



Brown Bear Management Plan for the Republic of Croatia

Zagreb 2008

Publishers:

Ministry of Regional Development, Forestry and Water Management, Directorate for Hunting

Ministry of Culture, Directorate for the Protection of Nature

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Typeset: Josip Šulj

Printed by: Narodne novine d.d.

Number of copies: 500

ISBN: 978-953-55169-1-0

CIP: 669508

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PREFACE

The Brown Bear Management Plan for the Republic of Croatia is the first comprehensive document offering the fundamentals of the brown bear life and management in the Republic of Croatia. This plan is based on scientific and ecological knowledge, placed within the legislative, administrative, cultural, economic and social frameworks in Croatia. Furthermore, it is largely based on the adopted international conventions, plans and recommendations related to the conservation and the protection of the brown bear worldwide, in Europe and in particular in the Alps-Dinaric-Pindos.

The brown bear in Croatia is a free-ranging species inhabiting an ecologically preserved area of more than 10.000 km² (1.000.000 ha). The area is part of the wider Alps-Dinaric-Pindos region, which is home to a large brown bear population, which requires coordinated action both in the development and implementation of this plan.

In accordance with the responsibilities deriving from adopted international conventions, directives, plans and recommendations, in 2002 the Ministry of Agriculture and Forestry and the Ministry of Environmental Protection and Physical Planning appointed an expert committee for the development of the Brown Bear Management Plan for Croatia. The committee is made up of eight renowned experts and scientists, who were chosen so as to ensure that the different institutions are equally represented.

It must be underlined that the activities for the protection of the brown bear in Croatia began much earlier, as described in Chapters 4.1. and 4.2. Starting from 1997 and aiming at achieving a consistent management and protection of bears in Croatia, a series of consultations on the matter were held with representatives of different stakeholders (Lividraga 1997, Gerovo 1999, Gerovo 2002). Furthermore, veterinary and forestry researchers, as well as hunters, have conducted comprehensive researches over the years, the result of which is the existence of an adequate scientific literature and valuable data regarding the brown bear biology.

This management plan attempts to encompass the current knowledge related to brown bear management, as well as to promote modern, ecologically-based wildlife management that includes protection and conservation of biological and environmental balance of natural habitats and their sustainable use.

The plan has been devised as an active document to be constantly updated, which brought about amendments to both primary and secondary legislation in force governing hunting protection of biodiversity and landscape diversity and other sectors; the Plan itself is based on the Hunting Act. Annual brown bear management plans, monitoring plans and reports for the competent authorities shall be based upon this plan.

In that sense, the plan is to be the fundamental document to which appendices concerning special researches (sociological, economic, biological, ecological, etc.) shall be added, alongside with Action plan for each year.

The Republic of Croatia is currently experiencing substantial changes in various domains, which may also be expected in the upcoming years and which may influence considerably the brown bear population. Those changes shall largely have negative effects, which makes it of even greater importance to recognise them, examine them and find adequate mechanisms to mitigate

their negative effects. This management plan shall be the central point around which the activities for the protection and the conservation of bears in Croatia shall be carried out in the upcoming period.



Preface to the I revised text

The Brown Bear Management Plan for the Republic of Croatia was developed in 2004 and adopted in may 2004 by means of the Decision of the Ministry of Agriculture, Forestry and Water Management. In the past three years of its implementation both its good and bad sides have arisen, different new regulations have been adopted (Nature Protection Act, Hunting Act, Regulation on the National Ecological Network, numerous ordinances, etc.), which resulted in the need to further adapt the Plan to the new situation.

Furthermore, the Environmental Protection and Energy Efficiency Fund has been put “in service”, showing full understanding for issues dealt with in this Plan.

Experience concerning the determination and the realisation of annual culling quotas of this species, as well as its distribution is also of great importance.

All those elements, along with other more or less important circumstances, are the reason for producing this revised text which may be expected to add some quality to the Brown Bear Management Plan for the Republic of Croatia, as well as to render it more acceptable (as is the hope of its authors) to other subjects involved in the brown bear population management, also beyond the state borders of the Republic of Croatia.

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INTRODUCTION

Geographically, Croatia belongs both to central and south-eastern Europe. Its innermost part is formed by the Dinara mountain range, the eastern slopes of the Alps and the Dinarides. It is a hilly and mountainous region inhabited by the brown bear for thousands of years, being an extensive, biologically and ecologically preserved habitat of the largest of the European wild carnivores. The integrity of this habitat is also confirmed by the presence of the two remaining large carnivores: the wolf and the lynx, as well as a number other animal species that have disappeared from other parts of Europe.

The brown bear in Croatia is a wildlife species, as well as a game species, which deserves the utmost care and attention and which undeniably has the right to exist. The brown bear is one of the most valuable representatives of biodiversity in this area and plays an important role in its preservation. With respect to other animal species, the brown bear is at the top of the food web and is directly threatened only by man and his activities. Since bear and man inhabit the same areas, it is apparent that there is a need to ensure their coexistence, which is the goal that a series of measures laid down in this Plan aim to accomplish.



Implementation of measures for the conservation and the protection of biological and environmental balance of natural habitats of bears, i.e. the coexistence of bear and man, has to be devised on the basis of modern ecological knowledge governed by the adequate legislation, but there has to be also a general consensus of different stakeholders concerning key issues. Those measures cannot be applied on the basis of individual cases or according to one person's will, but are to be regulated by an official document – in this case, the Brown Bear Management Plan for the Republic of Croatia.

The purpose of the Brown Bear Management Plan for the Republic of Croatia is to determine a management goal within a framework established by international and national regulations, to define measures to be implemented for the conservation of natural habitats and the bear population, as well as measures enabling the coexistence of man and bear. Furthermore, this Plan should be aligned with the equivalent plans of neighbouring countries that equally manage the existing bear populations, as well as with appropriate action plans of the European institutions. Guidelines for Population Level Management Plans for Large Carnivores, drawn up in 2007 by the Large Carnivore Initiative for Europe (LCIE) by contract for the European Commission, has been implemented in that way.

This plan encompasses the following basic sections: I General Overview, II Specific Section and III Bear Management. Certain items of each of these sections are more detailed depending on the issue being dealt with and the prescribed measures.

I GENERAL OVERVIEW

1 THE PURPOSE OF THE PLAN

Due to all its biological peculiarities, the important place it occupies in the human mind and the considerable international interest for its conservation, the management of large carnivores such as bears is extremely challenging. The Management Plan is expected to reconcile different interests, such as environmental, aesthetic and economic interests, as well as care for the safety of man and his property.

The purpose of the Plan is also to ensure conditions for the long-term survival of the brown bear, which listed as an endangered species and protected by a number of international regulations, in a way to preserve its game-species status in Croatia. Careful evaluation of encroachment upon the population is the most critical part of the Plan. Such encroachment should contain the size of the bear population within the social capacity of the habitat, i.e. the number of bears acceptable to man, which should minimize possible conflicts with man ensuring at the same time the long-term viability of the population. In order to achieve this goal, a series of other activities and measures related to the bears' habitat and human encroachment upon the habitat (e.g. construction of roads and so forth), the feeding of bears by humans, the prevention of the creation of nuisance bears and the scientific monitoring of all changes in the population are to be regulated. The implementation of the plan is largely the task of the hunting management experts; however, representatives of other stakeholders should also be actively involved. Finally, the plan should be revised on a regular basis and more extensively than other management plans.

Large carnivore management and especially bear management, presents itself with no final and universal solutions. Each change in the number, home range or behaviour of bears requires new decisions. The Plan should offer a framework for the adoption thereof and it should be adjusted through the review process to new, durable circumstances.

Croatian citizens, citizens of neighbouring countries, as well as Europe and the world, expect from Croatia to ensure the survival of this species on its territory in the largest sustainable number with as few negative effects as possible with its Brown Bear Management Plan.

2 STARTING POINTS FOR THE DEVELOPMENT OF THE PLAN

The key starting points for the development of the Brown Bear Management Plan are the bear population itself and its preserved natural habitat on a surface of more than 10.000 km² (1.000.000 ha), the already achieved level of understanding among different stakeholders and the society as a whole regarding the need to conserve and improve the coexistence between man and bear, as well as legal provisions and international conventions and agreements concerned with the brown bear protection. Other important starting points are the results of conducted and published scientific studies, rich experience in bear management, top expert knowledge, skilled staff and good organisation of plan managers.

3 LEGAL PROVISIONS CONCERNING BEAR MANAGEMENT

3.1 International Legal Provisions

- Convention on Biological Diversity, (Official Gazette of the Republic of Croatia, “Međunarodni ugovori” [International Treaties] – 1/6/96)
- Convention on the conservation of European wildlife and natural habitats (Bern Convention) (Official Gazette of the Republic of Croatia, “Međunarodni ugovori” [International Treaties] – 3/5/00)
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (Official Gazette of the Republic of Croatia, “Međunarodni ugovori” [International Treaties] n. 12/99)
- Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (Habitat Directive)
- Council Regulation (EC) No 338/97 of 9 December 1996 on the protection of species of wild fauna and flora by regulating trade therein
- Action plan for the conservation of the brown bear (*Ursus arctos*) in Europe. Report to the Council of Europe. Convention on the Conservation of European Wildlife and Natural Habitats T-PVS (2000) 24: 1-68 Swenson, J. E., Gerstl, N., Dahle, B. and Zedrosser, A. (2000)
- Guidelines for Population Level Management Plans for Large Carnivores, Large Carnivore Initiative for Europe (LCIE) by contract for EC, 2007.

The Republic of Croatia has signed all of the relevant international treaties concerning nature protection and in so doing has joined the international community in their efforts to protect nature on the global level. One of the fundamental provisions is the Convention on Biological Diversity, ratified by Croatia in April 1996 (Official Gazette of the Republic of Croatia, “Međunarodni ugovori” [International Treaties] – 6/96) and taking thereby the commitment to conserve and improve the existing biodiversity, as well as to use its components sustainably.

The Convention on the conservation of European wildlife and natural habitats (Bern Convention) was ratified by Croatia in 2000. This convention lays down the necessary measures that European countries are to carry out for the purpose of the protection of wildlife species, in particular those listed in the Appendices to the Convention, as well as the protection of their natural habitats. The brown bear (*Ursus arctos*) is listed in Appendix II of the Bern Convention containing strictly protected fauna species, for which all forms of exploitation, deliberate disturbance and deliberate destruction of their habitats are prohibited. Since the bear population

in Croatia is not as much endangered as to require strict protection, the Republic of Croatia has in accordance with Article 9 of the Convention made an exception to the provisions thereof by treating bears in Croatia as species listed in Appendix III of the Convention. The Large Carnivore Initiative for Europe (LCIE) has in relation to the Bern Convention developed the Action Plan for the Conservation of the Brown Bear (*Ursus arctos*) in Europe, containing also recommendations for the Action Plan for the Conservation of the Brown Bear in Croatia. Therefore, the brown bear in Croatia has the status of a species that may be exploited; however, this exploitation has to be regulated through legal provisions. In order to ensure the conservation of bear habitats the contracting parties shall include the areas inhabited by bears in the eco-network of Areas of Special Conservation Interest – ASCI (Emerald Network). In ASCI areas the implementation of protection measures and management aiming at the preservation of nature is compulsory.



The Republic of Croatia is a contracting party to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (Official Gazette of the Republic of Croatia, “Međunarodni ugovori” [International Treaties] No 12/99) and is therefore bound to control the international trade in endangered species through a system of import and export permits and certificates. The brown bear is listed in Appendix II of the CITES as a potentially endangered species, which is the reason why the international trade in bears must be strictly controlled. Import and export of that species is possible only with special permits.



Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (Habitat Directive) is one of the basic regulations concerned with nature protection in the European Union. Members of the European Union are to incorporate the provisions of the said directive in their national legislation. As a candidate country for EU membership, Croatia too has that obligation. The brown bear is listed in Annex II of the Directive, including animal and plant species of Community interest, the conservation of which requires the establishment of Special Areas of Conservation – SAC – within the European Ecological Network Natura 2000 (with the exception of the populations in Sweden and Finland). The brown bear is also listed in Annex IV, containing animal and plant species of Community interest requiring strict protection (capturing, killing and disturbing are prohibited), with the exception of the above populations. Pursuant to Article 16 of the Directive, the harvest of a limited number of bears is allowed in special circumstances only. Keeping, transport and trade in species listed in Annex IV are strictly prohibited, except in the interest of preventing serious damage to livestock, for public health and safety reasons, use for scientific purposes, restocking and re-colonisation.

Trade is also prohibited by the Council Regulation (EC) No 338/97 of 9 December 1996 on the protection of species of wild fauna and flora by regulating trade therein. This act regulates the trade in protected species of wild fauna and flora in the European Union and represents the legal basis for the implementation of CITES in the EU. The brown bear is listed in Annex A of the said Regulation, including endangered, extinct or rare species, the international trade in which would endanger their survival.

The European Parliament adopted a Resolution on 17 February 1989, inviting thereby the European Commission to encourage the creation of bear protection programmes in Europe and to continue with the implementation of the already existing programmes. The European Parliament Resolution of 22 April 1994 invited the European Commission not to support spatial planning activities which could have a negative impact to bear populations. Such spatial planning is to be avoided by the creation of protected areas and corridors.

The 1st edition of the Brown Bear Management Plan in Croatia (2005) entirely complies with the guidelines of the Action Plan for the Conservation of the Brown Bear (*Ursus arctos*) in Europe, whilst the 2007 revised version is also in compliance with the Guidelines for Population Level Management Plans for Large Carnivores, taking into account that Croatia shares its brown bear population with Bosnia and Herzegovina and Slovenia.

As a contracting party to the above conventions, Croatia is committed to implementing all necessary legal and administrative measures on the national and international level in order to ensure the protection of bears and their natural habitat, to ensure the existence of genetically viable bear populations which would constitute potential source for the reintroduction of this species into suitable habitats in other European countries in which the species has disappeared.

3.2 National legal provisions and documents

The national legal provisions and documents governing bear management and conservation are the following : the Hunting Act, Ordinance on Closed Hunting Season, Ordinance on Hunting Firearms and Ammunition, Ordinance on Contents and Methods of Development and Approval of Hunting Management Programmes, Game Rearing and Game Protection Programmes, Ordinance on Game Warden Service, Ordinance on the Expert Service for the Implementation of Hunting Management Programmes, Ordinance on Breeds, Numbers and Use of Hunting Dogs, Ordinance on the Assessment of Hunting Trophies, Hunting Trophy Certificates, Hunting Trophies Record Keeping and Report on Assessed Trophies, Hunting Management Programmes and Game Rearing Programmes, Forest Act, Nature Protection Act, Animal Protection Act, Veterinary Act, Ordinance on Handling and Disposal of Animal Carcasses and Animal By-products, National Strategy and Action Plan for the Protection of Biodiversity and Landscape Diversity – NSAP, Recommendations of the Bern Convention for the Action plan for the conservation of the brown bear in Croatia, authorities for the development and the adoption of the Management Plan and public involvement in the development of the Plan.

The brown bear has been included on the Red List of Threatened Species of Fauna and Flora of the Republic of Croatia (2004).

3.2.1 Hunting Act (Official Gazette No 140/05)

The Hunting Act was adopted on the session of 17 November 2005 of the Croatian Parliament and is aligned with the Croatian legal system in single administrative areas, embraces

the fundamental principles adopted by the International Council for Game and Wildlife Conservation (CIC), in particular concerning nature protection, conservation of biological and environmental balance of natural habitats and the protection of game and other wildlife species, as well as the provisions on the protection of game and other animal species and their habitats deriving from adopted international conventions. The Hunting Act is also aligned with international conventions.

The Hunting Act has replaced the old Hunting Act, which underwent numerous amendments in the course of its validity.

The Hunting Act classifies the brown bear as a game species in Croatia. The Act also lays down provisions for its protection, of which the following provisions related to rearing, protection, hunting and exploitation of game, the brown bear included, are listed below:

- Article 4 Game is of special interest for the Republic of Croatia and therefore enjoys its special protection;
- Article 12 Hunting unit leaseholders shall enable scientific and academic institutions to carry out research activities envisaged by their special programmes at own expense on their hunting units in accordance with a Ministry permit. Those institutions shall visually mark the areas in which such activities are performed;
- Article 49 Game rearing and protection includes all measures and activities prescribed by the Hunting Management Programmes, as well as the care for other species and their habitats;
- Article 51
 - a closed hunting season is prescribed for each game species;
 - hunting of a game species may be temporarily prohibited;
 - size, sex ratio and age structure of a game population must be maintained,
 - conditions for breeding and raising of offspring must be ensured,
 - preventative, diagnostic, therapeutic and sanitary measures must be ensured,
 - adequate quantities of food and drinking water must be ensured.
- Article 52 Hunting of mammal game females is prohibited in late gravidity or when nursing young offspring.
- Article 59 The brown bear hunting may be conducted in accordance with the annual Brown Bear Management Plan of the Republic of Croatia, adopted and implemented by the Ministry upon proposal of the National Committee for the creation of the Brown Bear Management Plan of the Republic of Croatia and monitoring of large carnivores populations.
- Article 64 Harvest of game by means causing mass destruction thereof or when threatened by floods, snowfall, frost or fire is prohibited; it is prohibited to use traps or snares for that purpose (except for scientific purposes), to hit animals by vehicles, and to use crossbows and bows, as well as narcotics;

- Article 66 Game may be harvested with hunting weapons and suitable ammunition corresponding to the size of the animal; large game may be harvested by using bullets fired from weapons with a rifled barrel; hunting with automatic weapons is prohibited;
- Article 68 Hunting is permitted to persons who successfully passed a hunting examination.
- Article 74 Game and their parts may be kept, transported or traded only with a certificate containing information on its origin;
- Articles 96 – 101 deal with criminal matters and applicable sanctions.

The Hunting Act lays down fundamental provisions, which are defined in detail for each procedure and action in the implementing regulations – ordinance, adopted by the Minister of Agriculture, Forestry and Water Management (currently Minister for Regional Development, forestry and Water Management) pursuant to the Hunting Act and the State Administration Act.

The following implementing regulations have been adopted pursuant to the Hunting Act:

3.2.1.1 Ordinance on Closed Hunting Season (Official Gazette No 155/05 and 82/06)

The Ordinance on Closed Hunting Season prohibits bear hunting from 1 May to 30 September and from 16 December to 1 March.

3.2.1.2 Ordinance on Hunting Firearms and Ammunition (Official Gazette No 68/06)

The Ordinance on Hunting Firearms and Ammunition lays down that bears may be hunted with hunting ammunition with a kinetic energy greater than 3,500 joule per 100 m and the bullets must be heavier than 11.50 grams. The maximum allowed shooting distance is 100 metres.

3.2.1.3 Ordinance on Contents and Methods of Development and Approval of Hunting Management Programmes Game Rearing and Game Protection Programmes (Official Gazette No 40/06)

3.2.1.4 Ordinance on Game Warden Service (Official Gazette No 63/06)

3.2.1.5 Ordinance on the Expert Service for the Implementation of Hunting Management Programmes (Official Gazette No 63/06)

3.2.1.6 Ordinance on Breeds, Numbers and Use of Hunting Dogs (Official Gazette No 62/06)

3.2.1.7 Ordinance on the Assessment of Hunting Trophies, Hunting Trophy Certificates, Hunting Trophies Record Keeping and Report on Assessed Trophies (Official Gazette No 62/06)

3.2.1.8 Hunting Management and Game Protection Programmes

An overview of these regulations is laid down in Chapter “Present-day Management”.

3.2.2 Forest Act (Official Gazette No 140/05 and 82/06)

The Forest Act refers to wildlife management with a limited number of provisions. The most significant one is the provision prescribing that forest wildlife should be managed in those numbers that do not jeopardize forest management. Management unit programmes lay down the acceptable number of wildlife animals per surface unit on a hunting ground.

Bear management and protection are also concerned by the Forest Act provisions related to the natural restoration of forest elements, sustainable use of forests and maintenance of a natural ratios among tree species. Provisions prohibiting and regulating the lighting of fires, building of objects in forests, timber harvesting periods and methods, mining, waste disposal, illegal use of forest roads and so forth are important as well.

3.2.3 Nature Protection Act (Official Gazette No 70/05)

The Nature Protection Act regulates the protection and conservation of nature and its resources; within the meaning of this Act, the nature is intended as the totality of biodiversity and landscape diversity.

The Act requires the adoption of implementing regulations which would establish measures for the protection of wildlife. It also incorporates provisions of international conventions and treaties.

Exploitation of protected wildlife species is allowed in those manners and quantities that do not endanger their population on the national or local level. Where a species is considered endangered due to its exploitation, the Minister may adopt an Order prohibiting or limiting such exploitation of the species in question.

3.2.3.1 Ordinance on declaring protected and strictly protected wildlife species (Official Gazette No 7/06)

Endangered or rare wildlife species (species and subspecies) may be classified as strictly protected and protected species. Protected species are important sensitive or rare local wildlife species which are not in danger of extinction on the territory of the Republic of Croatia. Wildlife species endangered within the meaning of this act have been declared protected or strictly protected species on the basis of an assessment of the level of their endangerment and obligations deriving from international treaties signed by the Republic of Croatia. The Ordinance has been adopted on the basis of the Red List drawn up by the State Institute for Nature Protection.

Accordingly, the brown bear is a protected species in the Republic of Croatia and it is managed pursuant to this Plan.

Natural resources management plans must prescribe measures and conditions for the protection of nature which ensure the conservation of wildlife species and their natural habitats.

3.2.3.2 Regulation on the National Ecological Network (Official Gazette No 109/07)

The ecological network is a system of interconnected or neighbouring ecologically important areas, which significantly contribute to the preservation of natural balance and biodiversity by their balanced bio-geographical distribution.

The conservation of the ecological network ensures the conservation of different types of habitats as well as the regeneration of disturbed habitats. Within the meaning of this act, ecologically important areas are the areas of presence of endangered and rare habitat types. The

aforementioned institutes is responsible for monitoring the habitats and their level of endangerment.

Certain ecologically important areas contribute significantly to the conservation of biodiversity and landscape diversity in the Republic of Croatia, of habitats of endangered species on the global, European or national level, of areas which contribute to the genetic exchange between populations of biologic species (ecological corridors), of animal migration corridors and so forth.

3.2.3.3 Ordinance on crossings for wild animals (Official Gazette No 34/06)

This Ordinance lays down protection measures, persons responsible for the protection and provisions concerning the maintenance of crossings, ensuring an undisturbed and safe crossing of wild animals. The said crossings are protected as natural heritage.

3.2.3.4 Ordinance on cross-border transport and trade in protected species (Official Gazette No 34/06)

Pursuant to this Ordinance, the Ministry of Culture issues permits for entry, exit, export or import of wildlife species, their parts and derivatives protected in accordance with the above Act.

3.2.4 Animal Protection Act (Official Gazette No 135/06)

One of the most important national regulations concerning animal protection is the Animal Protection Act (Official Gazette No 135/06). The Ministry of Agriculture, Forestry and Water Management is responsible for its implementation. This Act regulates animal welfare related to the keeping of animals, their housing, nutrition, protection and general conduct towards animals. It also regulates the animal killing and the protection of wild animals. Catching wild animals and their killing are not permitted in a way that causes lasting suffering, except if it is extremely necessary for scientific purposes and in order to help a certain animal population. Article 25 prohibits the use of constrained animals in shows (e.g. bears).

This Act regulated responsibilities, obligations and duties of natural and legal persons with respect to animal protection, including the protection of their lives, health and welfare, manner of conduct towards the animal, conditions necessary for animal protection related to the keeping, rearing and transport of animals, experimenting on animals, slaughter and killing of animals, keeping of animals in zoos and circuses, using animals in shows and competitions, pet sale and conduct towards abandoned and lost animals. Veterinary Directorate of the Ministry of Agriculture, Forestry and Water Management is the competent body for the implementation of this Act. This Act also regulates protection of wild animals in their natural habitats, for which hunting unit leaseholders must ensure the following:

1. all conditions necessary for the biological survival of the natural population, as well as ecological balance;
2. removal of existing or new habitat disturbances;
3. protection of animal health.

This Act also regulates keeping of animals in zoos and the protection of animals used in circuses and other shows. Article 53 prohibits the keeping of wild animals in circuses and their use in circus and other shows, as well as the use in shows of constrained animals and animals with physical defects.

3.2.5 Veterinary Act (Official Gazette No 41/07)

This Act regulates, among other, issues regarding animal health, implementation of veterinary public health measures, control of zoonoses, safety of products of animal origin and veterinary protection of the environment.

This Act also regulates protection of animal health, implementation of veterinary public health measures, improvement of animal reproductions, veterinary protection of the environment, official veterinary controls and inspections.

Within the meaning of this Act, the “animal” means also wild animals, i.e. carnivores.

The bear, like other animal species, is subject to certain infectious diseases. Measures for the detection and prevention of infectious diseases, as regulated by this Act, are defined each year for the following year by the Minister of Agriculture, Forestry and Water Management according to the epizootic situation and level of endangerment. In addition to the measures, with the aim of detecting and preventing infectious diseases, all animals and animal products are inspected during production and after their placing on the market. Each harvested bear is therefore checked for rabies and trichinellosis.

Processing facilities for game meat and other animal products intended for human consumption and facilities for storage, trade and placing on the market of such products must comply with the prescribed animal health conditions.

3.2.5.1 Ordinance on Handling and Disposal of Animal Carcasses and Animal By-products (Official Gazette No 24/03)

This Ordinance regulates the handling of animal carcasses and animal by-products, veterinary and sanitary conditions applicable to facilities and equipment for collection and temporary storage thereof, facilities for thermal processing of animal carcasses and by-products and incinerators for animal proteins and fat, as well as conditions applicable to vehicles for the collection and transport of animal carcasses and by-products.

Article 16 of the Ordinance allows the feeding of animals in hunting units with condemned viscera and slaughter by-products not intended for human consumption only against issue of a special permission by the Ministry of Agriculture, Forestry and Water Management.

3.2.6 National Strategy and Action Plan for the Protection of Biodiversity and Landscape Diversity – NSAP (Official Gazette No 81/99)

In June 1999 the Croatian parliament adopted the National Strategy and Action Plan for the Protection of Biodiversity and Landscape Diversity – NSAP (Official Gazette No 81/99) laying down the obligation to draw up action plans for the protection of endangered species. The Strategy envisages the protection and the development of the Brown Bear Management Plan for the Republic of Croatia.

The Strategy is currently under review.

3.2.7 Recommendations of the Bern Convention for the Action plan for the conservation of the brown bear in Croatia

The Large Carnivore Initiative for Europe was founded in 1995 with the goal to solve problems related to the protection of large carnivores and the conservation of viable populations thereof (brown bears, wolves, wolverines, Eurasian and Iberian lynxes) in coexistence with man. This group of experts prepared Action plans for the protection of large carnivores, which were accepted by the Council of Europe at the meeting of the Standing Committee of the Bern Convention in November 2000. One of those action plans is the Action plan for the conservation of the brown bear in Europe. By Recommendation No 74 (2000) the Council of Europe urges governments to incorporate recommendations from the Action plan for the conservation of the brown bear in Europe in the National Management Plans.

The following actions have been recommended to Croatia:

- Action 4.1.1: Adoption of Action Plan by Bern Convention.
- Action 4.1.2: Establishment of national brown bear management groups and management plans (countries sharing populations produce management plans co-operatively).
- Action 4.1.4: Protection of brown bear by law and game species only where viability is proven and hunting is used to reach population goals identified by management plans.
- Action 4.1.5: Intensification of law enforcement and appropriate penalties in populations where poaching is a limiting factor (bear populations).
- Action 4.3.1: Classification of areas within present and possible bear range according to their suitability and importance as habitat for bear management.
- Action 4.3.2: Identification and maintenance or recreation of linkage zones in fragmented populations.
- Action 4.3.3: Evaluation of impact of existing and planned infrastructure on bear habitat and mitigation of negative impact.
- Action 4.3.4: Control or prohibition of human activities detrimental in bear core areas and linkage zones.
- Action 4.4.1: Establishment of compensation systems.
- Action 4.4.2: Link of compensation system to individual farmer's use of preventive measures.
- Action 4.4.3: Inaccessibility of waste dumps and human waste for brown bears.
- Action 4.4.4: Abandon artificial feeding that may create food- or human-habituated bears.

- Action 4.5.1: Minimise the creation of problem bears through Action 4.4.1-Action 4.4.5 and Action 4.7.1.
- Action 4.5.2: Removal of problem bears in viable populations if preventive efforts have failed.
- Action 4.5.3: Evaluation of costs and benefits before removing nuisance bears in threatened populations.
- Action 4.6.1: Identification and involvement of public opinion leaders and stakeholders in brown bear management.
- Action 4.6.2: Establishment of permanent consultation protocol with locals about their needs and necessary management actions.
- Action 4.7.1: Initiate information campaigns designed for different target groups.
- Action 4.8.1: Co-ordinated scientific research on brown bears in Europe.
- Action 4.8.2: Co-ordination of gathering necessary data to monitor management and biological conditions of brown bears in European countries.

3.2.8 Authorities for the development and the adoption of the Management Plan

An 8-member expert committee developed the Brown Bear Management Plan for the Republic of Croatia in 2004. Four members of the committee were appointed respectively by the Ministry of Agriculture, Forestry and Water Management (currently Ministry for Regional Development, forestry and Water Management) and the Ministry of Culture. The expert committee cooperated also with external associates in developing the plan. The draft version thereof was reviewed by the said ministries and after final negotiations the plan was commonly adopted by the Directorate for Hunting of the Ministry of Agriculture, Forestry and Water Management and the Directorate for the Protection of Nature of the Ministry of Culture.

The 2007 review of the Brown Bear Management Plan for the Republic of Croatia saw the participation of the members of the Committee with a changed structure, as well as external associates.

3.2.9 Public involvement in the development of the Plan

The competent ministries – the Ministry of Agriculture, Forestry and Water Management and the Ministry of Culture – are aware of the importance of public participation in the development of management plans and, in particular, of the effects of such approach to the implementation of planned activities. Representatives of the general public were involved in the development of the 2004 plan through workshops held at the beginning (agreement on guidelines) and at the end of the process (discussion on the Plan proposal).

The expert committee in charge of the development of the Brown Bear Management Plan has taken into consideration the results of a public opinion survey regarding brown bears and brown bear management in Croatia, which was conducted in 2003 (Majić, 2003). Certain results are laid down in Chapter “Brown bears and humans” of this Plan.

A new public opinion survey regarding brown bears and brown bear management in Croatia shall be conducted at the beginning of 2008.

II SPECIFIC SECTION

4 BEARS – BASIC DATA FOR DEVELOPMENT AND UNDERSTANDING OF THE PLAN

4.1 Historical overview

At the Pleistocene archaeological site “Medvjeda špilja” [Bear Cave] on the island of Lošinj fossil remains of a brown bear were found along with fossil remains of a cave bear (*Ursus spelaeus*). Bears had lived there until approximately 10.000 years ago, i.e. until the end of the last Ice Age. Fossil findings of both bear species are numerous and present all over the territory of the Republic of Croatia.

Over time the increase of human populations has brought about the shrinking of bear habitats in Croatia. Bears were seen as hunting rivals, as well as harmful and dangerous animals; in the end it became and has remained a game species. Moreover, the number of bears in Croatia has reached the limit corresponding to the capacity of its habitat.

The first written evidence on the presence of bears on an area larger than presently dates back to the end of the 18th and the beginning of the 19th century. Back then the bear had a reputation as “a monstrous enemy of our useful game and livestock and a menace to man”. Bears were killed “by chance” or “out of need” by rangers and farmers desiring “both glory and bounty”. Since the number of bears was not monitored, it is difficult to assess the size of the population at that time. However, it is known that the regions of Gorski Kotar and Lika were considered “par excellence” for bear hunting in the 19th and the beginning of the 20th century. According to data contained in the reports of the Zagreb Chamber of Commerce and Handicrafts, in the period from 1887 to 1889 a total of 50 bears was killed in Croatia and Slavonia; more precisely, in Modruš-Rijeka County and the Lika-Krbava County. However, according to newspaper articles of the time, these numbers are likely double since many of the killed bears were not officially registered.

Bears were hunted and killed in different ways. They are mostly hunted by waiting in front of a den, tracking, by means of leg-hold traps, snares and poisoned baits. At the beginning of the 20th century the status of the bear did not change: on the national level bears were still considered harmful and remained unprotected, and bounties were paid for their heads. According to the handbill of 27 May 1915 of the government of Croatia, Slavonia and Dalmatia, for each adult bear a bounty of 20 crowns was paid from the state budget. The bounty for a killed cub amounted to 4 crowns. A closed hunting season was prescribed for “useful game” (red deer, roe deer and so forth), whilst “black beasts” such as wolves, bears and other predators could be hunted year round.

In the past when they were treated as harmful animals and were unprotected, and when a bounty was paid for the bear’s head, bears were mostly hunted by waiting in front of the den, battue hunting, by means of leg-hold traps and poisoned baits; since the 1950s, bears in Croatia have been hunted almost exclusively by waiting on high shooting stands located near a bait. The main reason therefore was the Hunting Act of 1947, which improved the status of bears by

means of stricter law enforcement and “because many old bear hunters died during the war without passing on their skills to younger generations” (Z. Car 1952). Furthermore, bear hunting became more popular among foreign hunters-tourists, who became regular clients of forest management units, the establishment of which began in 1960.

In the mountainous regions of Croatia areas in which free bear hunting was not permitted existed even before the adoption of the 1947 Hunting Act. The vast forests of Gorski Kotar and Kapela, in which bears were permanently present, largely belonged to the state, wealthy municipalities and aristocratic families. In those forests bear hunting was formally prohibited. For example, on the large hunting grounds (30.700 acres) in the Čabar fief owned by the aristocratic family Ghyczy, bear hunting was strictly prohibited to hunters and rangers employed on the estate during the last decade of the 19th century. Similar rules were in force in adjacent fiefs owned by the dukes Schonburg, Auersperg and Windischgratz in neighbouring Kranjska, as well as in the Grobnik fief (owned by the Thurn-Taxis family) and state forest management units, even though rangers freely practised bear hunting in the latter in 1902.

In order to stop uncontrolled bear hunting, the population of which became seriously endangered at the end of the 1930s, the government of the Banovina Savska adopted an Order allowing bear hunting only against state permission. The hunting of bears was allowed only with a permit from the national authorities. The Hunting Act of the People's Republic of Croatia adopted at the end of 1949 included the bear on the list of Game Species, group A. Game Mammals. The Ordinance on Protected and Unprotected Game and Closed Hunting Season of 7 November 1949 listed bears amongst game species to which the closed hunting season from 1 January to 31 October applies. Article IV of the Ordinance lays down that bears may be shot with bullets only and against a special permit issued by the Ministry of Forestry.

Back then the Institute for Nature Protection considered listing bears among endangered animal species in order to better conserve the population and attempted to create special bear reserves (Velebit, Velika Kapela, Mala Kapela and mountains Risnjak and Snježnik) and to prohibit the poisoning of wolves and foxes in the period in which bears come out of winter hibernation. The said activities of the institute were based on the data according to which most bears died due to poisoned baits intended for wolves (for the purpose of reducing their numbers) during 15 years from 1946 to 1960. Namely, the cause of death of 21 (57%) out of 37 bears was poisoning. In the said period two or three poisoned bears were found each spring in state forests.

A positive development for a better protection of bears in mountainous Croatian regions was the establishment of forest management units in 1960, as they became responsible for bear management. Active conservation measures, such as the prevention of illegal bear hunting, selective use of poisoned baits for the reduction of the numbers of wolves and foxes (in 1973 the use of Cyanan poison was prohibited) and additional feeding of bears, soon gave the first positive results.

In 1960 approximately 30 bears were present on the hunting grounds of the Delnice Forest Management Unit. In 1970 in just one of the Delnice hunting grounds (52.300 ha) 55 bears were counted (from high stands near bear feeding and reproduction sites; the number includes females with cubs). Ten years later the number of bears on the same hunting grounds had doubled. Along with the growth of the number of bears, bear harvesting activities increased as well. In the period between 1960 and 1970, marked by the development of hunting tourism, 26 bears were harvested on the hunting grounds of the Delnice Forest Management Unit. During the following nine years (1970-1979) 68 bears, i.e. 72 % of the planned twenty-year bear hunt was carried out.

From the 19th century to the 1950s the outer boundaries of bear-inhabited areas remained generally the same. In the second half of the 19th century bears were present also well beyond the current bear range. Around 1860 in the times of existence of Vojna Krajina one bear was shot in the forest area Miletive in the administrative unit Dvor na Uni, which was under the competence of the Rujevac Forestry Office. In the same area snow tracks made by bears were observed during the entire winter of 1946/47 between villages of Majdan and Komora. Official records of bears far outside their current range in Croatia may be found in the Forestry Chronicles of the Karlovac Forestry Office and concern a bear shot in 1895 in the forest Okićki Lug owned by the Rauch family, in the proximity of the today's ornithological reserve Crna Mlaka.

In the second half of the 20th century bears were given more attention and the numbers and the distribution thereof were determined. Most bears were found in Velebit, Velika Kapela, Mala Kapela, Lička Plješivica and the Mazin Mountain, as well as in Gorski Kotar. Bears were occasionally present on Lika's plains and Resnik. massif, which corresponds to the present situation. Already in the past it was clear that bears do not come into conflict with farmers' and cattle-breeders' interests.

The abolishment of forest management units, the constitution of a public corporation "Hrvatske šume" [Croatian Forests] with local forest administrations (1991) and in particular the new Hunting Act (1994) resulted in a substantial increase of the number of hunting unit leaseholders and physical and/or natural persons in charge of bear management. Since the commercial hunting of bears is very profitable, the up-to-then stable planned annual quota of approximately 40 bears increased considerably.

Since 2005 bears in Croatia have been managed in accordance with the Bear Management Plan and the annual Action Plans. The Action Plan is a shorter implementing document laying down the most important bear management actions to be carried out during the current year; it also sets annual hunting quotas per hunting unit. The adoption of the said documents has entailed amendments of primary and secondary legislation governing this area and significantly altered the brown bear management in Croatia.

On the basis of the overview of the bears' status through history, trends in the estimated size of populations and harvest rates, as well as many other conducted studies, it may be concluded that the legal bear hunting has not threatened the Croatian bear populations. Possible threats regarding the bears' future are constituted largely by the changes of natural habitats and increased hunting ambitions of numerous owners of hunting licences.

4.2 Biology and ecology

4.2.1 Classification and origin

The bear living in Croatia is a mammal belonging to the order of Carnivora (carnivores), family Ursidae, genus *Ursus* and brown bear species (*Ursus arctos*).



Eight species of the Ursidae family are currently present in the world. These are: the brown bear (*U. arctos*) in Eurasia and North America, the white or polar bear (*U. maritimus*) in the Arctic area, the American black bear (*U. americanus*) in North America, the Asian black bear (*U. thibetanus*) in Asia, the sun bear (*Helarctos malayanus*) in Southeast Asia, the spectacled bear (*Tremarctos ornatus*) in South America, the sloth bear (*Melursus ursinus*) in Asia and the giant panda (*Ailuropoda melanoleuca*) also in Asia. They had all evolved from a common predator Miacid approximately 25 million years ago.

As recently as fifty years ago different authors described several species and from 70 up to 150 subspecies of brown bears. Recent biological findings, supported by genetic research, have shown them to be ecological variants of the same species. Thus, the North American grizzly bear belongs to the same species as the Eurasian brown bear. Depending on the population of origin, those bears may present considerable differences. The bear has, to a greater extent than most species, an immense ability to adapt its size and appearance to the conditions in his habitat. In Alaska and on the Kamchatka Peninsula, due to long winters and a protein-rich salmon diet (which bears catch in the rapids of shallow rivers during their spawning migration), adult males may attain a weight of up to 1000 kg. On the other hand, the brown bears from the southern parts of Europe (e.g. Italy, Spain) weigh in at almost 10 times less. Nevertheless, they all belong to the same species as bears in Croatia.

4.2.2 Distribution, numbers and status

The brown bear used to inhabit the entire Eurasia and North America. The only place in Europe in which the bear has never been present are Iceland and the Mediterranean islands Corsica, Sardinia and Cyprus. Today, the bear has practically vanished from Western Europe, while the remaining populations are small, separated and disappearing (figure 2). The largest populations are located in Cantabria, Spain, numbering about 120 bears and separated into two groups, and in the Apennines, Italy, where 40 to 50 bears live within and around the Abruzzo national park. Very small groups of bears are still present in the Italian Alps (Trento), where 3 or 4 bears remain, and the western Pyrenees, also with 3 to 4 remaining bears. The last bears disappeared from the central Pyrenees in the 1980s; however, the species was reintroduced

thereto in 1996 and 1997 with three bears from Slovenia. A similar reintroduction was carried out in Austria, where three bears from Croatia and Slovenia were added to the last remaining bear between 1989 and 1993. Today, approximately 15 bears live in Austria. Another 10 bears from Slovenia were added between 1999 and 2002 to the Trento area and 5 Slovenian bears were transported to the Pyrenees in 2004.

The only stable population, numbering approximately 2600 bears, lives in the north-western part of Europe in Scandinavia. In Central and Eastern Europe, Russia excluded, only two significant populations remained at the end of the previous century. Today, it is estimated that approximately 8000 bears live in the Carpathians and about 2800 more in the Dinarides (table 1).

Bears living in Croatia are part of the Dinaric population, which is the second largest population in Central and Southern Europe. The bears in Croatia, together with those in neighbouring Slovenia, are the westernmost, genetically related stable population, potentially representing the last available source for the salvation of bears in Western Europe. Genetic studies comparing base pairs of the same genes of bears from different populations have created a tree of their genetic relatedness on the basis of numbers of different base pairs. Thus, bears from Croatia, Slovenia and Bosnia and Herzegovina are genetically identical to the remaining bears from the Alps and are genetically slightly from the bears from the Pyrenees. On the other hand, the bears from the Romanian Carpathians, Russia and Northern Scandinavia differ significantly from them and are not therefore suitable for reintroduction of the species in Western Europe. All this elements place the brown bear on the top of Croatia's most valuable natural heritage.

The limited size of the available habitat and the large living space every bear requires, prevent any significant further growth of the bear population, which is the reason why bears are biologically classified as a rare species.

4.2.3 Description

Bears are the largest terrestrial carnivores. In Croatia, adult females weigh on the average about 100 kg and males 150 kg; however, some specimens can weigh more than 300 kg. In the course of a year the weight of the same adult animal may vary by more than a third: it is largest in the late autumn before denning and lowest at the beginning of summer, i.e. at the end of the mating season.

The body of the bear is covered with long guard hair and thick ground hair. The ground hair is much thicker during winter than in summer. The hair colour is mostly brown and is often darker or even black over the back. However, the tips of the longer hair are sometimes light grey. Some specimens have an evenly distributed chocolate-brown pelt colour. Considering the range of pelt colouring of brown bears, with the predominant brown colour, the use of the name "smedi medvjed" (brown bear) is advocated for this species. This species is known around the world as the "brown bear", where one word of name is the adjective that denotes the brown colour in the respective languages: English brown bear, Italian orso bruno, French l'ours brun, German Braunbär, Slovenian rjavi medved, Serbian mrki medved.

Similarly to humans, bears touch the ground with the entire surface of their feet while walking. This way they leave tracks that are unlike any of the tracks belonging to other species living in our habitats. The fingers are tipped with claws, which are particularly long (approximately 5 to 6 cm) and strong on the forefeet. A bear uses them to dig soil, break open

rotten logs and dig up anthills, turn rocks, kill and rip its prey. Unlike cats, bears' claws are not retractable.



The bear's dentition has all the characteristics of a carnivore's teeth, with characteristic incisors, canines and carnassials (figures 7 and 8). The tooth formula is $I\ 3/3, C\ 1/1, P\ 4/4, M\ 2/3$, which adds up to 42 teeth. However, most specimens are missing some of the first three upper and lower premolars (some specimens are missing all of the said teeth); the existing premolars are usually small and have no functionality in chewing. The chewing surfaces of molars are somewhat flatter than those of other carnivores, which is an adaptation to the grinding of plants. The digestive tract is short and simple, similar to that of other carnivores, with a simple stomach, long small intestine, short vermiform appendix and short large intestine.

Bear scats vary in shape, consistence and colour, depending on the food the bear has eaten. Nevertheless, they can be easily distinguished from scats of other animal species by their size and often aromatic smell. Sometimes, a soft scat of a wild boar may be similar to a bear scat; however the boar scat does not contain bits of undigested food and lacks the recognizable smell.

4.2.4 Diet

Although their physical appearance is that of a true carnivore, bears satisfy approximately 95% of their dietary needs with vegetarian foods. The animal proteins they consume originate mainly from invertebrates and carcasses of larger animals. The plant material the bears eat in spring and summer consists mostly of green vegetation and grasses, which are supplemented in the summer with soft fruits, and in the autumn with beechnuts, which serves as the main food for the accumulation of winter adipose tissue. Due to the short and simple digestive tract, a significant part of the consumed plant material passes through it badly digested or not digested at all. This forces the bear to consume as much food as possible. On the other hand, due to this incomplete decomposition during the digestive process, the bear aids the spreading of plant species by its scat, the seeds of which may be carried over large distances.

The vegetarian foods the bear finds in the forest during spring are wild garlic (*Allium ursinum* L.) and cuckoo pint (*Arum maculatum* L.). On forest meadows it feeds on graminoids (*Graminae* sp.), clover (*Trifolium* sp.) and docks (*Rumex* sp.).

During the summer it most often feeds on wild angelica (*Angelica silvestris* L.), stinking aposeris (*Aposeris foetida* L.) and strawberries (*Fragaria* sp.), and in late summer on raspberries (*Rubus idaeus* L.), blackberries (*R. fruticosus* L.), common buckthorn (*Rhamnus cathartica* L.) and blueberries (*Vaccinium myrtillus* L.).

In the autumn, the beechnuts (*Fagus sylvatica* L.) are certainly the most important food. At that time it also feeds on crab apples (*Malus sylvestris* Mill.) and the common pear (*Pyrus communis* L.). It also eats hazelnuts (*Corylus uvellana* L.), fruits of the European mountain ash (*Sorbus aucuparia* L.), chestnuts (*Castanea sativa* Mill.), cornelian cherry (*Cornus mas* L.) and acorns of various species of oaks (*Quercus* sp.). In search of nutritious fruit and nuts a bear can often cover great distances, even leave its permanent home range.

In fields it feeds on all cereals, oats in particular. It is also attracted by cornfields, especially when the corn is still young. It visits orchards and vineyards, where it eats plums, apples, pears, peaches, cherries, grapes and other fruit. It likes to eat forest honey and bee larvae, which is the reason why it breaks into apiaries, causing thereby agricultural damage.

Animal food the bear eats are usually animal carcasses it finds in the forest. It feeds also on invertebrates, especially larvae of ants and other insects, and young wild animals. Among domestic animals, it most often attacks sheep, and occasionally cows, donkeys and horses. Among game animals, it attacks only young, injured and sick animals that it is able to catch.

4.2.5 Life cycle

Bears mate from the end of May until the middle of July. The males cover great distances at that time and fight among themselves if they are near the same female. Every male tries to fertilize more than one female. A female may mate with several males during the breeding season, which makes it possible that cubs from the same litter have different fathers. The embryo in the uterus has delayed implantation and most of its development takes place during the last three months of gravidity, which altogether lasts about seven months. The cubs are born in mid-winter during denning.

A bear spends the winter in a specially selected and prepared den without taking any food or liquid. In our region most dens are located in small natural cavities under rocks, which the bear adapts to its needs by digging. Only around 10 % of dens are located between roots of large trees and just as many out in the open or beneath the crowns of coniferous trees. Inside a den a bear prepares a comfortable bed using dry grass, leaves or twigs. Nevertheless, some specimens remain active throughout the winter. If a bear is disturbed and chased out of its den, it will have a shortage of body energy and will survive with difficulty until spring unless it has a thick layer of adipose tissue. The young two-year-old bears are usually badly prepared for the winter, since it is the first time they have to survive without their mother. However, the climate in Croatia is characterised by frequent warmer periods during winter and snow not covering permanently at least part of the bear habitat. It is not clear yet whether and how additional feeding at feeding stations affects the bears' winter activity.

The longest is the denning of gravid females, which usually give birth to 1 to 4 cubs weighing approximately 350g in the first half of January. They are born blind and hairless. Their

lives depend upon the direct contact with the body of their mother, who keeps them warm and feeds them with concentrated milk. Bear milk has around 22 % fat and 12 % proteins and can be compared only with the milk of seals. The gravest danger to newborn cubs is inside the den in wintertime. If the mother is disturbed and forced to abandon the den, the cubs inevitably die since they are not able to follow her. Attempts by mothers to carry at least one cub in their teeth have been seen in such situations; however, since the mother cannot carry the cub very far in this manner nor prepare a new den in the middle of winter, there is no chance for its survival. It is known that almost every winter a certain number of bear litters in Croatia dies because a den is disturbed. It is known that during the winter of 1987/88 just in the Gorski Kotar region at least ten cubs were abandoned by their mothers. At the beginning of April owing to the nutritious mother's milk the cubs have grown enough to leave the den and follow their mother in search for food. They stay with their mother during their entire first year of life and the following winter in the den, and reach independence at the age of 1,5 years during May and June when their mother mates again. Sometimes after mating mothers permits the previous year cubs to follow her until autumn, when she finally retires to a private den where she will give birth to a new litter. In the northernmost bear populations the cubs stay with their mothers for 2.5 or even 3.5 years, which makes the number of births per female in these places significantly lower.



Croatian bears reach sexual maturity at the age of 3 to 4 and have a life span of 10 to 20 years. The average age of the managed Croatian bear population is around 5 years.

4.2.6 Habitat

As a biological need, the brown bear has distinct habitat requirements. In the past the bears also lived in lowland forests, floodplains and natural meadows. Due to the increase of human presence, they were pushed into areas scarcely suitable for human habitation. Today they inhabit mountainous, forested areas only. As far as bear inhabited lowlands are concerned, bears are found only in taigas in the far north. A habitat suitable for bears must consist of different forest types, with the crucial role being that of the deciduous trees with large seeds (i.e. beech, chestnut, oak). The presence of thickets and meadows is important for escape cover and pasture. It is particularly important that bears have the possibility to move in all directions, including

zones of different altitudes. Peace and quiet in the habitat is of extreme importance during wintertime because of the newborn cubs in the dens.



Each night bears forage for food, usually in lower altitude areas with more open space (which means closer to humans) and during the day it retreats to quiet and densely vegetated areas where it makes the so-called “day bed”. The average daily movement of a bear amounts to 1.6 km, while the maximum exceeds 10 km. Furthermore, in springtime bears need lower areas with early vegetation and protein-rich food. During the mating season (May – June) the males cover large areas in search for females on heat. In autumn bears need access to mature forests with large quantities of nutritious nuts (e.g. beechnuts, chestnuts, acorns). In winter they retreat to inaccessible, quiet areas for the purpose of denning and giving birth, as far as females are concerned. If bears are hindered from accessing any critical part of the habitat or if part of habitat is lost to bears for other reasons, significant disturbances in their life cycle can occur: females may remain unfertilized, cubs perish in unsuitable dens or because of lack of food, the bears may be insufficiently prepared for winter, general mortality increases and property damage occurs due to bears searching for alternative sources of food in order to survive. Bear home range in Croatia is estimated to approximately 250 km² (25.000 ha).

4.3 Results of scientific research in Croatia

The modern radio telemetry methods of wildlife research (bear included) were discovered and implemented in the United States of America during the 1960s. The first radio-telemetric bear study in Europe took place in Northern Italy (Trento) in the 1970s, where two specimens were fitted with radio collars. Our project in Croatia began in 1981 and was the second of this kind in Europe. Here we present a summary of some of the results thereof.

The bears were captured using a leg snare made of steel cable attached to a torsion spring. They were baited with slaughterhouse by-products or animal carcasses. The captured bears were sedated with ketamine and xylazine hydrochloride using a dart gun or a blow-pipe. They were fitted with ear tags and a radio collar. A rudimentary first premolar was extracted for age determination. The locations of tracked bears were determined by means trigonometry from the ground or from an airplane. The size of the bear range was calculated using the minimum convex polygon (MCP) method.

Traps were set for a total of 4256 nights, which resulted in 34 successful bear captures, three of which were re-captures, while 5 of the captured bears were not equipped with radio transmitters. A total of 26 bears were marked and tracked: 14 in Plitvice and 12 on the Risnjak mountain. Only 6 out of the 26 tracked bears were females, 1 out of 14 in Plitvice and 5 out of 12 on Risnjak. 15 bears were adults and 11 subadults, with the average age at the time of capture of 4,7 years (range 1 – 13 years). There was no significant age difference between genders. In 5 cases we tracked a bear family. Two bear cubs were yearlings accompanied by their mothers and brothers. One female gave birth to at least one, while another to three cubs during tracking. One female had 2 yearlings following her at the time of capture. One motherless six-month-old cub was also tagged and it survived on its own for at least 15 months (for the entire duration of tracking). The average weight of adult females was 103 kg, and of males 153 kg.

The locations of the marked bears were determined on 517 different occasions, 487 of which on different days. The females were tracked on average for 712 days and the males for 250 days. Each of the 6 females was tracked for more than a year (range: 561 – 914 days), while only 2 out of 23 collars fitted on males (including 3 recaptures) lasted more than 1 year. 14 collars were taken off by the bears themselves, 5 transmitters stopped working and 2 bears were killed. The location of each female was determined 39 times on average (range: 6 – 130) and of each male 13 times (range 1 – 86). Only 58 % of the 434 daily searches for males were successful, while the females were found in 71 % of the 333 daily searches.

Only 3 out of 14 marked bears on the Plitvice lakes were not recorded leaving the national park. However, those three bears were located only on a limited number of occasions. The remaining 11 bears were found up to 11,3 km (the average of distances covered is 4,7 km) outside the national park boundaries. Approximately one half (145 out of 303) of all the locations of bears were outside the park. The total known range covered by all 14 bears was 736 km². Only 2 out of 7 bears that were tracked during winter were denning within the boundaries of the Plitvice lakes national park. One young female crossed the park boundaries at least 25 times in 16 months.

All 8 bears from the Risnjak area that were captured and tagged in the national park crossed its boundaries and covered distances of up to 25,6 km (average 10,4 km). Those bears were found outside the park for 62 % of the time (86 out of 139 locations). Nevertheless, 4 out of 6 dens of bears captured within the Risnjak national park were located inside the park.

The largest bear ranges amounted to 224 km² (22.400 ha) in 1330 days for a five-year old male and 147 km² (14.700 ha) in 840 days for a three-year old female. The size of the areas covered was gradually increasing with the increase of the number of the determined locations, although the said increase rate slowed down for females after about 40 determined locations. The average annual bear range was 128 km² (12.800 ha) during 4 male bear years and 58 km² (5.800 ha) during 5 female bear years.

No significant differences were recorded in size of the bear range in spring, summer and autumn. The average winter bear range was significantly smaller than during other seasons. The winter average amounted to 4 km² (400 ha) (range 0 – 18 km and 0 – 8 ha, respectively), while in other seasons it amounted to 28 km² (2.800 ha) (range 1 – 102 km and 100 – 10.200 ha, respectively). The spring and summer movements of males were significantly larger than of females: 81 km² in springtime as to 18 km² (8.100 as to 1.800 ha) and 34 km² in summertime as to 11 km² (3.400 as to 1.100 ha). A total of 143 straight-line distances between daily locations were determined. The range amounted to 0,2 to 8,5 km, with the median value of 1,5 km. Sixty-seven percent (n = 95) of daily movements were shorter than 2 km and only 2 % (n = 3) were longer

than 7 km. Only males covered distances longer than 7 km; however, the total difference in daily movements between males and females were not significant.

The tagged bears did not exhibit territorial behaviour. The bears in Plitvice shared their known home range with 2 to 11 (average 7,7) known home ranges of other tagged specimens. In the Risnjak area the home ranges of all 8 bears captured in the park overlapped.

The satellite tracking of brown bears (GPS transmitters) has been used in Croatia since 25 September 2003 as well (Figure, Table 1). The collars fitted on bears contain the GPS device which determines their location by means of geostationary satellites, while an additional GSM device sends data to researches in form of text messages.

Tag	Gender	No tracking days	No of locations	Bear range 100% (km ²)	50% KERNEL (km ²)
B29	M	224	878	79,4	21,8
B30	M	409	2758	653,8	41,9
B32	F	81	582	53,6	6,9
B33	F	191	922	31,4	4,1
B34	F	42	319	35,4	2,0
B35	F	236	786	87,2	0,9
Average km ²				M=366,6 F=49,0	M=31,9 F=3,5

The results of the scientific study of brown bears in Croatia through projects led by Đuro Huber of the Faculty of Veterinary Medicine in Zagreb were published in 42 scientific papers (27 in scientific journals and 15 in collections of scientific papers), 11 chapters of books, 47 scientific articles and 71 scientific congress presentations, for a total of 171 published bibliographic units. A partial list of those works is included in the list of references of this Plan.



4.3.1 Diseases

Due to their natural resistance and a relatively low population density, the natural occurrence of bear diseases is relatively rare. Rabies infection in Croatia was confirmed for one bear only in 2000. Most bears have internal parasites, usually Ascarids in the small intestine; however, these invasions are part of a stable host-parasite system that does not affect the health of the host. Serological testing of bears' serum discovered antibodies to most pathogens, but this is primarily a sign of resistance due to exposure to these pathogens and not the consequence of occurrence of the disease.

Table 2: Overview of the population structure of brown bear (*Ursus arctos*) in Europe (modified according to Linnel et al. 2007)

Population	Countries	Parts of population	Size
Cantabrian	Spain ¹	Western Eastern	120
Pyrenees	France, Spain ² Andorra	Western Central	15-17
Apennines	Italy ⁶		40-50
Alps	Italy ⁵ Austria, Slovenia, Switzerland	Trentino Central Austria ⁷ Southern Austria/Slovenian Alps ⁸	30-50
Dinaric-Pindos	Slovenia Croatia Bosnia and Herzegovina Serbia Montenegro FYR Macedonia Albania Greece	Northern Dinaric ⁹ Central Dinaric ¹⁰ Pindos ¹¹	2.800
East Balkan	Bulgaria, Greece Serbia	Rila-Rhodope Massif Stara planina [Old Mountain] Eastern Serbia – northwest Bulgaria	720

Carpathian	Czech Republic Poland Slovakia Romania, Ukraine Serbia	Western ¹² Main chain ¹¹ Apuseni Mountains	8.000
Scandinavia	Sweden, Norway	Southern / Central / Northern	2.600
North-eastern Europe	Finland		4.300
Karelian	Norway Russia ³		
North-eastern Europe	Estonia		6.800
Baltic	Latvia Russia ⁴ , Belarus		

1. Autonomous regions: Asturias, Cantabria, Castilla y Leon and Galicia.
2. Autonomous regions: Navarra, Aragon and Catalonia.
3. Russian oblasts of Murmansk and Karelia. The southern and eastern border coincides with the natural geographic structures of Lakes Onega and Ladoga and the White Sea.
4. Russian oblasts of Leningrad, Novgorod, Pskov, Tver, Smolensk, Bryansk, Moscow, Kalinigrad, Kaluzh, Tula, Kursk, Belgorod & Orel.
5. Autonomous provinces: Province of Trento, Province of Bolzano, Regions: Veneto, Lombardia, Friuli.
6. Autonomous regions: Lazio, Abruzzo, Molise.
7. The Austrian states of Lower Austria, Styria and Upper Austria.
8. The Austrian state of Carinthia.
9. Southern Slovenia, Croatia, Bosnia & Herzegovina.
10. Western Serbia, Montenegro, northern Albania.
11. Eastern Albania, FYR Macedonia, northern and central Greece.
12. Central Poland and Slovakia.
13. Eastern Poland, eastern Slovakia, Ukraine, Romanian Carpathians and eastern Serbia.

4.4 Natural characteristics of bear habitats in Croatia

4.4.1 Orographic and hydrographic environmental factors

The bear habitat is largely located in the high karst area. The surface has a broken up appearance with all typical karst elements and phenomena: potholes, sinkholes, dolines, grikes, shafts, blind valleys and residual hills. All these elements are intertwined and interconnected. Altitudes range from 0 m (sea coast) up to 1750 m of the highest peaks of Velebit. Since the habitat is preserved to a great extent, the karst elements are present in their typical form.



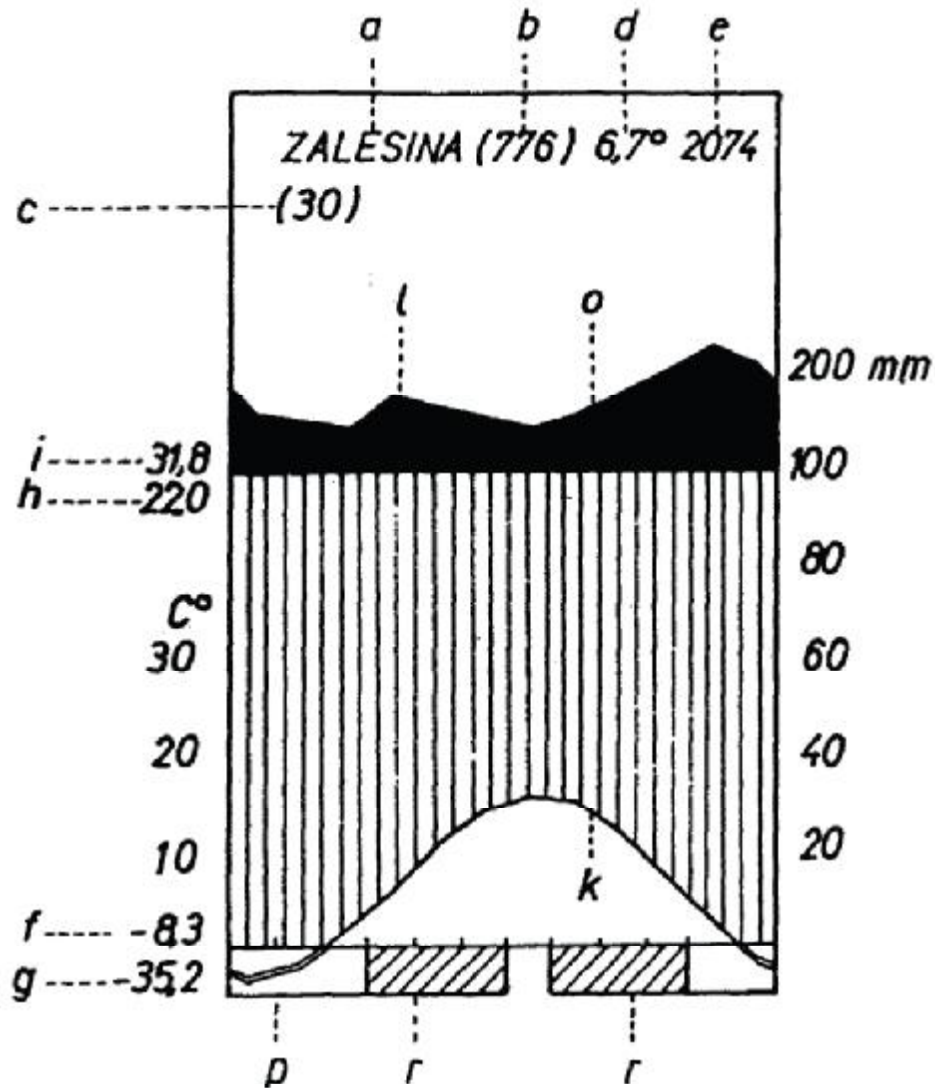
Larger watercourses existing within the bear habitat are the following: Rečina, Kupa, Dobra, Mrežnica, Korana, Zrmanja, Krupa, Gacka, Lika, and Una, along with the following lakes: Lokvarsko, Bajer, Lepenice, Sabljaci, Krušičko and Plitvice lakes. Apart from these watercourses and lakes bears also drink water from streams, creeks, puddles and forest ponds. Unlike many other animal species, bears crawl into caves and caverns in search for water.

4.4.2 Climate

Bear habitats are located in the Central European climate zone strongly influenced by the Mediterranean climate. The basic characteristics of climate in bear habitats are the following: long, snowy winters, sudden changes of weather, short vegetation period, low average annual temperature, high air humidity, early and late freezes and fogs, abundant rainfall and snowfall and strong winds from the north-east (Bura) and the south-east (Jugo).

There are more than 120 cold days (temperature below 0 °C) and more than 40 very cold days (temperature below -5 °C). The number of freezing days (temperature below -10 °C) exceeds 20. The average number of days with snow cover exceeds 85.

Winter starts in November and lasts until mid April. The snow cover can be as much as 2 m thick. Spring starts late and is short with abundant rainfall, interrupted by several revisits of winter. Summer is short and relatively hot. It starts in mid June and lasts until mid September. Autumn is pleasant and longer than spring, but it gets chilly, rainy and foggy as it approaches winter.



- a – station
- b – altitude
- c – years of monitoring (period)
- d – annual temperature in °C (several years' average)
- e – annual precipitation in mm (several years' average)
- f – average minimum temperature of the coldest month
- g – absolute minimum temperature during observation
- h – average maximum temperature of the warmest month
- i – absolute maximum temperature during observation
- j – average temperature fluctuation
- k – several years' average of air temperature by months
- l – several years' average of precipitation by months
- o – humid period
- p – months with the average minimum air temperature below 0 °C
- r – months with the absolute minimum air temperature below 0 °C

Figure 1: Climatograms according to Walter with data from meteorological stations typical for the bear habitat

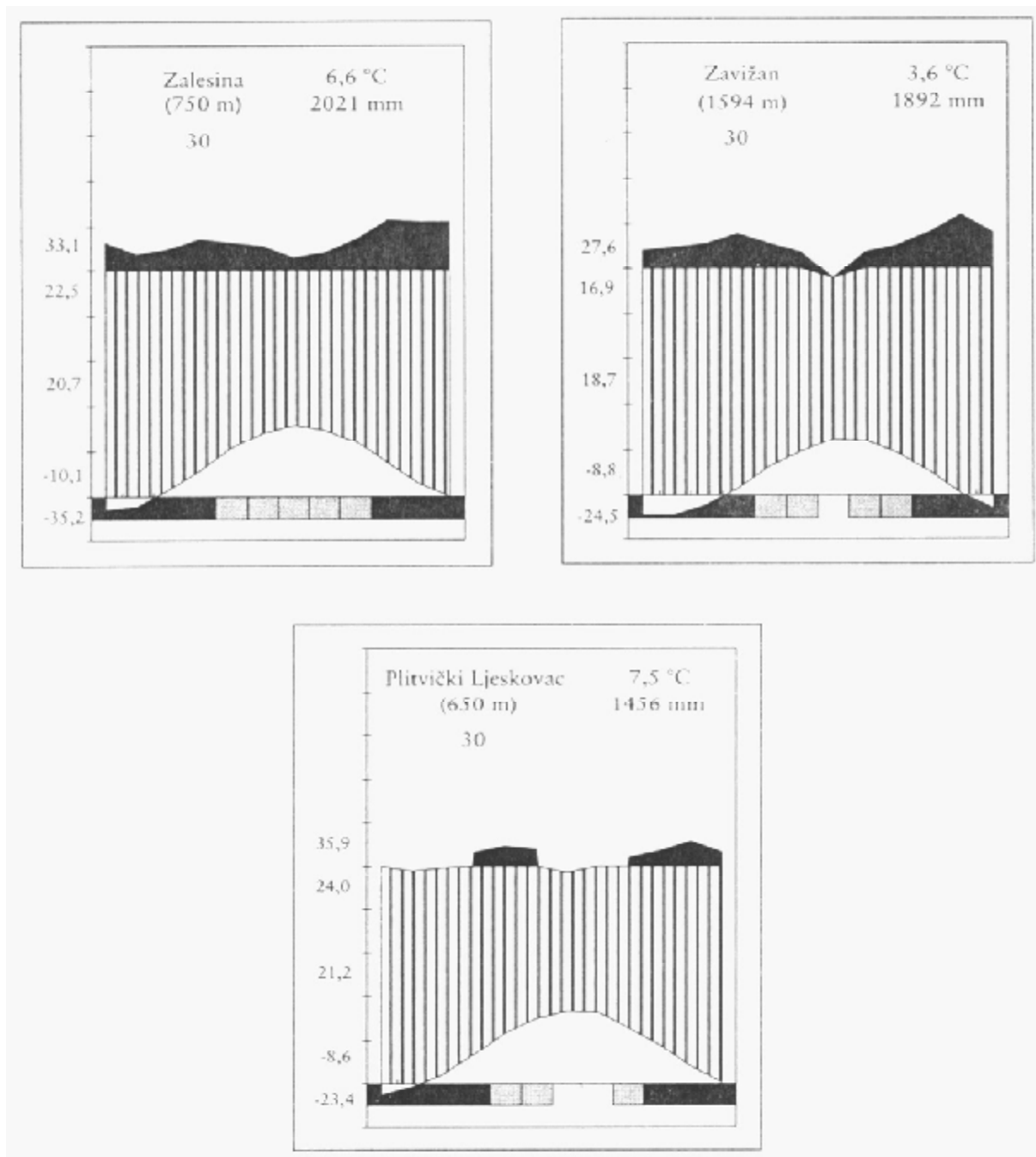


Figure 2: Climatograms for Zalesina, Zavižan and Plitvički Ljeskovac

4.4.3 Forest communities

The life of bears is highly dependant on large, unbroken forests, in which they find food, water, peace and quiet, shelter and dens. The bear habitat in Croatia extends over altitudes of 0 – 1700 m; bears may be therefore found in forest communities typical for the mountainous-hilly area of the Dinaric mountain range.

The most important forest communities overlapping with the bear home range in Croatia are the following:

- *Lonicero borbasianae* - *Pinetum mugii*/Ht. 1938 (Borh. 1963). This community forms the upper boundary of forest vegetation above 1350 m. It may be found on the highest peaks

of Gorski Kotar and Velebit. Due to temperature inversion this community also appears inside sinkholes at lower altitudes.

- Mountain spruce forest (*Aremonio-Piceetum* Ht. 1938). This forest is found in cold mountain hollows in which the concentration of cold air is relatively higher. It may be found in Gorski Kotar and on Velebit.
- Pre-alpine beech forest with *Homogyne sylvestris* (*Homogyne sylvestris* - *Fagetum sylvaticae* /Ht. 1938/Borh. 1963). It is located on altitudes from 1100 to 1500 m, above the beech-fir forests. It may be found in the areas of Gorski Kotar and Lika and represents an important source of bear food (beechnuts).
- Dinaric beech-fir forest (*Omphalodo-Fagetum* Marinček et al. 1992). These forests form the largest and the most important complexes inhabited by bears. They are found through most of Lika and Gorski Kotar. They are very important due to vast areas they cover, in which bears can satisfy most of its life requirements.
- Fir forest with ribbed fern (*Blechno-Abietetum* Ht. 1950). This community is found in Gorski Kotar on silicate rock and on podzol soil in beech-fir forests.
- Fir forest with feather reed grass (*Calamagrostio abietetum* Ht. 1956). Located on altitudes of about 1100 m. This community is found on large boulders, in pre-alpine beech forests or in beech-fir forests. Bears often finds cracks in boulders and uses them as a den.
- Illyrian mountain beech forest with dead nettle (*Lamio orvale-Fagetum sylvaticae* Ht. 1938). This community is found on the continental side of the Dinaric mountain range. It is important since bears feed on beechnuts and may be found on altitudes between 400 and 800 m.
- Beech forest with autumn moor grass (*Seslerio* - *Fagetum sylvaticae* Ht. 1950 (M.Wraber 1960)). This is a high karst community, found on the sea-oriented slopes of the Dinaric mountain range. It is important because of the beechnuts on which bears feed.
- Forests of downy oak and hop hornbeam (*Ostryo-Quercetum pubescentis* HT. 1938). This forest community forms the transition from coastal towards continental vegetation. It is found in the coastal region below the thermophilous beech forests and in the areas east of the Zrmanja river. In the coastal region this forest community often represents the boundary of the permanent bear home range.

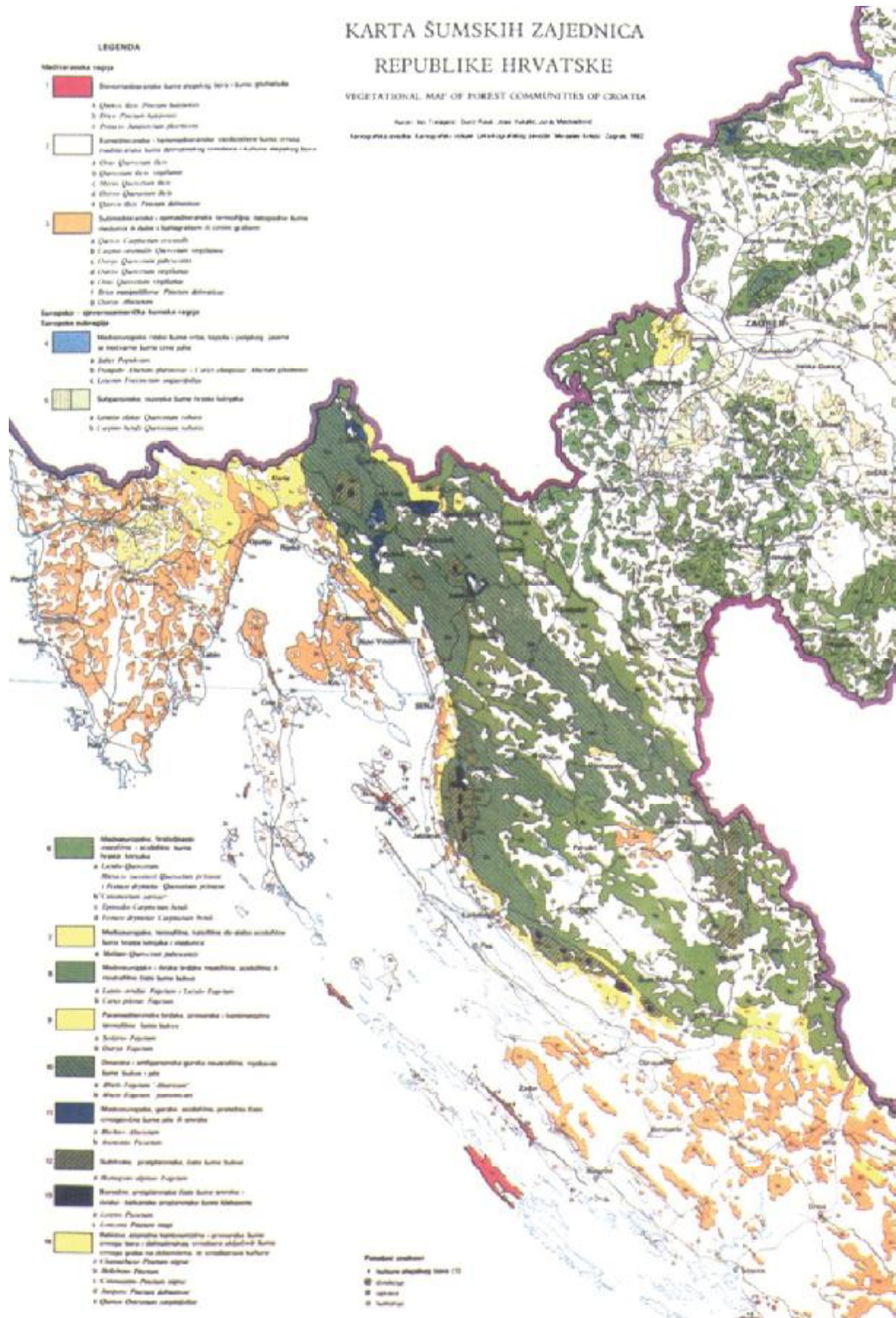


Figure 3: Map of forest communities within the bear range in the Republic of Croatia

4.5 Brown bears and humans

4.5.1 Public attitude towards bears and bear management in Croatia

A survey conducted among the general public, rangers and hunting unit leaseholders (n = 779) in 2003 in areas where bears are permanently (central areas) and occasionally present (peripheral areas) is the first survey of this kind in Croatia.

Overall, all the target groups have shown very positive attitudes towards bears since most of the respondents expressed favourable or very favourable attitudes towards bears. The most positive attitudes were shown by the hunting unit leaseholders (80 % favourable) and the rangers (76 % in favour), followed by the general public in Gorski Kotar and Lika (75 % in both regions). Positive attitudes towards bears were expressed respectively by 72 % in the eastern, 71 % in the western and only 50 % in the northern peripheral area. Accordingly, most of the respondents, especially from the central bear areas (Gorski Kotar and Lika) felt that the brown bear is a valuable resource. No less than 85 % of the respondents from Lika felt that the presence of bears may enhance tourism in the region.

Most of the respondents felt that bears do not cause considerable damage to livestock, nor to agricultural crops and orchards. Nevertheless, most of the respondents agreed that the government and/or the hunting unit leaseholders who manage bears should compensate for damage caused by bears and remove nuisance bears (those that cause damage repeatedly).

No less than 36 % of respondents from Gorski Kotar and 25 % from Lika had experienced damage by bears. In peripheral areas that percentage was much lower, namely 8 % of the respondents from the western peripheral area, 4,5 % from the northern peripheral area and none from the eastern peripheral area have experienced damage by bears. Respondents who had experienced damage had considerably less positive attitudes towards bears than the survey average.

Representatives of the general public have shown a relatively good knowledge of bear biology. On the other hand, their knowledge of the legal status of the species and official estimates of bear population size was very poor. This emphasizes the need for better information of the public by competent authorities.

Most respondents from the general public group believe that bears in Croatia should be entirely protected by law, while rangers and hunting unit leaseholders are against this idea. Furthermore, there was a considerable amount of support among the general public for controlled bear hunting, which suggests that their perception of legal protection does not necessarily exclude hunting as a way of using a protected species. Upon interpretation of these results account must be taken of the fact that the general public has shown a poor knowledge of the current legal status of bears. According to most of the respondents, the bear hunting quota should be determined on the national level and each harvested bear should be registered in a central database.

Most respondents from all areas concerned are willing to tolerate more bears. This attitude was particularly strong among the respondents from Lika. Although they have shown the most positive attitudes towards bears, hunting unit leaseholders and rangers were indecisive on the issue of increasing the size of the bear population.

Detailed results of the survey may be found in Majić, 2003 (Appendix to this Plan).

4.5.2 Damage caused by bears and bear attacks on humans

Damage caused by bears is diverse. According to damaged objects, the damage may be divided into following groups:

- damage to agricultural crops and orchards;
- damage to forest components;
- damage to livestock (including bees);
- damage to buildings;
- damage in traffic;
- danger to humans.

Damage to agricultural crops depends on the location of fields. Since the bear is a wildlife species that mostly inhabits the high karst and large forested areas, damage to agricultural crops are relatively rare and the most common form thereof is grazing on wheat fields during the period of seeds ripening. Bears prefer oats, followed by corn and wheat, and sometimes rye and barley.

Bears damage fruit trees by bending and tearing off branches during periods of fruit ripening. Bears primarily like plums, apples and pears. Other fruit interesting to bears (i.e. raspberries, blackberries, strawberries and so forth) are currently absent from the bear range in Croatia. In the coastal areas in which permanent bear presence has been registered over the past 20 – 30 years, bears have caused minor damage to fruit crops (i.e. figs, peaches, cherries and so forth).

Damage to agricultural and fruit crops caused by bears in Croatia is limited, in particular in the central part of the bears' habitat, while in the peripheral part such damage is somewhat more pronounced.

Damage to forest components. Since 2001 bear damage has been registered in the area under the competence of the Mrkopalj Forestry Office and the number of damaged trees has increased over the years. The number of damaged trees so far is estimated to 1000. Bears peel off the outer bark (mostly fir) and gnaw with their incisors the sweet cambial tissue. Damaged trees are located all over the forest, not only around the bear feeding stations. It is presumed that the habit of peeling off the bark of the trees is related to the situation in which a larger number of bears feed on the same feeding station, while younger bears (which also have a lower status) cannot access food in the presence or vicinity of a stronger bear. Due to the stress caused by such situations and the lack of natural sources of food, some bears start gnawing the tree bark and the sweet cambial tissue. Afterwards, this habit is maintained (as well as the habit of visiting waste dumps) and the bears continue to peel off the bark everywhere, while females pass the said habit to their young. All those factors render the solution to this problem difficult.

Possible actions:

1. Removal of bears damaging trees;
2. Reduction of the total number and local density of bears;
3. Reduction of the quantity of food on feeding stations. This may not be done before the reduction of the number of bears because it would cause their rapid spreading in other forest areas;
4. Additional feeding of bears by compound food containing sugar in order to prevent them from damaging trees (on the basis of the experience from the Washington State, USA and Bugojno, Bosnia and Herzegovina).

Damage to livestock and bees occurs more frequently and is the main cause of conflicts between people and bears. Such damage concerns both large and small livestock. As a result of the decrease of seasonal grazing of livestock in bear habitats, damage has occurred less frequently during the past 20 – 30 years. There were cases in which single bear would repeatedly attack large livestock or pigs located within a household or even in the stables. Compensations for bear-related damage on livestock in areas in which grazing is prohibited by law are not paid.

The most frequent damage caused by bears is damage to apiaries. A number of plant species and some of the best bee grazing areas (common heather and pubescent oak) important for honey production are located within the bear habitat, which is the reason of the development of apiculture in those areas. Furthermore, these are ecologically conserved areas where top quality honey is produced and where apiculture is already and shall become in the future in an even larger extent the most important part of local development programmes. It is estimated that more than 70.000 apiaries are present within the bear range in Croatia.

Damage to buildings mostly refers to damage caused by bears to hunting management structures (e.g. feeding stations, salt licks, food storages, etc.) and rarely to parts of households (such as fences, stables, storerooms, dry rooms and so forth). Since bear is a game species, hunting unit leaseholders do not report damage on their hunting management structures.

A research concerning bear damage in Croatia has been conducted by Huber and Morić (1989) in 1987 when 247 cases of damage caused by bears was recorded. Bears killed 13 farm animals, eight of which were of bovine species and three of which were sheep. The most damaged agricultural crops were oats (N = 107) and corn (N = 94).

Until the adoption of the Brown Bear Management Plan in 2005, official recording of bear-related damage in Croatia and data processing and presentation was not compulsory, nor has there been an administrative body in charge of such activities. Data on the number of cases of bear damage and the amount of damage are registered by hunting unit leaseholders, who are also liable for game-related damage and therefore for paying indemnities. All damage is not reported since it is incurred to hunters, too, and due to the fact that persons to whom such damage is incurred are not satisfied by the amount of compensation and the criteria for acknowledging the occurrence of damage (missing livestock does not count as damage and the loss thereof is not compensated). The amount of compensation is negotiated and it is not the same for the entire bear range area; furthermore, no common compensation tariffs exist for damage incurred by bears, as is the case of damage incurred by other protected wildlife species (in particular, wolves).

The implementation of the Brown Bear Management Plan, which began in Croatia in 2005, includes the organised collection of data on damage caused by bears. Within the LIFE COEX project entitled “Improving coexistence of large carnivores and agriculture in Southern Europe” (through which the European Union co-finances the implementation of the Brown Bear Management Plan), all hunting units within the bear habitat have received a questionnaire concerning damage caused by bears in hunting units during the previous year. 37 out of 82 hunting units located within the bear range sent the answer, reporting 26 cases of bear damage on 2004.

The Action plans for brown bear management for the years 2005, 2006 and 2007 provided the hunting unit leaseholders with guidelines on filling the forms and delivering data on damage caused by bears within the hunting units during the current year. In this way the organised collection of data on bear damage began and is jointly conducted by the Directorate for Hunting

of the Ministry of Agriculture, Forestry and Water Management (now Ministry of Regional Development, Forestry and Water Management) and the Biology Institute of the Faculty of Veterinary Medicine of the University of Zagreb.

In 2005 15 hunting units reported bear-related damage for a total of 88 damage cases. Most damage was incurred to the Hunting association Tetrijeb from Čabar in the Crna Gora hunting unit, with almost 40.000 HRK paid indemnities. The said damage was caused by a nuisance two-year-old female, which was killed on 6 April 2006 in accordance with a special permit of the Directorate for Hunting. The compensations paid by hunting units in 2005 amounted to almost 58.000 HRK. In 2006 7 hunting units reported bear-related damage for a total of 16 damage cases amounting to 44.000 HRK. Almost 37.000 HRK were paid as indemnities in two car accidents. Most bear damage is recorded in agriculture, i.e. to corn crops, orchards and vegetable gardens. Farm animals attacked by bears are usually bees (apiaries), fowl and rabbits, while large livestock is rarely attacked (1 cow and 13 sheep in 2005, 1 cow and 10 sheep in 2006). Damage is caused also by bears and motherless cubs attracted by waste dumps near human settlements. These are usually isolated cases accustomed to human smell on dumps, which therefore approach human settlements attracted by an easy source of food. The issues concerning such bears, known as “nuisance bears”, are dealt with in the Chapter “Nuisance bears”.

Damage in traffic occurs when vehicles collide with bears. In Croatia an average of 3 – 10 such traffic accidents occur each year. Such damage can be substantial (i.e. expensive vehicles, compensations for injuries or even death and so forth) and even though such accidents are rare, the total amount of damage can be greater than all other bear-related damage put together

Up till now official recording of bear-related damage in Croatia and data processing and presentation was not compulsory, nor has there been an administrative body in charge of such activities. Data on the number of cases of bear damage and the amount of damage are registered by hunting unit leaseholders, who are also liable for game-related damage and therefore for paying indemnities. All damage is not reported since it is incurred to hunters, too, and due to the fact that persons to whom such damage is incurred are not satisfied by the amount of compensation and the criteria for acknowledging the occurrence of damage (missing livestock does not count as damage and the loss thereof is not compensated). The amount of compensation is negotiated and it is not the same for the entire bear range area; furthermore, no common compensation tariffs exist for damage incurred by bears.

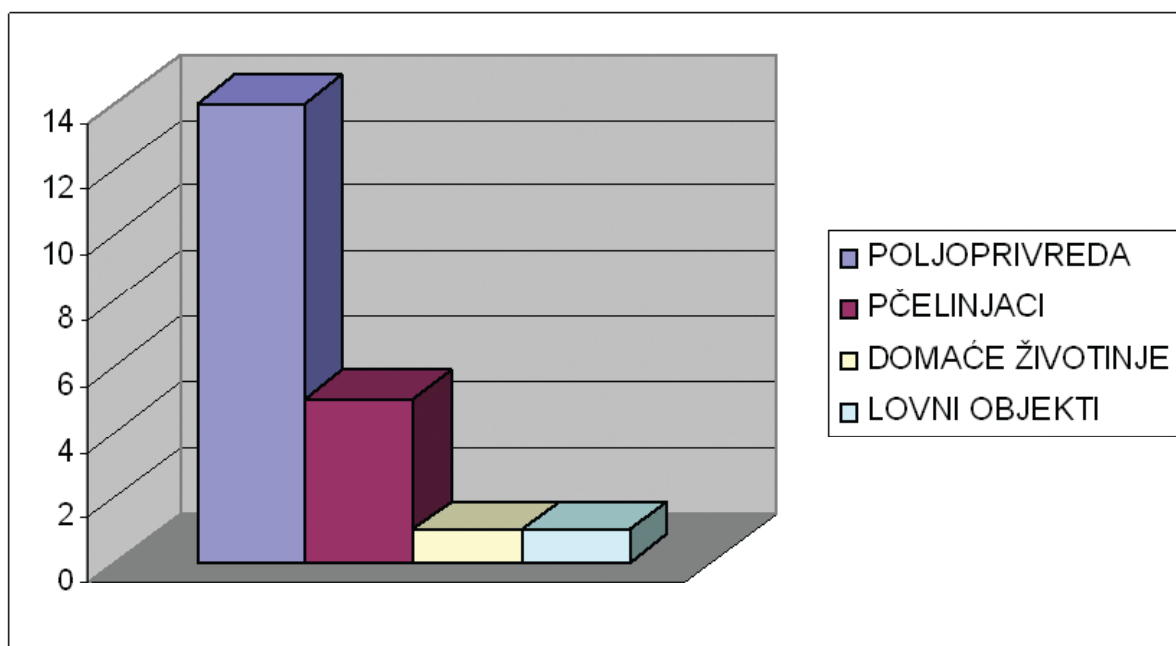


Figure 4: Bear-related damage in Croatia in 2004

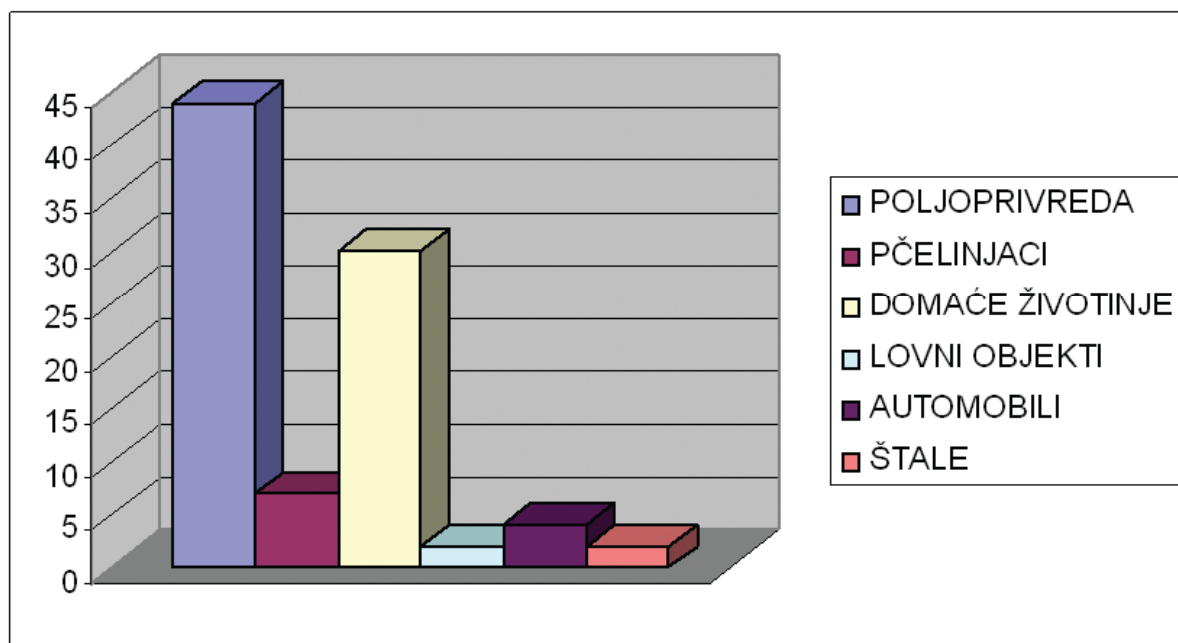


Figure 5: Bear-related damage in Croatia in 2005

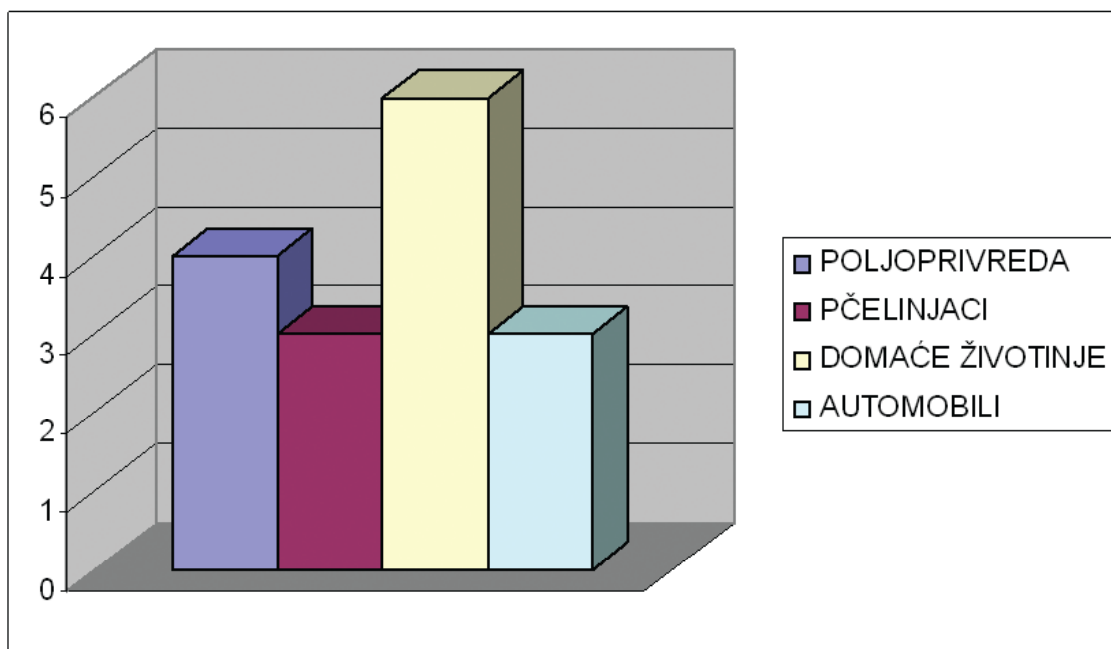


Figure 6: Bear-related damage in Croatia in 2006

Danger to humans. Due to their well-developed senses, bears can avoid people on time and unpleasant encounters with bear attacks on humans are rare.

There has been only one documented case of a fatal bear attack on a person in Croatia in the past 65 years, which occurred in the Plitvice Lakes National Park in March 1988. The man was killed by a female with a cub.

Apart from this case, a number of other unpleasant encounters was recorded, but with no tragic outcome. People got injured as a result of a bear attack, although in some cases persons got injured when running away from the bear and believing to be under attack. Accidental encounters with bear, in particular those with a female with cubs or with younger specimens, may be classified as irresponsible human behaviour in the bear habitat.

There are certain rules of behaviour in the bear habitat:

1. Do not feed the bears

Make sure you do not leave behind any organic waste in the bear habitat and that the food is not accessible to bears. Food leftovers and waste dumps attract bears. Certain bears pay regular visit to waste dumps, but they may also start looking for food nearer to humans and cause damage.

2. Do not surprise the bear

When moving in the bear habitat with thick vegetation you should be loud enough to be heard by a bear on a distance of about 30 m. If you move quietly, you may find yourself within the personal safety space of a bear. A bear may feel threatened and see the direct attack as the only escape, in particular where a female with cubs is concerned.

3. Do not approach the bear and do not run away from it

You may observe bears from a certain distance, cubs in particular. If a bear is moving in your direction, move away from his path. In case of an unexpected encounter, do not run away, but give the bear enough space to retrieve. Running away may provoke the bear to follow you.

4.6 Status of the bear

Within the meaning of the Hunting Act in force, the bear is a large game species.

Due to the biological characteristics of bears (rearing value, dynamics of growth, migrations, breeding) and ecological conditions of its habitat, the Ordinance on Closed Hunting Season (Official Gazette No 123/99 and 65/01) prohibits the hunting of bears between 1 May and 30 September (5 months), and from 16 December to 01 March (2,5 months).

This means that bear hunting season in Croatia lasts from 2 March do 30 April, ad from 1 October to 15 December of a calendar year (4,5 months). During the closed hunting season only injured and sick bears may be killed, as well as nuisance bear upon the issue of a special permit.

With the purpose of moving bears to other hunting units, the capturing of live bears is permitted under the following conditions: males year round and females in periods when they are not in late gravidity nor with cubs. The competent Ministry of Regional Development, Forestry and Water Management may approve bear hunting during the closed season for scientific purposes, protection of people or livestock and so forth.

4.7 Current management

In accordance with legal provisions game hunting within hunting grounds is regulated by the hunting management programme for each hunting unit. The hunting management programmes are basic planning documents which are adopted for each hunting unit and which regulate the entire hunting unit and game management for a period of 10 years. Hunting management programmes must be harmonised with the forest management programmes, agricultural land use conditions and manners, water management programmes, spatial planning and ratified international conventions and agreements concerning hunting, environmental protection and the protection of natural game habitats.

For each game species, bear included, inhabiting the hunting unit the hunting management programme determines the habitat capacity and the optimal number of animals in the hunting unit. As with other large game species, the number of bears is determined by monitoring, tracking and counting of bears during the hunting season in the bear habitat, and it is expressed as the number of specimens divided by sex and age. Therefore, the hunting management programmes plan bear management for a 10-year period.

In comparison to the hunting of other game species, bear hunting is conducted in accordance with the annual Action plan for brown bear management in Croatia, which is adopted and implemented by the Ministry of Regional Development, Forestry and Water Management upon proposal of the National Committee for the creation of the Brown Bear Management Plan of the Republic of Croatia and the Committee for the monitoring of large carnivores populations.

Hunting management programmes continue to be implemented through the use of supporting forms LGO-2, LGO-3, LGO-5 and LGO-6, but only bear management is regulated by the Management Plan and the annual Action plans.

Bears are hunted individually during moonlit nights by waiting on a high hunting stand near a bait at a feeding station. Only persons who have passed a hunting exam and have obtained a written hunting permit from the hunting unit leaseholder (in whose hunting unit bear management is implemented, i.e. who was allowed to harvest bears by the Action plan) may hunt.

Bears may be hunted only with rifled-barrel hunting weapons and hunting ammunition which has a kinetic energy greater than 3.500 joules per 100 m, i.e. 11.5 grams, while the maximum allowed shooting distance is 100 metres.

Because of the moonlight the high stand should face west in order to see well the targeted animal.

Article 64 of the Hunting Act permits the use of baits to attract bears to the hunting site, except in area are up to 300 m from the boundary of a national park or another protected area in which hunting is prohibited.

Harvested bears and their parts may be transported, stored and processed only with a special certificate confirming that the animal and its parts have been obtained in accordance with the legal provisions. Such certificate is issued by the hunting unit leaseholder.

Since bear meat may be intended for human consumption, the Veterinary Act (Official Gazette No 41/07) lays down that the hunting unit leaseholder must notify the local veterinary organization about the harvested bear for the purpose of inspection and control thereof, as well as the evaluation of safety of meat.

Bear meat must be checked in particular for the presence of *Trichinella spiralis* larvae; for that purpose a sample is taken from the diaphragm muscle.

Bear pelt and skull are hunting trophies and regardless of the age of the specimen or the trophy value, they must be evaluated and a trophy certificate is issued on the basis of the evaluation. In hunting tourism, the evaluation of the bear fur constitutes the basis for the calculation of the hunting duty. Bear fur and skull are evaluated in accordance with the instructions and formulas in force of the International Council for Game and Wildlife Conservation (CIC). The basic evaluation measures are the length and width of the skull, the length and width of the fur as well as the symmetry and beauty of the hair.

Top quality bear trophies (trophies with a higher number of points than the best documented trophy – champion of the Republic of Croatia) may not be exported. In 1996 the CIC decided that bear skulls and furs should no longer be considered official hunting trophies and therefore may not be used in national or international trophy competitions.

The hunting unit leaseholder must keep a register of all trophy certificates issued.

The Hunting Act regulates issues concerning compensation and the prevention of damage caused by game. Measures for the prevention of damage include:

- reduction of the number of game in a hunting unit to a tolerable level;
- providing enough food for game;
- fencing and guarding of crops;
- translocation of the game, and so on.

Both hunting unit leaseholders and land users must carry out certain measures for the prevention of damage. If damage has occurred regardless of preventive measures, the hunting unit leaseholder shall compensate the damage caused by bears that permanently inhabit his

hunting unit. Pursuant to the Hunting Act, the hunting unit leaseholder shall be responsible for damage incurred within his hunting unit by game (bears included) that does not permanently inhabit the given hunting unit, but he shall also be entitled to harvest the game in question. Such entitlement is established on the basis of evidence of paid compensation to the person to whom the damage has been incurred and the approval of the competent administrative body issued in agreement with the Ministry (if the damage was incurred in a state-owned hunting unit).

A detailed description of bear-related damage is laid down in Chapter 4.5.2.

The game harvest authorized in this manner must correspond to the amount of the compensation taking into account the market value of the trophy and the game meat. Compensations for bear-related damage on livestock in areas in which grazing is prohibited by law shall not be paid.

Inspection and surveillance of the implementation of the Hunting Act and hunting management programmes are carried out by the State Hunting Inspectorate of the Ministry of Regional Development, Forestry and Water Management, whilst the administrative control on the implementation of the Hunting Act is carried out by the Ministry of Regional Development, Forestry and Water Management.

Penalty provisions (Article 96 – 101 of the Hunting Act) lay down the fines for any violation of the law in question.

4.8 Current situation

4.8.1 Distribution and range

The bear distribution areas in Croatia may be categorized into areas with permanent bear presence and areas with occasional (desirable or undesirable) bear presence.

Permanent bear presence habitats are areas in which bears satisfy all their food, water, space, tranquillity, cover, breeding and denning needs and in which bears are present during year round. In those areas all prescribed protective measures are implemented in order to ensure the stability of the population. Local inhabitants accept bears as part of their natural environment.

The current permanent bear presence habitat in Croatia extends over 9.573,36 km² (957.336 ha).

Occasional bear presence habitats are areas with a sporadic presence of bears or areas in which the number of bears does not guarantee the continued existence of the species in the said area, or bears do not den regularly in the area. In short, these are habitats to which bears are returning and which are connected to permanent bear presence areas in Croatia, Slovenia or Bosnia and Herzegovina. Bears occasionally cause damage in these areas. Within occasional bear presence habitats there are areas in which bear presence is acceptable and areas in which bear presence is unacceptable. A detailed explanation of these categories is laid down in Chapter 9.

Table 3: Bear distribution areas in Croatia in 2007

AREA	PRESENCE		km ² /ha
Gorski Kotar	permanent	desirable	1205,93 (120.593 ha)
Istria	permanent	desirable	289,38 (28.938 ha)

Eastern Lika	permanent	desirable	4631,45 (463.145 ha)
Northern Lika	permanent	desirable	1603,13 (160.313 ha)
Western Lika	permanent	desirable	1843,48 (184.348 ha)
Biokovo and Zagora	occasional	desirable	1311,69 (131.169 ha)
Bosiljevo	occasional	desirable	429,82 (42.982 ha)
Ribnik	occasional	desirable	105,33 (10.533 ha)
Zdihovo	occasional	desirable	53,20 (5.320 ha)
Žumberak	occasional	desirable	159,86 (15.986 ha)
Krk	occasional	undesirable	260,29 (26.029 ha)
Coastal area	occasional	undesirable	478,61 (47.861 ha)
Total			12.372,17 (1.237.217 ha)

Occasional	2.798,80 (279.880 ha)
Permanent	9.573,37 (957.337 ha)
Total	12.372,17 (1.237.217 ha)

Occasional undesirable	738,90 (73.890 ha)
Occasional desirable	2059,90 (205.990 ha)
Total	2.798,80 (279.880 ha)

The total bear distribution area in Croatia extends over 11.824,33 km² (1.237.217 ha). The permanent bear presence habitat extends over 9.253,47 km², while the occasional bear presence habitat extends over 2.570,86 km². These data were obtained through an on-site drawing of the habitats on maps to the scale of 1:100000 (Figures 8-11) by means of digitalisation of habitat boundaries on maps to the same scale and computer calculation of the surface using the ArcView software.

Bears are distributed over the entire Gorski Kotar and Lika regions, the western and southern part of the Karlovac county, the Učka and Čićarija mountains in Istria, the central and northern part of the island of Krk, the Žumberak mountains, the coastal part from Bakar to Maslenica and the area surrounded by the Kamešnica, Mosor and Biokovo massifs.

94,2% of the permanent bear presence area are hunting units, while 5,8% thereof are parts of national parks. Bears are permanently protected in national parks (Table 4).

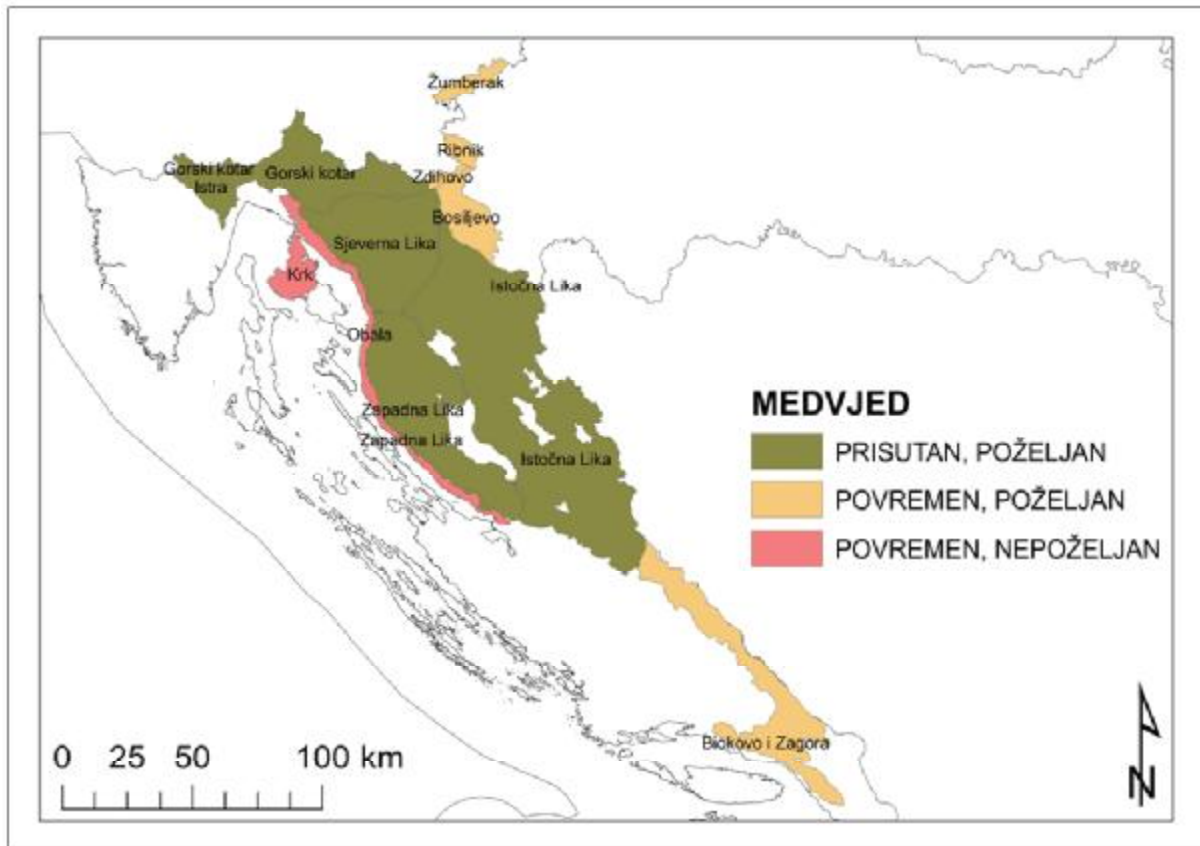
Table 1: National parks' surface in bear habitats

National Park	Surface (km ²)
Risnjak	64,00 (6.400 ha)
Northern Velebit	109,00 (10.900 ha)
Plitvice Lakes	295,00 (29.500 ha)
Paklenica (partly)	67,00 (6.700 ha)
Total:	535,00 (53.500 ha)

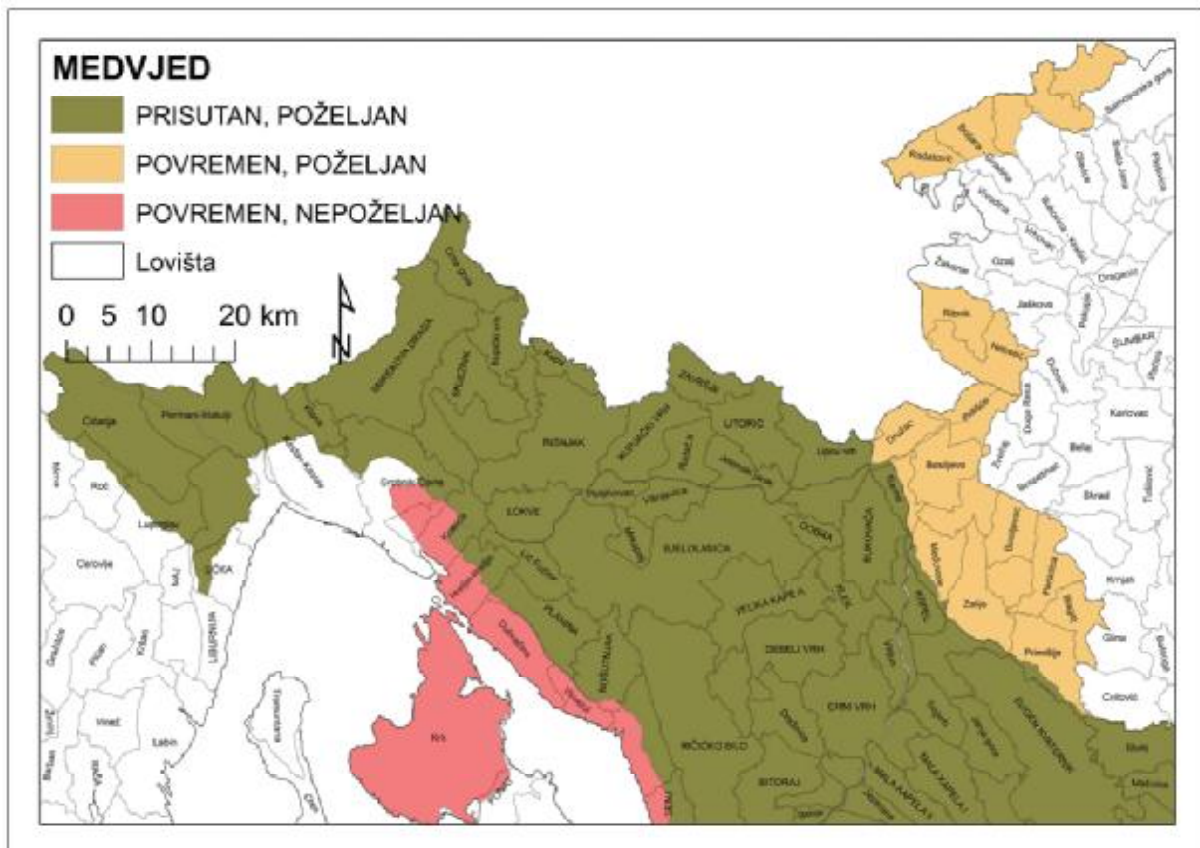
Table 2: Hunting unit and national park portions within the permanent bear presence habitat in Croatia

Permanent bear habitat	km ²	%
State and shared hunting units	9.038,37	94,2
National Parks	535,00	5,8
Total:	9.573,37	100

Figure 7: Bear distribution in Croatia



Figures 8-11: Bear distribution in Croatia (detailed)



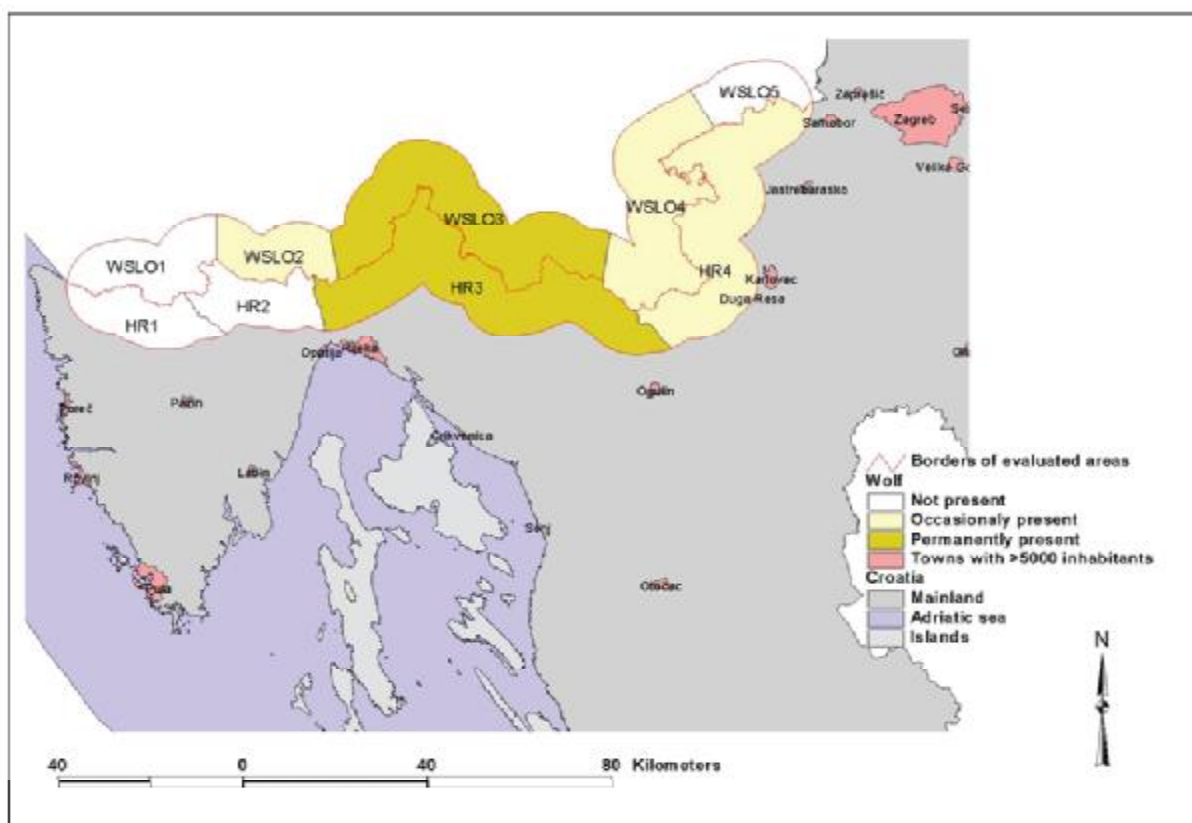


Figure 12: Border area with Slovenia inhabited by bears permanently or occasionally

Table accompanying Figure 4: Length of the border (km) between Croatia and Slovenia where bears, wolves and lynxes are permanently or occasionally present

Present	Bear	Wolf	Lynx
Permanently	131	112	112
Occasionally	196	120	120

4.8.2 Mortality by causes and regions – impact on the population

Known data on bear mortality collected up to the entry into force of the 2005 Plan are shown in the said document, whilst this document contains data obtained during the first three years of the implementation of the Plan.

Systematic monitoring of bear mortality by its causes was not carried out until 2000, except in the region of Gorski Kotar (Table 6), where the quality of bear management is the highest. The implementation of the Hunting Act, the leasing of newly-formed hunting units (at the end of 2000) and the implementation of hunting management programmes, ensured the conditions for collecting and analysing data on bear mortality and other bear-related data.

Table 3: Bear mortality in Gorski Kotar and Hrvatsko Primorje from 1990 to 1999 divided by years and causes (Frković et al. 2000).

Cause	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	
Hunting	17	12	11	11	12	9	12	21	16	17	138
Poaching	3	4	4	4	1	1	3	3	0	3	26
Road traffic accident	2	1	2	0	1	0	2	2	3	7	20

Railway traffic accident	3	6	1	1	2	2	2	3	3	2	25
Unknown	0	4	2	0	0	1	2	0	1	0	10
Others	4	1	1	0	5	0	1	2	1	2	17
Mines*	0	11	7	3	5	4	6	0	1	0	37
Total	26	28	17	14	20	13	19	24	17	23	273

* Includes war related mortality: mine fields, bomb shells, shooting at the combat frontline, traffic, deliberate illegal killing (Frković, 1999)

Table 6 contains data on causes of bear mortality from 1990 to 1999 for the areas of Gorski Kotar and Hrvatsko primorje, which account for 25% of the total surface inhabited by bears in Croatia. The reasons for the partial collection of data for the given period are the temporary occupation of large portions of the bear range in Croatia and warfare activities during the Homeland war, which made the collection of data in the entire bear distribution area impossible. After the end of the war (1996), the Hunting Act was implemented on areas previously under temporary occupation as well, hunting units were formed and leased, hunting management programmes were developed and approved for each hunting unit and systematic hunting management began on the given territory. The process of forming and leasing hunting units lasted from 1996 to 2001, when the last hunting units were formed and leased, and the last hunting management plans were developed to cover all game, bears included. This is reason why bear mortality data for the total bear range in Croatia could be collected only from the year 2000.

Table 4: Bear mortality in Croatia from 2000 to 2007 divided by years and causes.

Cause of death	Sex	2000/01	2001/02	2002/03	2004	2005	2006	2007
Hunting	M	31	57	52	31	22	38	42
	F	7	9	10	9	7	11	7
	Unknown					3		
Poaching	M		1			2		
	F			2		1		
	Unknown						1	
Road traffic	M	1	4	4		1	5	2
	F	1	1	1		3	7	
	Unknown				2	1	3	
Railway traffic	M	1	2	2	1	2	2	3
	F	3	1	4	3	2	5	
	Unknown				2	1	2	
Unknown	M	1	2	3				1
	F		1	3				
Other causes	M	1		1	1		1	
	F	3	2		1	1	2	
	Unknown					1	1	
Intervention culling	M						4	
	F						3	
TOTAL		49	80	82	50	47	78	55

Table 7 shows mortality in the entire bear range in Croatia. Data for the period 2000 – 2003 are divided by hunting years, whilst the collection of mortality data on the basis of the academic year began in 2004 after the adoption of the first brown bear management Action plan.

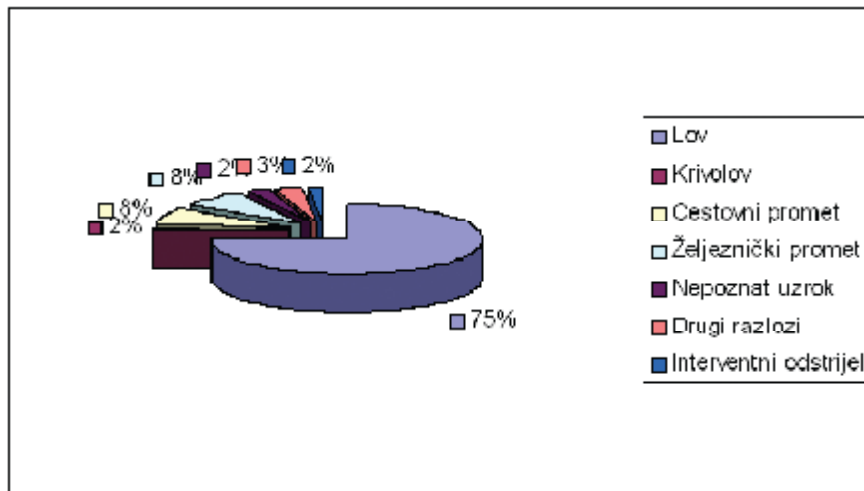


Figure 13: Causes of death of bears in the period 2000 – 2007

Death of 448 bears was recorded during the period 2000 – 2007, 320 of which were males (71%), 111 females (25%) and 17 specimens of unknown sex (4%). The most important cause of death (336 bears) was hunting (75%), followed by road and railway traffic accidents (16%, i.e. 32 bears). In the period 1990 – 1999 legal hunting was the cause of death of 50% of bears and poaching almost 10% thereof. In the said period traffic accidents were the second cause of death (16%) as well.

It must be underlined that the total bear mortality is not known and was probably higher than presumed for different reasons. Certain hunting units have not declared hunting activities nor any other cause of death of bears out of negligence, ignorance with respect to new regulations or for the purpose of hiding the real situation. This became evident in 2005 with the entry into force of new identification tags and the Module for harvested bears, that the hunting unit leaseholders must use in order to notify bear harvest to the Hunting Administration within 24 hours. Even though poaching has been reported, in most cases it is impossible to produce evidence thereof. Poaching is therefore likely to be the cause of death in more than 2% of cases. Nevertheless, due to the fact that all hunting units have a manager and are managed in accordance with hunting management programmes in force, poaching represents a very small percentage in the total bear mortality and does not threaten the bear population.

On the basis of the presented data the following conclusions may be drawn:

- poisoning is no longer a cause of death of bears;
- warfare activities (mine fields, bomb shells, shooting at the combat frontline, etc.) are no longer a cause of death of bears;
- mortality caused by road and railway traffic is considerable and it is expected to remain such in the future since road and railway traffic is constantly increasing in the bear range in Croatia (tourism is one of the most important economic activities in Croatia, as well as the transport of goods from northern to southern Europe through corridors passing through Croatia);
- bear mortality related to diseases or lack of food or water was not recorded.

The question of the possible influence of the 75% mortality of male bears on the entire bear population may be raised. The most important cause of death of males is hunting – 85%

(273 males, 60 females and 3 specimens of unknown gender were shot in the period 2000 – 2007), while other causes of death evenly apply to both males and females.

4.8.3 Number of bears and habitat capacity

Habitat capacity

Bears in Croatia inhabit an area of 12.000 km² (1.200.000 ha) with diverse, more or less favourable habitat characteristics. Consequently, the density of bears is different in different areas, i.e. from 0.5 up to 2, whilst in certain smaller areas and during shorter periods more specimens may be present in an area of 10 km² (1.000 ha). The best habitats in Gorski Kotar, Velika Kapela, Mala Kapela and Velebit, have an average density of 1 or more bears per 10 km². Due to such population density, migration of younger males to neighbouring peripheral areas of the bear range (Učka, Čićarija, Pokuplje, Priobalje, etc.) occurs.

This indicates that generally no further increase of the number of bears is necessary since it would further increase the bear migration to neighbouring peripheral areas, which are more densely inhabited by humans and where their activities are more intense, which may substantially lead to more conflicts between man and bear.

Until the adoption of the first Plan, bear management in Croatia was regulated by hunting management programmes developed pursuant to the Ordinance on the Contents, Methods of Adoption, Development and Approval of Hunting Management Programmes. Hunting management programmes are developed in accordance with the recommendation of the Ministry of Agriculture, Forestry and Water Management (Expert guidelines for the determination of the quality category of the hunting unit and the hunting grounds) and plan an increase of the number of bears of 15% as to the number of specimens before the mating season, i.e. in the base game stock.

It is difficult to calculate with precision the absolute bear habitat capacity in Croatia; however, approximate habitat capacity figures have been obtained by three methods.

The possible base game stock was defined by the hunting management programmes as the possible number of animals per 10 km² (1.000 ha) of the hunting productive surface (with respect to the habitat quality category) and corresponds to the meaning of the term “habitat capacity”. The hunting management programmes take into account the density of the population (the number of animals per 1.000 ha) amounting to 0,5 to 2,5 specimens, depending upon the habitat quality category in single hunting units. In this way possible base game stocks were calculated for 85 Croatian hunting units in which bears are managed pursuant to hunting management programmes and are considered as one of the main large game species. The said 85 hunting units extend over a total surface of 6.600 km² (660.000 ha), which is approximately 85% of the permanent bear range. This method has allowed the calculation of the total possible base bear stock in the 85 hunting units amounting to 808 bears. This figure should be added to the estimated habitat capacity of the current or the possible bear range, where bears are not managed nor hunted. It includes an area of over 500 km² of national parks and most of the 2.570 km² of the areas described in the previous chapter in which bears are not permanently present. Assuming that bear population density in national parks amounts to 1 bear per 10 km² (50 bears) and in areas with occasional bear presence amounts to 0.5 per 10 km² (128 bears), the total base bear stock capacity in Croatia would be 986 bears. With the expected natural increase of 15% (148 bears) for the year, the total capacity could amount to 1.134 bears.

Another method for calculating the total bear habitat capacity is based on the bear distribution in Croatia on a surface of approximately 12.000 km² (1.200.000 ha) and bear population density of 1,5 bears per 10 km². According to this method bear habitat capacity in Croatia amount to 1.050 bears. Even though certain areas have a larger capacity, a more significant increase of the population density of 2 bears per 10 km² (1.000 ha) is not recommended due to other factors, such as social relations within the population (expected rivalry and persecution of weaker bears, increased cannibalism and possible negative consequences for local inhabitants), presence of other large carnivores on the same territory and the conservation of the habitat, food and tranquillity for other animal species.

The third method for calculating the total bear habitat capacity is the estimation of the portions of areas with different possible bear population densities. An analysis of the habitat quality shows that approximately 20% of the entire bear range is in the category allowing the highest possible bear population density – 1,5 per 10 km² (i.e. 1.530 km² (153.000 ha) or 90% of the central 1.700 km² (170.000 ha) of Gorski Kotar and a further 870 km² (87.000 ha) of the central part of the Kapela massif and a part of Velebit). 360 bears could live within this area extending over 2.400 km². Approximately 50% of the habitat is in the category allowing a bear population density of 1 specimen per 10 km², i.e. 600 bears could live on a surface of 6.300 km² (630.000 ha). The remaining 30% of the habitat allows possible bear density between 0,1 and 0,9 specimens (0,5 on average) per 10 km², i.e. 180 bears. The sum thereof is the total possible habitat capacity in Croatia amounting to 1.140 bears.

Since the results obtained by applying those three methods correspond, it may be concluded that bear habitat capacity in Croatia amounts to approximately 1.100 specimens.

The difference between this biological habitat capacity and the so-called “wildlife acceptance capacity” (attitude of the local population towards bears) is a separate issue. As far as all large carnivores, bears included, are concerned, the wildlife acceptance capacity is generally lower than the biological capacity of the habitat. The goal is to keep the Croatian bear population as close as possible to the biological capacity of the habitat, whilst reducing conflicts with locals inhabitants to a minimum.

For the purpose of comparison, in northern forests and taigas of Scandinavia, Siberia, Canada and Alaska bear population density amounts to only 0,1 specimens per 10 km². It is interesting that the largest brown bear populations are present exactly in those areas, while the populations in southern and more productive habitats are smaller and more endangered with a low reproduction rate (the Apennines in Italy, Cantabria in Spain and the Pyrenees in France and Spain). The present and future bear reproduction rate and the survival of bears in Croatia highly depends on the conservation of the size and the quality of their habitat.

Number of bears

Currently there are different estimates of the number of bears in Croatia although none were made using strict scientific criteria. Similar methods of estimating the size of the the bear population are used in other countries as well.

According to the data from the hunting management programmes of hunting unit leaseholders in charge of bear management, the following estimates of the number of bears were made for previous hunting years: 2000/2001 = 813 bears and 2001/2002 = 854 bears. In 2006 716 bears were present in state hunting units (data concerning state hunting units were entirely collected and processed). By adding this number to approximately 150 specimens living in

common hunting units, a total of 866 bears is obtained. These data have been collected pursuant to laws in force and are the only official source. It is in the hunting unit leaseholders' interest that the estimated number of bears in their hunting unit is as close as possible to the real situation since the hunting unit leasing fee depends on the number of bears; therefore, overestimating the number of bears reduces profit. A hunting unit leaseholder failing to carry out or exceeding the planned harvest of bears is penalised. Furthermore, after the expiry of the lease, a hunting unit leaseholder must ensure that the game stock corresponds to the provisions of the hunting management programme.

In 1997 and 1999 attempts were made to estimate the number of bears in Croatia. On the basis of the assessments and data collected from local hunting management experts and bear biologists for different parts of the bear range, in 1997 the number of bears was estimated approximately to 378 (340 to 415). This estimate was made after the end of the Homeland war (1991-1995) and the return of parts of the bear range under state supervision after 5 years of occupation. The conclusion was that there the reduction of the bear population due to war and post-war activities amounted to 10% and that the survival of the population was not threatened.

In 1999 similar methods were used for another estimate and the resulting number was 623 bears without corrections. Afterwards this figure was corrected to 400 – 600 bears due to the possibility that certain bears might have been counted twice. The conclusion was that the reduction of the bear population due to war and post-war activities was recovered and that the number of bears was steadily increasing.

It may be concluded that the precise number of bears in Croatia is unknown; however, an increasing trend has been visible from the estimates. According to the latest estimates there are currently 600 to 1.000 bears in Croatia. The lower limit (600) of this range corresponds to the upper limit of the 1999 estimate with the expected positive trend. The upper limit (1.000) corresponds to 850 bears recorded within the hunting management programmes plus about 50 bears in national parks and at least 100 bears in areas for which no hunting management programmes exist. Furthermore, it seems that the number of bears is slightly increasing. It should be added that according to certain sources, the number of bears is rather lower than the number laid down in hunting management programmes and the trend is negative. On the other hand, other sources claim that the actual number of bears is higher. A slight decrease is assumed to have occurred in the western part of the bear habitat along the border with the Republic of Slovenia, in particular after the considerable increase of bear hunting quotas introduced in Slovenia over the past years.

DNA analysis of scat samples is currently being implemented and the first results should be available in 2008. The given estimates shall be subsequently narrowed down and the results shall be supported by statistical and scientific evidence.

Samples for genetic analysis are being collected in Croatia since 2003, while from 2008 the number of bears shall be estimated by the use of the DNA analysis method in order to determine single genetic markers for each specimen. Scat samples found within the bear habitat are stored in alcohol and marked according to the place and the time of finding. Bear DNA, originating from the mucosa epithelial cells of the digestive system, is isolated in the laboratory from the scat samples. The order of nucleotide bases (genetic code) of a certain number of gene parts is analysed in the bear DNA and it is sufficient to distinguish one bear from another. With a sufficient number of samples the statistical number of bears in a certain area may be calculated quite accurately. The larger the sample, the lower the possibility to make a mistake, with an

accuracy of 90%. Such accuracy may be obtained if the number of samples is three times higher than the number of specimens of the local population.

Bear counting, envisaged by the Action plan during certain days in spring and autumn, is done by observation from a high stand positioned on a feeding site for the purpose of establishing the population growing trend.

4.8.4 Trends and demography

The natural increase by reproduction includes all newborn animals that survive their first year of life. Since female bears give birth in January in their dens, yearlings too are counted among cubs and are taken into account as bears contributing to the increase of the population after their separation from the mother, usually when they are 1,5 years old.

The counting of females with cubs was carried out over a 6-year period (Table 8). The counting was carried out during autumn (cubs aged 9-10 months) and during spring (yearlings, aged 14-15 months). The bears were counted at feeding sites from high stands (Majnarić, 2002).

Table 5: Number of observed females with cubs

Year	Number of observed females	Number of cubs / yearlings	Number of cubs or yearlings/number of females
1996/1997	27	57	2,11
1997/1998	32	65	2,03
1998/1999	36	76	2,11
1999/2000	29	67	2,31
2000/2001	34	74	2,18
2001/2002	33	71	2,15
Total:	191	410	2,15

Table 6: Distribution of females with No cubs / yearlings (1996/1997-2001/2002).

Female with 1 cub	Female with 2 cubs	Female with 3 cubs	Female with 4 cubs	Total:
28 (14,7 %)	104 (54,4 %)	57 (29,8 %)	2 (1,0 %)	191 (100 %)

The tables show that the average number of cubs or yearlings per female was 2,15. Since adult females usually give birth every two years, the average reproductive increase per year is 2,15:2 or 1,075 per adult female.

More than 50% of females had two cubs, twice as many females had three rather than one cub, but females with four cubs were rare (Table 9).

From a published scientific article on the same subject "Brown bear litter sizes in Croatia", Frković et al. (2000) (abstract):

Mean litter sizes and maximum survival of cubs of brown bears (*Ursus arctos*) in Croatia were calculated based on 116 observations of 106 brown bear family groups. In addition to the number of cubs, each record contained the age of cubs (cubs-of-the-year [COY] or yearlings), date and location of observation. The mean litter size was 2,39 (n = 56, range 1-4) for COY and 1,96 (n = 50, range 1-4) for yearlings. The difference of 0,43 (18%) was statistically significant.

No significant difference in COY and yearling litter sizes was determined between spring and autumn of the same year. Significantly larger litters of all ages were observed with mothers away from feeding stations ($n = 2,36$, $n = 47$), than at feeding stations ($n = 2,05$, $n = 59$). This suggests that feeding bears in Croatia for management purposes has not influenced bear reproduction.



The high reproductive rates of bears in Croatia may be attributed to the following factors:

- Favourable climatic conditions during most of the year. Bears hibernate in their dens during the least favourable part of the year. A radio telemetry observation of 6 tagged bears has shown significant differences in the duration of denning, i.e. from 6 to 189 days, or 86 days on average.
- Bears find enough food in nature, a large portion of which is constituted by beech nuts. Most of the forests in the bear range are mixed coniferous and deciduous forests.
- Almost throughout the bear range, bears are additionally fed as a game species. However, studies have not confirmed the positive effects of supplemental feeding on reproduction.
- The existing human activities in the bear habitat do not disturb bears as much as to have a negative impact on their biological needs.

The sex ratio is expected to be natural, i.e. 1:1. Females reach sexual maturity between 3 and 4 years of age. The ratio of sexually mature (4-20 years of age) and sexually immature females (1-3 years of age) is such that sexually mature females account for over 50% of base game stock. The decrease in litter size between the cubs' first and second year is on average around 18%. This percentage was calculated on the basis of litters in which at least one yearling survived. The number of entirely lost litters is unknown, which means that the cubs' survival rate is also lower.

A significant portion of cub mortality is due to the fact that adult males kill the cubs of another bear. The survival rate of yearlings after leaving the mother and until adulthood is unknown as well. However, it is known that bears practice intraspecific killing and cannibalism during the given period. Therefore, it is difficult to estimate the total possible increase by reproduction. Theoretically, it might amount to as much as 25% (20% according to certain calculations) of the total number of bears (older than 1 year) if each sexually mature female gave birth to at least 1 cub. It is unknown how many cubs reach sexual maturity and participate in the new reproduction cycle. In the absence of scientifically confirmed facts, it may be concluded that the total reproduction of bears is sufficient to compensate annual losses up to 15%. The highest annual increase of the brown bear population has been recorded in Sweden in a determined period and amounted to 16% (Swenson 2004). The annual increase of other bear populations in the world accounts for less than 10%, in most cases 7%.

According to different calculations, the current annual increase of the Croatian bear population is estimated between 90 (15% if the bear stock amounts to 600 specimens) and 170 bears (20% if the bear stock amounts to 850 specimens).

Since bear mortality is relatively limited (planned hunting and officially recorded deaths), the question is raised whether the population continues to grow and where the remaining bears “disappear”?

It is a fact that bears continue to extend to new habitats, occupying area in which they have never been present or absent for a long time; furthermore, in certain areas larger density populations have been observed. On the other hand, beside legal hunting and planned harvest of bears, poaching is certainly one of the causes of bear mortality, but is difficult to prove due to the characteristics of the bear habitat. A number of bears cross the state border and is killed in the neighbouring country, which might be assumed as regards the border area with Slovenia, where bear harvest is considerably higher than in Croatia and a where mostly younger bears get killed. It may also be assumed that a number of cubs dies due to natural causes before separating from the mother. The complexity of possible impacts on the bear population and the unrecorded deaths may somewhat explain the difference between the actual reproductive rates of the population and the realised and recorded culling of bears.

4.8.5 Infrastructure and other human influences

4.8.5.1 Roads

4.8.5.1.1 Motorways

The Karlovac – Rijeka and Bosiljevo – Split motorways have divided the bear habitat into four parts. Even though these roads influence the habitat quality and the movement of animals, the large number and the length of infrastructure objects on the motorways allow animals to move rather freely. Structures allowing crossing (including one green bridge - Dedin) are present along 25% of the length of the motorway connecting Bosiljevo and Rijeka. Bosiljevo – Sveti Rok motorways presents only a half such structures 80 or more metres wide, but four green bridges have been build on strategic points and along all other structures, enable animal viability.

Table 10: Width of all structures and their number along the Bosiljevo – Grobnik section of the Zagreb – Rijeka motorway

	Number and width of structures according to sections							
	Bosiljevo- Vrbovsko		Vrbovsko- Tuhobić		Tuhobić-Grobnik		Total	
Type of structure	Width	No.	Width	No.	Width	No.	Width	No.
Bridge	0	0	898	3	0	0	898	3
Crossing	20	2	40	4	0	0	40	6
Passage	0	0	40	2	115	3	115	5
Tunnel	1.638	2	8.129	9	278	1	10.045	12
Viaduct	2.208	4	1.689	7	1.972	6	5.869	17
Green bridge	0	0	100	1	0	0	100	1
All structures	3.866	8	10.896	26	2.365	10	17.127	44
Length of the section (m)	13.632		43.572		11.330		68.534	
Width of the structure (%)	28,36		25,0		20,9		25,0	

Table 11: Permeability assessment of the Bosiljevo – Sveti Rok motorway including only objects wider than 80 m

	Name of the section	Length of the section	No. structure	Width of structures	Percentage of section (%)
1	IIIA1 Bosiljevo - Josipdol	27.168	4	498	1,8
2	IIIA2 Josipdol - Tunnel Mala Kapela	14.500	7	7.706	53,1
3	IIIC1 Tunnel Mala Kapela - Žuta Lokva	26.030	5	3.472	13,3
4	IIIC2 Žuta Lokva - Ličko Lešće	23.983	8	4.678	19,5
5	IIIB1 Likčko Lešće - Lički Osik	24.870	5	1.920	7,7
6	IIIB2 Lički Osik – Junction Sveti Rok	33.052	4	621	1,9
	Total	149.603	33	18.895	12,63

The only possible way of crossing the motorway to access another part of the bear habitat is above tunnels and under bridges and viaducts. The up to date study of animal movement by means of sand patches and infrared sensors established the following animal use of the green bridge Dedin in Gorski Kotar and three out of four green bridges in Lika (Tables 12 and 13):

Table 12: Assessment of the overall number of mammals crossing the structures under observation. The total number of crossings over the Dedin green bridge has been calculated on the basis of the share of tracks of single species in the total number of crossings by the infrared sensor (N = 12 519 in 793 days). As far as the remaining three bridges are concerned, the number of crossings has been calculated on the basis of the number of tracks encountered upon visits, increased by the ratio between the number of crossings registered by the infrared sensor and the number of tracks encountered upon visits of the Dedin bridge. The numbers shown in the table below are only approximate.

Species	Dedin				Golubinjak		Sopač		Sleme		Total	
	Assessment of the total number registered by the infrared sensor	No. of days of the assessment	No. of tracks per visit	Ratio between no. of crossings registered by the infrared sensor and the no. of tracks upon visits	No. of tracks per visit	No. of days of the assessment	No. of tracks per visit	No. of days of the assessment	No. of tracks per visit	No. of days of the assessment	No. of tracks per visit	No. of days of the assessment

Roe deer	5.258	6,63	2,59	2,56	0,87	2,23	1,74	4,45	4,63	11,85	2,23	25,16
Red deer	3.267	4,12	1,61	2,56	0,52	1,33	0,96	2,46	6,50	16,63	1,60	24,54
Wild boar	2.091	2,64	1,03	2,56	0,04	0,10	0,26	0,67	1,88	4,82	0,75	8,23
Brown bear	1.239	1,56	0,61	2,56	0,17	0,43	1,26	3,22	1,25	3,20	0,69	8,41
Wolf	125	0,16	0,06	2,67	0,04	0,11	0,09	0,24	0,13	0,35	0,07	0,85
Lynx	25	0,03	0,02	1,50	0,04	0,06	0,09	0,14	0,13	0,20	0,04	0,42
Man	513	0,65	0,25	2,60	0	0,00	0,00	0,00	0,00	0,00	0,14	0,65
Total	12.519	15,78	6,17	2,56	1,7	4,26	4,39	11,17	14,50	37,04	5,52	68,27

Table 13: Number of crossings of animals higher than 40 cm and man on green bridges in Lika (data of 24.02.2007)

WOLF	1,72	54	0,15
DOG	9,2	287	0,79
MAN	10,92	341	0,93
Total	100	3.123	12,3
Medina gora			
Species	% share	No. per year	No. per day
WILD BOAR	15,87	572	1,57
ROE DEER	9,52	343	0,94
RED DEER	0	0,00	0,00
BEAR	22,22	801	2,19
WOLF	36,51	1.316	3,60
DOG	4,76	172	0,47
MAN	11,11	400	1,10
Total	100	3.604	9,81
Varošina			
Species	% share	No. per year	No. per day
WILD BOAR	24,32	829	2,27
ROE DEER	18,92	645	1,77
RED DEER	2,7	92	0,25
BEAR	6,76	230	0,63
WOLF	8,11	276	0,76
DOG	5,41	184	0,51
MAN	33,78	1.151	3,15
Total	100	3.408	9,91

The only possible crossings between single habitats above tunnels and under bridges and viaducts. On the Rijeka – Zagreb motorway and the Bosiljevo – Sv. Rok tunnel motorway, bears may cross at the following points (only objects longer than 80m are shown):

Table 14: Rijeka – Karlovac motorway

Structure	Length (m)
Viaduct Severinske drage	700
Viaduct Osojnik	354
Viaduct Veliki Gložac	1.146
Viaduct Zečeve drage	1.103
Viaduct Hambarište	103

Viaduct Dobra	225
Viaduct Kamačnik	225
Viaduct Jablan II	228
Viaduct Jablan I	105
Tunnel Čardak	566
Viaduct Stara Sušica	390
Tunnel Pod Vugleš	564
Tunnel Bajt	249
Tunnel Javorova Kosa	876
Viaduct Zalesina	461
Tunnel Vršek	868
Green bridge Dedin	100
Tunnel Lučice	576
Tunnel Sopač	752
Viaduct Golubinjak	569
Tunnel Sleme	835
Tunnel Vrata	257
Bridge Bajer	485
Tunnel Tuhobić	2.140
Viaduct Hreljin	535
Viaduct Bukovo	395
Viaduct Melnik	140
Viaduct Mali svib	215
Viaduct Veliki svib	385
Viaduct Čičave	300
Total:	15.847

Data were collected from construction project documentations and directly on site.

Table 15: Bosiljevo – Sveti Rok tunnel motorway

Structure	Length (m)
Green bridge Ivačeno brdo	120
Bridge Dobra	171
Bridge Bistrica	171
Green bridge Rasnica	120
Bridge Mrežnica	92
Viaduct Krajine	386
Bridge Miljanica	476
Bridge Bjelobrajdić	276
Viaduct Modruš I	516
Viaduct Modruš II	276
Viaduct Modruš III	156
Tunnel Mala Kapela	5.760
Viaduct Mokro polje	600
Viaduct Jezerane	640
Viaduct Zeleni most	131
Viaduct Borici	476
Tunnel Brinje	1.625
Viaduct Babica bridge	253
Viaduct Grubori	144
Viaduct Oreškovići	340
Tunnel Kompolje	440

Tunnel Brezik	618
Bridge Gacka	443
Viaduct Obilje	251
Viaduct Vrsci	338
Tunnel Plasina	2.300
Viaduct Pećine	340
Tunnel Grič	1.220
Viaduct Duman	120
Green bridge Medina gora	120
Green bridge Varošina	120
Viaduct Lički Osik	81
Bridge Lika	120
Viaduct Vučjak	345
Bridge Suvaja	81
Bridge Grabara	114
Viaduct Krpani	350
Tunnel Krpani	150
Tunnel Sveti Rok	5.670
Total:	25.950

The above data has been obtained from a map to the scale of 1:25.000.

The length of the Karlovac – Rijeka motorway in the bear habitat amounts to 68.534 m.

The length of all crossings on the said motorway is 17.127 m, which accounts for 25% of the length of the motorway in the bear habitat.

The length of the Bosiljevo – Sv. Rok motorway in the bear habitat amounts to 149.603 m. The length of all crossings on the said motorway is 18.895 m, which accounts for 12,6% of the length of the motorway in the bear habitat.

As stated on several occasions, the bear habitat in Croatia is to some extent fragmented by built or planned motorways and their accompanying infrastructure, thus making communication between the single areas somewhat difficult. Scientific research has shown that daily and seasonal movements of bears are irregular, i.e. that the regularity thereof cannot be determined. Also the mobility of single bears is related to their age and gender and to a number of factors present in the habitat. Therefore, safety standards on fast motorways passing through the bear habitat aim also at achieving as much permeability by means of natural and artificial passages, tunnels, viaducts and structures specifically built for that purpose. Along with the need to ensure motorway permeability, it is equally required to prevent animals from crossing the motorway by erecting the necessary fences.

In Croatia this issue has been (and is still being) dealt with, including the design of special animal crossings, as well as the development a study entitled “The Permeability of Roads for Animals (Draft design guidelines)” IGH 2002 and the monitoring of the effectiveness of the selected sites based on the frequency of their use by animals.

4.8.5.1.2 Other roads

Other public roads too, either state, county or local, have an important impact on the bear population since each year traffic accidents involving bears occur thereon.

Forest roads, used for the purposes of forest management (e.g. transport of timber, machines and forest workers, fire protection and so forth) are of special importance – both negative and positive.

Since vehicles move at a relatively low speed, the risk of hitting an animal is quite limited. The fact that these roads are not regularly used for the most of the time is a favourable factor, even though presently many of them are open to the public. On the other hand, these roads may be used for the purpose of poaching, different activities such as fruit and mushroom picking, tourism and illegal waste dumping. Furthermore, the total surface of forest roads reduces the forest surface.

Forest roads in large forest complexes may also have positive effects since they represent sunny strips that constitute secondary forest edges and offer additional feeding possibilities. A prerequisite for this function are certain limitations to public access to forest roads.

The average density of public roads (i.e. main, regional and local) in Gorski Kotar is 0,83 km/km², ranging from 0,59 km/km² in the Čabar area, 0,72 km/km² in the Delnice and Vrbovsko areas to 1,31 km/km² in the coastal areas. Together with forest roads, the total average amounts to 1,91 km/km².

The area managed by the Delnice Forest Administration, covering most of Gorski Kotar (state and private-owned forests), has 18 km of forest roads per 10 km². The area under the competence of the Gospić Forest Administration has 8 km of forest roads per 10 km².

The current density of forest roads does not have visible negative impacts on the bear population in Croatia

4.8.5.2 Railway lines

Two railway lines cut across the bear range in Croatia: the line connecting Karlovac and Rijeka of 143,4 km length in the bear habitat and the Lika railway line connecting Oštarije and Knin of 213,3 km length in the bear habitat. The tracks are no obstacle to bear movement, but a large number of bears die in railway traffic accidents: 70% of all traffic related deaths (Huber et al. 1996). Tunnel openings and gullies are particularly dangerous for animals.



4.8.5.3 Waste

Waste is an inevitable by-product of the progress of technology and civilization. The waste from larger towns and settlements is mostly disposed of in an adequate way, albeit certain locations, inherited from the times when waste management was an important issue, became a source of food and interest for bears, that visit those locations regularly and present a danger for both bears and humans.

Improperly organised or illegal waste dumps located at easily accessible and scarcely visible points represent a potential danger within or in the proximity of the bear range.

The danger for bears is indirect and with long-lasting consequences. Adult and subadult bears – instinctively following the easiest way of food foraging– are regular visitors of these locations. These bears lose their instinct of foraging for food over large areas, gradually lose their innate fear of human scents, finally becoming a potential danger to people in case of an accidental encounter. Entire families of young subadults with mothers who have grown up near waste dumps represent may be even more dangerous. The possibility of an incident (a fatal incident in particular) as a consequence of the encounter of bear and man is much larger in this context and may have a negative impact to the public attitude, which took a long time to become positive whatsoever.

In the past 4 years (2004 – 2007) the **Environmental protection and energy efficiency fund** has stipulated agreements with local governments and authorities for the purpose of improving 298 existing waste dumps. Restructuring of 30 local waste dumps has been terminated so far, which is a step forward towards the solution of the said bear-related issue (data contained in this document are based on the Report on the implementation of the Working programme of the Environmental protection and energy efficiency funds, the special edition of Ekorevija (a magazine published by the Fund) and additional orally received information).

Gradual termination of the project of improving waste dumps and the simultaneous implementation of existing regulations shall contribute to the elimination (or a substantial reduction) of one of the greatest dangers that bears encounter in their existing range.

The **2005 Brown Bear Management Plan** identified 8 waste dumps within the bear range in the **Lika-Senj County**, 4 of which (Poljica – Kosmačevo, Vidovac – Karlobag, Rakitovac – Počuća brdo and Korenica – Plitvice Lakes) comply with the laws in force, while the remaining 4 (Klanac-Prokike-Brinje, Dugi dol-Bajino brdo-Vrhovine, Bare-Donji Lapac and Razbojište-Kvatre) should be restructured and closed.

Simultaneously with the drawing up the present document (December 2007) the construction of a county centre for waste management is planned and the necessary documentation is being collected for obtaining the building permit for the restructuring of the above waste dumps.

According to the Plan, all 3 waste dumps located within the bear range in the **Karlovac County** (Pavlovac-Slunj, Kvaternik-Slunj and Sodol-Ogulin) should be restructured and closed. Simultaneously with the drawing up the present document, the necessary documentation is being collected for the purpose of restructuring and transformation of the above waste dumps into an “eco-yard” or primary disposal of waste until the planned county centre for waste management is built.

Upon the creation of the Plan (2005) the environmental protection inspection examined 3 waste dumps in the Primorsko-goranska County (Peterkov laz-Čabar, Sović laz-Delnice and Cetin-Vrbovsko) concluding that Peterkov laz was to be restructured and closed, 1st restructuring stage was successfully completed in Sović laz, while Cetin was to be restructured and remain in use.

Sović laz and Peterkov laz have been restructured by the end of 2007, while the necessary documentation is being collected for obtaining the building permit for the restructuring of the Cetin waste dump.

The implementation of the 2005 Brown Bear Management Plan in Croatia began simultaneously with the implementation of the action "Waste kills bears", aiming at preventing bears from accessing waste and education the general public on the given issue. The action is implemented by the Directorate for Hunting of the Ministry of Agriculture, Forestry and Water Management and the Biology Institute of the Faculty of Veterinary Medicine of the University of Zagreb within the LIFE COEX project entitled "Improving coexistence of large carnivores and agriculture in Southern Europe" (through which the European Union co-finances the implementation of the Brown Bear Management Plan). Part of the Action plan was the development of educational materials and the attempt to raise public awareness concerning the given issue through the media and series of lectures. The goal of the action is to encourage municipal service companies and local governments and authorities to put in place containers and dustbins within the bear range, which are made in such a way to prevent bears from accessing waste. Such containers and dustbins were made and donated within the action during 2006 and 2007. Seven dustbins of 0,70 m³ and two containers of 5 m³ were donated for that purpose.

4.8.5.4 Mines

Along the entire eastern border of the Croatian bear range with the Republic of Bosnia and Herzegovina more or less narrow or wide belts with land mines (remnants from the Homeland war) are still present.

In certain areas the presence of mines (minefields) has been confirmed, while other areas are only suspected for mines. Minefields are relatively small and account for 50 km² (5.000 ha) of the entire bear range (11 800 km² or 1.180.00 ha) in Croatia. The areas suspected for mines are considerably larger and extend over at least 500 km² (500.000 ha) of the bear range. These areas are to be examined and the assumed presence of mines has to be either confirmed or refuted in years to come.

Demining of confirmed minefields and the examination of the suspected minefields require considerable financial resources, which the Republic of Croatia is not able to ensure in a short period of time. Therefore, a long-term demining strategy has been adopted, followed by short-term demining plans. In any case, the entire demining project shall not terminate in less than 10 years.

With regard to bear management, it is important to note that the bear range (large forest complexes, abandoned agricultural fields and depopulated areas) is the last demining priority.

Therefore, landmines in the bear habitats shall remain a problem for a number of years.

III BEAR MANAGEMENT

5 GOALS

The general goal of this Plan is the conservation of a stable brown bear population in Croatia in numbers ensuring its viability and coexistence with man.

Special objectives for achieving the general goal include (not in order of priority):

- 1. Conservation of the habitat
- 2. Application of international regulations
- 3. Avoiding the danger for humans and their property
- 4. Defining and subsequently achieving the desirable number of bears
- 5. Realization of economic profit for local inhabitants through tourism and hunting
- 6. Raising public awareness and involvement of stakeholders in decision-making related to bear management.

6 DESIRABLE NUMBER (CAPACITY)

6.1 Capacity

A comprehensive analysis of the bear habitat in Croatia extending over more than 12.000 km² (1.200.000 ha) indicates that the possible size of the bear population (biological capacity) is around 1.100 bears. The desirable capacity (social capacity, public attitude) for bears in Croatia is around 900 bears. This number is based on current knowledge, but it is possible that new monitoring results (DNA analysis) and future experiences in bear-man coexistence will change this desirable capacity for bear population in Croatia.

If additional feeding of bears is practised, habitats of poorer quality could also sustain higher bear population density, while good quality habitats could sustain a density of 2 or more bears per 10 km².

7 ZONING (AND POSSIBILITIES OF EXPANSION)

Bears inhabit areas in which they can satisfy most of their vital needs. With regards to habitat quality and possibilities for coexistence with people, the bear range in Croatia may be divided into 4 types of areas:

AREAS OF PERMANENT BEAR PRESENCE

AREAS OF OCCASIONAL BEAR PRESENCE where bears are acceptable

AREAS OF OCCASIONAL BEAR PRESENCE where bears are undesirable

ACCIDENTAL PRESENCE OF BEARS

A map showing these 4 zones is in the Appendix to this Plan. It should be noted that the bear habitat in Croatia is not fragmented since areas of permanent and occasional bear presence are connected to the corresponding areas in the neighbouring countries, Slovenia and Bosnia and Herzegovina, thus constituting a shared and continuous bear population of the Dinarides.

7.1 Areas of permanent bear presence

It is an area of high karst and in most of its part managed forests. The permanent bear presence area extends over 9.253 km² (925.300 ha). Since the area in question has a low human population density the number of conflict between bears and people is tolerable.

With regards to bear management, this area may be divided into zones in which bears are managed or are intended to be and zones in which bears are not managed and are not intended to be managed. The central bear management areas, national parks excluded, extends over 9.038.37 km² (903.837 ha).

The largest portion of hunting quotas should be planned in this area and harvesting should be carried out as planned in order to prevent major bear dispersion towards peripheral areas, which could increase the number of conflicts with people. In order to keep bears in the desirable area, additional feeding should be practised.

The central area includes four national parks extending over 535 km² (53.500 ha) or 5.8% of the total central area. No economic activities have been planned in national parks nor additional feeding of bears, with the exception of scientific research and ecotourism activities.

7.2 Areas of occasional bear presence

The areas of occasional bear presence are the continuation of the permanent bear presence (central) areas, but are less favourable for bears. They include areas of managed and other forests and the density human population is higher than in the central part of the bear range. Due to possible conflicts with people, this area may be divided into zones where the presence of bears is desirable and as such it might be reclassified as an area of permanent bear presence in the future, and zones where the presence of bears is undesirable. Areas of occasional bear presence extend over a total of 2.798,80 km² (279.880 ha).

7.2.1 The area of occasional and desirable bear presence extends over 2.059,90 km² (205.990 ha) and includes parts of Bosiljevo, the upper streams of Mrežnica and Korana rivers, Zdihovo, Vukova Gorica, Lipnik, the Kamešnica mountain, Mosor, Biokovo and Žumberak (Figure 5).

Bear harvesting is planned in this area, though at considerably lower rates than in the area of permanent bear presence.

7.2.2 The area of undesirable bear presence extends over 738,90 km² (73.890 ha) and includes the coastal areas from Bakar and the Vinodol valley to Maslenica (boundary defined on map) and the island of Krk and certain other Adriatic islands. In order to prevent bears from population the coastal area and swim across the Vinodol channel to the island of Krk, the entire Vinodol valley from Bakar to Novi Vinodolski has been classified as an area of undesirable bear presence. The boundary of this area is the regional road Bakar – Krasica – Praputnjak – Križišće, passing along the peak of the cliff separating the Vinodol valley from the inner mountainous region above the villages Klarić, Drivenik, Tribalj, Belgrad, Grižane, Podgora and Bribir to Novi Vinodolski. Since a large number of smaller settlements, along with a significant number of roads, is present in this area, traffic accidents involving bears occur frequently, which is one of the reasons why bear presence is not desirable at all. Extreme care should be taken to prevent bears from accessing potential food sources (waste dumps, food in the proximity of roads and railways and so forth). The additional feeding of bears is not permitted in this area.

Bear culling in the area of undesirable bear presence may be carried out with special permits only aiming at a complete absence of bears. The culling criteria are described in Chapter 9 – Encroachments upon the bear population.

7.3 Accidental presence of bears

This area includes all other parts of Croatia. Since bears are present here rarely and exceptionally, no activities concerning bears are planned, except in conflict situations.

8 MONITORING – MORTALITY, POPULATION

The status of the bear population is to be constantly monitored through systematic collection of all data regarding live specimens and bear mortality.

8.1 Monitoring of population trends and demography

The monitoring of the bear population is carried out through observation and counting of bears at feeding sites and other sorts of encounters with bears in their habitat. In particular, a record of the number of family groups consisting of the mother and her cubs of one or two years of age is kept. Special forms are used for record keeping, while the Action plan lays down the days intended for observation in each calendar year. Such monitoring provides an insight into the bear population trends.

Genetic identification is used to determine the absolute number of bears. Samples of fresh bear scat are used for DNA extraction for the purpose of genetic identification. From a sample taken from the surface of fresh bear scat, collected, marked and preserved in alcohol in accordance with a standard protocol, such a quantity of DNA may be extracted in the laboratory to identify the bear from which the scat has originated. A large enough sample of scat collected in a specified area and during a limited amount of time enables the assessment of the total size of the bear population with an error margin of less than 10%. Using this data, the index on population trends, obtained by counting sighted bears, may be determined. Genetic assessment of the total size of the population shall be conducted every 3 to 5 years. Beside the total number of bears, genetic methods allow the determination of the size of the effective population (participating in reproduction), the extent of genetic diversity of the population studied, the number of males participating in reproduction as well as the gene flow in the wider area or across borders of neighbouring countries that share the same bear population with Croatia.

Since the genetic method of assessing the size of the population is objective and based on scientific facts, it may be expected to serve as the basis for bear management decision making and to be accepted by all stakeholders.

8.2 Monitoring and bear mortality analysis

The death of each bear is recorded. Measurements and samples are taken in accordance with a standard form. Bear mortality data are forwarded to the competent Ministry within 24 hours.

The said form must contain the date and place of death, the cause of death (whether the bear was culled, information on the hunter and the trophy value) as well as basic

measurements (total length and weight), sex and age of the bear. Furthermore, the following basic samples are collected: one rudimentary molar for age determination (preserved dry in a paper bag), a sample of soft tissue for genetic analysis (kept in a freezer) and a sample for the purpose of determination of the presence of the trichina worm. Taking of additional measurements and the collection of other samples are agreed upon where required.

Each bear pelt and skull is individually marked. Marking tags, their distribution and method of application are determined by the competent Ministry.

9 ENCROACHMENTS UPON THE BEAR POPULATION

9.1 Hunting

9.1.1 Hunting season

According to the Ordinance on closed hunting season, the bear hunting season in a calendar year lasts from 2 March to 30 April and from 1 October to 15 December, for a total of 4,5 month per year.

9.1.2 Cull quota

On national level a total annual cull of 10 to 15% of the total estimated number of bears is planned. This percentage is determined with respect to the actual established population trends. A quota of 15% may be prescribed if the trend is positive and needs to be slowed down or stopped. If such action does not affect the trend and objective problems with the local number of bears are present, a major encroachment upon the bear population may be exceptionally carried out over a limited area. If a negative trend is recorded, the quota may be set below 10% or the cull may even be suspended in certain years or areas. The quota (in %) and the total number of bears planned for culling in the following calendar year are determined on the basis of the habitat capacity, the estimated size of the bear population and the population demography. On the basis of the current experience it may be expected that 70% of the total cull is attributable to harvest and 20% to other losses. If the annual quota is exceeded, the surplus cull is subtracted from the next year's quota. Likewise, if deviations appear as to the expected ratio of harvest and other losses in the total cull, the quota shall also be modified.

The cull quota includes legal hunting, poaching, removal of nuisance bears, bear deaths due to traffic and other anthropogenic causes, as well as the removal of live bears from the population.

Young bears following their mother and females leading their young are not culled.

9.1.2.1 Quota distribution and hunting rights

9.1.2.1.1 Criteria for quota distribution

The basic criteria for the distribution of the quota are:

- quality and size of habitat;
- population density.

In the area with the best quality habitat and permanent bear presence the presumed bear population density is 1,5 to 2,0 specimens per 10 km² (1.000 ha). This density permits an annual harvest of 0,15 bears per 10 km² (1.000 ha). This applies to the central part of Gorski Kotar, Velika Kapela and Mala Kapela, and Northern and Central Velebit (approximately 2.400 km² or 240.000 ha).

In the remaining part of the area of permanent bear presence (7173,37 km² or 717.337 ha) the presumed bear population density is approximately 1,0 specimens per 10 km² (1.000 ha). This density permits an annual harvest of 0,1 bears per 10 km² (1.000 ha).

In the area of occasional bear presence (2.798,80 km² or 279.880 ha) the presumed bear population density is approximately 0,5 specimens per 10 km² (1.000 ha).

In the part of this area in which bears are in no conflict with the local inhabitants (1.793 km² or 179.300 ha) the permissible annual harvest is 0,05 bears per 10 km² (1.000 ha).

The total cull quota is determined by the Action plan for each year, which is adopted not later than on 20 January of the current year. Distribution of the quota to hunting units is carried out in accordance with the above criteria, which depend on the size and quality of the hunting unit, but compliance with obligations prescribed by the Brown Bear Management Plan during the previous years is also an important factor. For each harvested bear a tag with a unique number, accompanying bear hunting trophies and the required documentation, is issued. For the purpose of reaching the total planned harvest, the competent Ministry may issue more such tags than planned, but it may withdraw them in the moment the quota is achieved.

In the areas in which bear presence is undesirable (e.g. islands, coastline, urban areas: 778 km²) bear culling is unlimited due to conflicts with local residents. Culled bears are not deducted from the cull quota, but are registered as other losses. The competent Ministry issues a permit for the removal of each bear after several confirmations of its presence, whether or not that bear had caused any damage and regardless of the bear hunting season. However, the culling of a bear is not permitted if the same specimen does not appear several times in different days in order to avoid the killing of a bear that is just passing through the area in question.

Before issuing the permit for the removal of a bear, the competent body must ascertain that the reasons for the bear to appear in the given area have been entirely or partially eliminated and that the competent organization or person has been warned in writing and instructed regarding the necessary measures. Persons suffering bear-related damage shall not be entitled to compensation if their property was not adequately safeguarded.

Vinodol valley and the island of Krk, as well as all other islands on which bears might appear, are not included in the bear management plan. Fulfilment of the conditions necessary to attain bear culling permits (as in other areas in which bears are not managed) is not required for the islands and the Vinodol valley.

The culling of undesirable bears is the responsibility of the local hunting unit leaseholder and he shall be entitled to use all group and individual hunting methods. If he refuses or is not able to carry out this task within the prescribed time limit, the Ministry shall appoint another subject.

9.1.3 Hunting methods and tools

Bears are hunted individually during moonlit nights by waiting on a high hunting stand near a feeding station in accordance with the provisions of the Hunting Act, as described in the chapter entitled “Current Management”. This Plan envisages the continued use of this hunting method.

Advantages of bear hunting from a high hunting stand are the following:

- It provides a good vantage point for observation, determination of age and sex category of the bear and the chosen specimen.
- It reduces the possibility of injuring the bear.
- Minimum disturbance of the habitat.
- Usually a forest road leads to the hunting stand on feeding station, which facilitates access to the stand of the hunter and his assistant, transportation of food to the feeding station and handling of the harvested game.
- It is the safest hunting method for the hunter, the assistant and the surroundings.
- It is the most efficient manner of bear harvesting control.

9.2 Supplemental feeding

Supplemental feeding with food of plant or animal origin is a common bear management measure.

A detailed description of the types of food the bear forages for in the wild is laid down in the previous chapter. Bears are omnivores. Most of the food they take is of plant origin and may account for up to 95% of their diet depending on the season. Beside plant food, bear also need protein-rich food to maintain a normal metabolism. Bears increasingly forage for protein-rich food (mostly) in spring. Protein-rich food includes insects, invertebrates, rodents and carcasses. bears may attack young game and domestic animals.

The reasons for supplemental feeding are the following:

- Keeping bears in the desired part of the habitat to prevent them from moving close to human settlements.
- Reduction of damage to people’s property.
- Possibility to observe and monitor bear population trends.
- Possibility of health treatment.
- Increase of the habitat capacity, population growth and increase of the reproduction.
- Eco-tourism (photo-hunting) and education.
- Execution of the planned harvest.

Possible negative effects of artificial feeding of bears are under research and shall be taken into account if and when evidence thereof is produced.

9.2.1 Time of supplemental feeding

Bears may be artificially fed up to 240 days per year in hunting units in which bear harvesting has been approved for the current year, i.e. from 1 January to 30 April and 16 September to 15 December. The removal of the remaining food is not required at the end of the autumn season, i.e. 15 December, but no artificial feeding of bears is to be carried out between 1 May and 15 September.

Supplemental feeding is not permitted in hunting units in which no cull quota has been approved for the current year.

In areas in which significant bear-related damage to trees occurred, supplemental feeding may be carried out until the beginning of June with plant food or special compound food containing sugar.

The aim of limiting supplemental feeding days is to prevent bears from becoming accustomed to or becoming dependent on food from human sources.

9.2.2 Feeding stations

The supplemental feeding of bears is carried out on feeding stations. These structures are built on small forest clearings in the proximity of forest roads in order to allow access thereto during the entire year.

A maximum of one feeding station for the supplemental feeding and hunting of bears may be placed per 40 km² (4.000 ha). Hunting units smaller than 40 km² may have one feeding site with a hunting stand, but which may be used (for placing food) only during the year in which the hunting unit has been granted a hunting permit. The feeding station must be at least 2 km away from the closest permanently inhabited human settlement. The minimum distance between the feeding station and a national park boundary must be 300 m. The choice of the location for a feeding station must be such to avoid any possibility of contamination of water springs, waterways, etc.

Bears are not to be artificially fed in protected areas, with the exception of bear observation and filming sites for educational and commercial purposes.

9.2.3 Types of food

Cereals, wet fodder and meat, as well as special annual and perennial crops are used for the supplemental feeding of bears. The cereals used for bear feeding are corn, oats and barley. During the supplemental feeding period (up to 120 days per year) a maximum of 300 kg of cereals per adult bear may be supplied. The wet fodders used for bear feeding are sugar or fodder beet and various fruits. A maximum 300 kg of wet fodder per adult bear may be supplied. The meat food should primarily consist of carcasses of dead animals (previously inspected by a veterinarian). If not enough animal carcasses are available, condemned meat from slaughterhouses may be used instead. A maximum of 400 kg of meat per adult bear during may be supplied. Other animal species visit the specially designed bear feeding stations too, for example wild boars, wolves, foxes, martens, birds, etc. Apart from the said supplemental bear feed, annual and perennial crops may be planted, oats in particular, in order to improve the bear diet. These fields are not only used by bears, but by other game species too. They should be located on forest clearings as far as possible from areas inhabited by people.

Likewise, bears visit feeding stations for wild boars and deer. The number of such feeding stations attracting bears should be as low as possible. Within the bear range the number of feeding stations for wild boars and deer should not exceed the number prescribed by hunting management programmes. These feeding stations as well must be placed far enough from areas inhabited by people or national parks' boundaries.

10 CONSERVATION OF THE HABITAT

Bear habitats in Croatia and in the entire Dinaric - Pindos region have the best brown bear habitat quality in Europe. This has been shown in detail in previous chapters. These habitats, as confirmed by several reseraches (Cicnjak et al., 1987; Huber and Roth, 1992, 1993; Huber and Frković, 1993; Kusak and Huber, 1998; Frković, 2001; Frković et al., 2001; Majnarić, 2002), enable positive population trends, population stability and encroachments upon the bear population that would not be possible in many parts of Europe where the bear is still present. By conserving and valorising natural habitats artificial bear feeding should be gradually reduced or even entirely eliminated.

The basic prerequisite for the development and implementation of the Brown Bear Management Action Plan in Croatia is the conservation of the habitat. The bear habitat in Croatia has the following characteristics:

- it is the integral part of the Alps-Dinara-Pindos region of bear distribution in Europe;
- it is homogenous instead of fragmented, meaning that strictly separated areas of bear presence exist;
- it is bound with extensive natural forest ecosystems;
- it is connected with the bear habitat of equal quality in the neighbouring Slovenia and Bosnia and Herzegovina, enabling unrestricted migration of bears.



10.1 Measures for habitat conservation

Constant monitoring of the habitat status and of the possible changes is required for the correct identification and subsequent implementation of the measures for its conservation.

10.1.1 Identification of:

- bear range;
- habitat suitability for bears;
- habitat quality.

10.1.2 Transport infrastructure

- identification of all types of existing infrastructure and their impact on the bear habitat;
- assessment all types of planned infrastructure and their impact on the bear habitat;
- prohibition of construction of new roads and modernization of the existing roads through the bear habitat unless the requirements laid down in the Nature Protection Act are met;
- where construction of roads is inevitable, the following measures should be adopted:
 - avoid intersecting the most vulnerable parts of the habitat (e.g. Greece);

- build crossings for bears and other animals across motorways (tunnels, viaducts, green bridges) (Permeability of Roads to Animals – Design Guidelines, 2002);
- roads used for forestry are to be excluded from public use.

10.1.3 Conservation and improvement of forest ecosystems

- identification and evaluation of the current situation;
- implementation of long-term forestry development guidelines (Forestry Strategy), natural regeneration, mixed forest stands, conservation of nut-bearing beech and oak trees, maintenance of selected forest meadows;
- valorisation of specially protected elements of nature;
- planning of enlargement of specially protected elements of nature.

10.1.4 Agricultural development

- identification and valorisation of the existing agricultural activities;
- planning and assessment of future interventions in this field (avoidance of intensive crop production over large areas, of the promotion of intensive livestock production in open spaces).

10.1.5 Sports and tourist facilities

- assessment of the current situation and the impact on the bear population;
- prohibition of construction of such facilities in the central part of the bear range unless the requirements laid down in the Nature Protection Act are met;
- prohibition of tourist and sports activities that disturb the tranquillity of the bear habitat;
- avoidance of all activities that might damage the bear habitat.

10.2 Waste

Every food source that is treated as waste – food scraps, waste deposited in dustbins and containers or on legal or illegal waste dumps – must be inaccessible to bears.

In such places bears start associating the smell of humans with a positive experience, which is opposite to the experience they had in the past. A bear with such experiences might not avoid humans in every situation or may even become accustomed to humans. This does not mean that the bear presents a danger, but such behaviour is certainly very undesirable.

Prevention of bears accessing waste:

1. Waste dumps should not be located in bear habitats. Where it cannot be avoided, the waste dump should be fenced-in in order to prevent bears from accessing it and feeding on waste. The most effective method is the installation of an electric fence. The entrance to the waste dump should be closed.

2. **Illegal waste dumps should be cleared. Perpetrators should be punished.**
3. **Containers for the collection of waste before transportation to a waste dump should be inaccessible to bears. Furthermore, they should be made of a sturdy metal and always closed in order to prevent bears from opening them. They should be regularly emptied and no waste should be lying around them.**



4. **Household dustbins should be kept inside structures inaccessible to bears. They should be placed in the open only during the daytime immediately before pick-up.**
5. **Dustbins in bear habitats should be made of metal and equipped with lids that can prevent bears from accessing their contents. They should be emptied on a regular basis.**
6. **The dumping of food scraps in bear habitats should be prohibited and people should be educated on this issue.**

11 NUISANCE BEARS

Nuisance bears are bears which frequently cause damage, stays in the proximity or within a human settlement, forages for food from human sources and shows no fear from man. Bears that do not flee from men are potentially dangerous. Loss of fear does not imply major aggressiveness, but the actual danger is considerably greater. Certain people might try to move closer to such a bear to get a better look or take a photo, while others might shoot and injure it. In both cases the bear may respond with an active defence. Furthermore, frequent sightings of a single bear accustomed to humans often fuel the belief that bears have multiplied beyond reasonable numbers. Some bears accustomed to humans might regularly cause damage in their search for food from human sources and thus become nuisance bears. Such behaviour is difficult to change. Nuisance bears usually end up killed in traffic accidents, shot in so-called self-defence or killed through planned culling.

Measures to prevent the creation of nuisance bears:

A) Preventing the bears from becoming accustomed to food from human sources.

These measures include all the measures laid down in the chapter on waste management in order to prevent bears from feeding on waste (Chapter 10.2).

All other sources of human food (food stores, orchards and gardens, means of transport, places for reloading of cargo, etc.) which might attract bears should be appropriately fenced, guarded or eliminated.

B) Preventing the appearance of cubs that have lost their mother.

Cubs that have prematurely lost their mother are particularly inclined to forage for food in the proximity of humans. The following actions should be implemented:

1. Measures should be taken to decrease the likelihood of cubs becoming orphans:
a) special care in hunting operations, b) prevention of poaching, c) avoidance of disturbance in habitats during winter months (from December to April), in particular around known bear denning sites.
2. Prohibition of feeding motherless cubs.
3. A cub that has lost its mother during the first 4 to 5 months of its life cannot survive in the wild. If it is fed artificially, it will have to be kept in an enclosed space for its entire life. Such bears may be adopted by specialised shelters within the limits of their capacities (in Croatia at the time of the development of this plan such bear shelter exists in Kuterevo and the solution of its legal status is under way). If such facilities are not available, no artificial feeding of orphan cubs of that age should be practised. Cubs that were orphaned at the end of May or later on during their first year of life have a possibility to survive in the wild, but shall behave normally only if people do not feed them and if they do feed on waste.

Measures for dealing with nuisance bears

The behaviour of a bear that has become accustomed to humans or has started making problems is difficult to change. The appearance of a nuisance bear should be immediately notified to a member of the intervention team (IT), who shall propose appropriate measures, supervise their implementation and, if necessary, participate in their implementation.

Measures that a member of the intervention team may propose:

1. Elimination of the food source that the bear is attracted to (particular attention should be given to waste). If this measure is not implemented, the IT member files a report to the head of the intervention team, who shall forward the notification to the competent body or service (municipal service company, forestry service, hunting service or veterinary inspection).
2. In case of damage, installation of an electric fence and use of guard dogs.
3. Intimidation by noise (noise, firecrackers) and rubber bullets. Rubber bullets may be used only by a person with a weapon licence. It is recommended that an IT member owning a weapon licence, if any, carries out the bear intimidation. All interventions are carried out jointly with the local hunting unit leaseholder.

4. Application for a permit for the removal of the nuisance bear (intervention culling). The permit is issued by the Directorate for Hunting of the MAFRD upon written request of the hunting unit leaseholder. The following documents are to be attached to the application: the exact description of the time and place of appearance of the nuisance bear, description of measures adopted in order to change his behaviour and the opinion of an intervention team member. The culling of the bear is carried out by the legal or natural person managing the hunting unit or areas outside the hunting unit. If the nuisance bear is present within the range of a human settlement, the culling thereof may be carried out only with police permission. The IT member must be present at the culling site or coordinate the intervention in order to ensure the removal of the problem bear.
5. Sick and injured bears

If a bear is temporarily incapable of surviving on its own in the wild due to an injury or sickness, only an on-site one-off medical treatment may be provided without keeping the bear in a clinic or any other form of captivity.

12 BEARS AND TOURISM

This Plan provides for a detailed description of the fundamental factors that define the bear habitat in Croatia. The bear habitat in Croatia extends over a surface of more than 11.800 km² (1.180.000 ha) of hills and mountains mainly covered with forest vegetation, with low human population density and typical rural characteristics. Beside the conserved biological and ecological values, this area presents little comparative advantage. The gross domestic product pro capite is considerably lower than in other parts of Croatia, the area exhibits strong depopulation trends and the local economy is underdeveloped as to the rest of the country.

This large area is threatened by the construction of large infrastructure connecting the more developed continental part of the country with equally developed coastal area. Furthermore, this area is used for the disposal of different types of waste, but local governments and the local population hardly benefit from any of the said activities, which might give rise to long-term problems.

It is therefore important to valorise and exploit the presence of bears in the area. In Croatia areas of bear presence are also inhabited by the other two large carnivores: the wolf and the lynx. These two species are strictly protected by law and are not considered a game species, but they have a considerable influence on hunting management since they feed on game. Thus it is important to ensure enough financial resources for the conservation of these species and for the benefit of the local population through bear hunting fees and the other ways of exploiting bears, wolves and lynxes.

Brown bears have been both persecuted and prized by people over the centuries. In the beginning, like other large carnivores, they were considered a menace and thus hunted down, which resulted in the disappearance of bear from almost the entire Western Europe. More recently, bears were valued as hunting trophies. In some areas, their numbers have been maintained by hunters, who have eventually helped bear populations to survive and recover.

Today, the presence of a healthy bear population is a sign of high-quality forests and thus the availability of resources such as timber, mushrooms, berries and game.

Bears are a symbol of the richness of nature and it is known that the quality of the environment is one of the main factors in tourism. Local communities can use this symbol to increase the market value of traditional products such as handicrafts. For instance, the creation and use of the “bear label” on local products (bear-friendly products) would mean that they come from well-preserved forests.

Nature lovers’ wilderness experience may be considerably enhanced by the presence of bears. Research has shown that most residents in areas of bear presence in Croatia feel that the animal’s presence attracts tourists, bringing economic benefits to the local community. Beside the already mentioned “hunting tourism”, bears can be used in other ways for tourism purposes and within the concept usually called “ecotourism”. According to the International Ecotourism Society, ecotourism may be defined as “responsible travel to natural areas that conserves the environment and improves the well-being of local people” (TIES, 2003). This concept is also known as the “non-consumptive” use of natural resources.

This Chapter mostly deals with the non-consumptive use of bears in producing economic benefits for local residents.

Although this is a bear population management plan, this Chapter shall also analyse and propose activities related to bears in captivity. There are two main reasons for this:

1. Some of the bears in captivity were taken from the wild.
2. Bears in captivity can be used for achieving certain objectives of this management plan (for example, information and education of the public about bears).

Shackley (1996) has identified four main factors that influence the development of the non-consumptive use of wildlife in tourism:

- The global increase of the variety of tourism products;
- Cheaper and faster journeys to tourist destinations;
- Increased public awareness about the environment;
- The search for sustainable substitutes to mass tourism.

We believe that it is important to plan and develop the use of bears in Croatian tourism in accordance with the above global changes and we propose that the Committee for bear management drafts the guidelines for the non-consumptive inclusion of bears among tourism products offered by Gorski kotar and Lika.

12.1 Bears in the wild

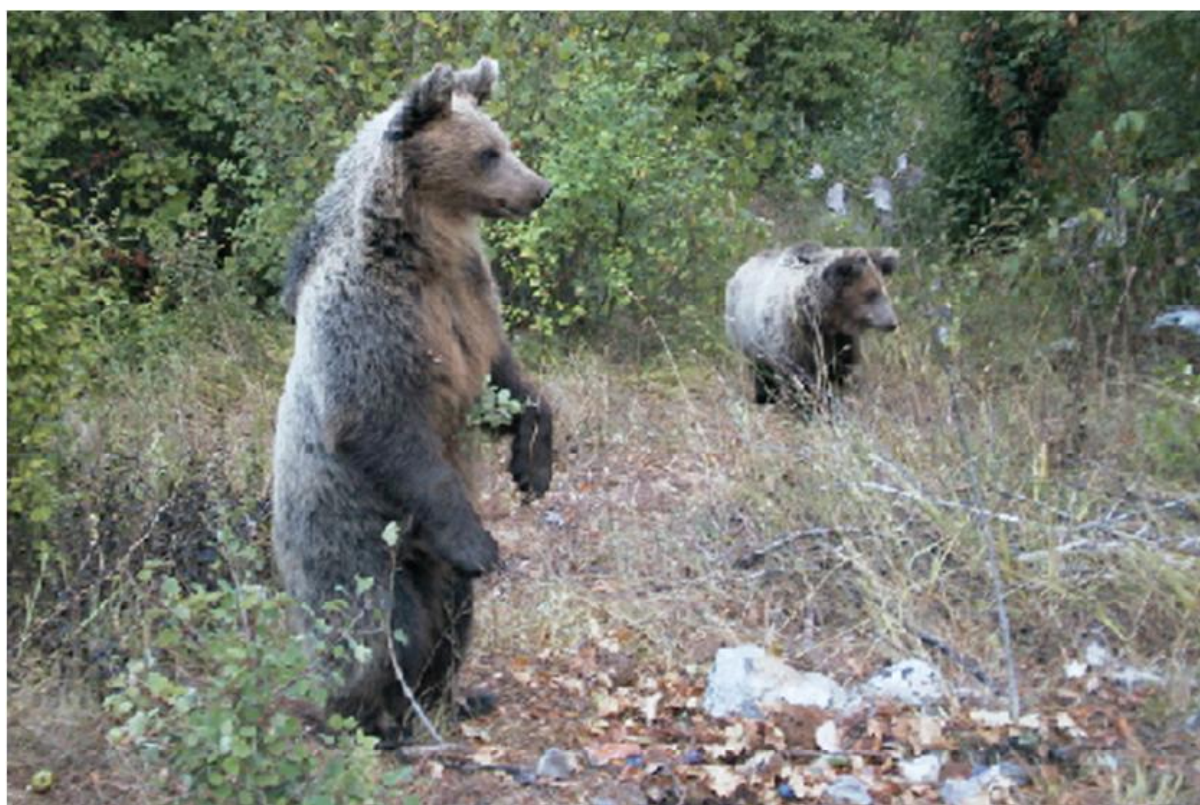
Concerning tourism, bears inhabit three different categories of areas, which may overlap, i.e. protected areas, hunting units and mountaineering destinations. Visitors come in contact with bears, which can have different effects both on the visitors and the bears. The key issues that need to be dealt with regarding the interaction between visitors and bears are the following:

- Disturbance of bears;
- Bears becoming accustomed to people;
- Visitors’ safety;

- Visitors' satisfaction;
- Visitor carrying capacity.

For the purposes of this Plan the visitor carrying capacity means the highest possible level of use of an area by the visitors with the highest possible level of visitor satisfaction and the lowest possible level of negative impacts on the bear population. Such approach is particularly important in protected areas; it is thus necessary to carry out scientific research in order to produce objective and quantitative assessments of:

- The level of visitor disturbance of bears;
- Visitor satisfaction during the visit to the protected area.



In order to avoid the bears being disturbed and getting accustomed to people, as well as to ensure the visitors' safety, it is important to educate visitors about the correct behaviour in the bear habitat (through brochures, flyers, signs on hiking trails, lectures and so forth.) and, if necessary, to limit the areas accessible to visitors or to limit the number of visitors in certain areas or periods. The remaining activities related to this issue are laid down in the Chapters "Waste" and "Nuisance bears".

With the aim of increasing their satisfaction, visitors may participate in the following supervised activities:

- enjoying the bear habitat;
- searching for, observing and photographing (filming) signs of bear presence;
- observing and photographing (filming) bears from high stands near bear feeding stations;
- participating in the activities of researchers and/or park rangers;

- education about bears.

12.2 Bears in captivity

Institutions that keep bears in captivity should use those bears to educate and entertain visitors, as well as to produce economic profit.

The bears must have:

- Suitable housing with sufficient space for moving, in which the animals will not be bored and which are the best possible copy of their natural habitat;
- Proper nutrition;
- Peace and quiet.

The visitors should obtain:

- Safety;
- Education about bears;
- Entertainment;
- The possibility to spend their money.

13 MINIMISING AND COMPENSATING DAMAGE

13.1 Minimising damage

13.1.1 Measures to be undertaken by hunting unit leaseholders and other legal persons managing bears

- Development and distribution of instructions on the use of protective instruments;
- Supplemental feeding of bears in order to keep bears away from human property;
- Keeping the size of the population under control in order to make the amount of damage tolerable;
- Regular notification of the Directorate for Hunting of the Ministry of Regional Development, Forestry and Water Management concerning the incurred damage.

13.1.2 Measures to be undertaken by land users

- Notification of the hunting unit leaseholders concerning the incurred and possible damage;
- Enabling the proper implementation of protective measures by the hunting unit leaseholders;
- Proper use of protective instruments;
- Harvesting of agricultural products within the agrotechnical deadlines.
- Observance of instructions aimed at preventing the creation of nuisance bears.

13.1.3 Other measures

Includes all other measures laid down in the Chapters 10 “Waste” and 11 “Nuisance bears”, mainly related to bears’ access to waste and other sources of human food.

13.2 Compensating damage

All damage that can be proven to be caused by a bear must be compensated as quickly as possible. The compensation must cover the entire damage where the person suffering damage has not contributed to the incurred damage by his actions or negligence.

In accordance with the laws in force (the Hunting Act) liabilities for bear-related damage are regulated as follows:

Areas occupied by hunting units:

Article 83, paragraph 1: the hunting unit leaseholder shall be liable for damage caused by game that permanently inhabits his hunting unit in which damage has occurred regardless of preventive measures that he was obliged to undertake in accordance with the Hunting Act.

Paragraph 2: it is presumed that the game in question permanently inhabits the hunting unit in which the damage occurred, unless the hunting unit leaseholder can produce evidence to the contrary.

Paragraph 3: the hunting unit leaseholder shall be liable for damage caused by game that does not permanently inhabit his hunting unit, but he shall also be entitled to harvest the game in question. Such entitlement is established on the basis of evidence of paid compensation to the person to whom the damage has been incurred and the approval of the competent administrative body issued in agreement with the Ministry (if the damage was incurred in a state-owned hunting unit).

Paragraph 4: the game harvest authorized under paragraph 3 must correspond to the amount of the compensation taking into account the value of the game meat and the hunting trophy in accordance with the compensation tariff.

Paragraph 5: compensations for bear-related damage on livestock in areas in which livestock access and grazing is prohibited by law shall not be paid.

Article 84: Where game related damage on the same agricultural crops is repeated, the value of single damages may not exceed the value of the expected crop yield.

Article 85: The jurisdiction for disputes concerning the compensation of game related damage shall be that of the local court competent for the territory in which the hunting unit has been established.

Where bear-related damage occurs within the hunting unit, the hunting unit leaseholder shall inspect the scene, draw up a damage report and evaluate the amount of compensation, while the owner shall sign the form if he agrees with the compensation. The amount of compensation depends on the use of protective instruments (electric fences, guard dogs) and the observance of other measures aimed at preventing the creation of nuisance bears, as well as measures for the prevention of the occurrence of damage. The hunting unit leaseholder shall forward the copies of the damage report to the Directorate for Hunting of the Ministry of Regional Development, Forestry and Water Management not later than on 31 December of the current year.

Areas not occupied by hunting units:

Article 19: In areas in which hunting units are not established the game shall be protected by the owner or the user (legal or natural person) of the land.

The hunting unit leaseholder shall notify unusual or frequent damage to a member of the intervention team, who shall inspect the scene and propose appropriate measures. Where the proposed measures do not stop the occurrence of damage, the hunting unit leaseholder may apply for a permit for the removal of the nuisance bear (intervention culling) (the description of the procedure is laid down in Chapter 11 “Nuisance bears”).

The continued application of the existing manner of dealing with bear-related damage is proposed, i.e.:

- implementation of measures to avoid the occurrence of damage;
- appropriate record-keeping and notification of damage;
- timely and appropriate compensation;
- possible procedure for culling bears that repeatedly cause damage.

14 PUBLIC INFORMATION AND INVOLVEMENT IN DECISION-MAKING

In order to improve the quality of brown bear management in Croatia and to avoid conflicts among different stakeholders, the following activities have been planned in accordance with the recommendations for Croatia laid down in the Action plan for the conservation of the brown bear in Europe:

- A) Systematic education and information of target groups and implementation of educational and information campaigns.

In order to ensure public support for bear management and to prepare the public for a constructive participation in decision-making, the public has to be informed timely and in an appropriate manner. It is required to use various educational tools and use the media in order to embrace a wide variety of target groups.

The committee shall initiate, coordinate and direct the activities of systematic education and information of target groups and the general public. By means of an action plan the committee shall annually determine the public information priorities for the following year and direct thereby its educational and information campaigns; it shall also begin the implementation of such campaigns.

1. Inhabitants in areas of permanent bear presence

The current level of acceptance of bears must be maintained and, if necessary, improved. Special attention should be given to the education of the public regarding measures for the minimisation of damage and direct dangers to humans, as well as to avoid the behaviour which may lead to the creation of nuisance bears. The public should be informed about the status of the local bear population and the possibilities to use bears as part of eco-tourism.

2. Inhabitants in areas of occasional bear presence

Importance should be given to education concerning bear biology in order to avoid panic reactions if a bear is encountered. Special attention should be given to the education of the public regarding measures for the minimisation of damage and direct dangers to humans and avoid the behaviour which may encourage bears to approach human settlement and lead to the creation of nuisance bears.

3. General public in Croatia

All citizens should be familiar with the basics of bear biology and accept and appreciate the presence of bears in Croatia. The general public should also understand all the elements of bear management, including encroachments upon the bear population through hunting. Systematic education and information on the national level should lead to the popularisation of bears as species.

4. Pupils

Elementary and secondary schools should provide for a clear picture of bears and other large carnivores in Croatia as valuable elements of our natural heritage with a special ecological status with respect to their habitat, feeding and relationship with man. The Committee should devise programmes and activities in order to involve schools in the protection and the popularisation of the brown bear.

5. Visitors of areas inhabited by bears

Each visitor, Croatian or foreign, of an area inhabited by bears should be able to obtain basic information about the visited bear habitat and the recommended behaviour therein. Such information should be provided by administrations of protected areas, tourist boards, non-governmental organisations, hunting associations, forestry employers and bear experts. The goal is not to generate fear from bears, but to avoid dangerous situations as well as to supply enough information for recognising signs of bear presence. The proper information of visitor shall also reduce the liability of the organisation managing the area in question in case of a bear-man conflict situation.

B) Identification and involvement of public opinion leaders and stakeholders in brown bear management through consultations and joined planning.

Main stakeholders in bear management are: local inhabitants of the area or permanent and occasional bear presence, general public, livestock owners, farmers, hunters and hunting associations, forestry workers, subjects in charge of environmental protections (public institutions, non-governmental organisations dedicated to environmental protection, animal lovers, etc.), scientists and experts, visitors of areas inhabited by bears (mountaineers and other tourists), tourist workers of the mountainous Croatia, institutions that keep bears in captivity and so forth.

The Brown Bear Management Plan for the Republic of Croatia and the annual Action Plans should be public documents that stakeholders can comment and that should lay down the strategy to relate to different stakeholders. A public conference should be organized on an annual basis in order to present the status of the bear population, the results of the previous year's management and plans for the following year. Meetings with opposing stakeholders should be organised as well, if necessary, in order to involve them

in the decision-making process.

C) Establishment of permanent consultation protocol with locals

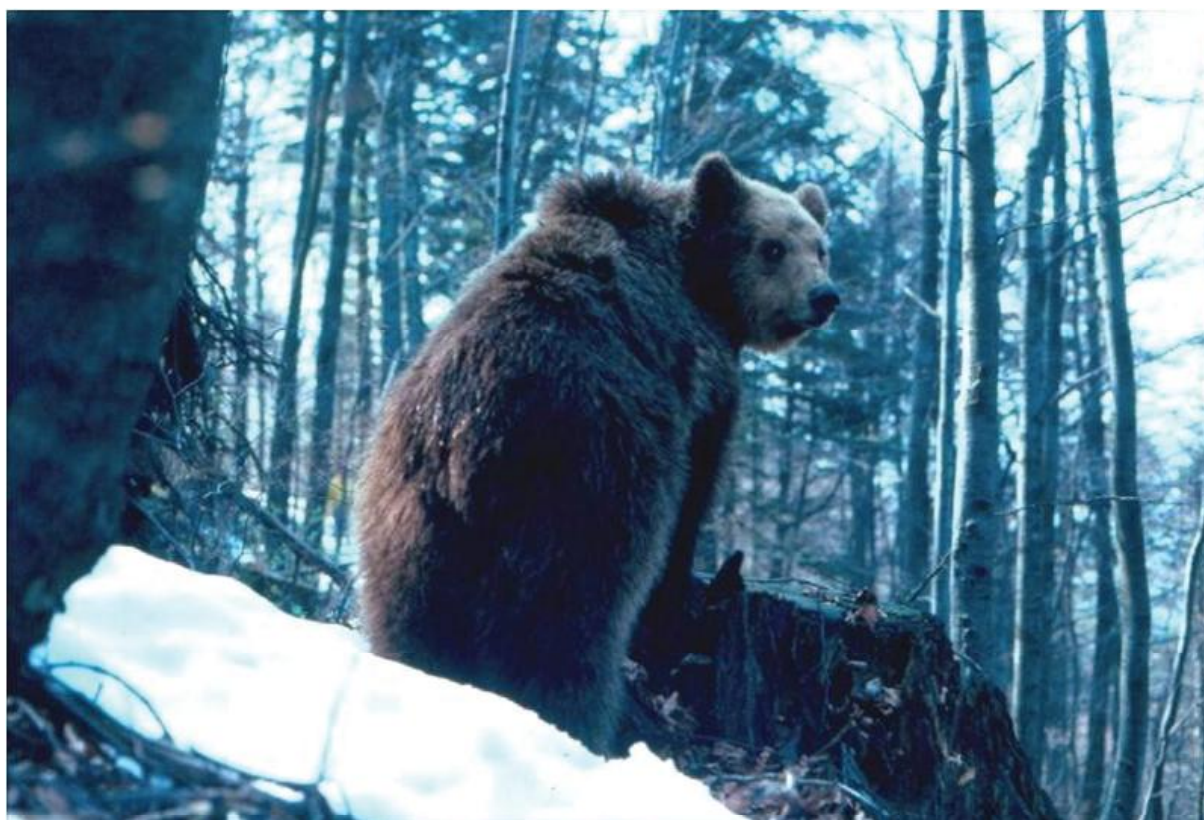
Local population should be regularly informed about the status of the bear population and in particular about any extraordinary situation (e.g. sighting of a nuisance bear or motherless cub). The local inhabitants should also be familiar with the procedure for reporting bear-related damage or dangerous situations, as well as with general attitude towards bears.

D) Monitoring of public attitudes towards bears and bear management

Understanding public attitudes towards bears and different bear management goals shall facilitate public involvement in the decision-making process. To that purpose public attitudes and possible changes of attitudes should be monitored by means of expert-conducted surveys.

E) Role of public institutions managing protected areas and institutions keeping brown bears in captivity in informing the general public

Public institutions in areas inhabited by bears should have the key role in the protection and popularisation of the brown bear, as well as in the education concerning the brown bear. Each visitor of a protected area should be notified about the presence of bears, receive basic information about the species and the appropriate behaviour in case of an encounter with a bear. Institutions that keep bears in captivity may significantly contribute to the education of people about bears and the popularisation of the species. Information offered by such institutions should be updated and refer to bear-related issues in Croatia.



15 INTERNATIONAL COOPERATION

By signing the international treaties laid down in Chapter 3.1 Croatia has committed to comply with their provisions and this Plan confirms that commitment regarding the conservation of the brown bear population. This Plan complies with another document, “Guidelines for Population Level Management Plans for Large Carnivores”, drawn up in 2007 by the Large Carnivore Initiative for Europe (LCIE) by contract for the European Commission.

On the global and/or European level this implies the harmonization with the guidelines for the conservation of the species in a “favourable conservation status”, in as high numbers as possible and over as large areas as possible in coexistence with the local inhabitants. The Plan shall also comply with the provisions related to habitat conservation and international trade in live bears and parts of their bodies.

The Croatian brown bear population is part of the population shared with neighbouring countries: the Republic of Slovenia and the Republic of Bosnia and Herzegovina. There are no obstacles to the free movement of bears between the countries and such a situation shall be maintained in the future as well. By understanding that bear population management in Croatia may influence bear populations in neighbouring countries, Croatia manages bears in a way to ensure a balanced population, which is the reason why an even number of bears crossing the state border back and forth may be envisaged. Croatia expects the neighbouring countries to adopt a similar approach to bear management.

Scientific knowledge on bears in Croatia shall be available to experts from the neighbouring countries. This Plan encourages cooperation between researchers in order to align research methods and enable comparisons and complete results. This is especially important for genetic and radio telemetry research. Tagged animals found outside the state border shall be reported without delay.

Meetings of experts in charge of bear management shall be organised on an annual basis for the purpose of exchanging experiences and developed joint management programmes for the following year.

16 INTERVENTION TEAM

The bear intervention team (hereinafter the “IT”) has been established pursuant to the Decision of the Ministry of Regional Development, Forestry and Water Management, classification: 323-01/08-01/59, registry number: 538-13-08-01 of 4 February 2008. The team has 9 members (the list thereof in Annex) selected on the basis of their occupation field, who act in accordance with the Brown Bear Management Plan for the Republic of Croatia. The Decision on the establishment of the Intervention team was accompanied by the adoption of the Protocol on the Intervention team members’ actions. IT members are selected in accordance with the above Decision and meet once a year (more often, if necessary) for the purpose of training, education and exchanging experience.

The Intervention team members are trained and equipped experts, who must be ready to inspect any location on which exceptional bear-related damage, an accident or the death of a bear occurred and, in particular, investigate the occurrence of nuisance bears. All questions regarding issues related to nuisance bears are to be directed to the intervention team. It is important to let

the local population know that they are not alone in case of extraordinary and dangerous situations involving bears.

The intervention team is equipped with dart guns, rubber-bullet firing guns and noise producing bullets, and traps for capturing live bears.

Intervention team members shall arrive as quickly as possible to the location where a bear is caught in a trap set by a poacher or a natural trap, or where a bear is in conflict with people.

Nuisance bears shall be in the first place intimidated in order to change their behaviour. If no result is obtained, the bear shall be captured, equipped with a radio transmitter (for the purpose of monitoring), relocated or placed in captivity (if possible); the culling of the bear is used only as the last resort if all other actions fail.

The members of the intervention team are appointed by the competent Ministry, which shall act as a mediator where the team's assistance is required. The members of the team evaluate situations in cooperation with hunting unit leaseholders and make a decision about the appropriate intervention.

17 FUNDING OF THE IMPLEMENTATION OF THE PLAN

17.1 Domestic sources

- the part of the state budget of the Republic of Croatia intended for financing the competent ministries;
- funds deposited to the special accounts of the competent Ministry and the counties pursuant to the Hunting Act and intended for the implementation of the said Act;
- hunting unit leaseholders' resources;
- local and regional governments' resources;
- scientific and academic institutions' resources;
- hunting federations' resources;
- other sources.

17.2 Foreign sources

- the European Commission – through programmes such as LIFE – for certain years and for certain projects;
- foreign donations;
- other sources.

18 IMPLEMENTATION AND REVISION OF THE PLAN

The Ministry of Agriculture and Forestry (currently the Ministry of Regional Development, Forestry and Water Management – Directorate for Hunting) and the Ministry of

Environmental Protection and Physical Planning (currently the Ministry of Culture - Directorate for the Protection of Nature) have formed the National committee for the creation of the Brown Bear Management Plan for the Republic of Croatia and the annual Brown Bear Management Action Plan.

This committee shall carry out revisions of the management plan and the action plans, as well as amend it and draw up all necessary reports. The revisions of the plan and the action plans shall be available to all stakeholders and the general public, who shall be able to express their proposals and remarks.

The Ministry of Regional Development, Forestry and Water Management – Directorate for Hunting and the Ministry of Culture – Directorate for the Protection of Nature shall be jointly responsible for the implementation of the Plan. However, the practical implementation shall be the responsibility of the Ministry of Regional Development, Forestry and Water Management. The implementation of the Plan includes the information and involvement of the general public in the decision-making process.



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ANNEXES:

1. Ordinance on crossings for wild animals

2. Protocol on the Intervention team members' actions

3. List of members of the Intervention team