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THE BULGARIAN BROWN BEAR MANAGEMENT PLAN – PROCESS OF CREATION, LEVEL OF NEEDED KNOWLEDGE AND CHALLENGES

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ABSTRACT

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The accession of Bulgaria in EU in 2007 put severe demands on law changes and fulfillment of obligations to comply with the European standards. One of the most important recommendations to each EU country with populations of brown bear is to prepare a national brown bear management plan which will comply with the EU and local laws.

In 2005 a bear project started to fill the gaps in the knowledge and management issues for the conservation of brown bears in Bulgaria. In 2007 we produced a management plan with the active involvement of all interest groups and supported by crucial data on the distribution, habitat quality, connectivity and corridors, management practices, human attitude and poaching, etc gathered by active field work and cooperation with forestry units. This paper deals with the step of developing the management plan and challenges to be faced, as well as the level of needed knowledge to create such a plan.

Key words: brown bear, management plan, field methods

Introduction

At the beginning of XX century the brown bear in Bulgaria was locally managed. In 1950-ties there were less than 300 individuals left. Later after some measures for preservation and limitation of the hunting were taken by the government there was increase of the bear numbers - around 600 in 1979.

After 80ties the species was hunted and bred as farm animal. In 1992 due to intensive poaching and hunting the Ministry of Environment and Waters issued a regulation for protection of the bear which resulted in a hidden quota using problem animals.

Why we need an action plan? As Bulgaria is a member of European Union since 2007 there is a strict demand for management and conservation of all large carnivores. Till now there was lack of effective management, proper legislation and implementation for the brown bear, lack of coordination between the different responsible institutions, lack of accurate census based on national scientifically-based methodology and lack of adequate compensation measures. There was also conflict of interests between the needs of the hunting, tourism, livestock breeding and agriculture.

Thus all interest parties agreed that there should be changes and that there is a need of sound management plan.

Material and methods

In January 2005 group of experts from Balkani Wildlife Society, Institute of Zoology and Sofia zoo, supported by Aletris, Holland and funded by PinMatra, Holland started a bear project to improve the knowledge about bears. The project evolved in a process of creation a National Action (Management) Plan. The Plan was created on base of consensual decisions taken during 8 workshops in 2006 and 2007, gathering interested parties of different exper-

tise – with more than 30 participants. The chapters were written by the participants during the workshops and after that, discussed and edited within the work group in the last two meetings.

The plan will be revised on the base of its effectiveness every 2 years. A National commission will be responsible for implementation and revision of this plan. After public hearings in towns in several key bear areas and later accepting of the plan by the Minister of Environment and Water (MoEW), MoEW and State Forest Agency will jointly undertake actions on plan's implementation.

Results and Discussion

The working group agreed on the following Vision for the Plan: "Bear management is based on scientific methods on monitoring to ensure long term preservation of the bear population in Bulgaria in coexistence with humans, where the populations develop naturally and are managed by the people for decreasing of the damages"

The main values and directions for the brown bear management in Bulgaria are:

- Long term preservation of Bulgarian brown bear population;
- Supporting the livelihoods and local practices in the rural areas of the country;
- Conflict resolution among different interested parties threw mutual understanding and cooperation;
- Public awareness rising among concerning bears and their importance;
- Build flexible and creative model for population management;
- In the regions with accidental bear appearance, effort are needed to preserve them there;
- Involvement of the local interested parties and communities;
- Decision making on the base of the real scientific facts.

The Management Plan for the conservation of Brown bear in Bulgaria is coordinated with the Action plan for the conservation of Brown bear in Europe, the National legislation (Bulgarian Biodiversity Act), the International legislation: Convention on the conservation of European wildlife and natural habitats (Bern Convention), Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (Habitat Directive), etc.

The Bear Management Plan includes several chapters:

Part 1 (Background) covers the aims of the plan, the methodology - process, roles and responsibilities of the participants, vision, values and key problems and legal provision for the plan.

Part 2 (Status of the species in Bulgaria) is looking at the historical review, ecological characteristic of the species (taxonomy, description, reproduction and dening, food, activity and signs), bear habitat description, distribution – contemporary data, corridors, bears and humans (infrastructure, damages, human dimension), legal status (national and international legislation), population dynamics and current management of the population.

Part 3 (Future management of the species in Bulgaria) is discussing the desired management for the bear population in Bulgaria - zoning and distribution, optimal numbers and density, monitoring of the population, activities affecting the population (potential harvest, supplementary feeding, poaching), conservation of the habitats, garbage, problem bears, the creation of bear emergency team, bears and tourism, minimizing and compensation of damages, the public involvement in the management of the species, the international cooperation and the sources of funding to be used.

One of crucial steps for a good management plan is the gathering of quality data on the distribution, habitat quality, connectivity and corridors, management practices, human attitude and poaching, etc. Such a data was gathered by active field work by bear project expert in cooperation with forestry units and the three national park authorities.

The first problem to be solved was the choice of methods to be used for gathering data. The methods was discussed and agreed upon during expert meetings and management plan workshops. The monitoring in the past conducted by the different organizations was chaotic, not covering the whole country, not following the same methodology and not conducted by bear experts. That's why the data in some of the areas proved to be untrustworthy. There were several monitoring approaches:

- Annual spring census organized by the Ministry of Agriculture and Forests (counting of the survived the winter individuals) - no organized and specific methodology applied.
- Habitat assessment by a point system. This method is highly subjective and dependent on the expert abilities of the observer. It doesn't produce maps and as a result is creating abstract territories. This method was used to estimate the bear density by calculating the number of bears in a percent suitable habitat.
- Footprint measuring. Not representative method as in most of the cases individual animals are difficult to identify. Different, often not experienced people are doing the measurement.

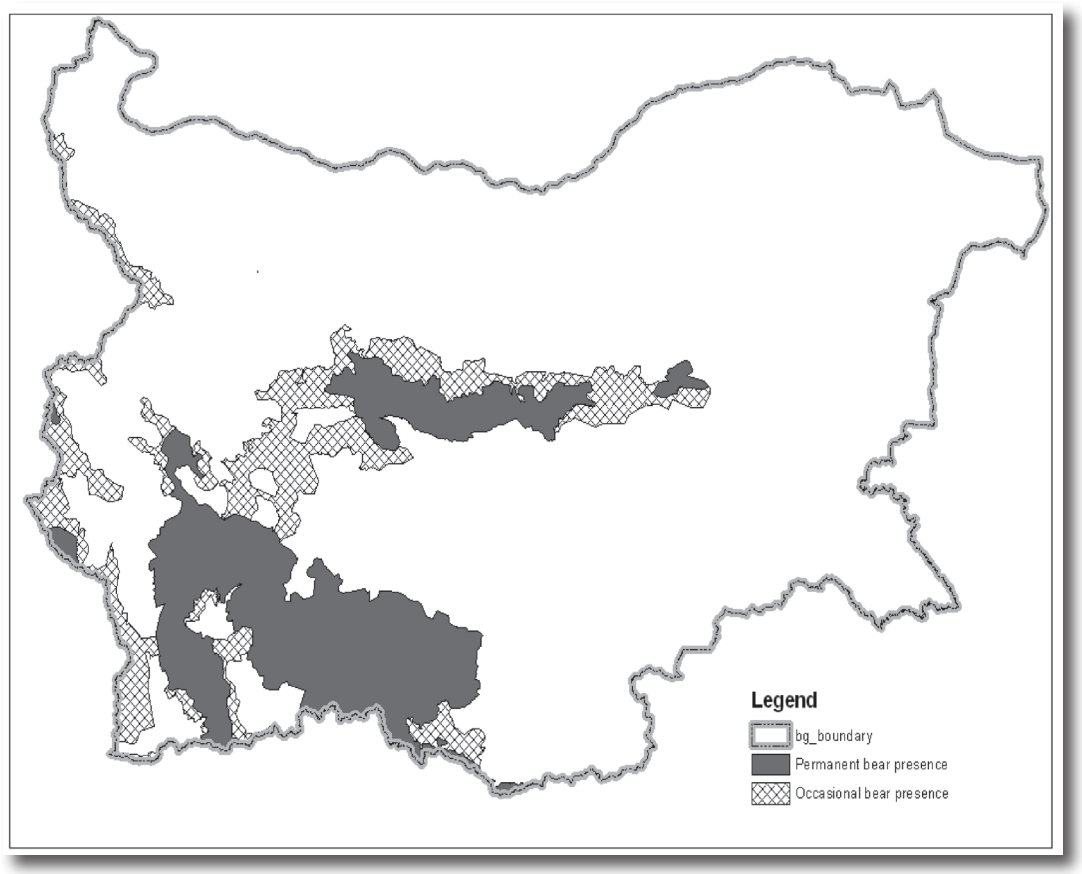

Fig.1. Map of brown bear distribution in Bulgaria

The methods for gathering and analyzing data we used for the plan were the following:

Detecting presence/absence by administrative structures:

The data for bear presence and absence was taken from forestry units and national parks. We came with preliminary map which helped us to identify the key area with a need of further study.

Detecting presence/absence based on field data:

After collecting data from the state forestry units we had conducted a field study for clarifying presence/absence status of bears in the previously appointed area. During this study we had also investigated areas which are important as corridors or occasional presence was reported by local people. This helped us to identify the viability of corridors between the 2 sub-populations in the country, the Rilo-Rhodopean and the Central Balkan, believed to be isolated. We had also studied the potential corridors connecting neighboring countries – Greece, Macedonia and Serbia. We came up with a map of permanent and occasional presence as presented on Fig.1.

Registering Reproductions:

We accepted it as an indicator for bear core areas. For the purpose of study we had collected all recorded observations by witnesses. To deal with observation errors we had recorded only observations from experienced observer. Then we proceeded with spatial separation of the observations. On the table 1 is presented the observed reproduction for the Western Rhodopi mountain for the season 2005-2006.

Bear den mapping

To identify the suitable areas for bear den we had collected field data for bear dens in Central Bal-

Tab.1. Reproduction for Western Rhodopi 2005-2006

	Female with 1 year old cubs				Female with 2 year old cubs	
Cubs number	1	2	3	4	1	2
Number of observations	10	20	1	1	12	8
%	32.3	62.5	2.6	2.6	62.5	37.5

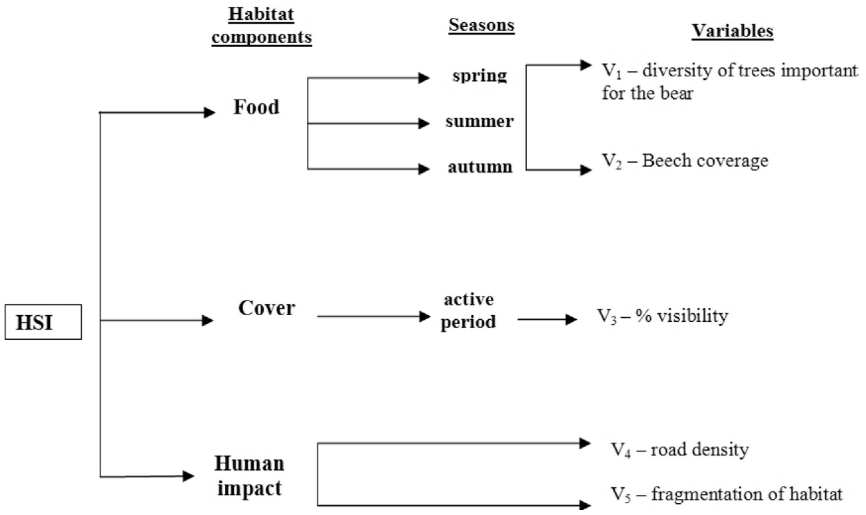

Fig. 2. Habitat suitability cladogram

kan mountain. For each den found we had recorded the type of den (cave, under log, etc.), exposure and size of entrance, size of the cavity, length between the entrance and the nest, material of the nest, if it was used or not the last winter, etc. For each den GPS coordinates and photos were taken. We had also recorded all found rest sites (day beds) and describing the habitat around these sites

Habitat Suitability Index (HSI) for corridor areas

Corridors are important for linking dispersed and fragmented populations. This study was conducted on the method of analyzing the habitat components called Habitat Suitability Index. (Aste 1993; Kusak et al. 1995; Huber 2004). The data collected in the field and from different sources about the corridor area was transferred into variables as shown on Fig.2.

The suitability index is calculated from the variables as the following equation:

$$HSI = \frac{2 \square SI_{food} + SI_{cover} + SI_{human\ impact}}{4}$$

On Table 2 is presented the Habitat Suitability Index for the corridor area connecting the Rilo-Rhodopean and the Central Balkan sup-populations. Having in mind that 0 is least suitable and 1 is most suitable, almost all forestry units have medium habitat suitability. During the field work we were able to find evidence (bear tracks and signs) that this corridor is functional.

Evaluation of transport infrastructure permeability

The evaluation of transport infrastructure permeability is vital for assessing the human impact on the bear habitat connectivity. For each available crossing structure we had measured GPS coordinates and altitude; object measures: high (m) (in 1/3, 2/3, 3/3, maximal high), width (m), distance to nearest house (m); Conditions under and around object– type of cover, vegetation, coverage in (%), slope; presence of animal tracks in and around the object; recommendations and evaluation.

Comparative analysis of the two motorways Trakia and Hemus shows, that in spite of the bigger length of Trakia highways when passing mountain and forest regions (totally 68.2 km. mountain area), compared to Hemus highways (totally 53.3 km. mountain area), the Trakia highway is worse equipped with infrastructures for large mammals/ bears crossing (Tab. 3.)

Tab. 2. Habitat Suitability Index for the corridor area connecting the Rilo-Rhodopean and the Central Balkan sup-populations

Forestry units	SIfood	SIcover	SIhuman influence	HSI
Pirdop	0,47	0,89	0,42	0,56
Koprivshtitsa	0,55	1	0,21	0,58
Aramliets	0,35	0,89	0,22	0,45
Ihtiman	0,45	0,99	0,26	0,54
Panagiurishte	0,33	0,58	0,38	0,41
Klisura	0,55	0,75	0,23	0,52
Mean:	0,45	0,85	0,29	0,51

Tab. 3. Assessed parameters for Trakia and Hemus highways about suitable objects for bear crossing

Assessed parameters	Trakia	Hemus
Total length, m.	68200	53310
Average altitude	675	683
Total number of objects	49	28
Number of objects suitable for bears	8	12
Total evaluation of the objects	142	131
Total evaluation of the objects suitable for bears	67	94
Tunnels	1	4
Total width of the objects	3570,4	9036
Total width of the objects suitable for bears	2200	8256
Total evaluation by km.	2,11	2,35
Total evaluation by km suitable for bears	0,98	1,53

Trends – counting on fixed number feeding places

Assessing the trend proved to be more important than acquiring data about bear numbers which in many cases is relative. Counting bear observations on fixed number of feeding places for a longer period gives a reliable look at the trends of bear population development. In Bulgaria the supplementary feeding is still a fact and this is used as a starting point for getting data for the trend. The count is done in all places the same day, recording all observed small bear, large bear, female with cubs 1st year and female with cubs 2nd year. Fixed number of locations, exact time, period of observation is crucial. So far we had done 3 counts (two in autumn and 1 in spring).

Habitat suitability modeling

Modeling the suitability of the habitat proved to be useful tool for creation a visual representation of the suitability for bears for management purposes. We had created a model in which we used several variables: Corine Land Cover, 2000 derived by satellite photos with pixels resolution 100 m.; Digital Elevation Model (DEM) with resolution 100 m.; GPS point location of bear presence (tracks, scats, mark trees, direct observations, etc.) – more

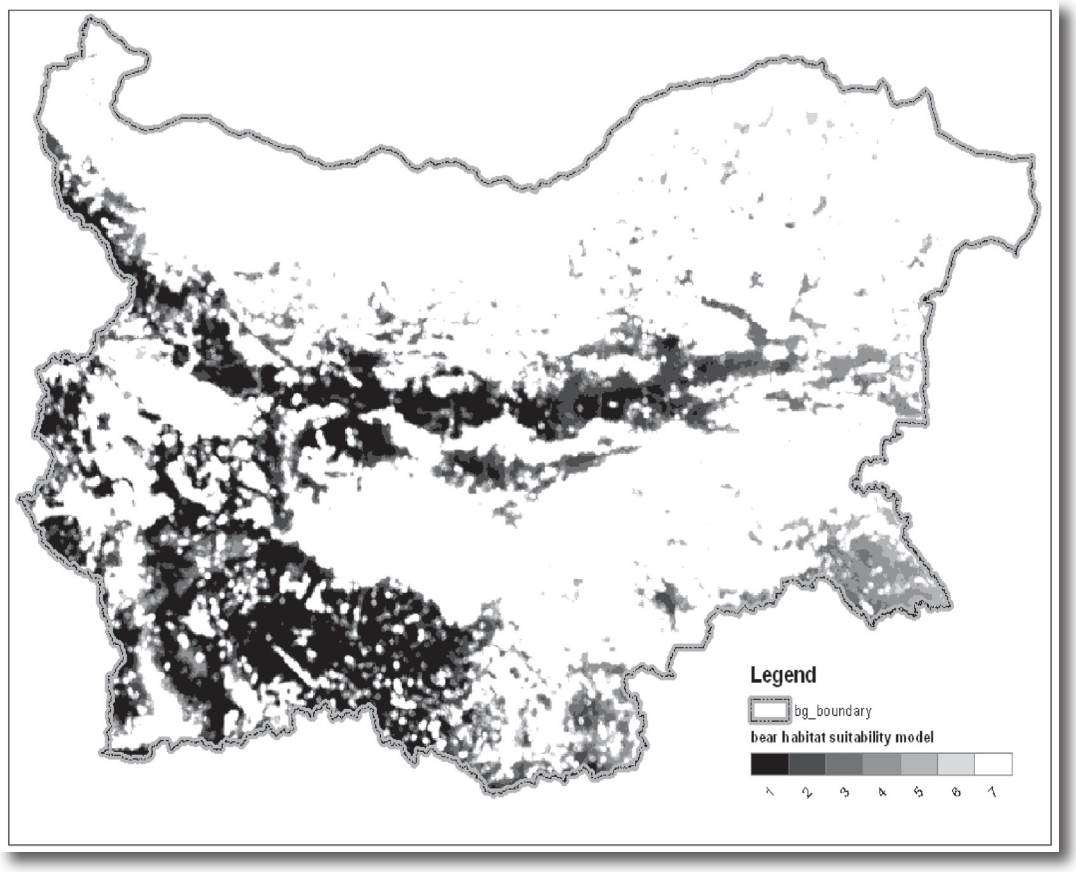

Fig. 3. Suitable bear areas in Bulgaria

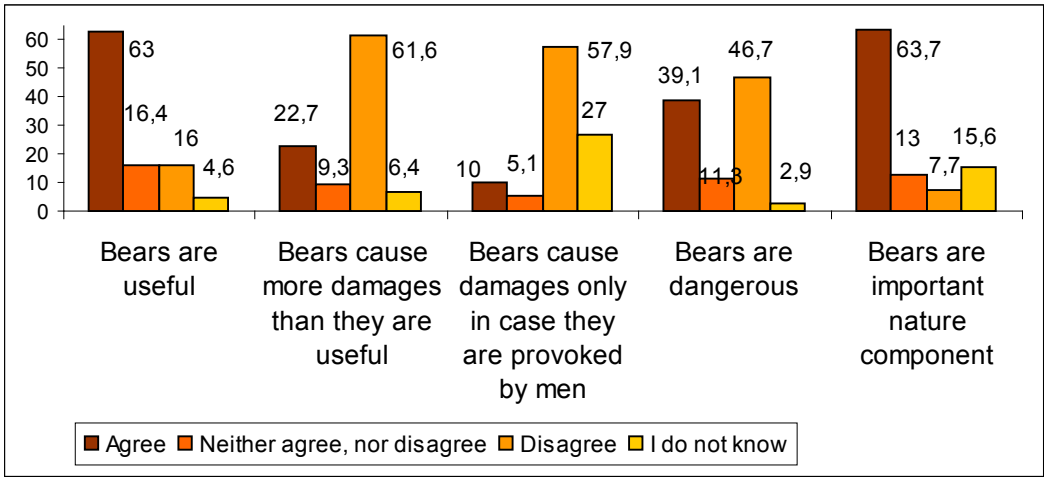

Fig. 4. Attitude towards bears in Bulgaria

than 250; additional layers – settlements polygons, roads and river/lakes/wetlands layer derived from a Bulgarian GIS data base. The data was analyzed with Mahalanobis distance (De Maesschalck et al. 2000). Similar approach is used for the Carpathian Mountains (Salvatori 2004) and the Alps (Corsi at al.2002). For processing, we used the Arc View 3.2 and the Mahalanobis distance extension provided by Jenness Enterprises (Jenness 2003). The model was further analyzed with ArcGIS Desktop (version 9.2, Environmental Science Research Institute [ESRI]). The validation was conducted through independent set of data coming from GPS telemetry of a female bear in Central Balkan mountain. The telemetry work was conducted in a cooperative project with Frankfurt Zoological Society and Deutsche Bundesstiftung Umwelt (DBU)

On Fig.2. are presented the suitable bear areas in Bulgaria. The suitability scores have been grouped into 7 classes, class 1 being the most suitable and class 7 the least suitable.

Though this model we had also assessed the questionable occasional presence in the mountains Konjavska and Kraishte and the linking corridors as also the suitable habitats and the linking mountains around the crossing points above or below the Trakia and Hemus highways.

DNA analysis

The microsatellite DNA based study of the brown bear sub-populations in Bulgaria aims to establish unique genetic identification of possibly more individuals using noninvasive sampling techniques. For the purpose we are collecting samples from scats and rub trees and additionally setting hair snares to collect hair samples on bait. The samples were collected in collaboration with forestry units, game breeding stations and national parks. The data provide the possibility to determine the sex and the home ranges of the individuals, and further will be used to estimate the population size. This data is still processed.

Damage assessment and preventive measures

Damages are one of the main reasons for poaching. The affected people are usually bad financial situation. The compensations are paid by MOEW. Apart from guarding dogs other preventive measures are hardly used, that's why the data we had collected about the damages and the preventive measures gave us a base for recommending steps in the Plan for binding the compensations with the prevention.

Human Dimensions Study

Human attitude towards bears is a vital key for understanding the problems that may occur after damages and the related poaching. In the period 2004-2007, a sociological survey was conducted within the framework of the project "Human dimension analysis of the attitude towards bears". Totally 1105 interviews were carried out. Standard questionnaire was used surveying most areas with large carnivore presence, covering all age classes, all social groups at random sampling. Generally the attitude towards bears is positive in Bulgaria, supporting the removal only of problem individuals. The results from the question "What is your attitude towards bears?" show that the friendliest towards bears are the people from Rila Mountain, compared to the other three regions. Fig.3 presents the attitude towards bears in Bulgaria according to the answers to the questions.

Radio Tracking

So far we had one bear marked with conventional VHF collar. The bear was trapped in poacher snare, cured and returned to nature. It was followed for six months and then disappeared - probably poached.

GPS Telemetry

GPS-GSM telemetry proved to be more accurate and time/money/efforts saving than the conventional VHF telemetry. To study the bears in Bulgaria we had acquired 5 GPS-GSM collars, several more are bought to serve other project but data would be used for the Plan. Permission is issued for catching 50 individuals in Central Balkan, Rila Mountain and corridor areas between them. We are using "Aldrich Traps" for most of the trappings. On 22.09.2007 young female bear named "Chara" was trapped and marked with GPS-GSM collar. The telemetry data is analyzed with ArcGIS Desktop (version 9.2, Environmental Science Research Institute [ESRI]) and the analyses provide vital information for the habitat use, home range and behaviour of Bulgarian bears.

The process of creation of the Management Plan is a difficult one due to many reasons. One is the lack of appropriate data to analyze the situation and to take decision to be included in the plan. Obtaining data is difficult, time demanding and costly. There are always not enough funds to conduct a thorough research.

Moreover the mistrust between different organization and experts created through many years made the task for close cooperation a challenging one. It was the group work during the workshop session which "broke" the ice and made the participants to collaborate for the common goal.

Another hindrance during the workshops was the mistrust itself. All interest parties agree that the bear should be better studied and preserved but they declare different values in the process. The need of compromise was hardly understand in the beginning but at later stage was a vital component of all agreements taken.

References

Aste, C. (1993). Habitatqualitat fur braunbaren in Osterreich. Diplomarbeit der Studienrichtung Forst - und Holzwirtschaft verfabt am Institut fur Wildbiologie und Jagdwirtschaft Universitat fur Bodenkultur Wien. 95 pp.

Corsi, F., Boitani L., Sinibaldi I. (2002). Ecological corridors and species: Large carnivores in the alpine region. Nature and environment, No. 127, Council of Europe,16

De Maesschalck R., D. Jouan-Rimbaud and D.L. Massart (2000). The Mahalanobis Distance. Chemometrics and Intelligent Laboratory Systems, 50: 1-18.

Huber, D. (2004) Georgia Bear Survey. International Bear News vol. 13, no. 4, p.19

Jenness, J. 2003. Mahalanobis distances (mahalanobis.avx) extension for ArcView 3.x, Jenness Enterprises. Available at: http://www.jennessent.com/arcview/mahalanobis.htm.

Kusak, J., Huber D. (1998). Brown bear habitat quality in Gorski kotar, Croatia. Ursus 10: 281-291

Salvatori, V. (2004). Mapping conservation areas for carnivores in the carpathian mountains. Thesis for the degree of Doctor of Philosophy. University of Southampton, Faculty of engineering, sciences & mathematics, School of geography. 231p