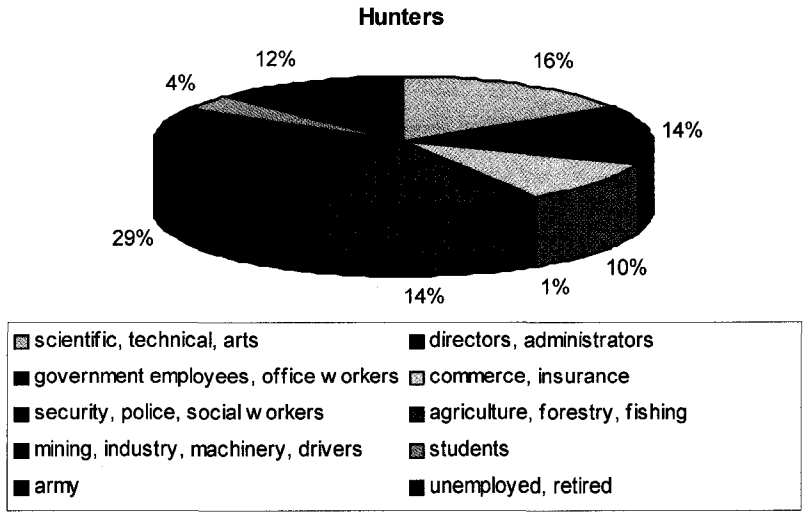


Figure 5.4 - Occupations of hunters interviewed in the study area.

In Aveiro/Viseu and Guarda, the vast majority of respondents from all interest groups have an elementary school education (Table 5.4). In Castelo Branco, the situation is similar, except among hunters who, in most cases, have some college education (5^{th}-9^{th} grade). A minority of the general public and the livestock owners have completed high school or a university degree. Hunters are the most educated, particularly in Aveiro/Viseu and Guarda. Hunters in Zone 2 are the only group where there were zero respondents in the "none" category. The highest percentages of unschooled respondents were found among livestock owners, reaching almost 20% in Castelo Branco. Overall, the sample is characterized by a low level of education.

Table 5.4 – Level of education by interest group by Zone.

Interest Group*	Level of Education	Zone 1	Zone 2	Zone 3	Total
General Public	none	6%	8%	12%	8%
	elementary (1st-4th grade)	44%	53%	44%	47%
	college (5th-9th grade)	37%	20%	26%	27%
	high school (10th-12th grade)	9%	13%	13%	12%
	university degree	4%	6%	7%	6%
	Total	100%	100%	100%	100%
Livestock Owners	none	6%	11%	19%	12%
	elementary (1st-4th grade)	64%	65%	53%	61%
	college (5th-9th grade)	21%	9%	13%	14%
	high school (10th-12th grade)	6%	7%	6%	6%
	university degree	3%	9%	9%	7%
	Total	100%	100%	100%	100%
Hunters	none	3%	0%	3%	2%
	elementary (1st-4th grade)	47%	41%	20%	36%
	college (5th-9th grade)	31%	18%	46%	31%
	high school (10th-12th grade)	6%	21%	23%	16%
	university degree	14%	21%	9%	14%
	Total	100%	100%	100%	100%

* Students are excluded from table because they all were on high school.

When asked about having seen a live wolf in the wild, most respondents from the general public and students stated they had not seen one or are not sure (Table 5.5). The majority of respondents living in more contact with nature (livestock owners and hunters) believe they had seen wolves in the wild, mainly in Viseu and Guarda. A fairly large percentage of the general public, in Guarda, and students, in Viseu, claimed they had seen a wolf. With the exception of students, most respondents have seen wolves in captivity (Table 5.6), which may contribute to the validity of their statements. However, considering the low number of wolves living in the region (3-5 in Aveiro; 12-19 in Viseu; and 8-10 in Guarda), and the secretive nature of the species, these percentages seem high, possibly indicating a lot of people seeing animals they believe to be wolves, are in fact seeing dogs or other wild species. In Castelo Branco, although wolves disappeared during the nineties, many respondents state they had already seen wolves in the wild. These observations probably occurred before wolves were extirpated from the county in the 1970s.

Only a few estimates on the number of wolves currently living in Portugal and the county where respondents live, are close to reality. Given that today 200-300 wolves live in Portugal, only livestock owners, followed by hunters, provided fairly good estimates on these numbers (Table 5.5). Hunters also gave the best approximation of the wolf population in the county. Estimates by the remaining groups of respondents were far from realistic at both the regional and national scales. Students show up as the most unknowledgeable group in terms of the estimates provided. Interestingly, many respondents living in Castelo Branco believe there are wolves in this county today (around 63% of students, 14% of hunters and 9% of livestock owners). Only 1% of the general public is aware that wolves are extinct in Castelo Branco.

Table 5.5 – Responses to the item: "Have you ever seen a live wolf in the wild?"; and perceived number of wolves living in Portugal and in the county where respondents live.

Interest Group	County	n	Have you seen a wolf in the wild?		# wolves people think exist in the county		# wolves people think exist in Portugal	
			No or Not Sure	Yes	min.	max.	min.	max.
General Public	Aveiro	91	82%	18%	0	50	0	1,000
	Viseu	311	67%	33%	0	2,500	0	1,000
	Guarda	406	54%	46%	0	1,500	0	1,600
	C. Branco	401	68%	32%	0	50	40	1,000
	Total	1209	64%	36%				
Livestock Owners	Aveiro	0	-	-	-	-	-	-
	Viseu	33	28%	72%	5	7	250	250
	Guarda	46	22%	78%	0	100	150	750
	C. Branco	32	50%	50%	0	10	200	200
	Total	111	32%	68%				
Hunters	Aveiro	0	-	-	-	-	-	-
	Viseu	36	32%	68%	0	20	100	2,000
	Guarda	34	50%	50%	0	50	20	500
	C. Branco	35	74%	26%	0	50	6	500
	Total	102	51%	49%				
Students	Aveiro	0	-	-	-	-	-	-
	Viseu	102	64%	36%	0	55,000	100	1,100,000
	Guarda	104	74%	26%	0	78,000	9	984,000
	C. Branco	122	72%	28%	0	10,000	30	50,000
	Total	325	70%	30%				

Note: There are 200-300 wolves in Portugal; 3-5 wolves in Aveiro; 12-19 wolves in Viseu; and, 8-10 wolves in Guarda. These are approximate numbers.

Table 5.6 - Responses to the item: "Have you ever seen a wolf in captivity?"

Interest Group	Zone	Have you ever seen a wolf in captivity?		Total
		No or Not Sure	Yes	
General Public	Aveiro/Viseu	47%	53%	100%
	Guarda	40%	60%	100%
	Castelo Branco	39%	61%	100%
	Total	42%	58%	100%
Livestock Owners	Aveiro/Viseu	33%	67%	100%
	Guarda	53%	47%	100%
	Castelo Branco	34%	66%	100%
	Total	42%	58%	100%
Hunters	Aveiro/Viseu	33%	67%	100%
	Guarda	30%	70%	100%
	Castelo Branco	37%	63%	100%
	Total	34%	66%	100%
Students	Aveiro/Viseu	58%	42%	100%
	Guarda	62%	38%	100%
	Castelo Branco	55%	45%	100%
	Total	58%	42%	100%

Respondents were asked about their interest in wolf management issues in Portugal, and about the importance of keeping up to date with these issues. These questions provide information on the interest of the respondents in wolf management issues by interest group and zone and help identify which groups in which areas are more willing to receive messages about wolf management. Responses to both items show differences among interest groups (F=13.401; df=3; $p \leq .001$), but not among zones. In terms of the interest in wolf management issues, most students consider these issues as very important (Figure 5.5). The general public, livestock owners and hunters very similarly consider the issues to be very important. The general public and the livestock owners do not show as much interest as the previous groups, but most still consider the issue to be very important. In the three zones, most respondents state that these issues are important or very important.

When asked about the importance of keeping up to date with wolf management issues, hunters and livestock owners give different responses than students and the general public (Figure 5.6). Hunters, and especially livestock owners, show the greater potential interest in receiving information about wolf management issues. The general

public and the students show less interest on keeping up to date with wolf-related information than the other groups. There are no differences among zones, and responses are equally divided among the three zones. A minority of respondents stated that it was not important to keep up to date with wolf management issues. Managers could use this information when selecting the interest groups to whom to direct important messages on wolf management.

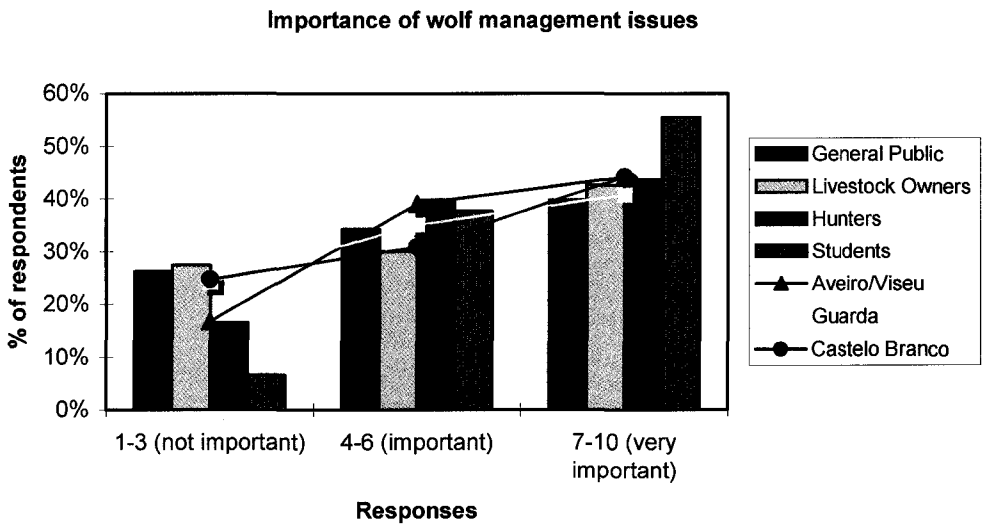


Figure 5.5 – Percentage of responses, by interest group and zone, to the item " On a scale from 1 to 10, how important is the issue of wolf management in Portugal to you personally?

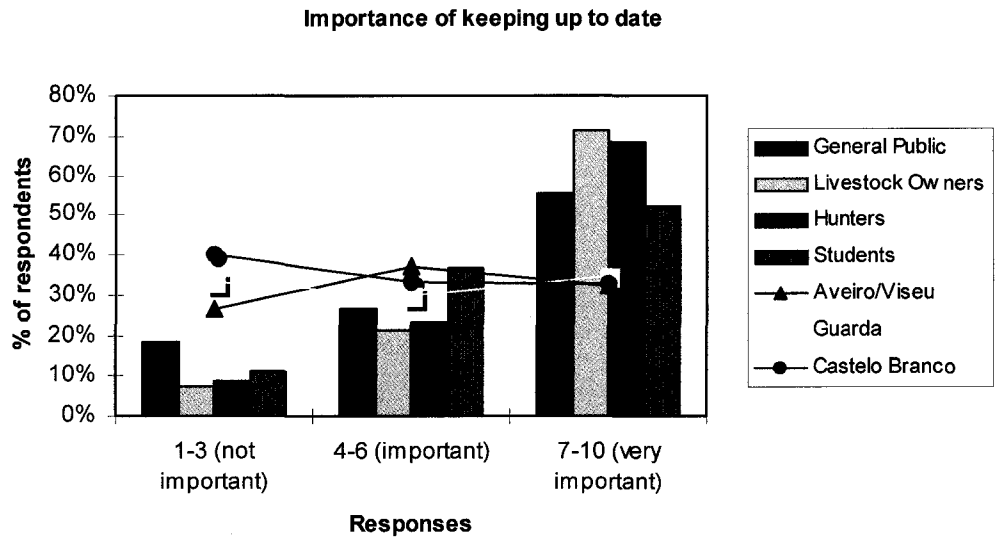


Figure 5.6 - Percentage of responses, by interest group and zone, to the item " On a scale from 1 to 10, how important is it to you to keep up to date with the issue of wolf management in Portugal?

The variables described (gender, age, residence, occupation, education, whether respondents have viewed a wolf in the wild or in captivity, and importance of wolf management issues or in keeping up to date) provide baseline information on the main characteristics of the sample. In addition this information allows a more in-depth discussion of the differences of attitudes and knowledge toward wolves and wolf management among interest group and zones, and helps identifying the factors affecting those attitudes and knowledge.

5.2 Quantitative Data

In this section the quantitative results by theme are presented as follows:

- Attitudes and knowledge toward wolves and wolf management among the general public and interest groups;
- Attitudes and knowledge toward wolves and wolf management in different zones;

- Relationships among attitudes and knowledge toward wolves and wolf management;
- Factors affecting attitudes and knowledge toward wolves and wolf management;

For each theme, one or more hypotheses are proposed as the basis for analysis and the results are presented separately for each interest group. Whenever necessary, a short introduction with a methodological background is presented to set the stage for the results described.

5.2.1 Attitudes and knowledge toward wolves and wolf management among the general public and several interest groups

5.2.1.1 Attitudes

Ho1: attitudes toward wolves and wolf management do not differ among the general public, livestock owners, hunters, and high school students.

- **General Public**

Principal component analyses with Varimax rotation were performed through SPSS FACTOR on 37 attitudinal items from the questionnaire for a sample of 1148 respondents from the general public. The procedures for preparing the data and verifying the assumptions were conducted as described in the Methods section. The PCA extracted four components for data from the general public. With a cut off of .40 for inclusion of a variable in the interpretation of a component, only 3 of 37 variables did not load on any component. Most variables loaded on a single component, which reflects homogeneity of the items on attitudes toward wolves or wolf management. Loadings of variables on components, and variance percentages are shown in Table 5.7. Variables are ordered and grouped by size of loading to facilitate interpretation. Loadings under .40 are omitted from the table. Interpretative labels are suggested for each component in a footnote.

Table 5.7 - Component loadings, and variance percentages for principal components extraction and varimax rotation on attitudinal items toward wolves and wolf management in Portugal (for the general public).

Item	C1[a]	C2	C3	C4
a4 - wolves in Portugal for future generations	.914			
a9 - it is important wolves exist in Portugal	.903			
a8 - it is important wolves exist in the county	.896			
a14 - wolves are unnecessary in Portugal if abundant in Europe	-.883			
a13 - wolves are unnecessary in the county if abundant in Portugal	-.846			
a6 - healthy wolf population in the county	.835			
a15 - wolves completely protected in Portugal	.831			
a1 - opinion toward wolves	.813			
a2x - to have wolves in Portugal	.804			
a3x - to have wolves in the county	.788			
a26 - wolves have the right to exist	.777			
a18 - wolf hunting year round in the county	-.728			
c1 - increase wolf # in Portugal	.722			
c3 - killing wolves that kill livestock	-.700			
a17 - specific wolf hunting seasons in the county	-.696			
c9e - authorized wolf hunts in the county	-.693			
c5 - there are enough wolves in Portugal	-.668			
a7 - abundant wolf population for future generations	.610			
a21 - wolves may increase tourism in the county	.512			
a19 - kill wolves by all means in the county	-.510			
a23 - wolf attacks on humans are common	-.452	.412		
a10 - wolves have a big impact on big game		.712		
a12 - wolves reduce prey to unacceptable levels		.580		
a11 - wolves have a big impact on small game		.480		
a20 - wolves keep wild prey in balance		.406		
a25 - afraid to hike in the woods, if wolves are present		.403		

c9c - requirement to buy insurance				
c9 - livestock owners should be compensated			.548	.472
a24 – wolves' primary food is livestock			.505	
a22 - wolves cause abundant damage to livestock			.486	
c8 - compensating only those who use preventive methods			-.403	
c7 - livestock owners receive $ for living in areas with wolves				
c9a - taxes used for compensation				.659
c4 - contribute with own money for a compensation program				.580
c9b - Gov. should pay compensation				.579
c9f - Gov. should help prevent damage				.419
c9d - Gov. should pay the insurance				
Percent of Variance Explained	33.87	6.36	5.34	5.24

[a] Component labels:
C1 *Existence*
C2 *Game/Prey*
C3 *Compensation ; Livestock*
C4 *Money*

The frequency plots of components extracted with PCA for the general public show an unimodal distribution for the components except for the first one (*Existence*). Figure 5.7 shows the bimodal distribution of frequencies on the attitudinal scores of component 1 for the general public. This split in frequencies reflects a divergence in attitudes among respondents. For this reason the interpretation of loadings in the first component is done separately for each subgroup: respondents with negative attitudes toward wolves (subgroup *a*) and respondents with positive attitudes (subgroup *b*).

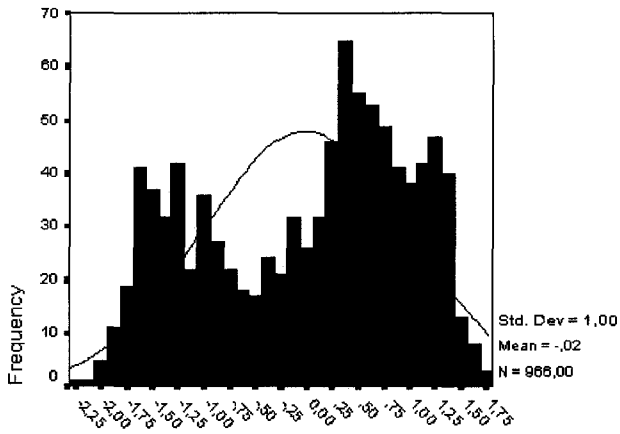


Figure 5.7 – Frequency of attitudes toward wolves (*Existence value*), among respondents from the general public.

Respondents with a positive attitude toward the *Existence* value of wolves (57 % of the general public) think wolves should exist for future generations in Portugal and in the county, independently from their abundance in other parts of the country or Europe. They are in favour of total protection of the species, and disagree with all kinds of lethal control (Table 5.7). On the other side of the attitudinal spectrum are respondents with a negative opinion about wolves (43% of the general public). This subgroup of people thinks wolves are not important and agrees with wolf hunting seasons, and lethal control of individuals that kill livestock.

The first component explains 34% of the variance in the original variables and is the most important one (Table 5.7). Components 2, 3, and 4 explain residual variance, and provide information on attitudes of the general public toward wolf management issues. For these components, the frequency plots of attitude scores are unimodal which reflect homogeneous opinions toward the issues. In terms of wolves' impact on *Game/Prey* (see loadings on component 2), most respondents from the general public have a neutral opinion about wolves' impact on big game. With a much lower loading than the previous item (thus being less important), the item about "wolves reducing prey to unacceptable levels" tells us that most respondents disagree with this statement. Other game-related items of this component have low loadings and do not contribute

significantly in explaining the general public's attitudes toward the impact of wolves on game species. The fear of the species is reflected when respondents say they are afraid of hiking in the woods if wolves are present.

Component 3 summarizes attitudes toward compensation issues and the impact of wolves on livestock (*Compensation; Livestock*). Respondents' answers which have a positive correlation with this component show that all livestock owners should be compensated, not only those using preventive methods. Most respondents think wolves' primary food is livestock, resulting in abundant damage on this prey (more than 80%). The fourth component (*Money*) also deals with compensation issues, but in this case with the source of money used for payment of compensation. Items loading in this component are all positive (which means that most people tend to agree with the statements provided in the questionnaire regarding the source of money used for payment of compensation), but the first two items have bimodal distributions. Respondents' opinions split when asked about the utilization of taxes to compensate livestock owners. While 33% of the general public disagree with taxes being used for compensation, 57% agree with that measure. In the same way, 40% of the public would not contribute their own money for a compensation program, but 56% are willing to contribute. In general, most respondents think the government should be the financial source for compensation to livestock owners (93%) or by helping prevent damage (82%).

- **Livestock Owners**

Principal component analyses with Varimax rotation were performed through SPSS FACTOR on 36 attitudinal items from the questionnaire for a sample of 111 livestock owners. As for the general public, the procedures for preparing the data and verifying the assumptions were conducted as described in the Methods section. The PCA extracted five components for data from livestock owners. With the same cut off of .40 for inclusion of a variable in the interpretation of a component, only 2 of 36 variables did not load on any component. As with the general public, most variables loaded on one component, which reflects homogeneity of the items on attitudes toward wolves or wolf management.

Loadings of variables on components, and variance percentages are shown in Table 5.8, in which variables are ordered and grouped by size of loading above .40.

Table 5.8 - Component loadings, and variance percentages for principal components extraction and varimax rotation on attitudinal items toward wolves and wolf management in Portugal (for livestock owners).

Item	C1[a]	C2	C3	C4	C5
a9 - it is important wolves exist in Portugal	.887				
a4 - wolves in Portugal for future generations	.883				
a15 - wolves completely protected in Portugal	.814				
a14 - wolves are unnecessary in Portugal if abundant in Europe	-.812				
a2x - to have wolves in Portugal	.803				
a1 - opinion toward wolves	.791				
c1 - increase wolf # in Portugal	.786		-.405		
a6 - healthy wolf population in the county	.781				
c5 - there are enough wolves in Portugal	-.769				
a3x - to have wolves in the county	.759				
a17 - specific wolf hunting seasons in the county	-.736				
a13 - wolves are unnecessary in the county if abundant in Portugal	-.735				
c3 - killing wolves that kill livestock	-.719				
c9e - authorized wolf hunts in the county	-.715				
a18 - wolf hunting year round in the county	-.707				
a26 - wolves have the right to exist	.703				
a7 - abundant wolf population for future generations	.526				
a19 - kill wolves by all means in the county	-.435				
a25 - afraid to hike in the woods, if wolves are present					
a10 - wolves have a big impact on big game		.773			
a20 - wolves keep wild prey in balance		.713			
a12 - wolves reduce prey to unacceptable levels		.712			
a11 - wolves have a big impact on small game		.622			
c7 - livestock owners receive $ for living in areas with wolves					

a24 - wolves' primary food is livestock			.744		
a22 - wolves cause abundant damage to livestock	-.425		.576		
a23 - wolf attacks on humans are common			.440		
c9b - Gov. should pay compensation				.713	
c9 - livestock owners should be compensated				.669	
c8 - compensating only those who use preventive methods				-.616	
c9d - Gov. should pay the insurance				.594	
c9a - taxes used for compensation					.609
c9c - requirement to buy insurance					.567
c4 - contribute with own money for a compensation program					.505
a21 - wolves may increase tourism in the county					.487
c9f - Gov. should help prevent damage					.439
Percent of Variance Explained	30.25	7.38	7.10	6.26	5.05

[a] Component labels:
C1 *Existence*
C2 *Game/Prey*
C3 *Livestock*
C4 *Compensation*
C5 *Money*

Attitudes of livestock owners toward the *Existence* value of wolves are presented in the first component extracted with PCA, which has a normal distribution of frequencies (Table 5.8). However, most frequency plots of items loading on this component have bimodal distributions, which show heterogeneity of opinions among livestock owners. Some of the respondents from this interest group think of wolves as an important species with the right to exist, and state there are not enough wolves in Portugal. A slight majority of livestock owners holds a negative opinion about wolves. They disagree with the total protection of the species or the increase of wolf numbers, and define the presence of wolves in Portugal or in the county as "bad". Most livestock owners would like to see authorized wolf-hunting seasons and the lethal control of individuals that kill livestock. Wolf-hunting year round or by all means is not well accepted by the respondents.

The second component produced with PCA summarizes opinions about the impact of wolves on game and prey (*Game/Prey*). Livestock owners whose answers are correlated with this component hold the view that wolves do not have a significant impact on big game. The same respondents agree that wolves neither keep wild prey in balance nor reduce prey to unacceptable levels. With a lower loading than the previous items, the question about wolves' impact on small game brought a slightly different attitude from livestock owners. Most respondents (60%) agree that wolves have a significant impact on small game species.

Component 3 (*Livestock*) groups items related to wolf damage to livestock and attacks on humans. Most livestock owners agree that wolves' primary food is livestock (92%) and that the species cause abundant damage to this prey (94%). This is the only interest group where items related with livestock issues group in a separate component, which highlights the importance of these issues to this group. Less important is the question of wolves attacking human beings. The item has a bimodal distribution of frequencies, and most livestock owners (68%) do not think wolves attack humans frequently.

Another important issue in wolf management is livestock owners' attitudes towards compensation, which is summarized in component 4 (*Compensation*). Almost all livestock owners surveyed agree that government must pay them compensation for damage caused by wolves. The majority of respondents think that government should compensate all livestock owners, not only those using preventive methods (around 35% disagree with this generalized payment of compensation). The last component refers to financial issues (*Money*) and, although loadings are all positive, opinions diverge over most of the items. Most livestock owners agree with taxes being used for compensation (64%), and with government's help in preventing damage (81%). The majority of respondents also accept the idea of mandatory insurance (52%), or the possibility of contributing their own money for a compensation program (67%), although 30-40% of respondents disagree with these measures. The potential role of wolves in increasing tourism is recognized by 37% of the livestock owners and, although in general there are

not significant differences among regions, most respondents from Aveiro/Viseu (61%) think the presence of wolves in their county can increase tourism.

➢ Hunters

The same procedures for PCA were performed on 35 attitudinal items from the questionnaire for a sample of 103 hunters. The PCA extracted three components for data from the hunters. In this case, 10 of 35 variables did not load on any component. Failure of numerous variables to load on a component reflects heterogeneity of opinions among this interest group. Loadings of variables on components, and variance percentages are shown in Table 5.9. Variables are ordered and grouped by size of loading to facilitate interpretation. Interpretative labels are suggested for each component in a footnote.

Table 5.9 - Component loadings, and variance percentages for principal components extraction and varimax rotation on attitudinal items toward wolves and wolf management in Portugal (for hunters).

Item	C1[a]	C2	C3
a9 - it is important wolves exist in Portugal	-.883		
a4 - wolves in Portugal for future generations	-.880		
a1 - opinion toward wolves	-.851		
a2x - to have wolves in Portugal	-.850		
a3x - to have wolves in the county	-.839		
a14 - wolves are unnecessary in Portugal if abundant in Europe	.808		
a13 - wolves are unnecessary in the county if abundant in Portugal	.799		
a26 - wolves have the right to exist	-.764		
c1 - increase wolf # in Portugal	-.762		
c3 - killing wolves that kill livestock	.748		
a15 - wolves completely protected in Portugal	-.704		
c9e - authorized wolf hunts in the county	.702		
a17 - specific wolf hunting seasons in the county	.686		
a18 - wolf hunting year round in the county	.674		

c5 - there are enough wolves in Portugal	.660		
a25 - afraid to hike in the woods, if wolves are present	.607		
a23 - wolf attacks on humans are common	.573		
a19 - kill wolves by all means in the county	.561		
a7 - abundant wolf population for future generations	-.531		
a22 - wolves cause abundant damage to livestock	.429		
a24 - wolves' primary food is livestock			
a11 - wolves have a big impact on small game			
c9b - Gov. should pay compensation		.598	
c9 - livestock owners should be compensated		.557	
c4 - contribute with own money for a compensation program			
a20 - wolves keep wild prey in balance			
c9a - taxes used for compensation			
c7 - livestock owners receive $ for living in areas with wolves			.508
c9d - Gov. should pay the insurance			.497
c9f - Gov. should help prevent damage			.472
a21 - wolves may increase tourism in the county			
c8 - compensating only those who use preventive methods			
a12 - wolves reduce prey to unacceptable levels			
a10 - wolves have a big impact on big game			
c9c - requirement to buy insurance			
Percent of Variance Explained	31.87	6.30	5.83

[a] Component labels:
C1 *Existence*
C2 *Compensation*
C3 *Prevention*

Similar to the results from the general public and the livestock owners, the first component produced with PCA is the most important one and shows hunters' attitudes towards the *Existence* value of wolves. The most important items loading on this component have negative loadings which makes the interpretation of the component more

difficult. For this reason the component was reflected and signs of loadings changed. This way the component illustrates attitudes of the majority of hunters. Answers to items positively correlated with component 1 (after being reflected) show a neutral attitude of hunters toward wolves. Descriptive analysis of frequencies of the items show that most hunters think that the species is important, that it should exist for future generations, and that it should be present in Portugal even if abundant in other European countries. Although the majority of respondents think wolf numbers should increase, and defend total protection of the species, around 40% of hunters do not agree with these statements. Lethal control of wolves that kill livestock, authorized wolf hunting in specific seasons or year round, and killing of wolves by all means are not accepted at all by surveyed hunters.

The second component (*Compensation*) contains only two items but these are highly correlated with each other and not with other items. This distinct component shows hunters' agreement with the payment of compensation by the government to livestock owners due to damage caused by wolves. This unique component dealing exclusively with prevention issues only appears among hunters (*Prevention*). Most hunters (83%) disagree with the payment of subsidies to livestock owners living in areas where wolves exist instead of compensation due to wolves' attacks. However, those who agree with this measure are also in favour of a system of mandatory insurance in which the government pays the insurance. The same respondents think government should help livestock owners prevent damage caused by wolves. The fact that items related to wolves' impact on game species do not group in one component shows that this issue is not of concern to those hunters surveyed. This is supported by the fact that most hunters (55%) think wolves keep wild prey populations in balance. The vast majority (71%) also disagrees that wolves reduce prey populations to unacceptable levels.

- **Students**

PCA with Varimax rotation, performed on 41 attitudinal items from the questionnaire for a sample of 310 high school students, extracted four components. Three of 41 variables did not load on any component. Most variables loaded on a component,

which reflects homogeneity of the items on attitudes toward wolves or wolf management. Loadings of variables on components, and variance percentages are shown in Table 5.10. Interpretative labels are suggested for each component in a footnote.

Table 5.10 - Component loadings, and variance percentages for principal components extraction and varimax rotation on attitudinal items toward wolves and wolf management in Portugal (for high school students).

Item	C1[a]	C2	C3	C4
c2 - increase wolf # in the county	.817			
a8 - it is important wolves exist in the county	.768			
c1 - increase wolf # in Portugal	.768			
a5 - wolves in the county for future generations	.745			
a3x - to have wolves in the county	.740			
c6 - there are enough wolves in the county	-.722			
c5 - there are enough wolves in Portugal	-.721			
a2x - to have wolves in Portugal	.684			
a6 - healthy wolf population in the county	.675			
a4 - wolves in Portugal for future generations	.672			
a9 - it is important wolves exist in Portugal	.658			
a1 - opinion toward wolves	.608			
a16 - wolves completely protected in the county	.573			
a14 - wolves are unnecessary in Portugal if abundant in Europe	-.558			
a13 - wolves are unnecessary in the county if abundant in Portugal	-.557			
a15 - wolves completely protected in Portugal	.534			
a7 - abundant wolf population for future generations	.515			
a21 - wolves may increase tourism in the county	.483			
a25 - afraid to hike in the woods, if wolves are present	-.460			
a18 - wolf hunting year round in the county		.748		
a17 - specific wolf hunting seasons in the county		.746		
c9e - authorized wolf hunts in the county		.694		
a19 - kill wolves by all means in the county		.677		

a26 - wolves have the right to exist		-.566		
c3 - killing wolves that kill livestock		.440		
a12 - wolves reduce prey to unacceptable levels			.676	
a24 - wolves' primary food is livestock			.528	
a10 - wolves have a big impact on big game			.524	
a22 - wolves cause abundant damage to livestock			.516	
a23 - wolf attacks on humans are common			.483	
a20 - wolves keep wild prey in balance			-.430	
a11 - wolves have a big impact on small game			.420	
c9c - requirement to buy insurance				
c9a - taxes used for compensation				
c8 - compensating only those who use preventive methods				
c9 - livestock owners should be compensated				.674
c9b - Gov. should pay compensation				.620
c9d - Gov. should pay the insurance				.595
c4 - contribute with own money for a compensation program				.520
c9f - Gov. should help prevent damage				.510
c7 - livestock owners receive $ for living in areas with wolves				.408
Percent of Variance Explained	22.18	8.63	6.32	6.15

[a] Component labels:
C1 *Existence*
C2 *Wolf hunting*
C3 *Prey/Game/Livestock*
C4 *Compensation*

Similar to the previous interest groups, student data load strongly on a single component (*Existence*). Students express a neutral and homogeneous opinion toward wolves. Analyses of individual items' plots show that students agree with the increase of wolf populations both regionally and nationally. Students are in favour of wolf existence for future generations and total protection of the species. Most respondents express fear to hike in the woods if wolves are present.

Students differ from the general public and the other interest groups mainly in the second component (*Wolf hunting*), which refers exclusively to a total disagreement with wolf-hunting and the lethal control of wolves that cause damage to livestock. When analysing data from other interest groups, these items are usually included in the first component and have relatively low loadings. Among students, the issue of wolf killing is so important that items correlate strongly and group on a separate component.

Component 3 (*Prey/Game/Livestock*) contains items mentioning the impact of wolves on wild prey, game and livestock. Most students do not exhibit an opinion concerning wolves' impact on big and small game, or wolves' role in balancing wild prey populations. However, more than 70% of the students think wolves cause abundant damage to livestock. Equal percentages of students disagree, have no opinion, and agree with the statement "wolf attacks on humans are common", which shows that around one third of the surveyed students tend to think of wolves as a threat to humans. Although perceiving wolves as a threat to livestock and humans, this interest group consistently holds a general positive attitude toward the species, being against any kind of wolf killing.

The last component provides information on students' points of view toward compensation issues (*Compensation*). Respondents agree that livestock owners should receive compensation from the government for damage caused by wolves. Students also agree with other forms of minimizing livestock losses like the payment of insurance or establishment of preventive methods by the government. A willingness to contribute money for a compensation program is also evident from students' answers.

All components extracted with PCA for the general public, livestock owners, hunters, and students have an unimodal behaviour except the first component (*Existence*) for the general public which has a bimodal distribution. The heterogeneity of opinions among the general public indicates two distinct subgroups, one in each extreme of the attitudinal spectrum. For this reason, data from the general public are divided into two groups for further statistical procedures and analysed separately.

The comparison of attitudes of the general public and the various interest groups toward the *Existence value* of wolves (the most important component obtained with

PCA), is presented in Figure 5.8. The graph presenting the average attitudinal scores shows the neutral position of most interest groups and the extreme positions of the two subgroups from the general public. Besides the differences in attitudes among one group of respondents (general public), there are also distinct ways in which wolf management issues aggregate and prioritize within each interest group. The components produced with PCA and the loadings of items are very different among the groups. These quantitative and qualitative differences allow the rejection of the null hypothesis (Ho1), and suggest that attitudes toward wolves and wolf management do differ among the general public and the various interest groups.

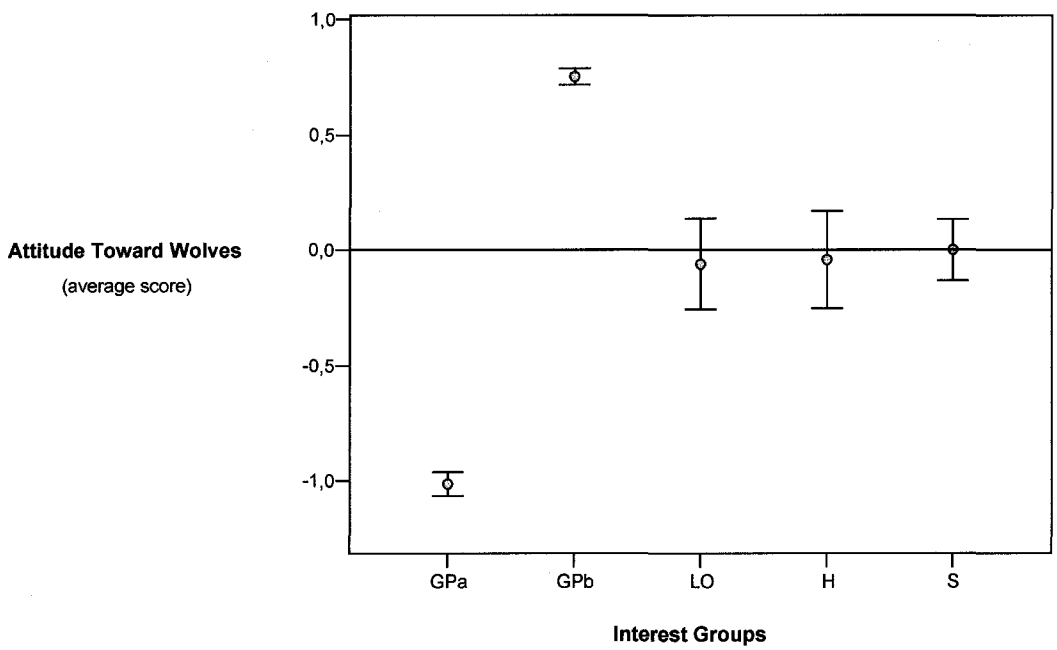


Figure 5.8 – Attitude average scores (with 95% Confidence Interval) of negative members of the general public (GPa), positive members of the general public (GPb), livestock owners (LO), hunters (H), and students (S), toward the existence value of wolves in central-north Portugal.

5.2.1.2 Knowledge

Ho2: knowledge about wolves does not differ among the general public, livestock owners, hunters, and high school students.

Knowledge about wolves is significantly different among the general public, livestock owners, hunters, and high school students (F=93.829; df=3; $p \leq .001$), which lead us to the rejection of the null hypothesis (Ho2). The average scores range between 1.85 for students and 4.14 for hunters, and do not aggregate in subgroups according to Tukey's HSD test (Table 5.11). The scores show a low knowledge among all interest groups. Most respondents answered more than half of the questions incorrectly. Although hunters have the highest knowledge level about the species (see red circle and arrow in the graph), the scores never reach the highest point of the scale (Figure 5.9).

Table 5.11 – Results from Tukey's HSD test, using knowledge scores about wolves from the general public, livestock owners, hunters, and students in the study area.

Knowledge score - Tukey B					
	N	**Subset for alpha = .05**			
Interest Group		**1**	**2**	**3**	**4**
Students	328	1.85			
General Public	1209		2.82		
Livestock Owners	111			3.51	
Hunters	105				4.14

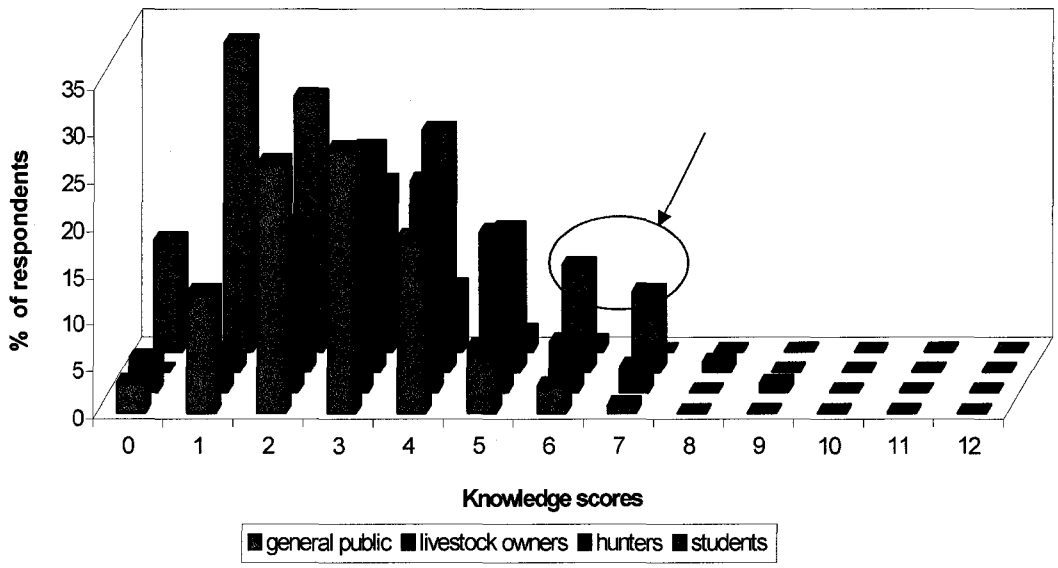


Figure 5.9 - Knowledge scores about wolves among the general public, livestock owners, hunters and students in the study area (knowledge scores ranging from 0 [low] to 12 [high]).

In general, questions related to the size and the trend of the wolf population in Portugal and in the county where residents live are answered incorrectly or are not answered. More than 80% of the respondents failed to answer this type of question correctly. The same happens with items asking about various biological aspects of the species, such as the number of wolves in the pack that breed in each year, the number of livestock killed by wolves in the previous year in the county, or the success rate of wolves when chasing their prey. The trend of the wolf population in the county, the weight of an adult male wolf, the legal status of the species, and the average size of a wolf pack in Portugal, are examples of questions answered incorrectly by 55%-80% of the respondents from all interest groups. The majority of the respondents only correctly answered the items about the presence of wolves in the past in the entire county, and about the predation of wolves on livestock even when wild prey are sufficient.

5.2.2 Attitudes and knowledge toward wolves and wolf management in different zones

5.2.2.1 Attitudes

Ho3: attitudes toward wolves and wolf management do not differ among the counties of Aveiro/Viseu, Guarda and Castelo Branco.

ANOVA was conducted for the general public and each interest group separately to determine if differences exist in attitudes and knowledge across regions. The attitudinal scores used in the ANOVA were the scores produced after running the PCA. The first component extracted with the PCA (*Existence*) is common to the general public and all interest groups. This is the component that better reflects attitudes toward wolves, being the more suitable for comparison of regions. The analysis of attitudes of the general public across zones was also divided in two parts, due to the bimodal behaviour of frequencies for the first component of PCA (as previously explained and illustrated on Figure 5.7). In terms of attitudes toward wolf management, the scores produced with PCA for the other components were used to evaluate differences among regions. Also in these cases, the analyses were conducted for each interest group individually.

- **General Public – subgroup *a***

Respondents from the general public belonging to subgroup *a* (those that are more negative toward wolves in terms of an *Existence* value; 43% of the total respondents of the general public) do not show significant differences in attitudes across regions (F= .343; df=2; p= .710). This analysis was conducted after confirming that the proportion of the population in GPa and GPb is approximately the same in the three zones (respectively 44%/56% in Zone 1 and 2, and 42%/58% in Zone 3). Independently from the zone, members from this subgroup consistently express a negative opinion when asked, for

instance, about the importance of having wolves in the country presently and for future generations.

- **General Public – subgroup *b***

Respondents from the general public (57%) who are included in subgroup *b* (more positive about wolves) show a consistent opinion, across the three regions of the study area, about the *Existence* value of wolves in the country. In none of the regions did respondents express a negative feeling about the species (F= .209; df=2; p= .811).

Analysis of attitudes of the general public toward wolf management tells us that attitudes differ significantly among regions, when comparing components 2 and 3 from PCA. Although close to a neutral position the general public in the region of Guarda differs from the other regions when asked about the impact of wolves on game/prey (component 2) (F= 6.079; df=2; p= .002). In Guarda, the public seems slightly positive toward wolves suggesting that they do not have a big impact on big game. On the other hand, the general public from Aveiro/Viseu (area with constant presence of wolves) and Castelo Branco (area without wolves) show a negative opinion toward wolves, considering that the species has a significant impact on big and small game and prey. In these two regions, more people are fearful of hiking in the woods if wolves are present than in Guarda. Results change when comparing the general public's attitudes toward compensation and wolves' impact on livestock (component 3). Particularly in Guarda, and to a lesser degree in Castelo Branco, the general public think livestock owners that lose livestock due to wolves should be compensated, even those not using preventive methods against wolf attacks. The same respondents believe that wolves' primary food is livestock and that wolves cause abundant damage to livestock. Respondents from Aveiro/Viseu are closer to a neutral opinion on those items (F= 3.777; df=2; p= .023).

Most respondents from the general public are slightly positive toward the idea of having taxes being used for a compensation system for livestock owners due to damage caused by wolves. People showed a willingness to contribute to a compensation program, but believe that Government should be the main source of compensation. The general

public also agree that Government should help livestock owners to implement methods for preventing damage, such as good livestock guard dogs and fences. These opinions do not differ across regions (F= .291; df =2; p= .748).

➢ **Livestock Owners**

Attitudes of livestock owners toward wolves and wolf management are similar in every region of the study area. ANOVA did not show significant differences for any of the components analysed. Although consistent in spatial terms, opinions diverge along the attitudinal spectrum depending on the issues. Most livestock owners have a slightly negative attitude toward the *Existence* value of wolves (component 1) (F= 1,872; df=2; p= .160), considering that wolf numbers should not increase, and that the species is not important for future generations if living in the wild. Although not evident from the results of the questionnaire during the face-to-face interviews, livestock owners expressed a willingness to accept the species in "big fenced natural reserves" where they do not cause damage to livestock. At present, respondents from this interest group are in favour of some forms of control of the wolf population (e.g. authorized wolf hunts in specific seasons of the year, or lethal control of individuals that kill livestock).

Livestock owners in the three regions (F= .541; df=2; p= .584) slightly agree that wolves do not have a big impact on big or small game/prey (component 2), but most of them think wolves cause abundant damage to livestock (component 3). ANOVA did not detect significant differences in attitudes toward the issue of wolves' attacks on livestock and humans among different regions (F= 1.619; df=2; p= .204). However, we should note that, while a high percentage of livestock owners strongly agree that wolves' primary food is livestock, Aveiro/Viseu is the region where one third of the surveyed livestock owners only moderately agree with this idea. Also in areas with constant presence of wolves, 12% of the livestock owners do not believe wolves cause abundant damage to livestock, but in Guarda and Castelo Branco, respectively 94% and 100% of the livestock owners agree with this.

Regarding compensation issues (component 4), livestock owners think that Government should pay compensation to livestock owners for damage caused by wolves, and that all owners should be compensated whether or not they use preventive methods. If a system of mandatory insurance is implemented, livestock owners' opinions were split on who should be paying for the insurance. While 43% of the livestock owners agree that the government should pay this insurance, 46% think that each owner should pay his/her own. Also in this case, ANOVA did not detect regional differences in attitudes toward compensation (F= 2.283; df=2; p= .108), but livestock owners from areas with constant presence of wolves (Aveiro/Viseu) have a particularly different opinion about one item loading on this component. Most livestock owners from Aveiro/Viseu (55%) agree with payment of compensation only to those who employ preventive measures against wolf attacks on livestock. The interpretation of results requires some caution because statistical analyses do not immediately show differences among regions but minor differences have to be considered if management measures have to be suggested for a specific region. Attitudes of livestock owners toward financial issues (component 5) are relatively consistent across the three regions (F= .902; df=2; p= .409). In general, data reflect a willingness of this interest group to directly or indirectly support costs of damage caused by wolves, but also feel that the Government should help.

- **Hunters**

In general, hunters in the study area are moderately positive toward wolves. The variance of scores in the three components from PCA (*Existence, Compensation, Prevention*) is not significantly different among the three regions (respectively, F= 1.109; df=2; p= .335; F= .117; df=2; p= .890; and, F= .498; df=2; p= .609), but whereas Aveiro/Viseu is slightly positive toward the *Existence* value of the species, respondents from Guarda and Castelo Branco tend to be more negative toward having the species in the country and in their county.

In Aveiro/Viseu the species is considered to have the right to exist, now and for future generations, and that wolf numbers should increase. Although the average score of

attitudes in Zone 1 is very similar to the average scores in Zones 2 and 3, these last two are on the negative side of the attitudinal spectrum, which means that they tend to disagree with these *Existence* statements. In Aveiro/Viseu, hunters are not in favour of *Prevention* to avoid damage caused by wolf predation, while respondents from Guarda and Castelo Branco have a slightly different opinion about this. Most hunters are moderately negative toward the idea of livestock owners receiving money for living in areas with wolves instead of compensation for losses caused by the predator. In terms of other *Prevention* issues, hunters' opinions in the three regions are divided when asked about Government's obligation to pay insurance to livestock owners. Mainly hunters from Guarda and Castelo Branco agree that Government should help livestock owners to implement methods for preventing damage caused by wolves. In areas with constant presence of wolves, hunters are more in favour of livestock owners implementing their own preventive measures without Government assistance.

- **Students**

Attitudes of high school students toward wolves and wolf management are, in general, similar in the three regions of the study area. ANOVA for component 1 (*Existence*), showed that attitudes toward the increase of wolf numbers, the importance of having wolves for future generations, or the complete protection of the species, are usually around a neutral position and tend to be slightly negative in Guarda (F= 2.291; df=2; p= .103). Corroborating these findings is the significant and negative correlation (Pearson) found between attitudes toward wolves and residence in Guarda (r = -.132; p=.044). Most students do not agree with wolf hunts year round or in specific seasons, with the control of the species by all means, or with the lethal control of individuals that kill livestock. Students think wolves have the right to exist and opinions are uniform across all regions (F= 1.238; df=2; p= .292). Also spatially consistent, are the opinions about the impact of wolves on game, prey, or livestock (F= .078; df=2; p= .925). Wolves are seen as feeding primarily on livestock, thereby causing significant damage. Students do not show a clear opinion about wolves' impact on game and prey. In all sampled

regions, one third of the students think wolves attack humans frequently. Concerning attitudes toward compensation issues, students in the three zones think that the Government should compensate livestock owners for damage caused by wolves (F= .919; df=2; p= .40). A slight majority of the students also agree with other forms of compensation like the payment of insurance by the Government, and show some willingness to contribute money for a compensation program.

Overall, statistical results indicate similarities in attitudes between the general public and the various interest groups toward wolves and wolf management across the three regions. Except for attitudes of the general public toward compensation and the impact wolves have on game, prey and livestock, one can assume that there are no differences among zones. Nevertheless, although the average scores of attitudes are similar, the fact that some scores are on the negative and others on the positive side of the attitudinal spectrum requires some caution in the interpretation of results. In some cases, attitudes toward wolves and wolf management differ spatially, although very moderately.

When this study was designed the study area was divided according to:
- the biological data on wolf distribution: Aveiro/Viseu represents most of the wolf distribution area; Guarda corresponds to the area were wolves have been disappearing in the 1990s; and, Castelo Branco corresponds to an area where wolves existed in the 1970s, but not anymore.
- the administrative divisions of the counties. If we take into consideration the practical component of this study, different management measures can be suggested and applied in each county if public wishes varying degrees of wolf management and if different measures are to be accommodated.

If we only consider the biological data and if we aggregate data in terms of respondents' place of residence: living in an area with confirmed presence of wolves (Zone A), probable presence of wolves (Zone B), or non-existence of wolves (Zone C), and run the same analysis, we can test if different results are produced in terms of public attitudes toward wolves (Figure 5.10). Attitudes of respondents from the general public

were used to test for differences, because of the large sample sizes. The statistical procedure was the same as used for testing for differences among Zones 1, 2 and 3 (the original division of the study area).

Analyses of the proportions of negative and positive members of the general public in Zones A, B and C show similar proportions. Among members of the public with negative attitudes toward wolves, ANOVA showed no significant differences in attitudes among Zones A, B and C (F= 1.466; df=2; p= .232). The same results were obtained among the positive members of the general public (F= .517; df=2; p= .597). The conclusion is that there are no differences in attitudes of the general public across zones. One can assume that independent of the approach used for the division of the study area, results are similar. The original division of the study area was kept.

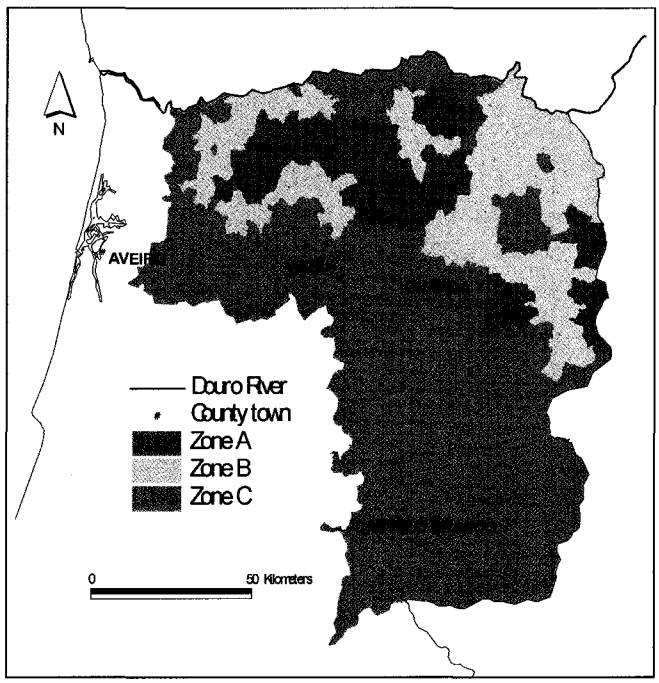


Figure 5.10 – Other possible division of the study area in three zones considering only the wolf distribution and not the county limits, for testing the reliability of the statistical results. Zone A: area of confirmed occurrence of wolves; Zone B: area of probable occurrence of wolves; Zone C: area with no wolves.

5.2.2.2 Knowledge

Ho4: knowledge about wolves does not differ among the counties of Aveiro/Viseu, Guarda and Castelo Branco.

The knowledge scores used in the ANOVA for the comparison among regions were the same as used for comparison of interest groups. For each interest group data were not divided in subgroups, because in all cases knowledge scores showed normal distributions.

- **General Public**

Knowledge scores of the general public are different among the three regions (F= 22.133; df=2; $p \leq .001$). The average scores are distinct and vary between 2.5 in Aveiro/Viseu, 2.8 in Castelo Branco, and 3.1 in Guarda. On a knowledge scale between zero and 12, all the average scores are low. Results show that respondents living in areas with constant presence of wolves (Aveiro/Viseu) scored the lowest on knowledge items.

- **Livestock Owners**

Average knowledge scores of livestock owners do not differ among the three regions, ranging between 3.3 in Guarda, and 3.7 in Castelo Branco. There is consistency on the knowledge levels of this interest group (F= .973; df=2; p= .381), and all scores are normally distributed.

- **Hunters**

Hunters are in a similar situation to livestock owners. The variance of knowledge scores is similar in the three regions of the study area (F= 1.462; df=2; p= .237). However, in this case, average scores range between 3.9 in Guarda, and 4.4 in Castelo Branco, which are higher than for the previous groups. For each region, the scores have a

normal distribution. Hunters from Castelo Branco scored the highest in knowledge about wolves of all interest groups and regions sampled.

- **Students**

Among students, there are significant differences in knowledge about wolves among regions (F= 11.65; df=2; $p \leq .001$). Aveiro/Viseu and Guarda scored higher than Castelo Branco (respectively 2.3, 1.9 and 1.5). This interest group has an inverse situation of the general public in which residents from Aveiro/Viseu registered the lowest knowledge level about wolves. Here, knowledge scores have a significant positive correlation (Pearson) with residence in Aveiro/Viseu (r = .223; p<.001), and a negative one with residence in Castelo Branco (r = -.239; p<.001). In fact, students from Castelo Branco had the lowest knowledge level about wolves of all interest groups and regions.

Overall, livestock owners and hunters consistently know more about wolves than the other interest groups in the three regions of the study area. The null hypothesis is rejected in the cases of the general public and the students, which means that their knowledge levels vary across space. The general public knows more about wolves in Guarda than in the other regions, although respondents in this zone usually fail questions related to the size and trend of the wolf population, the legal status of the species, the impact of wolf predation on livestock, and various biological aspects of the species. Although today there are no wolves in Castelo Branco, hunters and livestock owners from this region know more about the species than any other group in wolf areas. Nevertheless, the types of questions referred above are answered incorrectly most of the time by these interest groups. Members of all interest groups could benefit from information focusing all kinds of wolf-related issues because all groups registered low knowedge scores. Students from Castelo Branco are the least knowledgeable about wolves, and therefore should be the priority for these information programs.

5.2.3 Relationship between attitudes and knowledge toward wolves and wolf management

Ho5: attitudes toward wolves and wolf management are not correlated with knowledge about wolves.

The relationship among attitudes toward wolves and wolf management and knowledge levels about the species was analysed through the Pearson correlation coefficient with pairs of variables. The variables used were the attitudinal scores extracted with PCA (for the various components) and the knowledge scores, for each interest group separately. Respondents from the general public were divided in subgroup *a* and *b* considering their negative or positive attitudinal scores for component 1 (*Existence*). From all the pairs of variables analysed, the results presented in Table 5.12 only report cases in which significant correlations were found (p-value $\leq .05$).

Table 5.12 – Attitudinal components significantly correlated with knowledge scores about wolves, for each interest group in central-north Portugal.

Interest Group	Component	Pearson Correlation Coefficient	*p*-value
general public – subgroup *a* *(negative toward wolves)*	*Existence*	- 0.112	0.021
general public	*Game/Prey*	- 0.154	≤ 0.001
general public	*Compensation;Livestock*	0.151	≤ 0.001
general public	*Money*	0.108	0.001
livestock owners	*Compensation*	0.346	0.001
hunters	*Existence*	- 0.339	0.001

The correlation coefficients (*r)* values are low but statistically significant, which means that there is a linear association between pairs of variables. The absolute *r* value indicates the strength of the relationship, with larger absolute values indicating stronger

relationships. The sign of the coefficients give us the direction of the relationships, which helps understanding how attitudes and knowledge are linked. Although weak, the correlations between attitudes and knowledge levels mainly occur among the general public: respondents' opinions about wolves and wolf management issues are associated with their knowledge about the species. Knowledge is negatively correlated with attitudes toward the *Existence* value of wolves, and the impact of wolves on *Game and Prey*, and positively correlated with the payment of *Compensation* and various *Money* issues.

Respondents with negative attitudes toward wolves (*Existence* value) have strong negative attitudes associated with relatively high knowledge levels. When analysing the factors that simultaneously correlate with high knowledge levels and negative attitudes, it is possible to characterize this specific sector of the general public. These respondents are mainly elderly, living in rural areas, who consider wolf management issues to be very important and want to keep up to date on these issues.

The perceived impact of wolves on livestock and on wild species increases when respondents have more knowledge about the species. In such cases, there is more agreement with payment of compensation to livestock owners, independent of the use of preventive methods. The willingness of more knowledgeable respondents to contribute their own money for a compensation program, or to see their taxes being used for compensation by the Government, is another significant finding among the general public.

The relationship between livestock owners' attitudes toward *Compensation* and knowledge is positive and stronger than among the general public. Livestock owners with higher knowledge scores are more convinced that the government should pay them compensation or insurance, no matter what prevention they use to avoid wolf attacks.

The relationship of hunters' attitudes toward the *Existence* value of wolves and their knowledge level is the strongest of all correlations reported. Although negative ($r = -0.339$), this correlation coefficient shows a shift of opinions toward the positive side of the attitudinal spectrum among hunters with increasing knowledge about wolves. Variables negatively correlated with the first component of PCA indicate a more positive attitude because most items included in the component have negative loadings.

Student data on attitudes and knowledge do not show significant correlations. However, student attitudes are strongly influenced by their fear of wolves (Pearson correlation coefficient r = -.482; $p \leq .001$). Those students who are more fearful of hiking in the woods if wolves are present or who chose the wolf as the most dangerous animal to humans are usually more negative toward wolves. In fact, although knowledge does not have a direct relationship with attitudes in some interest groups, fear is strongly correlated with attitudes toward the existence value of the species in all cases. Respondents from the general public in favour of or against wolves show attitudes becoming more negative when fear of wolves increases (respectively, r = -.340; $p \leq .001$ and r = -.217; $p \leq .001$). A similar correlation is found among livestock owners and hunters (respectively, r = -.462; $p \leq .001$ and r = .677; $p \leq .001$. Note: sign of correlation changed in the case of hunters, which means that positive attitudes are associated with less fear).

When attitudes and knowledge levels about wolves do not show a clear relationship, one should also examine the correlations among fear, attitudes and knowledge. Low knowledge about wolves is associated with more fear of the species. These findings occurred among positive respondents of the general public (r = -.190; $p \leq .001$), livestock owners (r = -.275; $p = .004$), and hunters (r = -.273; $p = .006$). As seen before, more fear is associated with negative attitudes among these and other interest groups. These examples show a more complex situation than simple relationships between knowledge and attitudes. Here, it seems that knowledge relates with fear, and fear influences attitudes.

Overall, the null hypothesis can be rejected when analysing the association of knowledge and attitudes of the general public toward wolves and a variety of wolf management issues. Knowledge and attitudes show a direct relationship among respondents from the general public. There is also an association of attitudes and knowledge of livestock owners and hunters in terms of compensation and the existence value of wolves, respectively. In all other cases, the null hypothesis cannot be rejected. People's fear about wolves negatively affects attitudes most of the times in a stronger way than knowledge about the species. Fear and knowledge are also interrelated among some respondents of the general public, livestock owners and hunters.

5.2.4 Factors affecting attitudes and knowledge toward wolves and wolf management

Ho6: attitudes and knowledge toward wolves and wolf management are not affected by socio-demographic characteristics of respondents (gender, age, location of residence, occupation, education, and permanence/absence in the county for the entire life) or by other factors related to personal experiences with wolves (seeing a wolf in captivity or in the wild, the importance of wolf management issues, the importance of keeping up to date with the issue of wolf management in Portugal, and the presence of wolves in the respondent's residential area).

Multiple Regression Analyses were conducted to evaluate the influence of several factors on attitudes and knowledge toward wolves and wolf management. The value of adjusted R^2 was examined to evaluate the goodness-of-fit of the model. The reported values of adjusted R^2 are low but acceptable in social science research. Previous studies of attitudes toward large carnivores also present reduced values of adjusted R^2 (e.g. from 0.17 to 0.29 in Bath (1989), from 0.08 to 0.17 in Bjerke et al. (2001), and from 0.14 to 0.18 in Teel et al. (2002)). Descriptive analyses were used to characterize respondents from the various interest groups, with negative, neutral and positive attitudes, in terms of socio-demographic data, and to help support findings from regression analyses. The first component extracted with PCA (*Existence*) was the one used in the descriptive analyses because it is the most important and common to the general public and the various interest groups. It reflects attitudes of respondents toward wolves and the value of their existence.

- **General Public**

The negative and positive respondents from the general public have their opinions toward wolves affected differently by the various socio-economic variables. The negative respondents are mainly affected by age and education - the old or the less educated

holding more negative attitudes (Table 5.13). Among respondents in favour of wolves, males and urban people expressed the highest scores on the positive attitudinal spectrum. The importance of wolf management issues clearly drives opinions toward the ends of the spectrum. Negative opinions are stronger when the interest in the issues decreases, and positive opinions increase among respondents who express a high interest in these subjects and in keeping up to date on wolf management issues.

People who think wolves have a big impact on game and wild prey are mostly women, from urban centres, or areas without wolves, with low education and with no interest in wolf management issues. It seems that this particular sector of the society has little direct contact with the species, and unaware of its real impact on prey populations. On the other hand, old people from rural areas, with less education, who seem to live in direct contact with wolves, think the species causes abundant damage to livestock, and they are in favour of compensation to livestock owners for damage caused by wolves. The ideas of seeing taxes being used for a compensation system, of contributing their own money to compensate livestock owners, and seeing the government paying compensation or helping prevent damage, are all well-accepted by older and less educated people who express interest in wolf management issues and in keeping up to date on these issues. Young people with more education, but less interest in wolf management issues are not in favour of these management measures. This might be related to their low interest in these subjects or the low perceived impact of wolves on livestock and wild prey. Many factors affect attitudes toward wolves and wolf management, but although the significance of the results is statistically acceptable, the relationships between independent and dependent variables are usually weak. The identification of the relative relevance of each factor affecting attitudes can be determined, but attitudes cannot be predicted based on these variables.

Knowledge scores of respondents from the general public are mainly affected by gender, residence and the fact of having seen a wolf in the wild (Table 5.14). Men from rural areas, who have already seen a live wolf in the wild, have the highest knowledge levels about wolves. Although the relationship is weak there is also higher knowledge among people expressing interest in wolf management issues.

The large sample size of the general public allows the construction of profiles of people holding positive and negative attitudes toward wolves and wolf management (Table 5.15). Positive respondents are, in general, young men, living in more urbanized areas, with occupations not related to agriculture, with more education (college and higher), interested in wolf management issues, and living in areas with no occurrence of wolves. Although less evident, it is possible to find more positive opinions among people who had lived out of the county at some point in time, and who had seen a wolf in captivity or in the wild. Elderly women, from rural areas, farmers, foresters (and other agriculture related occupations), less educated, living in areas with wolves, and not interest in wolf management issues, are in general strongly negative toward wolves. In the region where the study was conducted, this is the profile of the sector of the society that holds the most negative opinions about the wolf. While positive opinions tend to be moderately positive, respondents expressing negative opinions usually are strongly against the species, providing more definite answers.

Table 5.13 – Influence of socio-economic factors and personal experience with wolves on attitudes toward wolves and wolf management among the general public. Results from multiple regression analyses.

Independent Variables	***Existence*** GP*a*[1]		***Existence*** GP*b*[2]		***Game/Prey***		***Compensation Livestock***		***Money***	
	B	SE	B	SE	B	SE	B	SE	B	SE
Gender	-.079	.053	-.125**	.036	.289**	.065	-.016	.059	-.049	.061
Age	-.093**	.002	-.00005	.001	-.004	.003	.009**	.002	.005*	.002
Residence	.038	.034	.097**	.019	.093*	.038	.013	.035	-.066	.036
Occupation	-.080	.079	-.079	.077	-.133	.118	-.080	.107	-.043	.110
Education	.081*	.033	-.009	.014	-.082**	.030	-.059*	.027	-.061*	.028
Lived Out	.087	.053	.053	.034	.053	.065	.065	.059	-.045	.061
Captivity	.047	.052	.039	.034	.004	.065	.040	.059	.061	.061
Wild	.037	.057	.051	.037	-.136	.071	.079	.064	.088	.066
Issue	-.020*	.009	.038**	.008	-.060**	.013	-.015	.012	.037**	.012
Updated	-.016	.009	.031**	.008	.039**	.013	-.009	.011	.051**	.012
Wolf Presence	-.098	.056	.036	.040	-.156*	.073	.143*	.066	.021	.068
Constant	-.558**	.188	.100	.108	.350	.211	-.085	.192	-.474*	.197
Observations	414		542		956		956		956	
R-squared	.201		.237		.078		.076		.105	

Note: B - Unstandardized Regression Coefficients. SE - Standard Errors. * p<.05 **p<.01

[1] GP*a* – respondents from the general public who dislike wolves;

[2] GP*b* – respondents from the general public who like wolves.

Table 5.14 - Influence of socio-economic factors and personal experience with wolves on knowledge about wolves among the general public. Results from linear regression analysis.

Independent Variables	*Knowledge about wolves*	
	B	SE
Gender	-.473**	.081
Age	.0005	.003
Residence	-.297**	.047
Occupation	-.054	.153
Education	-.068	.037
Lived Out	-.118	.081
Captivity	.109	.081
Wild	.462**	.088
Issue	.033*	.016
Updated	.017	.016
Wolf Presence	.146	.092
Constant	3.237**	.262
Observations	1130	
R-squared	.134	

Note: B - Unstandardized Regression Coefficients.
SE - Standard Errors. * p<.05 **p<.01

Table 5.15 - Distribution of attitudes toward wolves (*Existence value*) among the general public (percentages). [SD-Strongly Dislike; MD-Moderately Dislike; N-Neutral; ML-Moderately Like; SL-Strongly Like]

Independent Variables	*n*	SD (%)	MD (%)	N (%)	ML (%)	SL (%)
Gender						
female	*440*	31.4	18.0	15.2	26.6	8.9
male	*526*	18.4	10.3	10.3	35.6	25.5
Age						
18-29 yr	*147*	6.8	6.1	16.3	52.4	18.4
30-44 yr	*244*	13.9	15.2	12.3	35.2	23.4
45-64 yr	*365*	24.1	17.3	12.6	26.8	19.2
over 64 yr	*210*	49.0	11.4	10.0	20.5	9.0
Residence						
rural	*412*	31.1	16.5	11.4	30.3	10.7
semi-rural	*286*	26.2	12.2	13.3	30.4	17.8
semi-urban	*248*	12.1	12.1	14.1	33.9	27.8
urban	*20*	10.0	0	5.0	40.0	45.0
Occupation						
farmers, foresters, loggers	*77*	44.2	19.5	9.1	18.2	9.1
other	*889*	22.6	13.3	12.8	32.6	18.7
Education						

no education	*81*	55.6	11.1	9.9	18.5	4.9
elementary	*457*	32.6	17.3	10.7	23.9	15.5
college (5th-9th grade)	*261*	14.2	13.0	16.5	37.9	18.4
high school (10th-12th grade)	*110*	.9	8.2	15.5	47.3	28.2
university degree	*55*	5.5	3.6	7.3	49.1	34.5
Lived Out of the County						
lived out some point in time	*357*	21.0	11.5	12.0	31.9	23.5
always lived in the county	*606*	26.2	15.0	12.9	31.2	14.7
Saw wolf in captivity						
yes	*561*	22.5	10.9	11.8	34.2	20.7
no	*405*	26.9	17.8	13.6	27.7	14.1
Saw wolf in the wild						
yes	*343*	25.9	12.5	9.6	29.2	22.7
no	*623*	23.4	14.4	14.1	32.7	15.2
Importance of wolf issues						
not important	*254*	45.3	22.8	13.8	13.4	4.7
important	*336*	11.0	16.1	18.5	41.1	13.4
very important	*370*	22.2	5.4	6.2	35.1	31.1
Keeping up to date						
not important	*173*	37.6	22.5	17.3	17.3	5.2
important	*264*	18.2	15.2	18.6	37.1	11.0
very important	*523*	22.9	10.1	8.0	33.3	25.6
Wolf presence in the area						
present	*250*	29.6	14.4	13.6	26.4	16.0
not present	*716*	22.5	13.5	12.2	33.2	18.6

➢ Livestock Owners

Livestock owners with positive opinions about wolves are in general young adults, more educated, and have already seen a wolf in captivity (Table 5.16). Most females, who have lived out of the county sometime in their lives, and who have never seen a wolf in captivity or in the wild, think wolves have a big impact on game and wild prey. So far, the fact of seeing wolves in captivity or in the wild seems to have a positive effect on respondents' attitude toward the species. These results are potentially useful when designing education activities for this interest group in this region. Livestock owners who think wolves primarily feed on, and cause abundant damage to, livestock are characterized as living in rural areas, having low education and having their main jobs

unrelated to agriculture. None of the factors analysed seem to affect attitudes toward compensation issues in any particular way.

In terms of money issues, livestock owners who have lived out of the county at some point in time agree with taxes being used for compensation, with mandatory insurance, with the contribution of their own money for a compensation system, or the government's help in preventing damage caused by wolves. The same respondents think the presence of wolves can increase tourism in the region. The relationship between attitudes toward wolves and the factors affecting those attitudes are much stronger than in the case of the general public. Among livestock owners, there is a clear distinction in attitudes based on respondents' socio-demographic characteristics and experiences with wolves.

Livestock owners' knowledge about the species is uniquely influenced by the type of occupation they have (Table 5.17). A livestock owner whose main source of income is agriculture tends to show a much greater knowledge about wolves than livestock owners who practice agriculture-related activities as a hobby or a secondary job. The relationship between occupation and knowledge is particularly strong (.866) among individuals from this interest group. A positive feeling about the wolf was found among livestock owners who are young, female, with higher levels of education, who have seen wolves in captivity but not in the wild, and living in areas where wolves are not present (Table 5.18). Livestock owners with strongly negative opinions about the species are mostly males, 45 years of age or older, living in rural areas, with their main job in agriculture, with no education, who have lived in the county for their entire life, who have seen live wolves in the wild but may or not live in areas with wolves, and who think wolf management issues are very important. Probably, high levels of conflict occur between this group and wolves, which highlights the importance of listening and working with this group in future wolf management decision-making.

Table 5.16 - Influence of socio-economic factors and personal experience with wolves on attitudes toward wolves and wolf management among livestock owners. Results from multiple regression analyses.

Independent Variables	*Existence*		*Game/Prey*		*Livestock*		*Compensation*		*Money*	
	B	SE	B	SE	B	SE	B	SE	B	SE
Gender	.115	.245	.488*	.244	.185	.226	-.084	.264	-.107	.282
Age	-.020*	.008	-.008	.008	.0004	.007	.011	.009	-.005	.009
Residence	.097	.147	.156	.146	-.349*	.136	.199	.158	.105	.169
Occupation	-.037	.212	-.074	.211	-.423*	.196	.168	.228	-.008	.244
Education	.170*	.086	.078	.085	-.274**	.079	-.078	.092	-.057	.099
Lived Out	-.030	.220	.468*	.219	-.093	.203	.281	.237	-.624*	.253
Captivity	.480*	.212	-.480*	.211	.050	.196	.064	.228	.422	.244
Wild	.194	.227	-.624**	.226	.090	.210	-.032	.245	-.191	.262
Issue	-.035	.034	-.004	.034	-.027	.031	.045	.036	.016	.039
Updated	-.032	.042	-.025	.042	-.027	.039	.020	.045	-.018	.049
Wolf Presence	-.285	.218	.142	.217	-.091	.201	.320	.235	.225	.251
Constant	.625	.660	.623	.657	1.748	.61**	-1.399	.712	.350	.760
Observations	92		92		92		92		92	
R-squared	.301		.318		.350		.143		.134	
Note: B - Unstandardized Regression Coefficients. SE - Standard Errors. * p<.05 **p<.01										

Table 5.17 - Influence of socio-economic factors and personal experience with wolves on knowledge about wolves among livestock owners. Results from linear regression analysis.

Independent Variables	*Knowledge about wolves*	
	B	SE
Gender	-.281	.395
Age	.013	.012
Residence	-.095	.242
Occupation	.866*	.340
Education	.150	.129
Lived Out	-.250	.343
Captivity	.586	.329
Wild	.602	.346
Issue	.060	.052
Updated	.034	.064
Wolf Presence	.322	.333
Constant	.715	.994
Observations	108	
R-squared	.144	
Note: B - Unstandardized Regression Coefficients. SE - Standard Errors. * p<.05 **p<.01		

Table 5.18 - Distribution of attitudes toward wolves (Existence value) among livestock owners (percentages). [SD-Strongly Dislike; MD-Moderately Dislike; N-Neutral; ML-Moderately Like; SL-Strongly Like]

Independent Variables	*n*	SD (%)	MD (%)	N (%)	ML (%)	SL (%)
Gender						
female	*22*	22.7	27.3	4.5	40.9	4.5
male	*72*	22.2	25.0	19.4	15.3	18.1
Age						
18-29 yr	*8*	12.5	0	25.0	37.5	25.0
30-44 yr	*21*	9.5	28.6	9.5	33.3	19.0
45-64 yr	*45*	22.2	28.9	13.3	20.0	15.6
over 64 yr	*20*	40.0	25.0	25.0	5.0	5.0
Residence						
rural	*74*	20.3	25.7	16.2	23.0	14.9
semi-rural	*13*	30.8	30.8	23.1	15.4	0
semi-urban	*5*	20.0	20.0	0	20.0	40.0
urban	*2*	50.0	0	0	0	50.0
Occupation						
farmers, foresters, loggers	*60*	30.0	23.3	13.3	20.0	13.3
other	*34*	8.8	29.4	20.6	23.5	17.6
Education						
no education	*11*	45.5	36.4	18.2	0	0
elementary	*59*	23.7	25.4	18.6	22.0	10.2
college (5^{th}-9^{th} grade)	*12*	16.7	16.7	16.7	25.0	25.0
high school (10^{th}-12^{th} grade)	*6*	0	50.0	0	33.3	16.7
university degree	*6*	0	0	0	33.3	66.7
Lived Out of the County						
lived out some point in time	*27*	11.1	33.3	14.8	18.5	22.2
always lived in the county	*67*	26.9	22.4	16.4	22.4	11.9
Saw wolf in captivity						
yes	*53*	20.8	17.0	15.1	28.3	18.9
no	*41*	24.4	36.6	17.1	12.2	9.8
Saw wolf in the wild						
yes	*66*	25.8	22.7	21.2	15.2	15.2
no	*28*	14.3	32.1	3.6	35.7	14.3
Importance of wolf issues						
not important	*24*	12.5	41.7	29.2	12.5	4.2
important	*28*	10.7	25.0	14.3	32.1	17.9
very important	*42*	35.7	16.7	9.5	19.0	19.0
Keeping up to date						
not important	*7*	0	14.3	28.6	57.1	0
important	*20*	20.0	25.0	25.0	15.0	15.0

very important	*65*	24.6	26.2	12.3	20.0	16.9
Wolf presence in the area						
present	*43*	20.9	27.9	25.6	18.6	7.0
not present	*51*	23.5	23.5	7.8	23.5	21.6

➢ Hunters

Hunters' attitudes toward wolves (*Existence*) and knowledge levels about the species show no significant relationship with the independent variables analysed (Tables 5.19 and 5.20). Nevertheless, most hunters less than 65 years old, with non-agriculture related occupations, with high education levels, who have lived out of the county at some point in time, who have seen a wolf in captivity, and who express interest in wolf management issues, hold positive attitudes toward wolves (Table 5.21). Older hunters who do not express interest in wolf management issues are clearly negative toward the species. Opinions diverge among hunters who have never seen a wolf in captivity. In general, variables like place of residence, the experience of seeing a wolf in the wild, or the presence of wolves in the residential area do not affect hunters' attitudes toward the species (Table 5.21).

When examining variables affecting hunters' attitudes toward wolf management there is a strong difference in opinions depending on the respondent's occupation (Table 5.19). Hunters having jobs unrelated to agriculture are in favour of compensation paid by the government to livestock owners for damage caused by wolf predation. On the other hand, hunters who have never seen a wolf in captivity and who have agriculture-related jobs agree with preventive methods, government paying insurance or subsidies to livestock owners living in areas with wolves, or government helping livestock owners implement methods to prevent damage (e.g. fences or livestock guard dogs).

Table 5.19 - Influence of socio-economic factors and personal experience with wolves on attitudes toward wolves and wolf management among hunters. Results from multiple regression analyses.

Independent Variables	*Existence* [1]		*Compensation*		*Prevention*	
	B	SE	B	SE	B	SE
Gender [2]						
Age	-.012	.009	.019	.009	-.008	.009
Residence	.100	.099	.074	.104	-.016	.099
Occupation	-.510	.280	-.615*	.296	.958**	.281
Education	.108	.091	.085	.096	.059	.091
Lived Out	.337	.202	.197	.214	.329	.203
Captivity	.266	.216	.308	.229	-.792**	.217
Wild	.224	.200	.296	.211	.092	.200
Issue	.082	.041	-.032	.044	.063	.041
Updated	.003	.039	.050	.042	.038	.039
Wolf Presence	.444	.240	.219	.042	-.349	.241
Constant	-1.316*	.659	-1.903*	.697	-.227	.661
Observations	86		86		86	
R-squared	.349		.229		.324	

Note: B - Unstandardized Regression Coefficients. SE - Standard Errors. * p<.05 **p<.01
[1] The dependent variable (DV) was reflected before conducting the regression analysis, so that an increase in the DV means increase of attitudes.
[2] Variable "Gender" is deleted from analysis because all surveyed hunters are males.

Table 5.20 - Influence of socio-economic factors and personal experience with wolves on knowledge about wolves among hunters. Results from linear regression analysis.

Independent Variables	*Knowledge about wolves*	
	B	SE
Gender		
Age	-.006	.015
Residence	-.164	.157
Occupation	.014	.451
Education	.246	.152
Lived Out	-.412	.315
Captivity	-.277	.359
Wild	.439	.331
Issue	.111	.065
Updated	-.003	.062
Wolf Presence	.355	.389
Constant	3.21**	1.087
Observations	100	
R-squared	.040	

Note: B - Unstandardized Regression Coefficients. SE - Standard Errors. * p<.05 **p<.01

Table 5.21 - Distribution of attitudes toward wolves (Existence value) among hunters (percentages). [SD-Strongly Dislike; MD-Moderately Dislike; N-Neutral; ML-Moderately Like; SL-Strongly Like]

Independent Variables	*n*	SD (%)	MD (%)	N (%)	ML (%)	SL (%)
Gender						
female	*0*	-	-	-	-	-
male	*88*	14.8	18.2	17.0	44.3	5.7
Age						
18-29 yr	*9*	0	11.1	22.2	66.7	0
30-44 yr	*31*	9.7	16.1	9.7	51.6	12.9
45-64 yr	*39*	15.4	25.6	20.5	35.9	2.6
over 64 yr	*9*	44.4	0	22.2	33.3	0
Residence						
rural	*48*	14.6	18.8	20.8	39.6	6.3
semi-rural	*14*	21.4	21.4	0	57.1	0
semi-urban	*15*	13.3	20.0	26.7	33.3	6.7
urban	*11*	9.1	9.1	9.1	63.6	9.1
Occupation						
farmers, foresters, loggers	*12*	41.7	8.3	0	41.7	8.3
other	*76*	10.5	19.7	19.7	44.7	5.3
Education						
no education	*2*	100.0	0	0	0	0
elementary	*33*	21.2	21.2	18.2	36.4	3.0
college (5^{th}-9^{th} grade)	*26*	11.5	23.1	19.2	46.2	0
high school (10^{th}-12^{th} grade)	*13*	7.7	15.4	7.7	61.5	7.7
university degree	*14*	0	7.1	21.4	50.0	21.4
Lived Out of the County						
lived out some point in time	*47*	6.4	21.3	17.0	48.9	6.4
always lived in the county	*40*	25.0	15.0	17.5	37.5	5.0
Saw wolf in captivity						
yes	*54*	7.4	14.8	16.7	51.9	9.3
no	*33*	27.3	24.2	18.2	30.3	0
Saw wolf in the wild						
yes	*42*	14.3	16.7	19.0	40.5	9.5
no	*45*	15.6	20.0	15.6	46.7	2.2
Importance of wolf issues						
not important	*16*	37.5	31.3	31.3	0	0
important	*34*	11.8	29.4	11.8	44.1	2.9
very important	*37*	8.1	2.7	16.2	62.2	10.8
Keeping up to date						
not important	*8*	37.5	25.0	25.0	12.5	0
important	*21*	9.5	38.1	19.0	28.6	4.8
very important	*58*	13.8	10.3	15.5	53.4	6.9

Wolf presence in the area						
present	*30*	13.3	16.7	20.0	46.7	3.3
not present	*58*	14.8	18.2	17.0	44.3	5.7

➢ **Students**

Students' attitudes toward the existence value of wolves are mainly influenced by gender. Boys are more positive toward wolves than girls (Table 5.22). Students who have already seen a wolf in the wild and who think wolf management issues are important are usually more positive, although the relationship is weaker than in the case of gender. Although boys are positive toward the existence of wolves, they are also in favour of wolf killing or hunting in some situations. However, this group of students does not show interest in wolf management issues. Students' opinions about the impact of wolves on game, prey or livestock, and about compensation issues do not seem to be affected by any of the analysed factors. As previously presented, students' knowledge about wolves is very low. Regression analysis shows that knowledge levels are even lower among girls than boys (Table 5.23), which might be related to girls being more negative toward wolves than boys. Results presented in Table 5.24 confirm these statements. While girls are moderately to strongly negative toward wolves, boys tend to be moderately and strongly positive.

Age does not affect attitudes. Independently from the place of residence, attitudes are in general moderately positive, but responses from students from rural areas tend to spread equally from strongly negative to strongly positive. The fact of always having lived in the county does not affect students' attitudes toward wolves. Differences exist among students who have seen a wolf in the wild and those who have not. The ones who state that they had seen a live wolf in the wild tend to be more positive. Seeing a wolf in captivity does not strongly affect attitudes of the surveyed students.

These results have implications when discussing the effectiveness of some educational activities direct towards students, in particular visits to zoos and wolf recovery centres. The higher the interest on wolf management issues, more positive the

attitudes are toward the species. Students living in areas where wolves exist hold similar attitudes to students from areas with no wolves. Other factors were also explored to evaluate their possible effect on student's attitudes toward wolves and wolf management. These factors are *school's location* (rural or urban settlement) and *program* (student's current program in high school). While students from "urban schools" are in general positive, students from "rural schools" are equally negative and positive. The program in which the student is currently registered does not affect their opinions about wolves.

Table 5.22 - Influence of socio-economic factors and personal experience with wolves on attitudes toward wolves and wolf management among students. Results from multiple regression analyses.

Independent Variables	***Existence***		***Wolf hunt***		***Game/Prey/ Livestock***		***Compensation***	
	B	SE	B	SE	B	SE	B	SE
Gender	-.566**	.117	-.387**	.129	.221	.139	-.069	.124
Age	.030	.044	-.019	.049	-.021	.053	-.041	.047
Residence	.061	.069	-.080	.076	-.041	.081	-.074	.073
Occupation [1]								
Education[1]								
Lived Out	-.179	.131	.008	.145	-.238	.156	-.137	.140
Captivity	.174	.119	-.176	.131	-.124	.141	-.126	.126
Wild	.315*	.131	.043	.145	.204	.155	.233	.139
Issue	.160**	.034	-.124**	.037	-.040	.040	-.035	.036
Updated	.057	.030	-.019	.033	.039	.035	.042	.031
Wolf Presence	.097	.144	.023	.159	-.003	.171	.016	.153
School	.081	.140	.015	.155	.095	.166	.034	.149
Program	-.022	.117	-.143	.129	-.206	.139	-.027	.124
Constant	-1.941	.802	1.788*	.886	.543	.952	.968	.853
Observations	225		225		225		225	
R-squared	.318		.141		.048		.037	

Note: B - Unstandardized Regression Coefficients. SE - Standard Errors. * p<.05 **p<.01
[1] Variables deleted from analysis because all respondents are students and with the same level of scholar education.

Table 5.23 - Influence of socio-economic factors and personal experience with wolves on knowledge about wolves among students. Results from linear regression analysis.

Independent Variables	***Knowledge about wolves***	
	B	SE
Gender	-.462**	.146
Age	-.028	.056
Residence	.134	.088
Lived Out	-.107	.160
Captivity	.073	.147
Wild	-.123	.162
Issue	-.063	.042
Updated	-.004	.037
Wolf Presence	.222	.179
School	.144	.182
Program	-.135	.144
Constant	2.969**	.983
Observations	301	
R-squared	.058	

Note: B - Unstandardized Regression Coefficients.
SE - Standard Errors. * p<.05 **p<.01

Table 5.24 - Distribution of attitudes toward wolves (Existence value) among students (percentages). [SD-Strongly Dislike; MD-Moderately Dislike; N-Neutral; ML-Moderately Like; SL-Strongly Like]

Independent Variables	*n*	SD (%)	MD (%)	N (%)	ML (%)	SL (%)
Gender						
female	*132*	22.7	26.5	18.9	23.5	8.3
male	*99*	10.1	8.1	23.2	37.4	21.2
Age						
< 18 yr	*173*	16.8	17.3	20.2	31.2	14.5
18-29 yr	*58*	19.0	22.4	22.4	24.1	12.1
Residence						
rural	*113*	20.4	21.2	21.2	24.8	12.4
semi-rural	*47*	14.9	19.1	19.1	29.8	17.0
semi-urban	*47*	19.1	10.6	19.1	38.3	12.8
urban	*24*	4.2	20.8	25.0	33.3	16.7
Lived Out of the County						
lived out some point in time	*61*	16.4	19.7	16.4	34.4	13.1
always lived in the county	*168*	17.3	17.9	22.6	28.0	14.3
Saw wolf in captivity						
yes	*93*	11.8	17.2	20.4	32.3	18.3
no	*137*	20.4	19.7	21.2	27.7	10.9
Saw wolf in the wild						
yes	*64*	7.8	18.8	17.2	35.9	20.3
no	*166*	20.5	18.7	22.3	27.1	11.4
Importance of wolf issues						
not important	*11*	54.5	36.4	0	9.1	0
important	*88*	22.7	30.7	20.5	20.5	5.7
very important	*131*	10.7	9.2	22.1	37.4	20.6
Keeping up to date						
not important	*21*	28.6	47.6	0	19.0	4.8
important	*85*	18.8	28.2	23.5	20.0	9.4
very important	*123*	13.8	7.3	22.0	38.2	18.7
Wolf presence in the area						
present	*61*	18.0	19.7	23.0	27.9	11.5
not present	*170*	17.1	18.2	20.0	30.0	14.7
School						
urban area	*116*	15.5	14.7	19.0	36.2	14.7
rural area	*114*	18.4	22.8	22.8	22.8	13.2
Program						
sciences program	*113*	17.7	19.5	19.5	28.3	15.0
other	*117*	16.2	17.9	22.2	30.8	12.8

Overall, the null hypothesis is rejected in most of the cases, and one can assume that attitudes and knowledge toward wolves and wolf management is influenced by: socio-demographic factors, experience with wolves, the interest in wolf management issues, or the presence of wolves near the respondents' residential area. Attitudes of positive and negative respondents of the general public toward the existence value of wolves are influenced by respondents' socio-demographic characteristics and their interest in wolf management issues. Attitudes of the general public toward various issues of wolf management are influenced by these same factors. However, attitudes toward compensation issues and wolves' impact on game, prey and livestock also depend on the proximity of respondent's residential area to the wolf distribution range. The general public's knowledge level about wolves is influenced by socio-demographic factors, by experiences with wolves, and the respondent's interest in wolf management issues.

Attitudes of livestock owners toward wolves and their impact on game, prey, or livestock are always influenced by socio-demographic factors and most of the time by the kind of experiences respondents have had with wolves. Their attitudes toward compensation issues are not influenced by the analysed factors. Livestock owners' knowledge about wolves is influenced by socio-demographic characteristics.

Hunters' attitudes toward the existence value of wolves or their knowledge levels about the species do not have a clear association with the factors analysed in this study. Hunters' attitudes toward compensation and prevention issues are influenced by socio-demographic factors and sometimes by some experiences with wolves.

Finally, students' opinions toward the value of having wolves in the country or in the county and not allowing any kind of wolf killing, are influenced by socio-demographic factors, by their interest in wolf management issues and by the fact of seeing a live wolf in the wild. Their attitudes toward compensation and wolves' impact on game, prey or livestock are not affected by the factors explored in this study. Students' knowledge level about wolves is influenced by socio-demographic characteristics. These differences in the kind of factors that might be affecting attitudes or knowledge about

wolves in each interest group can help define strategies for the involvement of each group in the wolf management process, and in understanding the reasons behind their attitudes.

- **Qualitative Data**

In this section, the presentation of the qualitative results is in two main parts:

- Key issues and solutions based on the CGM;
- The roles of each interest group.

The results from the qualitative interviews were summarized and presented here in a way that reflects as closely as possible, that which was originally said by the respondents. Sometimes, topics for discussion are raised during the presentation of the results. A more detailed discussion of these results and the integration with the quantitative data is presented in the Discussion chapter.

5.2.5 Key Issues and Solutions based on the CGM

5.2.5.1 Key Issues

Individual interviews with thirty-one members of different interest groups allowed the collection of qualitative data regarding wolf management in Portugal and in the study area. Presidents of livestock owner associations, presidents of hunting associations, members from the governmental ICN, wolf biologists, and presidents of environmental NGOs were asked about the key issues facing wolf management from their perspective, the role they felt each group could play in the wolf management issue, which other groups they believe should be involved, and key solutions facing wolf management. Given the number and length of the interviews with the various interest groups, many issues and solutions were mentioned. The issues and solutions identified by each interest group are listed in the Common Ground Matrixes that follows: CGM-ki (CGM with key issues) and CGM-s (CGM with solutions) (Tables 5.25 and 5.26 respectively). A CGM is a method developed for presenting the key issues back to the interest groups to illustrate that there are issues of common concern. In this case a CGM is also used to present the solutions,

because it simplifies the presentation of the results from the perspective of each interest group, and helps in identifying the solutions most frequently mentioned by the respondents.

A total of twenty-seven key issues were identified, most of them being mentioned by two or more interest groups (Table 5.25). Some twelve issues (44%) were considered important by almost all the interviewed groups, which shows a broad and diversified vision about the wolf management situation in Portugal. Five issues were mentioned by all interest groups: presence of feral and stray dogs, wolf poaching, lack of wolf habitat, lack of sensitization and environmental education, and lack of biological data. These issues are of common concern and are a good starting point toward the working together with all interest groups.

The CGM-ki shows that livestock owner associations tended to identify the greatest number of issues (twenty-five in total). This interest group points out issues not only related to wolf predation on livestock, but also concerning public involvement in decision-making, the lack of environmental education, and the need for more scientific research on wolves. Institutions involved in nature conservation (the ICN and environmental NGOs) were more narrowly focused, mentioning just ten to thirteen issues (37-48% of all issues). Only livestock owners mention the issue of fear of wolves, which reflects that this is not an issue of high concern among the interest groups generally. Some issues were mentioned just by two interest groups: European Union policy related to agriculture, loss of biodiversity, livestock damage, anger felt by livestock owners due to wolf predation, and lack of good livestock guard dogs. Some issues listed on the CGM-ki seem very similar, but are in fact different. For example, the damage caused by wolf predation on livestock are not of general concern, but most respondents seemed worried with the actual damage compensation system. The management implications of these results are discussed in the next chapter. Issues indicated by interest groups can be grouped into five key areas (parentheses indicate the number of times the issue was mentioned):

Agricultural / livestock issues

- abandonment of traditional agriculture (3)
- feral and stray dogs (5)
- livestock damage (2)
- damage compensation system (4)
- anger felt by livestock owners due to wolf predation (2)
- hunting (3)
- wild boars (3)
- livestock guard dogs (2)

Communication / understanding people

- mistrust (4)
- lack of sensitization (5)
- public involvement (4)

Biological issues

- loss of biodiversity (2)
- fires (3)
- wild prey (4)
- lack of habitat (5)
- biological data (5)

Legal / political issues

- European Union (2)
- ICN efficiency (4)
- poaching wolves (5)
- lack of enforcement (4)
- legislation (3)

Cultural issues

- "wolves' value" (3)

- release of wolves into the wild (myth) (2)
- clarify myth about wolf reintroduction (1)
- tourism (3)
- cultural (childhood stories, myths) (4)
- fear of wolves (1)

Agriculture and livestock issues are diversified and focus on a variety of aspects. However, many agricultural issues are mentioned only by livestock owners or hunters, which are the groups more directly related with the use of land and wildlife for subsistence, commercial or recreation activities.

The area of *communication / understanding people* only includes three topics, but these are issues of generalized concern. The majority of groups see these issues as important for the wolf management process. The interest groups see the mistrust and the lack of communication between themselves and other interest groups, or between themselves and government agencies, as an important impediment to the start of a successful wolf management program. The respondents also note the lack of public involvement in decision-making, which is linked with the previous issue of mistrust among the parties.

The most important issue is the need for environmental education and sensitization of the public in terms of wolf management and nature conservation in general. Most groups mentioned the lack of information provided to the public by governmental authorities through the media or during schooling.

Biological and *Legal / political issues* are equally important in terms of the number of times each issue is mentioned. Some items are frequently reported, such as the lack of good habitat for wolves and poaching. These issues are interrelated because respondents express much concern over the lack of physical space for wolves to exist without disturbing human activities and vice-versa. Poaching is seen as an attempt to release some areas from wolves for livestock grazing.

Cultural issues are not widely identified as the most important issues for wolf management, but nevertheless, can be addressed when the interest groups discuss other

issues like the lack of sensitization. The issues are very often interrelated, and if wolf managers are able to get the interest groups together to discuss the most important issues, there will be the opportunity to discuss the least important items too.

5.2.5.2 Key Solutions

The interest groups were asked to suggest solutions to address the wolf management issues they mentioned. The number of solutions indicated by respondents was even higher (twenty-nine) than the number of key issues (Table 5.26). Some of the solutions are large in scope, while some others have the aim of resolving specific problems. The most common solution, which was pointed out by all interest groups, is large in scope and clearly addresses many issues toward wolf conservation. Environmental education targeted at the general public and various interest groups of all ages, is consensually seen as the most important measure. The five most important solutions – environmental education, wolf habitat improvement, scientific research, preventive methods for livestock owners, and eco-tourism development – directly or indirectly are aimed at solving the five most important issues listed in the CGM-ki. The CGM-s shows that all interest groups identified a similar number of solutions. Only livestock owners and hunters suggested measures involving the control of the wolf population, either by lethal control of some individuals, or by restricting the wolf range. These two measures only represent 7% of the total number of solutions, and are not mentioned by any other group. Twenty-seven ways of addressing wolf management deal with improving wolf habitat or wolf wild prey populations, enforcement, recovery of traditional agriculture, improving the damage compensation system, revision of legislation, environmental education, eco-tourism, etc., all of which can be interpreted as positive ideas towards coexistence of humans and wolves.

Table 5.25 – Common Ground Matrix with list of key issues, mentioned by each interest group, on wolf management in the study area.

CGM-ki	INTEREST GROUPS					
KEY ISSUES	Livestock Owner asso.	Hunting Asso.	ICN	Wolf Biologists	Environ. NGOs	TOTAL
Abandonment of traditional agriculture	x	x		x		3
"Wolves' value"	x	x			x	3
European Union	x				x	2
	x	x	x	x	x	5
Mistrust	x	x		x	x	4
ICN efficiency	x	x		x	x	4
Loss of biodiversity	x	x				2
Livestock damage	x	x				2
Damage compensation system	x	x	x	x		4
Release of wolves into the wild (myth)	x	x				2
Clarify the myth about "releasing wolves"				x		1
	x	x	x	x	x	5
Anger felt by livest. owners due to wolf predation	x	x				2
Tourism	x	x		x		3
Fires	x	x		x		3
Cultural	x	x		x	x	4
Hunting	x	x		x		3
Wild boars	x	x	x			3
Livestock guard dogs	x	x				2
Wild prey	x	x	x	x		4
	x	x	x	x	x	5
	x	x	x	x	x	5
	x	x	x	x	x	5
Lack of enforcement	x	x		x	x	4
Public Involvement	x	x	x		x	4
Legislation			x	x	x	3
Fear of wolves	x					1
TOTAL	25	23	10	17	13	88

Table 5.26 – Common Ground Matrix with list of solutions, mentioned by each interest group, for wolf management in the study area.

CGM-s	INTEREST GROUPS					
SOLUTIONS	Livest. Ow.	Hunt. Ass.	ICN	Wolf Biologists	Envir. NGOs	TOTAL
Control of wolf population	x	x				2
Revise hunting management legislation	x	x				2
Improve populations of rabbits		x				1
Implement hunting restrictions; enforcement		x	x	x		3
Insurance for livestock losses due to wolf attacks	x		x			2
	x	x	x	x		4
Recovery of traditional agriculture	x					1
Stop rural exodus				x		1
Keep wolves in fenced natural parks	x	x				2
Pay for damage caused by feral and stray dogs	x	x				2
Abolish the actual damage compensation system	x					1
Simplify and improve efficiency of actual damage compensation system		x			x	2
	x	x	x	x		4
Control feral/stray dogs; identification of dogs; sensitizing the public	x	x	x			3
	x	x	x	x	x	5
Media passing positive messages about wolves				x	x	2
	x	x		x	x	4
	x		x	x	x	4
Appropriate reintroduction of wild prey		x	x	x		3
Stop poaching of wild prey			x	x		2
Fires: control; prevention; education; enforcement		x		x		2
Revise legislation on wolf conservation			x			1
Control the use of poison			x	x		2
Enforcement: damage compensation system, fires, poison, poaching			x	x		2
Public Involvement in scientific research and wolf management	x			x	x	3
Researchers need to build trust among local people				x		1
Design a Wolf Management Plan					x	1
ICN - Revise its structure and functionality					x	1
Funding: political will to prioritize the conservation of nature					x	1
TOTAL	14	14	12	15	9	64

5.2.5.3 Roles of Each Interest Group

The success of the solutions suggested by each interest group requires the involvement of many players. From the perspective of each interest group, it is important to understand who should be involved and with which role in wolf management in Portugal. During the qualitative interviews the respondents stated that many interest groups should be involved in wolf management nationally and regionally. Among the five sampled interest groups, not all groups mentioned the remaining four (Figure 5.11). Livestock owners, hunters, and the ICN are pointed out by all groups, as key players in wolf management in Portugal.

All surveyed groups stated that local Municipal Governments, the Ministry of the Environment, and the Ministry of Agriculture should be involved in some aspect of wolf management (Figure 5.12). Although the ICN is under the authority of the Ministry of Environment, many interest groups see it as an independent institution, with an independent role and decision-making power in wolf management. For this reason the ICN is considered separated from the Ministry in the list of interest groups. From all the groups identified, only the Municipal Governments, the Ministry of Environment and the Ministry of Agriculture were not included in this study. Members from the Ministry of Agriculture were contacted and invited to participate in this study, but no response was received. Municipal Governments and other members of the Ministry of Environment were not included in this study because HD was used as a research tool in most part of the research and not as a facilitated workshop approach where all possible interest groups should be considered.

By summing the number of interest groups from Figures 5.11 and 5.12 listed by each group, it is possible to see that environmental NGOs list the highest number of players (n=17), followed by hunters and biologists (n=13), livestock owners (n=11) and ICN (n=10). However, respondents did not assign a role to every interest group they think should be involved in wolf management, and sometimes the same task is considered a responsibility of more than one interest group. The ICN is always given the highest

number of roles in the opinion of other interest groups and according to the ICN itself (Figures 5.13 to 5.17). In second place is the Ministry of Environment or the Ministry of Agriculture, which means that the public usually sees the Government having more responsibility for wolf management than any other interest group.

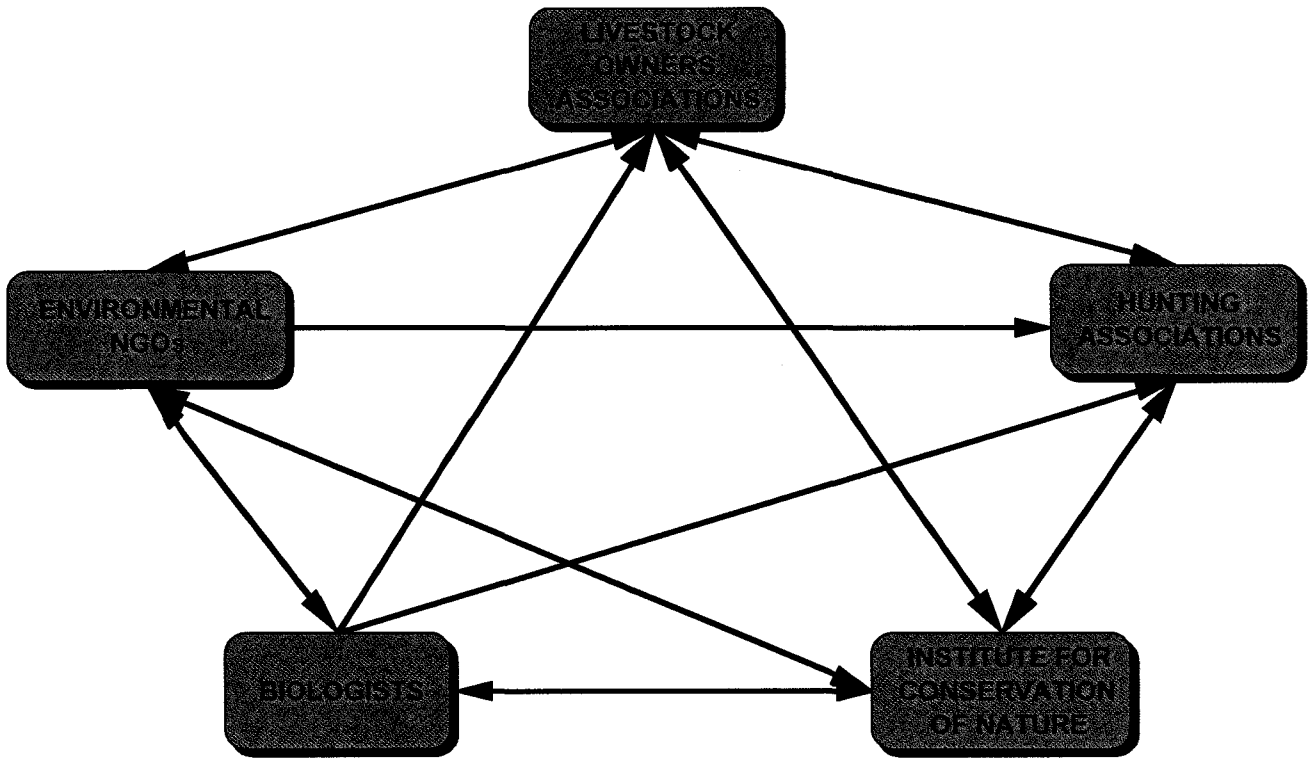


Figure 5.11 – Interest groups that should be involved in wolf management in Portugal (sampled in this study), from the perspective of each group.

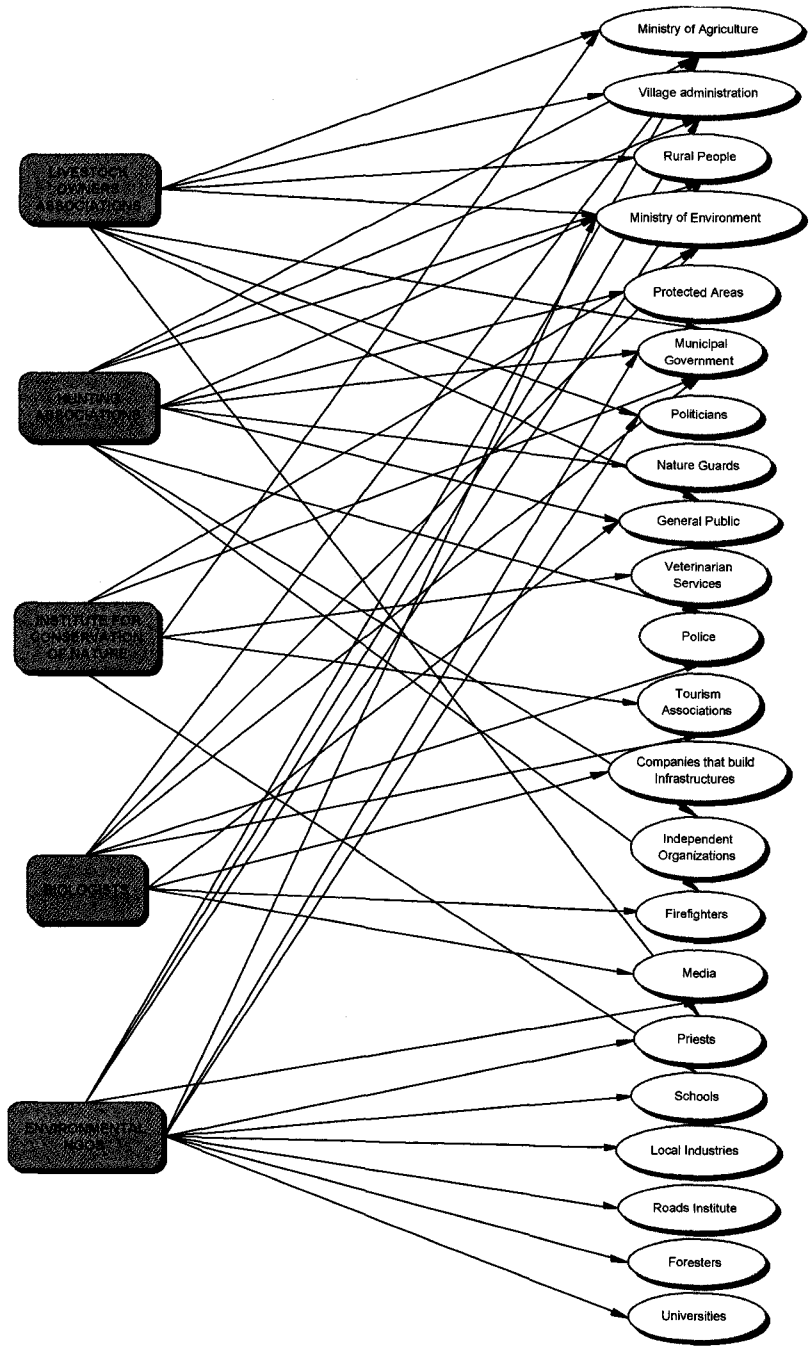


Figure 5.12 - Interest groups that should be involved in wolf management in Portugal (but not sampled in this study), from the perspective of livestock owner associations, hunting associations, the Institute for Conservation of Nature, wolf biologists, and environmental NGOs.

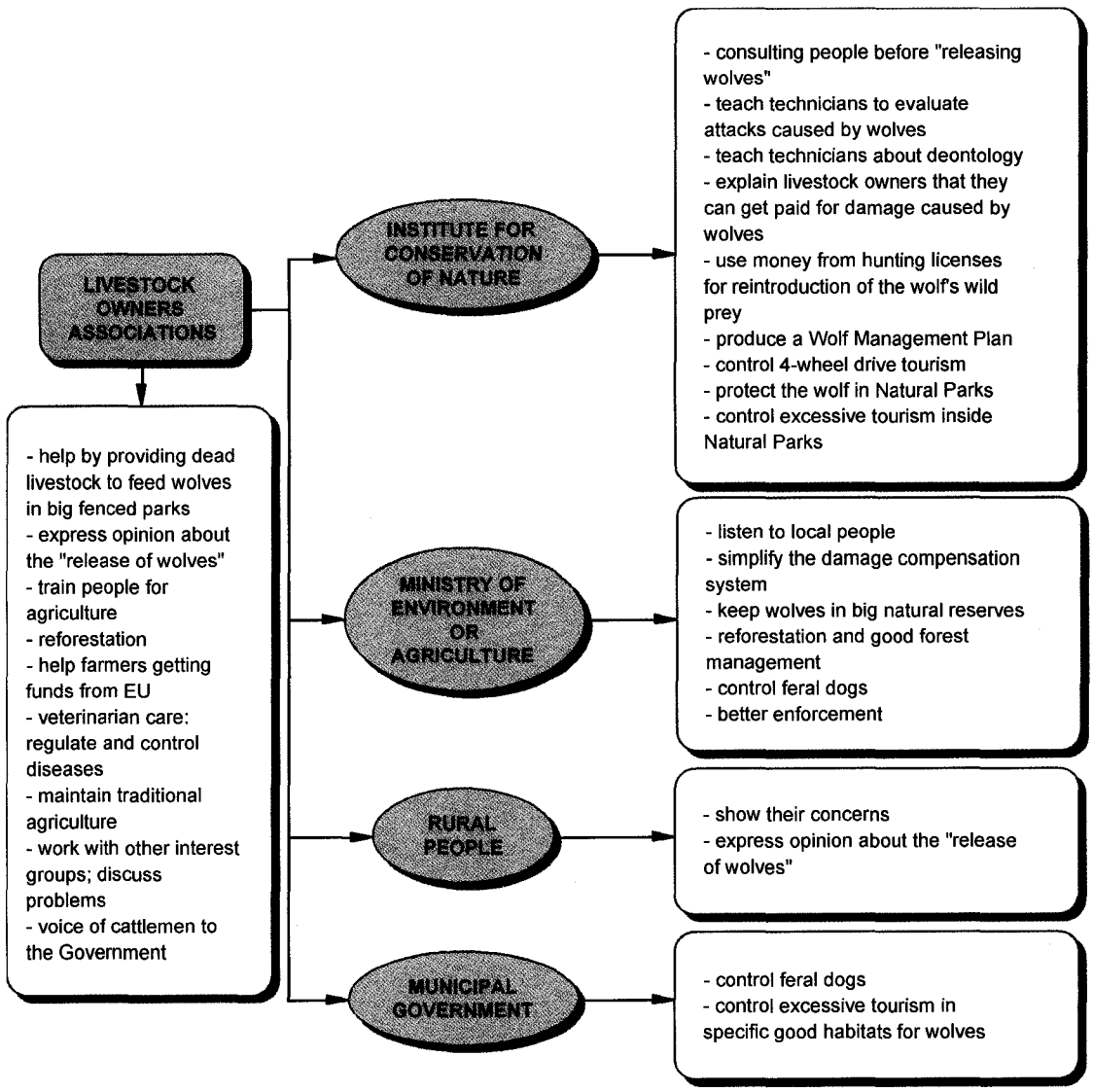


Figure 5.13 – Roles of key interest groups that should be involved in wolf management in Portugal, from the livestock owner associations' perspective.

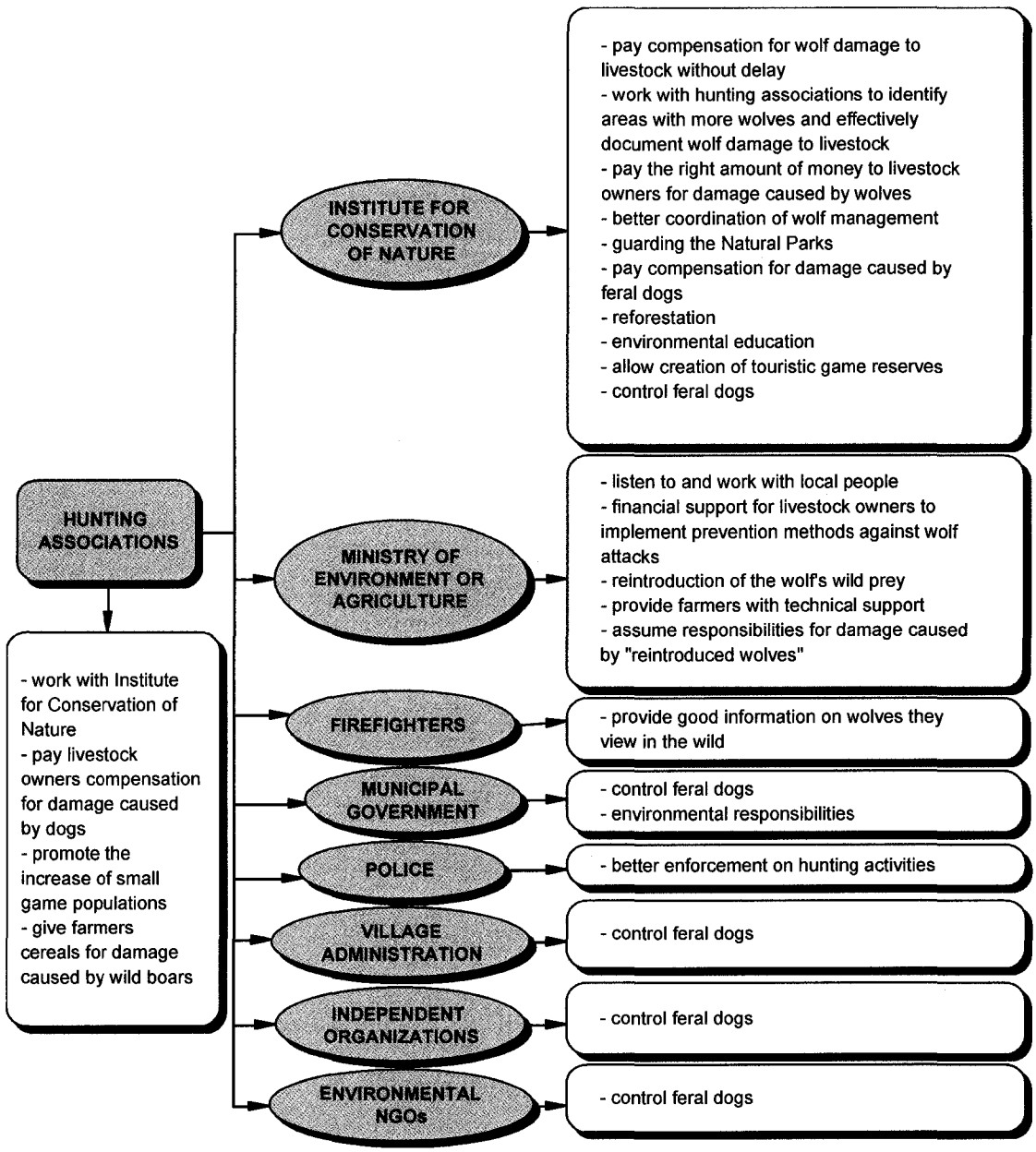


Figure 5.14 - Roles of key interest groups that should be involved in wolf management in Portugal, from the hunting associations' perspective.

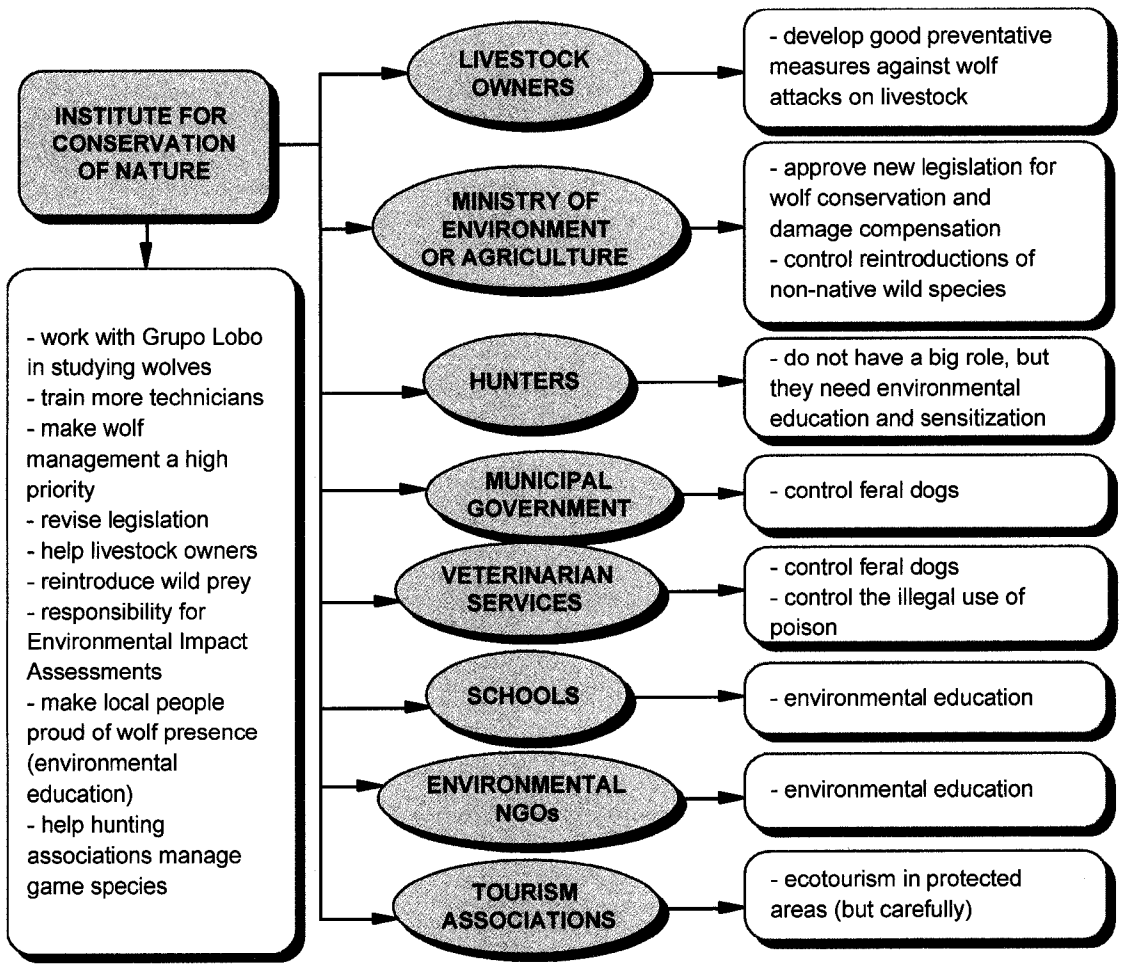


Figure 5.15 - Roles of key interest groups that should be involved in wolf management in Portugal, from the Institute for Conservation of Nature's perspective.

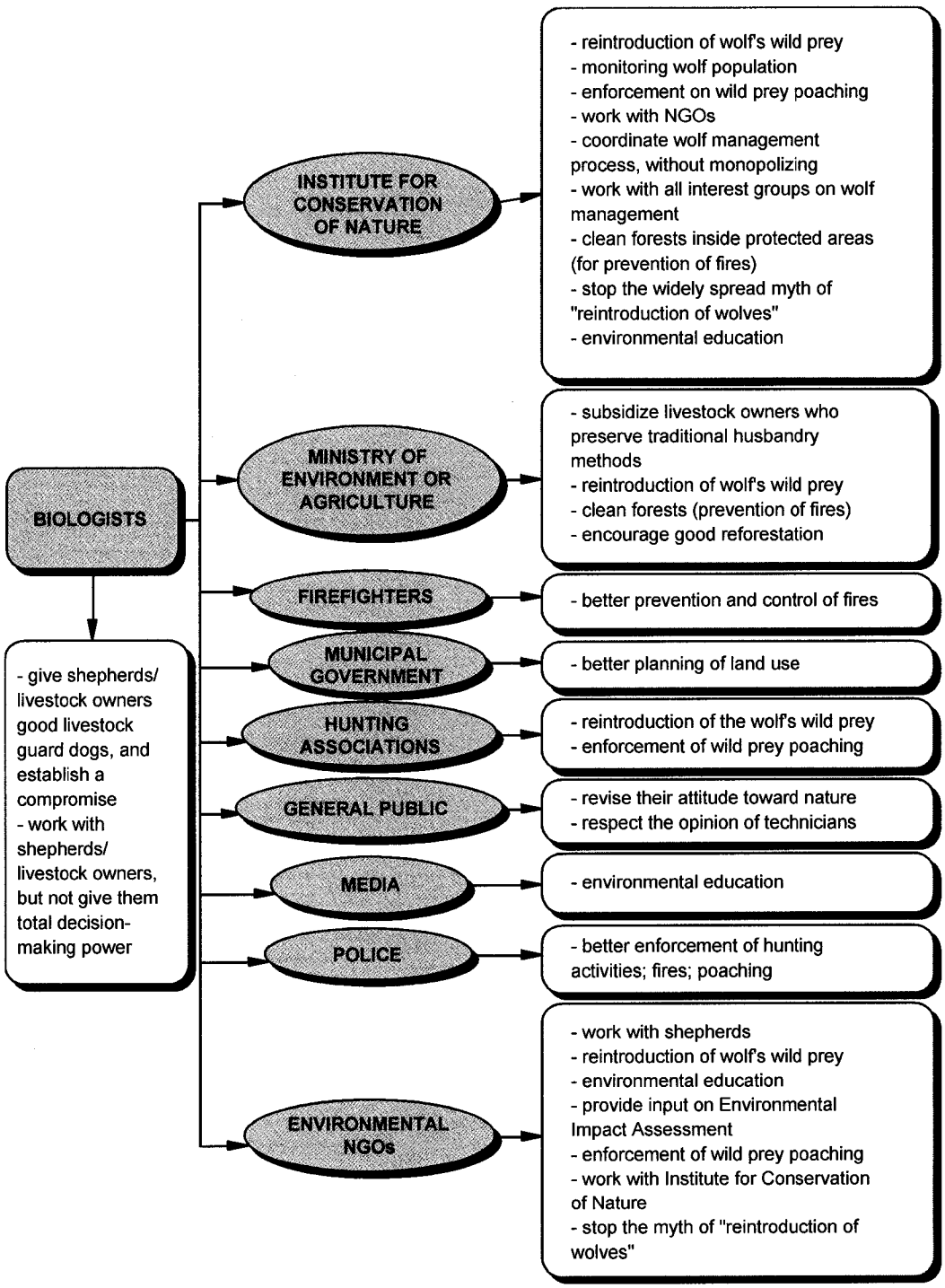


Figure 5.16 - Roles of key interest groups that should be involved in wolf management in Portugal, from the biologists' perspective.

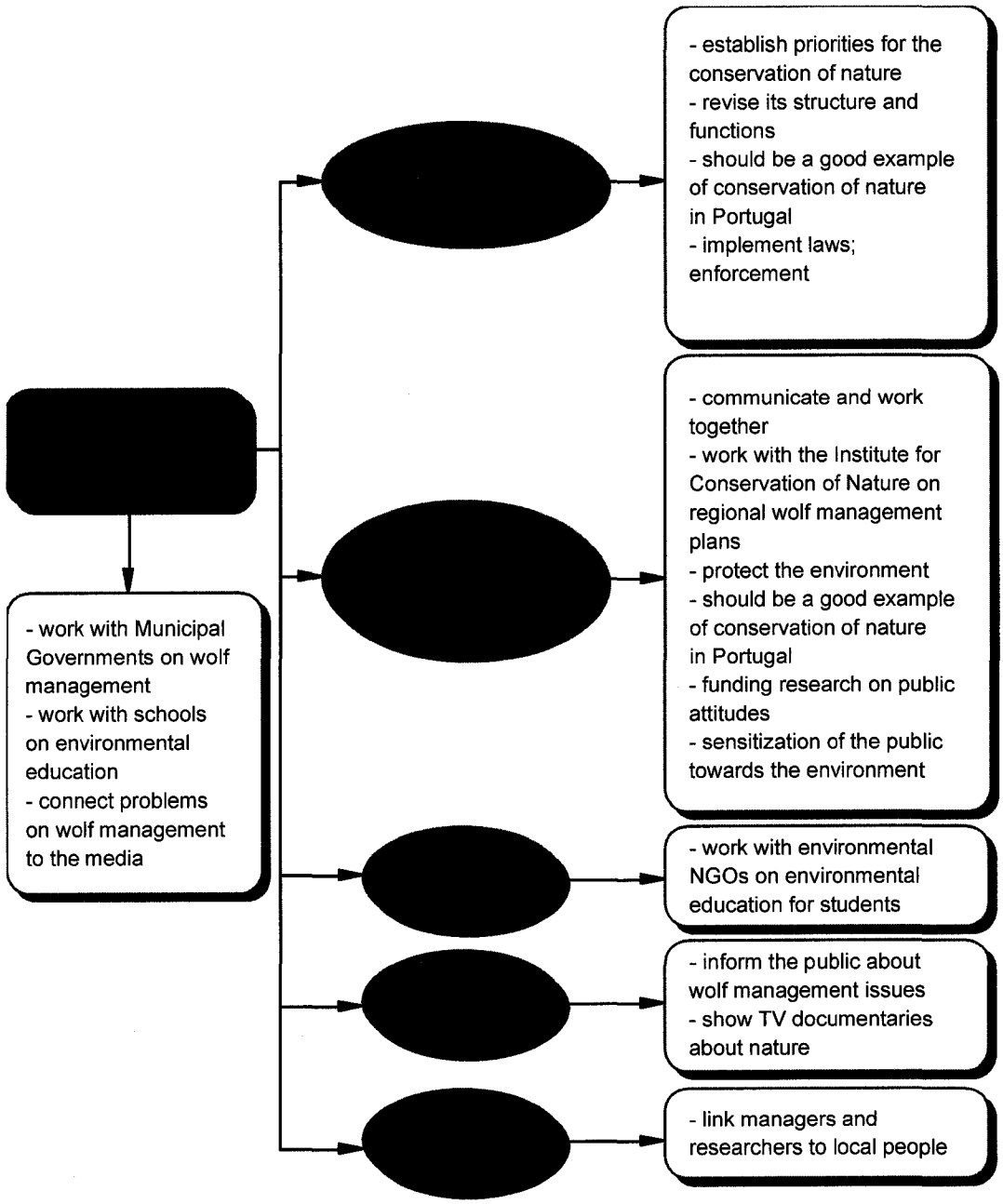


Figure 5.17 - Roles of key interest groups that should be involved in wolf management in Portugal, from the environmental NGOs' perspective.

Livestock owner associations are the group that assign themselves most responsibilities in wolf management (Figure 5.13). Other interest groups see livestock owners as an interest group, but usually with a passive role. The roles assumed by livestock owners are directly or indirectly related to wolf conservation, never with wolf killing. Those indirectly related to wolves deal with agricultural issues and the conditions under which agriculture in Portugal is carried out. Livestock owners see the improvement of agricultural production and the recovery of traditional techniques as a way of achieving coexistence of humans and wolves.

The control of feral and stray dogs is a major concern for livestock owners and also for the remaining interviewed interest groups, as we will see later. Livestock owners see governmental institutions, almost exclusively, as having the responsibility for wolf management in Portugal. Most of the roles given to the ICN deal with the criteria for evaluating livestock damage caused by wolves and the compensation system for livestock owners. At the same time, they see the ICN as having responsibilities for tourism management, protection of good wolf habitat, and zoning of wolf conservation areas. Under the current legislation these tasks should be shared by the Ministry of Environment or Agriculture, and the Municipal Governments.

Livestock owners think of rural people as an important interest group for the discussion of the perceived reintroduction of wolves (many people believe that wolf reintroduction programs are already happening). The "release of wolves" or "reintroduction of wolves" presented in the diagrams refers to the wide spread myth that someone is releasing captive wolves in the wild. During the interviews respondents were confronted with the hypothesis of this being a false idea, but respondents claimed that it was true. They seemed very displeased with these supposed practices and angry with those who were reintroducing wolves. There is no agreement on who is supposedly responsible for these reintroductions. Respondents who believe in this myth point to the Natural Parks' staff, the ICN, Municipal Governments' staff, biologists, Spanish people, etc. as being responsible for these reintroductions. This new myth is considered today as one of the most serious threat to wolf conservation in Portugal (F. Álvares, pers. comm.).

Hunters see themselves as having an important role in a process of public involvement in wolf management and showed willingness towards working together with other interest groups, namely the ICN and livestock owners (Figure 5.14). They showed some concern not only with the issue of damage caused by wolves on livestock, but also that caused by feral and stray dogs and wild boars on crops. Hunters think they can help to compensate livestock owners and farmers for losses caused by these species. Hunters seem to believe that, by addressing farmer-feral dog and farmer-wild boar conflicts, the problems between humans and wolves will be addressed too. Once again, the ICN and the Ministries are thought to have various responsibilities for wolf management in Portugal. These roles are related to the compensation system for livestock owners, which hunters think should be fair and paid on time.

Hunters also feel the need for these governmental institutions to play an exemplary role in coordinating wolf management in Portugal, through actions at different levels including: implementing environmental education, guarding protected areas, reintroducing wild prey for wolves, and reforestion. The expected roles for the other interest groups are concerned mostly with the control of feral and stray dogs and environmental education. Hunters see the problem of feral and stray dogs as the main problem, and name many interest groups with responsibilities over the control of those dogs. Hunters do not take responsibility for the control of these dogs or the mitigation of negative effects caused by them. Nevertheless, they assume responsibility for damage caused by hunting dogs. During the interviews, the majority of other interest groups state that hunters are the ones responsible for the existence of so many feral or stray dogs, which are originally lost or abandoned hunting dogs. Hunters do not agree with this allegation but they are in fact the most responsible. The occurrence of attacks on livestock caused by feral and stray dogs is well known by all interest groups, and this is the reason why the issue is so frequently mentioned by everybody.

The ICN lists for itself a variety of roles on wolf management including scientific research, revision of legislation, management of game species, support for livestock owners, environmental impact assessments, and environmental education (Figure 5.15). This is the interest group that most strongly recognizes the need to have an active role in

managing the wolf in Portugal. All other interest groups interviewed in this study also recognize the ICN's position. This recognition is made clear by the number of roles listed for the ICN by the other groups.

The ICN also presents a long list of interest groups with a role in wolf management and shared responsibility for several issues (for instance, the control of feral and stray dogs by Municipal Governments and Veterinarian Services, or environmental education by schools and environmental NGOs). The development of regulated eco-tourism and the control of existing tourism activities in protected areas is mentioned only by the ICN and livestock owner associations. These interest groups think of eco-tourism as an important tool in wolf management, but recognize some danger in these practices if done without control.

Off all interviewed groups, biologists list the highest number of interest groups with a role in wolf management (**Figure 5.16**). The ICN and environmental NGOs have the highest number of tasks concerning various activities. Biologists feel these two groups should work together and with other interest groups on a process of public involvement for consensual decision-making. Environmental education is an example of a shared role among these two groups and also the media. Biologists see the reintroduction of the wolf's wild prey species, as a responsibility of the ICN, the Ministry of Agriculture, environmental NGOs and hunting associations. In fact, only biologists and hunters see hunting associations having an active role in wolf management. Most of the roles and required actions presented by the biologists for a successful wolf management process deal with habitat protection or habitat recovery, and improvement of the wolf's wild prey populations. Biologists also perceive the importance of helping livestock owners, and clarifying the myth about the reintroduction of wolves. However, biologists do not see themselves as having as a wide range of responsibilities in wolf management as the other interest groups.

Again, the ICN and the Ministries of Environment or Agriculture are given the greatest number of roles in wolf management by the environmental NGOs (Figure 5.17). However, the roles of these interest groups do not directly address wolf management problems, but deal in the first place with the functionality and structure of these

institutions. Environmental NGOs see these governmental units as the first line in nature conservation in Portugal, but express the opinion that their objectives are far from being achieved. During the interviews, the environmental NGOs showed concern about the way government is working in terms of nature conservation, and stated that structural problems have to be solved before addressing wolf management issues in detail. Environmental NGOs believe most interest groups can contribute positively to wolf management through a joint approach to environmental education. Overall, the interest groups believe they can make a contribution to the process of wolf management, although those roles are sometimes different from each group's perspective. There is a need to get all interest groups together to think about who should be involved, to finding common solutions and to determine the various roles in wolf management.

Chapter 6 - DISCUSSION

This human dimension in wolf management study is the first of its kind in Portugal. The utilization of quantitative and qualitative approaches, the large sample sizes, the variety of interest groups, and the regional analysis provide a good understanding of the attitudes, knowledge and key issues about wolves and wolf management in the central-north region of Portugal. On one hand, the study was designed as a baseline assessment of attitudes and knowledge about wolves thus allowing for the possibility of conducting a future "post-test" to evaluate whether attitudes and knowledge have changed over time. As well, the study will allow attitudinal and belief monitoring to occur if new policies are implemented and if the wolf population changes. On the other hand, the study was intended as a partnership-building exercise for a process of public involvement in wolf management where all interest groups can have a role. From both perspectives, the study can be deemed a successful beginning to better address the key issues in wolf conservation in Portugal.

The quantitative approach allowed the construction of an attitudinal spectrum where the opinions of the interest groups were positioned and the general public's points of view were then analyzed in comparison with those groups. Together with the analyses of attitudes, the assessment of knowledge levels of the interest groups provided baseline information for targeting key messages directly relevant in influencing attitudes and for evaluating the effectiveness of future educational programs.

All sampled groups are willing to participate in wolf management decision-making, but they recommend the integration of more interest groups. The qualitative data should be viewed as a safe starting point toward conflict resolution. Wolf management issues like the presence of feral and stray dogs, wolf poaching, lack of wolf habitat, lack of sensitization and environmental education, and lack of biological data were mentioned by all interest groups. These issues are of common concern and are a good starting point toward the working together with all interest groups. Conclusions are not sufficient for assessing who should be involved in wolf management in Portugal, what roles each group

should play, and how decisions should be implemented, but they help researchers, managers, and interest groups understand the importance of listening to all perspectives and working together toward finding ways of managing the wolf in Portugal.

6.1 Attitudes Toward Wolves: Differences Among Interest Groups and Zones

Attitudes toward wolves (the value of their existence) differed among the general public, livestock owners, hunters and students, and in some cases attitudes also differed within groups across space. Hunters, livestock owners, and students held close to neutral attitudes while the general public was either strongly negative or strongly positive toward wolves. One goal of this study was to test if interest groups' attitudes were positioned at the extremes of the attitudinal spectrum, and to see the position of the general public (the silent majority of the constituency) in relation to those groups. While literature suggested that the general public usually holds a neutral attitude toward wolves in contrast with the opposing interest groups (Bath 1989, Bath and Buchanan 1989, Ericsson and Heberlein 2003, Kellert 1985), this study found that the general public expressed the most diverging opinions from all interest groups analysed. These findings lead to the rejection of the hypothesis set at the beginning of the study, which means that attitudes are different among interest groups and the general public.

The importance of natural resource managers recognizing strong versus weak attitudes was first suggested by Hendee & Harris (1970). They found that managers underestimated the extent to which the public had neutral or no opinions on management issues. The extreme positions and the certainty shown by the general public when asked about their attitudes toward wolves indicate a well-defined opinion about the value of having wolves now and for future generations. Managers will find it difficult to make wolf management decisions that will have wide public support. If attitudes toward wolf management are influenced by attitudes toward wolves (Bath 1989, Enck and Brown 2002) managers should strive toward finding consensual wolf management options that include compromise strategies to current attitudinal positions.

While hunters are stereotyped as being negative toward wolves, this has not generally been shown to be the case (Ericsson and Heberlein 2003). In a literature review,

Williams *et al.* (2002) reported mixed results of what hunters think about wolves, but in most cases these respondents were more positive about wolves than the general public (Bath 1989, Bath and Buchanan 1989, Bath and Majic 2001, Kellert 1985, Kellert 1986, Kellert 1991). In the current study area, most hunters gave neutral responses to items about the existence value of wolves, and attitudes seem not to have changed and remained neutral since 1995 (Espírito-Santo and Petrucci-Fonseca 2003). These results have important management implications because attitudes that are not strong may be susceptible to change, although they can remain neutral in the absence of outside influences (Petty & Krosnick 1995, in Williams et al. 2002). Inappropriate management measures or delivery of wrong information about wolves or wolf management can drive neutral opinions of influential interest groups to the positive or negative extremes of the attitudinal scale. It is more difficult to work with extremely polarized interest groups than with neutral groups when the goal is to achieve consensual decision-making. Polarized attitudes are difficult to change, making it more challenging for managers in finding agreement amongst groups. Regardless of strength and direction of attitudes it is important to engage the various interest groups in a meaningful process, however when attitudes are polarized this is even more important. Involving interest groups helps define basic principles of agreement and at the very least avoids greater antagonism emerging between groups.

Livestock owners interviewed in this study were in general moderately negative toward the existence value of wolves. They think of wolves as a species with the right to exist, but agree that wolf presence is "bad". They are against increasing the number of wolves or seeing abundant wolf populations and they support some forms of lethal control.

Although livestock owners perceive the wolves' impact on livestock as significant (see discussion later in this chapter) the low percentage of animals affected by wolf predation (below 1% across the three regions, per year), can explain the moderately negative attitudes of livestock owners. Calculations of the costs of damage per wolf show that Portugal has the lowest cost of most Mediterranean countries (Spain, France, Italy and Greece) (Fourli 1999). Several studies have shown that livestock owners hold the

most negative views of wolves whether it is in Europe (Bjerke et al. 1998c, Blanco and Cortés 2002, Kaltenborn et al. 1999) or in other countries (Bath 1989, Bath and Buchanan 1989, Buys 1975, Kellert 1985, Kellert 1986, Kellert 1991, Stepanov and Pole 1996). In Portugal, livestock owners are not amongst the most negative respondents although they suffer the highest costs as a result of damage to livestock.

All students surveyed in this study were high school students and they held neutral attitudes toward wolves. In comparison with the average level of education of the whole sample (general public, hunters and livestock owners) these students have relatively high education; however, this is not reflected in more positive attitudes toward wolves. In contrast to results seen in other parts of Europe, which often indicate a positive feeling from students toward wolves (Bath and Farmer 2000), most Portuguese students surveyed in this study expressed a neutral attitude toward the animal. Neutral attitudes among students were also found in France and Croatia (Bath 2000, Bath and Majic 2001). While students expressed a generally neutral attitude toward the existence value of wolves, when asked about the importance of having wolves for future generations, most expressed a positive response and also indicated a desire to see an increase in wolf numbers. Students agreed that wolf conservation was an important issue even though they did not have well-defined opinions. These findings should be encouraging to managers and educators (teachers, NGOs, etc.) desiring to develop an awareness campaign.

Data did not show significantly different opinions toward wolves among the three zones of the study area and thus one can accept the null hypothesis that attitudes are similar across space. However, results also need to be examined at a larger scale. The items included in the questionnaire also allowed for the comparison of attitudes both regionally and nationally. For various issues, respondents were asked about their opinions regarding their county and their country (Portugal). Most of the time respondents answered consistently regardless of whether the issue was discussed at the regional or national scale. For instance, if the respondent was in favour of protecting wolves in the county, he/she was also in favour of the national protection of the species. Negative attitudes toward wolves expressed in a particular region were also expressed for the country.

The existence of a NIMBY (Not In My Back Yard) syndrome has been reported by several authors in other countries (Bath and Majic 2001, Hamazaki 2002). These authors showed situations in which people defend, for example, the protection of a species generally, but not near their residential area. Among respondents surveyed in the study area, the NIMBY syndrome was not apparent. This may be due to the small size of Portugal or due to culture-specific aspects of the population. The public sees the positive and negative aspects of having wolves in their county as they see them in other parts of Portugal. However, these results do not show whether respondents from other regions would express the same opinions both regionally and nationally as respondents from the study area. Wildlife management should not be designed and applied nationally without prior research into regional conditions and attitudes of the public. Decision-making regarding wildlife resource management should start locally and, if regional differences do not exist, then they might be applied nationally (or, at a larger scale).

6.2 Attitudes Toward Wolf Management Issues: Differences Among Interest Groups and Zones

Portuguese respondents' attitudes toward wolf management depended on the issue and vary by interest group and region. The quantitative approach utilized in this study allowed the identification of those wolf management issues that each interest group believes are important. Not all management issues are comparable among interest groups because not all issues were considered important by the groups. For example, students' responses to financial issues (e.g. who should be paying compensation to livestock owners) are not consistent and did not correlate with each other and were thus left out of the main set of items used to describe their attitudes toward management issues. Discussions are presented for the sets of issues comparable among the interest groups and for individual sets of issues considered important for specific groups.

Inside each interest group most respondents have similar opinions regarding wolf management options. Although the general public split in its attitudes toward the existence value of wolves, it showed consistent opinions about the various aspects of wolf

management. These results are good news for wildlife managers trying to find consensual management strategies with potentially wide public support.

6.2.1 Wolves' Impact on Game and Prey

The impact wolves have on ungulate numbers and hunting opportunities is often an argument that surfaces when debating forms of wolf management (Bath and Majic 2001). In the study area, most respondents from the general public held a neutral opinion about the impact of wolves on big game species. Overall, the majority of the public remained quite positive toward the species, suggesting that the hunting issues may not be as important in influencing attitudes as earlier believed.

One objective of this study was to check if hunters see wolves as competitors for wild ungulate populations and if this potential competition was a cause of conflict between hunters and wolves. Wolves' impact on small game species or wild ungulate populations, such as roe deer or wild boar, is not an issue of concern among hunters. Nevertheless, although hunters at present do not show negative attitudes toward wolves, results from Sweden show that hunters' positive attitudes can change with time after wolf recovery in a region (Ericsson and Heberlein 2003). If the wolf population in the study area were to increase, and if news of wolves predating hunting dogs or wild prey spread, then discussions on the effects of wolves on game species will be more common and hunters' attitudes may well shift. The revenue generated by hunters and hunting ground managers has stimulated them to recover healthy game populations to ensure fruitful future hunting seasons. Hunting associations have made significant financial investments by reintroducing roe deer in several places inside the study area, and some of those locations overlap directly the wolf range. Will hunters' tolerance level toward wolves decrease after roe deer recovery in the region? This type of question needs more human dimensions research in order to predict and address conflicts of difficult resolution in the future.

6.2.2 Impact of Wolves on Livestock

A vast majority of livestock owners living in the study area think that the wolf's primary food source is livestock and that wolves cause abundant damage to this kind of prey. Although some livestock owners may be affected, proportionally few animals are likely to be killed by wolves in most villages located in the wolf range.

In an effort to understand public perceptions or beliefs about losses to livestock caused by wolf attacks, all interest groups were asked about the number of sheep and goats killed by wolves in the previous year in the county. All interest groups have no knowledge of the number of domestic animals taken by wolves in Portugal, in the county, or even in the villages where they live. The perception of most respondents surveyed in this study, however, is that wolf predation on livestock is very high.

The percentage of animals taken by wolves (per year) is less than one percent of the available livestock. In some villages, more than 300 wolf attacks have occurred on a five-year period and opinions of livestock owners are more positive than attitudes of ranchers and farmers living in the Yellowstone area in the U.S, where 150 wolves caused less than 70 livestock losses over a three-year period. The magnitude of the wolf-livestock depredation issue in Portugal and many parts of Europe is huge from a North American perspective, and yet compensation is paid, and public attitudes in most parts of Europe toward wolves remain neutral to positive.

When people's tolerance towards wild predators is in question, it is the perceived rather than actual loss that influences public opinion towards the predator. Actual damage is generally much lower than perceived damage, particularly in the case of the wolf. The emotional factor plays an important role in the perception of damage (Fourli 1999). This becomes evident when considering that even though damage to livestock caused by wolves is low compared to other causes of livestock mortality, it is often perceived as extremely important (LCIE 1998 in Fourli 1999). Even though there are no data on livestock mortality caused by brucellosis, this cause of death is a much stronger concern for livestock owners than mortality caused by wolves' attacks to livestock (Espírito-Santo 2006).

If many residents feel wolves can never coexist near livestock, then potentially there could be very few areas where the public might be willing to tolerate the presence of wolves. However, if the public is willing to discuss ways of dealing with wolf-livestock problems and finding solutions to address those issues, then the stage for coexistence is set and managers only have to work with the interest groups toward finding the most appropriate management measures. Opinions do not differ regionally in terms of wolf management. Only the general public expressed points of view towards the impact of wolves to livestock and wild prey on a regional scale.

The vast majority of the general public (more than 80%) thought wolves cause abundant damage to livestock, and these negative opinions were stronger in Guarda than in Aveiro/Viseu or Castelo Branco. This may be one reason why wolves have been disappearing in Guarda county. This county has the lowest number of goats from all regions in the study area. Considering that this is the most frequently depredated livestock species in this region, the perceived impact caused by wolf predation is stronger than in areas with high densities of goats. This might be the reason why Guarda's residents are so strongly in favour of seeing government paying compensation to livestock owners.

Attitudes in Aveiro/Viseu, the region with a regular presence of several wolf packs and with more damage to livestock caused by depredation, are not as negative as in the other regions, thus indicating a higher level of tolerance. The high densities of livestock (cattle, goats and chicken) raised in this zone decrease the perceived impact of wolf predation on livestock. These facts help explain the neutral opinion of the general public from this zone on this issue. Castelo Branco no longer has wolves, so negative opinions toward wolf depredation on livestock may have been minimized after three decades without wolf presence. The actual predation occurring on wild and domestic species is, most of the times, done by feral dogs. There are no data available on the number of feral and stray dogs living in the study area, or on the damage caused by these dogs on livestock. Nevertheless, people from Castelo Branco very often report significant financial losses caused by predators attacking livestock. The type of husbandry being practiced in this region, where large herds of sheep are kept in fenced areas, increases the probability of a predator killing many animals because livestock cannot escape. Surplus

killing of livestock is common among large carnivores (Andelt et al. 1980, Fritts et al. 1992, Horstman and Gunson 1982, Kruuk 1972, Odden et al. 2002).

Very often respondents argue that the fact of wolves killing more than they can eat is a "waste". These episodes cause people's anger and intolerance toward wildlife. Most of the times people consider the wolf responsible for the damage, and intentionally or not, do not immediately identify feral dogs as potentially responsible. In the absence of a direct observation, livestock owners rarely admit that the attack was caused by a dog. The general public from Castelo Branco believed there are around fifty wolves in the county, which explains why wolves are still considered responsible for damage caused to livestock. In actual fact, there are no wolves in the area.

6.2.3 Compensation

A slight majority of the general public thought people who have lost livestock due to wolf attacks should be compensated whether or not they use preventive measures. Opinions are homogeneous across the study area. Compensation issues are of major importance for livestock owners, and opinions are very homogeneous across space. Nearly one hundred percent of the surveyed livestock owners hold the opinion that compensation should be paid to livestock owners with damage caused by wolf predation and that the government is the responsible agency for those payments. When asked if all livestock owners experiencing losses should receive compensation whether or not they use preventive measures, most respondents from Guarda and Castelo Branco agree that everybody should be equally compensated. Respondents from Aveiro/Viseu, the region with more wolves and more damage caused by wolf attacks, have divided opinions. A slight majority thought it is fairer to pay compensation only to those who make some effort in preventing attacks from wolves. Livestock owners living in wolf areas have a direct and more constant contact with wolf-caused damage and payment of compensation. This proximity allows them to better evaluate the management approaches in terms of what is more fair and balanced. In wolf areas livestock owners seem to think of wolf management locally and applied to the specific conditions under which each livestock

owner raises the cattle. Opinions were equally split when livestock owners were asked about who should be paying for insurance if a system of mandatory insurance for livestock is implemented. With no regional differences, half of the livestock owners thought the government is responsible for paying for the insurance, while the other half thought that each person should pay his/her own premium.

Involving various interest groups, particularly livestock owners and the ICN (Institute for the Conservation of Nature – a governmental agency) in the discussion of compensation issues is of major importance for proper wolf management. However, managers should not forget that compensation paid to livestock owners might not be a good approach for minimizing conflict and increasing tolerance. First of all, interest groups should think about whether compensation mechanisms should exist, by evaluating the benefits and the sustainability of such mechanisms over the long term. The literature refers to an inverse relationship between damage levels and compensation payments, which suggests that a compensation mechanism might be less and less capable of covering damage as damage levels increase (Fourli 1999). Does this imply that compensation systems are likely to be incompatible with increasing wolf populations, assuming that damage increases along with the wolf populations (Fourli 1999)? If the interest groups agree to keep the actual compensation system, managers should have in mind that: (a) the compensation mechanism's sustainability depends on the efforts for the recovery of wild prey populations for wolves; (b) compensation payment is a passive strategy and should be linked to the level of preventive measures used by the livestock owner; (c) compensation mechanisms should have built-in procedures to minimise fraudulent cases; (d) the level of compensation payments should have a defined relation to the market prices of animals (Fourli 1999). In Portugal, managers have to make a stronger effort in recovering wild prey populations for wolves. In terms of prevention of damage, it would be interesting to experiment with a system where those livestock owners who use preventive measures have benefits in the payment of compensations (higher and faster payment). Managers should make livestock owners responsible for implementing preventive measures and then compensate them for that.

6.2.4 Financial Issues and Tourism

The general public is very consistent across the study area in their opinions about who should pay what, in terms of minimizing damage caused by wolves to livestock. More than 90% of the public agreed that the government should pay compensation to livestock owners, but opinions split by half on the utilization of money from taxes. Those in disagreement very often argue that "this is not a priority because livestock owners already receive huge subsidies from the EU to cover costs with livestock breeding".

A vast majority of the public think that government should help livestock owners to implement methods to prevent wolf attacks on livestock. The public sampled in this study is representative of the constituency living in the study area. These opinions reflect the public's view on a controversial issue of wolf management, which means that these considerations are useful for managers when decisions on the allocation of tax monies into wolf conservation efforts need to be made.

Livestock owners from the three regions suffer varying degrees of damage from wolf attacks on livestock, but their opinions are homogeneous across space. Most livestock owners accept the fact that part of their taxes would be used for a compensation system. They also see the requirement to buy insurance against wolf attacks on livestock as a good measure (52%), but opinions decline by half when asked if the Government should pay the insurance premium. Most respondents (81%) expressed their total agreement with the notion of Government help in implementing preventive methods. Overall, livestock owners show willingness to pay, directly or indirectly, for the cost of damage caused by wolves, but they also count on Government assistance. These results reflect livestock owners' tolerance toward wolves if they see government helping to cover part of the economic losses resulting from wolf depredation.

Most livestock owners and students living in Aveiro/Viseu (area with regular presence of wolves) hold the view that tourism activities centred on wolves in this region could provide income for local communities. Among the general public and hunters, only a minority of the respondents supported the belief that tourism to the area would grow as a consequence of wolf presence or recovery. Similar results were found in France,

Croatia, and the U.S., (Bath 2000, Bath and Majic 2001, Kellert 1991), but unlike North America, tourism activities centred on wolves are not developed in Portugal. Only a couple of agencies have developed some hiking trails designed to show ecological, cultural, and historical aspects related to wolves in the north of the country (e.g. Álvares and Petrucci-Fonseca 2002). Eco-tourism is still in its infancy in Portugal. New tourism agencies very often focus on adventure sports. For some individuals, support for conservation efforts occurs only when it can be shown economically that the species generates income (Bath and Majic 2001). Research has shown that tourism and carnivores can generate significant economic benefits to local communities (WWF-UK 2000). Considering that the most injured interest group in the study area (livestock owners living in areas with more wolves and wolf-caused damage) sees wolves as a potential tourism attraction, then conservationists, managers, tourism operators, and local communities should work together toward developing responsible wolf tourism that generates income. Tourism agencies should also ensure that educational programs are in place before proceeding with this kind of initiatives. These are the first steps to ensure a successful ecotourism plan.

Controlled and well-managed tourism can play an important part in protecting the environment both for people and for nature. The presence of wolves can be a valuable asset to the tourism industry; it can, for example, be used as an income generator, a symbol of wilderness, a source of local and national pride, and as an educational resource (WWF-UK 2000). Responsible tourism can encourage and maintain harmonious co-existence between people and wolves, but this involves establishing partnerships among communities, park managers, tour operators, local governments and conservationists (WWF-UK 2000). For conservation and wolf tourism to be successful, local communities should feel that tourism and wolves are part of their future and that they will benefit both (WWF-UK 2000). In light of the overall positive attitude toward wolves by most respondents in the study area, the development of wolf tourism initiatives for the region and the debate of tourism issues with various interest groups are an important priority. Interest groups should be aware that tourism should support local economies, but also respect the natural, social and cultural diversity of destinations, and the capacity of local

communities, wildlife and habitats to support a certain number of tourists (WWF-UK 2000).

6.2.5 Preventing Damage to Livestock

More than 80% of the hunters, livestock owners and respondents from the general public in the three regions disagree with a system based on fixed compensation given out to livestock owners that operate in areas with wolves. The idea underlying this system is that each livestock owner receives a fixed amount as a compensation for living in an area with wolves. The livestock owner is then free to use the given amount as he wishes (installation of preventive measures or other personal or professional reasons). However, if wolves do cause damage to his livestock, he/she does not have the right to request any additional compensation. The main advantage of such a system is that it alleviates the administrative burden of the case-to-case compensation system, which is very time-consuming (Fourli 1999). The disadvantage of the fixed-amount system is that it constitutes still another subsidy for livestock raisers, a group which is already heavily subsidised (Fourli 1999). This might be one reason why most respondents disapprove of this measure. Another potential shortcoming is that damage levels fluctuate each year, thus making livestock owners very hesitant to accept a system based on a fixed amount (Fourli 1999). This study provides only an idea of the public's receptiveness toward this method. This alternative should be further discussed with the various interest groups, in order to understand the advantages and disadvantages of the method.

In general, anytime respondents express their concern for livestock owners and defend the utilization of compensation systems, the justification is the disappearance of traditional husbandry practices and the decrease in livestock production, not the perceived damage suffered from wolf attacks on livestock. Livestock owners stated, during the face-to-face interviews, that big herds of animals kept with traditional husbandry practices are disappearing, and wolf-caused damage is only aggravating the problem. Local communities have been losing the habit of protecting livestock with trained guard dogs, and some practices like the active guarding of flocks by professional shepherds or the use

of night time enclosures, still in use for example in Romania (Salvatori et al. 2002), is disappearing in Portugal. Livestock owners agree that the Government should help them to prevent damage to livestock with guard dogs or good fences. Comments provided by the respondents suggest that the sources of the problem are political will, subsidy policies, the Common Agricultural Policy, and other top-down decisions approved by the government with no understanding of the key issues from the locals' point of view. These concerns were expressed by all interest groups and many respondents from the general public. These worries are also evident in data from the qualitative interviews.

When discussing wolf management, a variety of aspects like livestock issues, compensation, prevention and financial issues are linked and cannot be examined separately. In the same way, wolf management should be examined in a broader socio-political context, taking into account the social, economic and political dimensions of the population coexisting with wolves. Overall, the results of this study show characteristics of the Portuguese population that apply to a variety of issues, and not only to wildlife management. Comments provided by the general public, during the interviews, showed people's sadness toward a "subsidy addiction" happening inside the agricultural world. Those comments lead us to think that the population has the tendency to see the government as a major source of funding for agriculture. In terms of livestock production or other agricultural practices, fewer and fewer farmers use traditional techniques for preventing damage whether the hazard is wildlife or natural disasters. Managers now face the challenge of reintroducing those techniques and to work with livestock owners on the implementation of those measures. Today citizens who are willing to discuss preventive practices express their interest in seeing government covering the expenses for the implementation of those methods.

6.2.6 Lethal Control and Hunting

Although western Europe no longer contains large wilderness areas, it still offers large areas with the potential habitat to sustain wolf populations beyond their present reduced numbers and distribution. Wolf conservation must often occur in multi-use

landscapes, within which a variety of real or perceived conflicts with humans can occur, including:

- depredation on livestock;
- fear for personal safety and other psycho-social conflicts;
- competition with hunters for wild ungulates (LCIE 2003).

The first two topics apply to the study area, while the third does not seem to be of concern among most of the hunters interviewed. Nevertheless, in some situations coexistence may be more readily achieved if wolf populations were maintained at a lower density than that which an area could biologically support (LCIE 2003). Biologists have predicted that the wolf population living in this region of the country (south of the Douro River) is reaching the minimum limit for a viable population because no immigration of individuals is occurring from the north of Portugal or from Spain, and mortality rates are very high (Pimenta et al. 2005). Considering the critical situation of this wolf population, biologists would need to discuss this topic with other interest groups before managers should consider lethal controls or wolf hunting as management options. Wolf hunting has long been, and still remains, a tradition in many parts of Europe. The motivations vary from limiting damage and other conflicts, to hunting as a recreational activity, and the desire for a wolf as a trophy (LCIE 2003).

In the study area hunters do not show any willingness to see authorized wolf hunting for recreation. However, livestock owners and respondents from the general public with negative attitudes toward wolves hold the view that lethal control of individuals to limit damage should be used because recreational hunting is prohibited. Wolf conservation does not necessarily imply strict protection, and hunting/lethal control may be compatible with wolf conservation, but clearly not in all regions and situations (LCIE 2003). The issues of hunting/lethal control are controversial and need to be discussed among the various interest groups with respect to the future of the wolf management process.

All issues related to lethal control and wolf-hunting seasons seem to be of importance for the surveyed students. In the three regions students consistently disapproved of any kind of wolf killing. They stated that the species has the right to exist

as much as any other species. Other interest groups share some of these opinions. Even livestock owners and general public respondents with negative attitudes agreed that wolves have the right to exist, and strongly disagree with the use of poison and snares. Nevertheless, they were in favour of specific wolf hunting seasons to reduce the number of wolves when "wolves are too abundant" or to kill wolves that depredate livestock. Similar opinions were found in the U.S. regarding the wolf and the coyote (Arthur et al. 1977, Kellert 1985, Kellert 1991). However, in these three North American cases reported by the previous authors, sheep and cattle producers strongly supported predator reductions by shooting or trapping as many as possible.

In Portugal, the most negative respondents showed higher tolerance levels than livestock owners in the United States. The most hostile respondents surveyed in Portugal were far more in favour of methods focusing on the specific animal responsible for the livestock loss. There is, indeed, acceptance of some form of lethal predator control, but they only favoured methodologies that focused on the offending animal rather than the species in general and the use of humane control techniques.

In Portugal, interactions between carnivores and hunters are well rooted in the culture of local communities. The control of predators (like foxes and mongooses) is a hunting practice carried out by hunters and gamekeepers every year in Portugal. Hunters perceive predators as having a role in ecosystems but often think of them as "populations in excess" threatening game species survival. Wolves are not regarded as a major threat to big or small game populations in the study area. However, it is unknown if tolerance levels of hunters in this area will increase or decrease in the future in the face of a recovering wolf population. In the same way, livestock owners' opinions on the utilization of lethal techniques in the event of a larger wolf population are unknown. This study helps in predicting attitudes of interest groups toward the use of lethal techniques and in finding ways of mitigating conflicts among opposing groups. Whether or not lethal control is an alternative measure for managing the wolf population in Portugal is certainly a controversial issue and one for debate with all interest groups. This study underlines the need for integration of hunting activities and scientific knowledge for future management practices.

6.3 Knowledge About Wolves: Differences Among Interest Groups and Zones

The various interest groups have different knowledge levels about wolves, and differences also occured within the same group at the regional scale. Students, for example, scored the lowest on knowledge items of all interest groups (particularly in Castelo Branco). In Aveiro/Viseu and Guarda, students are more knowledgeable about wolves, which could be the result of more direct contact with the species. Wolves disappeared from Castelo Branco during the 1970s, just before most of the surveyed students were born. The majority of the students in Castelo Branco have never lived in areas where they could feel the presence of wolves (seeing wolves, listening stories of wolves, hearing howls, etc). In contrast to this region, the transfer of information from generation to generation might be increasing knowledge among students living in wolf areas.

Information about wolves might not be reaching the public through the school system but through direct contact and experience with nature. In the case of students, attitudes and knowledge about wolves are not directly associated. By providing information about wolves in schools one should not expect to change attitudes immediately. In fact, educational programs targeted at reducing fear of wolves, or outdoor activities aimed at providing students with direct experiences with nature can be very effective in improving attitudes (Gangaas 2003). Close to neutral attitudes are easier to change than strong positive or negative views, and if one of the goals of wolf management in this region is to change students' attitudes, then outdoor activities could be the best approach to do so. This study provides baseline information on attitudes and knowledge toward wolves, thus allowing an assessment of the effectiveness of future educational programs.

Overall, knowledge about wolves remains low among all respondents in the three regions. The vast majority of the respondents had little idea of the number of wolves currently living in Portugal. Bjerke *et al.* (1998c) have pointed out the importance of asking people how large they believe the size of the wolf population is (perceived population size), because those perceptions are linked to attitudes. Dahle (1987) showed

that when information about the small size of the wolf population was given to respondents, they were more willing to support a larger population than when such information was not given. Most of the respondents overestimated considerably the total number of wolves in Portugal and in each region often believing there were hundreds or thousands of wolves present. There are only 200-300 wolves estimated in Portugal. What makes this finding interesting is that even with beliefs that many more wolves exist than is actually the case, there is still support for the conservation of the species within Portugal by most respondents. In terms of wolf management, this finding suggests that by providing accurate information on wolf numbers, managers can more easily get agreement from most groups over the importance of taking measures for wolf conservation in Portugal.

6.4 Relationship between Attitudes and Knowledge

It is often assumed that the more knowledge people have about wolves the more positive they will be, and several examples have revealed association of negative attitudes with low knowledge about a species (Bath 1987, Ericsson and Heberlein 2003, Espírito-Santo and Petrucci-Fonseca 2003, Hook and Robinson 1982, Kellert 1985). However, evidence for this relationship is inconclusive from the few quantitative studies that address specifically this hypothesis (Williams et al. 2002). In this study, hunters are an example of such a group; Portuguese hunters' attitudes are not related to their knowledge.

Varying degrees of contact with wolves result in varying levels of knowledge about the species. Hunters and livestock owners, the interest groups with the highest knowledge about wolves, score the same across the study area. These interest groups have a higher contact with wolves than the general public or the students, which means that the contact with wolves has a strong effect on increasing knowledge.

It is not clear whether more knowledge about wolves makes people more or less supportive when wolves are present (Ericsson and Heberlein 2003). Providing information about wolves can increase knowledge levels among respondents willing to receive that information thus positively shifting neutral attitudes or by making positive attitudes even stronger. This approach might be effective in the case of some respondents

from the general public. However, among other interest groups who already have some knowledge about wolves, but still express negative opinions toward the species, the development of "wolf related" educational activities may not be effective. Managers would have to find other strategies to get the interest groups involved in wolf management decision-making. By engaging residents and other important interest groups in a co-management process, managers will be able to increase decision-making confidence (Chase et al. 2000).

Results from this study show that a much stronger variable than *knowledge* has influence on attitudes toward wolves and wolf management. *Fear* is highly (and negatively) correlated with knowledge and with attitudes of some respondents. If fear affects attitudes (Bath 1987, Hook and Robinson 1982), usually in a negative way (Bath and Farmer 2000, Lohr et al. 1996), and poor knowledge about a species is associated with fear, then providing information to people with negative attitudes can reduce their fear about wolves, thus making their attitudes more positive. This approach could be used among people with negative attitudes caused by fear. In this study, female students, for instance, were more negative toward wolves than male students. Literature has shown that women are more fearful than men (Bjerke et al. 2001), so educational activities targeted at reducing fear will probably be more effective in improving attitudes among girls. When negative attitudes are linked with other factors (e.g. dissatisfaction with current wolf management policies, credibility or trust conflicts, economic conflicts or value conflicts) the development of public awareness and educational programs is not enough to achieve more sympathetic attitudes toward these animals.

It was not the main goal of this human dimensions research to show how to improve attitudes toward wolves, but to help managers understand the conflicts among interest groups and to gain support from a well informed public into a co-managed process of decision-making. Dissemination of factual knowledge about wolves could be used as residents, vocal interest groups and wildlife managers discuss the issue of wolf management, in helping work towards a decision on how wolves should be managed. Increased knowledge may enhance opportunities for the public and the interest groups to adequately assess the degree to which they want wolves to exist for future generations

and under what conditions. However, managers should be aware that providing information to residents to address their low levels of knowledge about wolves and possible impacts associated with wolf recovery will not necessarily lead to more positive attitudes, despite the finding that, in some cases, greater levels of knowledge are associated with positive attitudes.

Future research should explore the extent to which the media affects public attitudes toward wolves and wolf management. The fact that many people surveyed in the study area have neutral attitudes toward wolves may hinder the recovery of the wolf population in the future. People who do not feel strongly about wolves might be influenced by single events, because one well-publicized negative event could sway the attitudes of many (Ericsson and Heberlein 2003). It is essential to gain the interest of a well-informed public for a process of public involvement; for this reason, education has an important role in the decision-making process (Bath 1989).

6.5 Factors Affecting Attitudes and Knowledge

Although knowledge scores about wolves do not have a clear relationship with attitudes among most of the interest groups on a variety of issues, the level of education plays a major role in influencing attitudes. This and other socio-economic factors, like gender, age, residence and occupation, have a strong association with opinions toward wolves and wolf management. The kind of experiences with wolves and the interest expressed by the respondents about wolf management issues also drives attitudes and knowledge about the species.

6.5.1 Socio-demographic Characteristics

Socio-demographic variables have an effect on knowledge and attitudes toward wolves and wolf management among the general public and the various interest groups. Overall, socio-demographic characteristics are important for understanding attitudes and knowledge among all respondents, but each variable affects attitudes and knowledge in a different way, depending on the interest group.

Gender affects attitudes toward wolves and wolf management especially among the general public and the students. In both cases, males usually hold more positive attitudes than females. Gender is also related to knowledge about wolves, and men from the general public usually score higher than women. Although most attitudinal studies show that females are more positive toward wolves than males (Williams et al. 2002), this and other studies (e.g. Ericsson and Heberlein 2003, Kellert 1985) present opposing results. Women might be exhibiting more negative attitudes because of fear of wolves; several studies have shown that females more often express phobic fears than males (Balciauskienè and Balciauskas 2001, King et al. 2000 in Bjerke et al. 2001). However, the observed gender difference in fear of wolves may be artificial, because it is socially more permissible for women to admit their fear, while males often are socialized to deny their fears (Bjerke et al. 2001). On the other hand, issues of large carnivore management and species conservation are more important to men than to women, and a lot more women show no interest in these issues (Balciauskienè and Balciauskas 2001, Kellert and Berry 1987). These findings are similar to data collected by Kellert and Berry (1987) in the U.S.. The authors found that men were more concerned about conserving wildlife species and habitats than were women, who tended to be more concerned about domestic animals and individual animal welfare. Later, Czech *et al.* (2001) revealed different results showing that women supported all species conservation more than men. It looks like attitudes of the Portuguese respondents are, to some degree, affected by gender differences similar to attitudes of U.S. residents in the late 1970s. Regardless of whether men are more or less positive than women toward wildlife conservation, gender is one important demographic factor in determining attitudes about animals in our society. Major efforts to broaden the scope and effectiveness of wildlife management should thus consider and understand the influence of gender (Kellert and Berry 1987). The relationship between gender and values can provide critical insight into the formation of attitudes toward wildlife management decisions (Dougherty et al. 2003). Gender may even act as a moderator variable by influencing the strength of the relationship among values, beliefs, and attitudes, differentially affecting the causal relationship among these items among female and male respondents (Baron and Kenny 1986).

Age of the respondents helps to understand attitudes of the general public and the livestock owners toward wolves and wolf management. In general, older people from these groups have negative attitudes toward wolves but show positive attitudes toward wolf management issues aimed at reducing damage caused by wolves. A negative perception of wolves found mainly among the elderly has been consistently reported by several authors (Andersone and Ozolins 2002, Bath 1987, Bath 1989, Bjerke et al. 1998c, Bjerke et al. 2001, Blanco and Cortés 2002, Ericsson and Heberlein 2003, Espírito-Santo and Petrucci-Fonseca 2003, Hook and Robinson 1982, Kaltenborn et al. 1999, Kellert 1985, Lohr et al. 1996). There are probably cultural changes between elderly and young respondents (such as the dependence of agricultural activities as the major source of income, several decades ago) that affect their attitudes toward wolf management. Managers should have in mind the age of the public and of livestock owners most likely to be affected by any management measure.

Livestock owners and members from the general public living in urban areas were more positive toward wolves than people from rural areas. Nevertheless, they believed that wolves have a negative impact on game and wild prey populations. Livestock owners who had lived out of the county at some point in their lives (usually in urban areas) believed that wolves have a significant impact on game and prey. The experience of living abroad, usually associated with a better financial situation, may have influenced livestock owners' opinions toward use of tax money or donation of funds to cover damage caused by wolves. These respondents were more likely to recognize the touristic potential of wolves in the region.

Previous research has found positive attitudes toward predators to be associated with urbanization (Andersone and Ozolins 2002, Bath 1987, Bath and Buchanan 1989, Bjerke et al. 1998c, Blanco and Cortés 2002, Ericsson and Heberlein 2003, Hook and Robinson 1982, Kaltenborn et al. 1999, Kellert 1985, Llewellyn 1978). This study also found that rural residents tended to have more negative attitudes toward wolves than urban residents. People living in wolf areas claimed that their quality of life had been reduced, and that the wolf-problem for the rural people is neglected by the urbanites and the authorities (Ericsson and Heberlein 2003, Sharpe et al. 2001). Many people felt that

decisions are made for them by urban people without knowledge about the reality of the situation (Nilsson & Knutsson 2000 in Ericsson and Heberlein 2003).

Occupation was an important variable in helping to explain attitudes and knowledge of livestock owners toward wolf management. In general, livestock owners sampled in this study were neutral or moderately negative toward wolves. Those with more negative opinions, who think wolves cause abundant damage to livestock, usually carry out livestock breeding as a second source of income, and their primary occupation is not related to agriculture. It would be expected to find attitudes of livestock owners living entirely from livestock breeding to be negatively influenced by the damage caused by wolf predation. Blanco and Cortés (2002), for example, found more negative attitudes associated with full-time livestock breeders than part-time farmers. However, livestock owners living in closer contact with nature and practicing livestock breeding on a daily basis as the main source of income seem to be more realistic about the real impact of wolf predation than other livestock owners. Although wolf attacks on livestock usually elicit strong emotions among the population, the real impact is very minor to the industry as a whole, *i.e.* on a yearly average wolves kill less than 0.7% of the livestock available inside the wolf range (Table 3.3) but this could still be significant to an individual farmer. Analysis of livestock owners' knowledge about wolves confirms these findings.

Those living entirely from livestock breeding are the most knowledgeable about wolves and wolf-livestock issues. These livestock owners are mainly men, 45-64 years of age, living in rural settlements, with an elementary school education, and who had seen wolves in the wild and in captivity. Knowledge levels among livestock owners were consistent across the study area. Even in areas with no wolves, livestock owners had the same kind of knowledge as in wolf areas. These respondents are older adults who clearly remember having seen wolves in the wild all across the study area. New generations of livestock owners growing up in areas with no wolves will probably have different knowledge levels. Results from human dimensions research like this project have practical applications for the short and medium term, but not necessarily for the long term because the context in which attitudes are shaped will not be the same as the societal context described here. Wolf management in a couple of decades from now will need

some new human dimensions research again, because the opinions and key issues registered today may not be applicable in the future.

Among hunters the influence of occupation is felt in a different way from livestock owners. While hunters with occupations unrelated to agriculture think the government should compensate livestock owners for damage caused by wolves, hunters with agriculture-related jobs are more in favour of helping livestock owners develop strategies to prevent wolf attacks on domestic animals.

Education did not have an influence on knowledge about wolves among livestock owners and members of the general public, but had some influence on attitudes toward wolves and wolf management. Respondents with higher education were more positive toward wolves. This study supports the findings from other authors who concluded that positive feelings toward predators were directly related to educational level (Andersone and Ozolins 2002, Bjerke et al. 1998c, Blanco and Cortés 2002, Hook and Robinson 1982, Kaltenborn et al. 1999, Kellert 1985, Lohr et al. 1996). Education level affects attitudes of respondents at both extremes of the attitudinal scale (general public), and also attitudes of moderately negative respondents (livestock owners). This socio-demographic variable always affects attitudes in the same way, by increasing positive attitudes among the more highly educated. However, this does not mean that the most educated respondents always have positive attitudes. Overall, students were the most educated interest group, but their attitudes were not the most positive among all respondents.

The fact that education does not affect knowledge levels about wolves indicates that information about the species is not reaching the public through education programs. What might be more important is the information passed from generation to generation and the respondents' experience with nature. These facts have important implications for the design of educational programs, the type of activities and the target group to which the program is aimed.

6.5.2 Experience With Wolves

People living in wolf areas can be expected to have had more direct experience with wolves than the general population (Ericsson and Heberlein 2003). Direct experience has been demonstrated in social psychology to lead to stronger attitudes (Petty et al. 1992 in Ericsson and Heberlein 2003). In the study area, the type of experience people have with wolves, such as seeing a wolf in captivity or in the wild, seems to have a strong influence on attitudes toward the existence value of the species and on how wolves should be managed. Livestock owners and students who have already seen wolves in captivity or in the wild are more in favour of wolves than those who had not had these experiences. This kind of experiences with wolves seems to be a helpful predictor of attitudes. This finding shows the importance of designing education programs based on some knowledge about the target group. The most negative livestock owners are not influenced by negative experiences with wolves. Not all surveyed livestock owners live in close proximity to wolves, but most of them express the same opinions toward wolf management issues. This group solidarity in attitude may result from an understanding and empathy for their counterparts within or near the wolf area (Bath and Buchanan 1989). Wolf managers will probably find a homogeneous acceptance or rejection of new management measures among most livestock owners of the country.

Living in areas with wolves may increase the likelihood of a respondent seeing or hearing wolves and these experiences may have a positive effect on people's attitudes. However, the general public living in wolf areas also reported, during the interviews, other kinds of experiences such as seeing livestock or pets killed by predators or hearing/reading news about these episodes on radio, television, or newspapers. The fact of living in wolf areas differentiates opinions among the general public. Respondents from the general public living in wolf areas think wolves have no big impact on wild animals, but cause abundant damage to livestock and these respondents are in favour of paying compensation to livestock owners for damage caused by wolves.

Overall, this study shows that people living in the wolf areas have more first-hand experience with both negative and positive aspects of wolves, and these experiences do

influence attitudes. Livestock owners from wolf and non-wolf areas are in general consistent in their negative attitudes toward specific issues of wolf management, while livestock owners who have had positive experiences tend to be more positive toward wolves. Students' attitudes are more positive when they experience the positive aspects of wolves. In wolf areas, the general public has less first-hand experience with wolves than livestock owners, and there are indications that their attitudes are negatively influenced by news of predators killing livestock or pets. There is evidence that an increasing amount of media coverage about wolf management issues is correlated with more extreme negative attitudes (Enck and Brown 2002). The role of the media in influencing attitudes was not explored in this study, but future research should address this variable.

The literature shows mixed results about the effects of experiences with wolves on people's attitudes. In some cases, attitudes toward wolves are not more negative in areas where people are more likely to come into direct contact with wolves (Johnson 1974), while in other regions negative experiences make attitudes more negative, and positive experiences have no effect at all (Ericsson and Heberlein 2003). Basically, in the study area experiences with wolves have negative or positive effects on attitudes depending on the interest group and on the type of experience. These findings justify the importance of analysing in detail the biological and societal context of wolf management at a local scale before designing an Action Plan with wolf management measures to be applied at a regional or national level.

6.5.3 Interest In Wolf Management Issues

With respect to a process of public involvement for developing a wolf management plan for this region or for the country, it is important to understand the validity of the suggestions mentioned by the public. It is reasonable to suspect that, often, the public will provide an attitude toward a natural resource policy on a questionnaire simply because the researcher asked for it, not because the respondent actually holds such an attitude (Bright and Manfredo 1995). Research in social psychology has found that, although attitudes can predict behaviour, the relationship is often weak (Bright and Manfredo 1995).

Characteristics of the attitude or attitude-object may influence their predictive validity. These characteristics include (1) the strength with which attitudes toward natural resource policies are held, (2) the personal importance of the natural resource issue, and (3) the availability of information about the natural resource issue (Bright and Manfredo 1995). How can managers assure that the interest groups are responding in a genuine way to their ideas? Questioning the public about their interest in wolf management issues helps managers understand the validity of the answers. Extreme attitudes or, attitudes regarding what respondents believe to be important natural resource issues are better predictors of support for specific management issues than attitudes toward what they consider to be unimportant issues (Bright and Manfredo 1995). Managers should focus on respondents expressing interest on wolf management issues. In fact, inside the study area, members of the public expressing interest in these issues have more knowledge about wolves than those with less interest or experience with wolves. By focusing on this public, managers assure the involvement of a well-informed public, able of supporting or rejecting management options based on accurate information.

In this study, the interest expressed by respondents in wolf management issues and on receiving information about wolves, drives the opinions of the general public and students toward the extremes of the attitudinal spectrum. In general, respondents with a strong interest in wolf management issues are very positive toward wolves and open to receiving information about wolves. On the other hand, the most negative respondents surveyed in this study show no interest on wolf management issues. These respondents belong to the general public and are mainly elderly women, living in rural wolf areas, having low education and living from agriculture. It will be particularly difficult to involve this segment of society on future wolf management decision-making processes as these respondents show little to no interest in participating in or receiving information about wolves. People do not seek out or attend to information about things they do not care much about (Ericsson and Heberlein 2003, Pierce et al. 2001, Shanahan et al. 2001). On the other hand, livestock owners with the most negative attitudes expressed a high interest in wolf management issues and in receiving information about wolf management in Portugal. Efforts for involving the public in decision-making should therefore be

focused on more receptive people, that is, those expressing interest on wolf management issues, regardless of their attitudes toward wolves.

6.6 Key Issues in Wolf Management

The qualitative research conducted on this human dimensions project allowed the identification of many issues and potential solutions for wolf management. Issues of common concern to all groups, like the occurrence of feral and stray dogs, wolf poaching, lack of wolf habitat, lack of environmental education and lack of biological data, are good starting points for a process of conflict resolution. Overall, all interest groups, to some extent, mentioned the following issues: agriculture and livestock, communication/understanding people, biology, legislation/policy and culture. The various interest groups not only identified issues and problems around wolf management, but also developed long lists of possible solutions to address those issues and solve problems. The groups recognized the need to integrate other interest groups and local communities into the wolf management decision-making process. The importance of this project and the urgency of a joint approach were recognized by all respondents from the various interest groups. The following sections present a discussion of the most important set of issues related to wolf management, based on responses provided by the interest groups.

6.6.1 Agricultural / Livestock Issues

Agricultural and livestock issues are some of the most important issues regarding wolf management in central Portugal. Some of these issues are larger in scope than wolves and wolf management, and usually difficult to resolve. Working toward resolving problems like the abandonment of agriculture go beyond involving only the interest groups most directly affected or able to affect wolf management. The interest groups recognized the need to stop the rural exodus and return to traditional agricultural practices (e.g. raising large herds of animals with traditional husbandry methods), but they find it difficult to suggest practical measures to do so. For several decades, the Common Agricultural Policy has changed the way agriculture is carried out in Portugal. In addition,

the EU subsidies received by Portugal are much lower than in other EU countries where agriculture does not have as much importance to the economy of the country as it has in Portugal. The public now shows some uncertainty about the implications of the common agricultural reform policy. People believe that the abandonment of agriculture will continue if farmers do not receive financial support from the government. Farmers may change from agricultural production to industry, commerce and other activities likely to cause significant changes on the landscape, all of which are likely to have negative consequences for wolves.

More specific issues related to livestock damage and compensation are directly related to wolf management. These issues need to be addressed through a consensus-building approach involving all interested parties. Communication programs directed toward interest groups on these types of agricultural/livestock issues might do best to concentrate on wolf-livestock preventative measures and compensation issues. In a situation where the local economy is heavily based on agriculture and pastoralism, losses to livestock can be of significant importance if no preventive measures are used (Salvatori et al. 2002). In some areas the culture of preventive action needs to be encouraged. Reinstating the use of livestock guard dogs is something the public feels is important but needs to be promoted in order to minimize the number of wolf attacks to livestock and the costs with payment of compensation. The public shows concern not only with damage caused by wolves but also damage caused by feral dogs. There is, indeed, a considerable uncertainty about the real impact of feral dogs' predation on livestock. A better knowledge of this impact will likely affect attitudes of the various interest groups toward wolves. Informing the public about the real magnitude of this issue is a priority for future wolf management in the region.

For the majority of the interest groups, more important than the attacks by wolves on livestock, is the effectiveness of the actual damage compensation system. The main element that has an impact on the efficiency of a compensation mechanism is the speed by which claims are paid (Fourli 1999). A slow compensation system may quickly lose support since it does not manage to achieve one of its objectives immediately: to appease social tension (Fourli 1999). The public seems to tolerate wolf presence if livestock

owners who have experienced damage from wolf predation are immediately compensated in some way. Seeing that the most commonly referred to issues are those related to wolf conservation rather than wolf eradication shows the tolerance and willingness of the public toward wolf presence.

Agricultural/livestock issues are mostly mentioned by livestock owners and hunters. Both groups seem concerned with the same type of issues. Hunting issues are mainly related to poaching, the relationship between wolves and hunters, game management and predator control inside hunting grounds. Wild boar issues are related to the damage caused by these animals in agriculture, the control of wild boars to minimize damage, and the wolf-wild boar relationship. The interest groups have opposing opinions about most issues, but usually agree on the best approach for dealing with those issues. Very often the interest groups agree that better enforcement and improvement of wolf habitat could help in solving most of the problems. This consistency among the groups could help in reaching consensual solutions for dealing with wolf management issues. Points of agreement are good starting points for managers trying to work with groups toward finding consensus.

In general, when designing communication programs about wolves to be directed to the agricultural community, managers may find it more effective to use persuasive messages that place the agricultural community and "wolf conservation "advocates" on the same side against a "common enemy" " (Bath and Majic 2001). Wolf conservation and livestock breeding are, for example, both threatened by development pressures, changing land use, feral dogs and poaching. If opposing interest groups focus on implementing common solutions, such as protecting livestock, improving habitat for wolves or implementing environmental education programs, then wolf management programs have a better chance of succeeding.

6.6.2 Communication / Understanding People

One of the most frequently mentioned issues is the lack of sensitization of local communities. Frequently the interest groups blame ICN for not providing locals with

information about what has been done concerning nature conservation and for managing natural resources without public involvement. Livestock owners in particular hold the opinion that official entities should meet them and listen to their concerns regarding wolf management and livestock issues. In general, many interest groups have a strong lack of confidence in the Ministries of Environment and Agriculture. This behavioural conflict resulting from the mistrust among interest groups is felt not only in Portugal. In all HD in large carnivore projects, one of the most important and common issues mentioned by interest groups is the lack of communication both between themselves and other interest groups, and between themselves and government agencies (Bath and Majic 2001). This problem represents a challenge for managers who do want to listen and truly engage the interest groups; in this situation the use of an independent facilitator might be necessary to overcome distrust. Some groups showed strong support for and interest in this HD study and saw it as a good starting point to an integrated approach that would involve all parties. The public is willing to see wolf management based on two-way decision-making, not the traditional one-way policy based upon protection-oriented attitudes that has been typical.

Also important is the lack of credibility of environmental NGOs and scientists (biologists), especially among livestock owners and hunters. These interest groups blame environmentalists and biologists for focusing too much on nature conservation when the country faces bigger challenges like unemployment or health care. In addition the respondents mention that "radical environmentalists give bad examples of exaggerated actions toward nature protection".

On the other side, environmentalists argue that their views are never taken into account by government agencies when wildlife management decision-making or environmental impact assessments are taking place. Most key issues concerning wolf management are based on Human-Human conflicts and not Wolf-Human conflicts. The issue of value polarization is common in controversial environmental issues. For example, in the French Pyrenees, the issue of brown bear reintroduction has been very controversial from the beginning. More than a Bear-Human conflict there is a strong political conflict between those who wanted the bears to be reintroduced

(conservationists) and those who did not (livestock owners). Many livestock breeders with a very strong power over the local political authorities were able of killing some reintroduced bears, because they were not involved from the early stages of the bear reintroduction process. Today, conflicts also happen between livestock owners and tourism operators who recognize the importance of bear presence in attracting an increasing number of visitors to the region. These types of issues are difficult to resolve and can only be addressed when interest groups start listening to each others' concerns and begin working together toward finding common solutions. Gaining credibility and respect among local communities is a key factor for government agencies wanting to design a wolf management plan through public involvement.

6.6.3 Biological Issues

All interest groups agreed that human pressures on habitat and food resources threatened the survival of the wolf. These are some of the most important issues to deal with in wolf management. Some argued that coexistence of humans and wolves is difficult to achieve if the wolf population increases. In a highly populated country, where wild prey species for wolves are disappearing, people show their scepticism by arguing that there is a lack of space for humans and wildlife. One of the most important solutions suggested by all interest groups is the improvement of remaining habitat for wolves. Some livestock owners and hunters present more extreme solutions like maintaining wolves enclosed in "natural reserves" and feeding them artificially with dead livestock provided by livestock owners. Both solutions show the willingness of the population to accept wolf presence and avoid the prospect of wolf extinction in the country. Managers should take advantage of such acceptance to start working with the population against a common enemy - human pressure threatening wildlife resources.

Another key issue for all interest groups is the lack of good biological data, which reflects a poor dissemination of data gathered by biologists and other researchers to the general public. Although studies on wolf biology have been taking place for decades, people feel that there is a lack of reliable and valid information concerning basic wolf

biology. The respondents identified an important key solution: the improvement of scientific research focused on damage monitoring, wolf biology and human dimensions, and the delivery of that information to the general public and all interest groups through educational programs.

A valid and balanced discussion of wolf management measures can only be achieved when all the interest groups involved have basic knowledge on the issues under discussion. As a first step in the decision-making process, the groups should share information and evaluate the data that each one has so that all parties can make their decisions based on common ground. For example, if a group perceives that the impact of wolves on livestock is very high, it is more likely to support lethal control measures or payment of significant levels of compensation to livestock owners. Where hunters perceive that wolves have a big impact on reintroduced roe deer populations, such perceptions may lead hunters to support wolf-hunting seasons in the future. Sharing valid and unbiased information on wolf numbers, wolf biology, the impact of wolves on livestock and wild prey, etc. with all the interest groups involved may help to reach consensus and avoid cognitive conflicts among the groups.

6.6.4 Legal / Political Issues

One of the most important issues in wolf management identified by all interest groups was the direct killing of wolves by locals who want to control the number of predators and thereby decrease the level of damage to livestock. In many cases, poisoned bait is used to intentionally kill wolves, feral dogs or other predators perceived by the population as a threat to livestock or game species. Although wolves have been completely protected in Portugal since 1988 (Assembleia da República 1988), many wolves are shot or caught in snares every year. The lack of enforcement is felt by the population as a major problem that needs to be addressed.

Associated with the lack of enforcement of wildlife protection is the inefficiency of official authorities in verifying the implementation of legislation that directly or indirectly affects wolves. For instance, under EU legislation, it is forbidden to leave carcasses of

domestic animals exposed in the fields. Because many people fail to bury the carcasses and enforcement is not effective, wolves have access to additional food resources. In the study area some wolf packs depend entirely on carcass dumping areas for survival. This presents a dilemma, because if legislation is effectively applied, wolf survival will be compromised. At a higher political level, some policies are put in practice with no understanding of the local conditions, and potential conflicts result from contradictory policies. For example, on the one hand, the EU strives for conservation of large carnivores and habitat protection and yet the legislation of burying carcasses could in fact reduce available food sources and decrease large carnivore numbers. The interest groups recognize the difficulty of these broader issues and the challenges of changing such policies. Many solutions presented by the respondents deal exactly with these problems. Revising legislation and the actual damage compensation system, developing new strategies for a better enforcement, and sensitizing managers and politicians for the need of involving the public on decision-making, are all examples of solutions presented by the interest groups, but these must be consistent with larger Pan-European policies.

A common issue mentioned by the respondents is the lack of efficiency of the ICN; the Institute for the Conservation of Nature is responsible for protecting wildlife resources, developing action plans, paying for damage caused by wolves to livestock owners, etc. Whether the issue is the lack of coordination inside the Institute, the lack of credibility of the ICN to the population, the delays in payment of compensation, or the lack of willingness of the Institute to listen to the public, it seems that most people have a negative opinion about the agency. Wolf management is one of many key issues concerning wildlife management in Portugal today. The population recognizes the role of the government and of the ICN in particular in developing appropriate policies for managing wildlife resources. This HD study shows that the population is not pleased with the top-down approaches typically adopted by the government for decision-making purposes. The involvement of the public in the early stages of decision-making is an urgent issue in Portugal if successful wildlife management is to be implemented; not only wolves will benefit from such an approach.

6.6.5 Cultural Issues

Most interest groups mentioned the importance of childhood stories and myths about wolves attacking humans and their importance in influencing the thinking of many people today. People's opinions are still shaped by these stories and sometimes it is difficult to show them that reality is something different from what they have learned from previous generations. Today, a new myth concerning the release of captive wolves into the wild has been causing anger among various sectors of the population. Hunters, livestock owners, the general public, and even municipal governmental staff and veterinarians believe in this modern myth.

For some, these "reintroductions" have to stop, for others the myth has to be clarified. No one seems to agree on who is responsible for such "reintroductions". It seems that each one believes in what is most convenient. In Portugal, such reintroductions have never happened, but nobody shows any willingness to accept the correct information. Ironically, several interest groups felt that if biologists and/or government would simply admit to "reintroducing" wolves, then at least there would be some room to begin building trust.

One cause of strong conflicts, which will be difficult to resolve is the value that people put on wolves and wildlife conservation in general. While some individuals think of wolves as magnificent animals and a symbol of the wilderness, others put a negative value on wolves due to the economic damage caused to livestock. This latter group argues that they would only support wolf conservation when wolves can be shown to be profitable in some way. The development of eco-tourism programs is one solution suggested by pro-wolf and anti-wolf respondents, which means this is an example of a consensual solution toward wolf conservation. However, rural residents still view this type of approach with great scepticism. Managers should start working with locals willing to implement appropriate wolf tourism programs. One good approach to start showing locals the benefits of wolf tourism initiatives is through the presentation of success stories from other countries, like in the Carpathian Mountains in Romania or at the International Wolf Centre in Minnesota, USA. Once the tourism agencies realize the potential

economic benefits of such activities, the most sceptical part of the population will face a new image of the wolf.

Wolf management in Portugal is mostly a problem of conflicting values and mistrust among interest groups. Many respondents argued that other interest groups have different opinions from their own regarding wolf management. Presentation of these results back to the individual groups should be one of the first steps toward getting groups to work together to understand and address wolf management in the study area. A successful engagement of these interest groups in a meaningful public involvement process may include a communication and public awareness component in the future and a demonstration of willingness by political authorities to listen first before acting. In that sense, managers can use these findings to show the interest groups that they share many concerns. Then, interest groups would have to focus on prioritizing the issues and start discussing the issues of common concern with the aim of finding consensual solutions.

6.7 Roles of Each Interest Group

Interest groups were asked about individuals or groups they think should be involved in the decision-making and what role or roles they should play in the management of wolves. All interest groups identified livestock owners, hunters, environmental NGOs, Municipal Governments, the Ministry of Agriculture, and the ICN as important key players in wolf management. Identifying the key players that all groups think are important for the decision-making is a major first step for a successful wildlife management planning process.

It is necessary to show all interest groups the importance of listening to all viewpoints and working together toward finding consensual solutions. There are several points of agreement about the total list of players mentioned by the sampled interest groups. All surveyed groups stated that the Municipal Governments, the Ministry of the Environment, and the Ministry of Agriculture should be involved in some aspect of wolf management.

Hunters see themselves as having an important role in a process of public involvement in wolf management, and showed a willingness toward working together

with other interest groups. A higher level of integration between hunting associations and wildlife scientists is obviously required. To a certain extent, this can be achieved relatively easily in the study area where the hunting associations have a strong interest in re-establishing healthy populations of roe deer, because these will represent a significant source of income for hunters and an additional food source for wolves.

The ICN lists for itself a variety of roles in wolf management including scientific research, the revision of legislation, the management of game species, support for livestock owners, environmental impact assessments, and environmental education. All interest groups and the ICN itself recognize the important role of the government in wolf management. The high number and type of roles assigned to governmental agencies usually carries high responsibility. However, some of the most important solutions mentioned by the interest groups (Table 5.26) are not only the responsibility of the ICN, but also of the Ministry of Agriculture, municipal governments, environmental NGOS, researchers, to name a few. The groups showed a real willingness to be actively involved in working on wolf management, and on inverting the traditional top-down approach to decision-making around wildlife management.

Environmental NGOs did not focus on key issues and key groups around wolf management, but presented ways of dealing with major issues concerning wildlife management in general. They allocated important responsibilities to the government but recognized serious problems with the functioning and structure of various governmental agencies. Environmental NGOs thought these problems needed to be solved first and only afterwards can the interest groups and the general public focus on wolf management.

Livestock owners assigned themselves an active role in wolf management usually aiming at the coexistence of humans and wolves, not wolf eradication. However, sometimes the voice of the executive board level of an association does not necessarily match the opinions of all individuals within the membership of the association. Findings from this study could aid managers wishing to compare attitudes of livestock owners in general to opinions provided by the directors of livestock owners associations. It is of course necessary to evaluate if opinions are consistent.

Biologists listed a large number of interest groups with a role in wolf management, but did not see themselves with as wide a range of tasks as other interest groups. Instead, they seemed to think of wolf management as a process involving many interest groups with specific roles. The groups should discuss whether wolf management should involve many parties each with a small number of responsibilities, or only a few interest groups with a wide range of responsibilities.

Each group mentioned other groups that should be involved which were not included in this study. More detailed interviews with these and other organizations and with more of their members through a focus group format would generate more issues and information. It appears that all groups, if pulled together around a common table and led by an independent facilitator, could each make a valuable contribution to addressing and understanding wolf management. Those involved must agree on who should do what in terms of wolf management. All interest groups with active roles on wolf management should be considered from the early stages of decision-making.

6.8 Public Involvement and Future Research

Public involvement in wildlife management is something new in Portugal and in many European countries. Comments from respondents indicate that this HD study is a welcome effort towards listening to the population. Wolf management certainly deals with many types of conflicts, some of them difficult to resolve. Behavioural conflicts among institutions or individuals are, very often, related to mistrust and not about particular issues around wolf management. Adding old behavioural conflicts to current wolf management issues results in additional challenges that can only be solved through a public involvement process.

The interest groups surveyed in this study have indicated that they see this project as an innovative way to begin listening to the public and grouping information on major key issues for discussion. The groups are interested in working together if the traditional decision-makers show willingness to listen and incorporate others' views in the management process. Managers can expect a strong interest from the public for

participating in the design of a Wolf Action Plan. Public involvement in wolf management *per se* will probably increase people's tolerance toward wolves.

This HD study highlights some important key issues, but does not provide a full understanding of the reasons behind some of the issues. Cognitive dissonance might be affecting opinions toward wolf management issues and attitudes toward wolves. Different interest groups are likely to have varying degrees of information about wolves and wolf issues, thus resulting in different perceptions. Wolf management rests both on reliable scientific information and informed public consent (Minta et al. 1999). Managers have to decide whether education programs and communication campaigns should be implemented in the future. Education programs associated with carnivore conservation programs are the most frequent way in which conservation and communities interact (Sillero-Zubiri and Laurenson 2001), but these programs have to be designed carefully. This study provides directions for communication efforts, allows an assessment of future education programs and enables changes to be measured in attitudes as the wolf population changes and policies affecting management change. This study can be the start of a longitudinal data collection process over time. HD research is not a one-shot, crisis-driven approach to solving complex issues, but a beginning of a process that should see HD integrated regularly into decision-making (Bath and Majic 2001) thus providing managers with opportunities to better understand people's and wildlife's needs.

In Portugal, attitudes toward wolves generally are positive, but people worry about negative impacts to local communities, particularly the damage caused to livestock. These attitudes toward wolves and wolf management should be interpreted as how people thought about the issue at the time they were surveyed, given that attitudes about environmental issues often change as people receive more information and as issues are debated (Fazio et al. 1982). It is uncertain whether wolf populations will increase or decrease in Portugal, whether public attitudes will change, or whether conflicts will remain unsolved in the future. If wolf populations increase, more conflicts with livestock owners are likely because of increased losses of domestic animals. If the human population becomes more urbanized, attitudes seem likely to become more positive. So, what should managers, the various interest groups and the general public expect over the

long-term? The future of wolves depends almost entirely on human will. Today agriculture is declining in Portugal generally and traditional livestock production is declining specifically. If there is very little wild prey, few livestock and no livestock carcass disposal, then wolves have less food available, and are likely to decline. Most respondents surveyed in this study do not want wolves to become extinct. Even those with negative attitudes very often state they would like to have wolves for future generations. This existence value of wolves are in the minds of many people, but do livestock owners have to carry the burden of maintaining the wolf population at their own emotional and financial cost? What will be the tolerance levels of hunters who are currently engaged in reintroducing wild ungulates? Besides linking biophysical information to the socio-political and economical dimensions of the resource management process, HD research can analyse changes over time thus providing updated information to the public and managers alike.

At a spatial scale, HD research also helps in understanding regional and national differences that need to be considered in local management plans. As the LCIE points out, there is no single approach that will enable coexistence of wolves and humans to be achieved throughout a continent as diverse as Europe (LCIE 2003). There is great variation in (1) habitat and landscape, (2) availability of prey, (3) patterns of land-use and animal husbandry, (4) social traditions and attitudes toward large carnivores, and (5) levels of socio-economic development (LCIE 2003). In addition, some large carnivore populations are abundant and continuous with other populations, while others may be critically small, fragmented and highly endangered (LCIE 2003). This is the case of the wolf population living in the area where this study was conducted. In order to succeed, a management strategy must clearly be adapted to local ecological and social conditions, and be flexible to cope with changing circumstances (LCIE 2003).

Findings presented here result from a survey aimed at understanding the HD issues of wolf management in the study area and do not necessarily reflect the situation in the country as a whole. In the north of Portugal the results of a similar survey could be very different because there are more wolves, more damage reported and more wild prey. Even inside the study area there are some regional differences. Future HD research around wolf

management should focus on other regions of Portugal. By using a similar methodology in other parts of the country, managers can compare the human dimensions of wolf management at a regional and national scale and develop, if necessary, different strategies for managing wolves. In the same way as results from HD research conducted in other countries should not be extrapolated to Portugal, findings from this study should not be used for decision-making in other parts of Portugal. This study offers researchers directions for future HD studies in wolf management in Portugal and shows the importance of extending HD research to wildlife management in general.

Future HD research should include sampling more interest groups and conducting more interviews with other members of the groups sampled in this study. It is preferable to focus on members at the executive board level of each institution and then get them to think about the best approaches for sampling other members of the same group. Future HD research around wolf management in Portugal should try to move one step further. It is important to invite all the interest groups, put them together around a common table and work with them on the Common Ground Matrices (CGMs). The various groups can look at these results and realize that they share issues of common concern, and recognize similar solutions for managing wolves. By evaluating the effectiveness of the CGMs presented before, managers can encourage the interest groups to continue working together toward finding consensual solutions. These two phases highlight the practical component of HD research of wildlife management. The interest groups sampled in this study are already involved and demand a continued process of public involvement. Governmental authorities and wildlife managers can use the information presented here to understand the interest shown by the groups on issues around wolf management. It will depend on political will to start a process of wolf management based on the findings presented here. This HD study can help managers understanding the social-political context of wolf management in the study area. More specifically managers can more easily understand that:

- there are differences in knowledge levels and attitudes towards wolves and wolf management among the general public and the various interest groups, and differences in attitudes toward some issues also occur across space ;

- knowledge levels are consistently low among most respondents and those levels are not directly associated with attitudes toward wolves;
- factual knowledge about wolves might not be reaching the public through the school system but through direct contact and experience with nature;
- knowledge levels and attitudes are affected by the socio-demographic characteristics of the respondents as well as by their interest and experience with wolves;
- most interest groups share issues of common concern and very often agree on the approaches to deal with those issues;
- many interest groups not surveyed in this study should be involved in future wolf management decision-making;
- all interest groups want the wolf to survive for future generations and are willing to participate in a wolf management process from the early stages of decision-making.

Overall, this study shows that wolf management in Portugal will likely remain more a socio-political issue than a biophysical one. This situation is common to most wildlife resource issues. Managing natural resources without considering human and biophysical components together will certainly lead to unbalanced decision-making. The HD component of wildlife management is very new in Portugal and is still evolving in countries with a longer tradition of HD research. In this century, with a rapid increase in the number of human-wildlife conflicts and a growing public interest and involvement in wildlife issues, HD research will undoubtedly become more important. The rule is simple: "If people are part of the problem, they must be part of the solution". One of the main challenges facing HD research in the future is to develop strategies to integrate informed public input and involvement into wildlife management decision-making. The continued maturation of HD research will be vital to the evolution of wildlife management to meet future societal needs for the wildlife resource.

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Chapter 8 - APPENDIX

APPENDIX I: Questionnaire

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

1. Which of the following best describes your opinion about wolves?

a) Strongly dislike
b) Moderately dislike
c) Neither like or dislike
d) Moderately like
e) Strongly like

2. To have wolves in Portugal is:

a) good b) bad c) indifferent

3. To have wolves in the county of *Aveiro-Viseu / Guarda / Castelo Branco* (in regard to respondent's 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** = No opinion; **4** = Agree; **5** = Strongly Agree

		Strongly Disagree	Disagree	No opinion	Agree	Strongly Agree
4.	**It is important to maintain wolf populations in Portugal for future generations.**	1	2	3	4	5
5.	**It is important to maintain wolf populations in the county of *Aveiro-Viseu/Guarda/C. Branco* (in regard to respondent's region), for future generations.**	1	2	3	4	5
6.	**It is important to have a healthy population of wolves in the county of *Aveiro-Viseu/Guarda/C.Branco* (in regard to respondent's region).**	1	2	3	4	5
7.	**We should ensure that future generations have an abundant wolf population.**	1	2	3	4	5
8.	**Whether or not I see a wolf, it is important to me that they exist in the county of *Aveiro-Viseu/Guarda/C. Branco* (in regard to respondent's region).**	1	2	3	4	5

		Strongly Disagree	Disagree	No opinion	Agree	Strongly Agree
9.	**Whether or not I see a wolf, it is important to me that they exist in Portugal.**	1	2	3	4	5
10.	**Wolves have a big impact on big game.**	1	2	3	4	5
11.	**Wolves have a big impact on small game.**	1	2	3	4	5
12.	**Wolves reduce populations of roe deer and wild boar to unacceptable levels.**	1	2	3	4	5
13.	**It is unnecessary to have wolves in the county of *Aveiro-Viseu/Guarda/C. Branco* (in regard to respondent's region) because abundant populations of wolves already exist in other parts of Portugal.**	1	2	3	4	5
14.	**It is unnecessary to have wolves in Portugal because abundant populations already exist in other European countries.**	1	2	3	4	5
15.	**Wolves should be completely protected in Portugal.**	1	2	3	4	5
16.	**Wolves should be completely protected in the county of *Aveiro-Viseu/Guarda/C.Branco* (in regard to respondent's region).**	1	2	3	4	5
17.	**Wolves should be allowed to be hunted in specific hunting seasons in the county of *Aveiro-Viseu/Guarda/C. Branco* (in regard to respondent's region).**	1	2	3	4	5
18.	**Wolves should be allowed to be hunted year round in the county of *Aveiro-Viseu/Guarda/C.Branco* (in regard to respondent's region).**	1	2	3	4	5
19.	**Wolves should be killed by all means including the use of snares and poison in the county of *Aveiro-Viseu/Guarda/C.Branco* (in regard to respondent's region).**	1	2	3	4	5
20.	**Wolves keep roe deer and wild boar populations in balance.**	1	2	3	4	5

		Strongly Disagree	Disagree	No opinion	Agree	Strongly Agree
21.	**Having wolves in the county of *Aveiro-Viseu/Guarda/C.Branco* (in regard to respondent's region) may increase tourism in this region.**	1	2	3	4	5
22.	**Wolves cause abundant damage to livestock.**	1	2	3	4	5
23.	**In areas where wolves live in close proximity to humans, 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.	**Wolves have the right to exist as any other species.**	1	2	3	4	5

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

a) Wolf
b) Lynx
c) Wild boar
d) Feral dogs
e) Equally dangerous
f) None are dangerous

SECTION B: The next few questions ask about your general knowledge of the wolf.

1. How many wolves do you believe currently exist in Portugal? _____ wolves

2. Do you believe wolf numbers in Portugal are:

a) increasing
b) decreasing
c) remaining the same

3. How many wolves do you believe currently exist in the county of *Aveiro-Viseu /Guarda / Castelo Branco* (in regard to respondent's region) ? _____ wolves

4. Do you believe wolf numbers in the county of *Aveiro-Viseu /Guarda / Castelo Branco* (in regard to respondent's region) are:

a) increasing
b) decreasing
c) remaining the same

5. How much does the average adult male wolf weigh in Portugal?

a) 1-20 Kg
b) 21-40 Kg
c) 41-60 Kg
d) more than 60 Kg
e) I don't know

6. There used to be wolves throughout the entire county of Aveiro-Viseu /Guarda / Castelo Branco (in regard to respondent's region).

a) yes b) no c) not sure

7. Wolves are completely protected in Portugal.

a) yes b) no c) not sure

8. Is it generally true that only two members of a wolf pack breed in any one year?

a) yes b) no c) not sure

9. How many sheep and goats do you think were killed by wolves last year in the county of *Aveiro-Viseu /Guarda / Castelo Branco* (in regard to respondent's region) ? _____ sheep and goats

10. Wolves kill sheep and goats only if there is not enough wild game.

a) truth b) false c) not sure

11. How often is a wolf generally able to kill wild prey?

a) in every case
b) one in two chances
c) one in ten chances
d) one in twenty chances
e) not sure

12. What is the average pack size of wolves in Portugal?

a) 1-5 wolves
b) 6-10 wolves
c) 11-20 wolves
d) more than 20 wolves
e) not sure

Section C: These last few questions ask about your feelings toward various management practices and your attitude toward wolves. Please, choose the response that best describes your opinion, using the following scale:
1 = Strongly Disagree; **2** = Disagree; **3** = No opinion; **4** = Agree; **5** = Strongly Agree

	Strongly Disagree	Disagree	No opinion	Agree	Strongly Agree
1. I would agree with increasing wolf numbers in Portugal.	1	2	3	4	5

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

_____

_____

If you agree or strongly agree, what is your primary reason for not wanting wolf numbers to increase in Portugal?

_____

_____

		Strongly Disagree	Disagree	No opinion	Agree	Strongly Agree
2.	**I would agree with increasing wolf numbers in the county of *Aveiro-Viseu /Guarda/C.Branco* (in regard to respondent's region).**	1	2	3	4	5
3.	**If a wolf killed livestock, I would agree with killing that wolf.**	1	2	3	4	5
4.	**I would be willing to contribute money toward a compensation program for livestock owners for losses due to wolves.**	1	2	3	4	5
5.	**There are enough wolves in Portugal.**	1	2	3	4	5
6.	**There are enough wolves in the county of *Aveiro-Viseu/Guarda/C.Branco* (in regard to respondent's region).**	1	2	3	4	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 receive compensation for damage caused by wolves only if they do use methods to prevent damage, e.g., 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 ***agree*** or ***strongly agree*** with **#9**, please answer the following questions **a)** to **g)**. If you ***disagree*** or ***strongly disagree*** or have ***no opinion***, please answer questions in **SECTION D**. Thank you.

		Strongly Disagree	Disagree	No opinion	Agree	Strongly Agree
a)	*I would like part of my taxes to be used toward paying compensation for damage caused by wolves.*	1	2	3	4	5
b)	*The Government 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)	*The Government should pay for this insurance for livestock owners.*	1	2	3	4	5
e)	*There should be authorized wolf hunts in the county of Aveiro-Viseu/Guarda/ C.Branco (in regard to respondent's region).*	1	2	3	4	5
f)	*The Government should help livestock owners to implement methods for preventing damage, e.g. good guarding dogs and fences.*	1	2	3	4	5

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

1. Have you ever seen a wolf in captivity?

a) yes b) no c) not sure

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

a) yes b) no c) not sure

3. When was the last time you saw wolves in the county of *Aveiro-Viseu /Guarda / Castelo Branco* (in regard to respondent's region)?

a) in the last 2 years ☐ more precisely in 200__
b) in the 90s ☐ more precisely in 19___
c) in the 80s ☐ more precisely in 19___
d) in the 70s ☐ more precisely in 19___

in the village _____, in the municipality_____

4. Have you ever killed a wolf?

a) yes (village_____; municipality_____; year_____)

b) no

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

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

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

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

SECTION E: Personal information (all data is confidential):

I. Gender

a) Female b) Male

II. Age: _____

III. Place of residence: village _____ municipality _____

Place of birth: village _____ municipality _____

IV. How long have you lived in this county? _____

V. Occupation _____

VI. Education level

a) never went to school
b) 1st-4th grade
c) 5th-6th grade
d) 7th-9th grade
e) 10th-12th grade
f) bachelor or major
g) graduation

VII. Did you ever hunt?

a) no b) yes (last time:_____)

VIII. If you are a livestock owner, what type of livestock do you have? (choose all that apply)

a) sheep
b) goats
c) cows
d) other_____