Project "Landscape Scale Conservation in the Prespa Lake Basin – Transboundary Species and Habitat Conservation Action Plans"

Brown Bear Conservation Action Plan for the Prespa Lakes' Watershed

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The present Conservation Action Plan is the product of data analysis carried out in the framework of the project "Landscape Scale Conservation in the Prespa Lake Basin – Transboundary Species and Habitat Conservation Action Plans. The project was undertaken within the UNDP project "Integrated ecosystem management within the Prespa lake watershed".

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Summary

The Brown bear (*Ursus arctos* L.) is the largest of the carnivore species found in the area of Prespa Lakes' watershed. Indeed, it is clear from surveys of public opinion that it enjoys considerable popularity among the local population, as well as having full legal protection in all three countries sharing Prespa Lakes' watershed. It is a species with a number of habitat requirements and its presence can be indicative of general ecosystem health. As for other large carnivores, the brown bears are territorial animals and use very large areas. As a result they are very difficult to conserve on traditional scales of protected areas and in single countries. Instead, there is a need for transboundary cooperation between the three countries sharing Prespa Lakes' watershed in the development of coordinated management and conservation plans for the species which will secure its survival for future generations.

Brown bear inhabits the mountainous forested areas that surround the Prespa Lake watershed. Brown bear population estimates are still uncertain and figures are more or less expert guesstimates. Based on the available scientific data, the estimated number of bears in the broader area of the Prespa Lakes' watershed is up to 60 individuals.

Several projects and programmes focusing directly or indirectly on Brown bear protection and conservation have been implemented in all three countries sharing Prespa Lakes' watershed during the last 15 years. All of them provided solid ground data which can be used in future planning and preparation of appropriate measures for conservation and management of the brown bear population in broader Prespa region.

Having in mind all the above and especially the recent new bear genetic background it is obvious that the bear population of the Prespa area plays a very critical role in the genetic continuation of the western Balkan bear population of Dinaric – Pindus mountain range. This means that Prespa Transboundary Park must be a core protection area which with the combination of the neighbouring protected areas as Natura 2000 sites, can create a important network of protected areas which can be used as a base for the protection of the brown bear in West Balkans.

The Brown Bear Conservation Action Plan is the first comprehensive document to systematically offer fundamental guidelines for brown bear management in the broader Prespa Region. This plan is based on the recent scientific and ecological knowledge on brown bear from all three countries sharing Prespa Lakes' watershed. It is also based on the accepted and ratified international conventions, plans and recommendations related to brown bear conservation and protection worldwide. This action plan is not solid and final, but an adaptive and flexible tool that can be changed subject to revisions made over periods of time.

In the first part of this document (PART I), we provide background information including a brief description of the study area, information on brown bear status, biology and ecology, and we present the conservation and legal protection status of brown bear in all three countries sharing Prespa Lakes watershed. In the second part (PART II) we describe the threats and limiting factors to which the brown bear population is exposed, and we focus on the overarching goal of this action plan, as well as all aims, objectives and recommended actions defined for fulfilling the overarching goal.

Part I BACKGROUND INFORMATION

1. Introduction

1.1. Action Plans

The aim of the UNDP/GEF "Integrated ecosystem management in the Prespa Lakes Basin" is to mainstream ecosystem management objectives and priorities into productive sector practices and policies in the Prespa watershed. The project is designed to strengthen capacity for restoring ecosystem health and conserving biodiversity at the local, national and trans-boundary level in the three riparian countries in the Prespa region by piloting ecosystem-oriented approaches into spatial planning, water management, agriculture, forest, fisheries and protected areas management.

On the basis of the *i*) Technical Assessment Report for the Prespa Park Coordination Committee in transboundary ecosystem management (2007), *ii*) Technical Task Team (TTT) assessment and evaluation of national information in support of the Transboundary Diagnostic Analysis (TDA), *iii*) development of a Strategic Action Programme (SAP) in the Prespa Lakes Basin-National Report, as well as *iv*) the Assessment prepared in the frame of the Project-Consulting Services of training on Conservation and Action Planning for Priority Transboundary Habitats and Species in the Prespa Lakes basin-Preparatory Phase (2009), and *v*) based on proposed selection criteria (DEKONS-EMA 2009), three priority habitats and three priority species have been proposed for protection. Findings and proposals for protection of these priority habitats and species were presented on the session of the Monitoring Committee for Prespa Park, on 26 November 2009. The following species and habitats were adopted as priority and relevant status papers (DEKONS-EMA 2010) were prepared for them, namely:

- Species: Mountain tea (*Sideritis raeseri*)*; Prespa barbel (Barbus presepensis) as key species enforcing the protection of other endemic fish species and Brown bear (Ursus arctos).*

- Habitats: Grecian Juniper woods; Reedbeds and Caves not open to public.

This proposed Conservation Action Plan presents the overall conservation goal and strategy, institutional setup, threats and efficient conservation actions for Brown bear.

1.2. Transboundary aspects of the conservation

Transboundary conservation is increasingly important in protecting and maintaining large ecosystems and enhancing the socioeconomic development in concerned areas. Transboundary conservation can have much greater impact than smaller, localized and national projects. Collaborative projects between adjacent countries can protect large areas, support species migrations and reduce the risk of biodiversity loss. Habitats become less fragmented and a greater number of species can be protected. In addition, transboundary projects generate increased income opportunities and the chance for countries to overcome previously frosty relationships.

As for other large carnivores, brown bears are territorial animals and use very large areas. As a result they are very difficult to conserve at traditional scales of protected areas and single countries. Instead of this, there is a need for transboundary cooperation, in this case between the three countries sharing Prespa lakes' watershed in the development of

coordinated management and conservation plans for the species which will secure its survival for the future generations.

Many conservation actions for brown bear study and conservation have been carried out during last two decades as shown in sections from the chapter 2.4 of this document. However, official and coordinated trilateral cooperation in relation to conservation of the whole biodiversity of Prespa did take place until the year 2000.

In February 2000, the Prime Ministers of Albania, Macedonia and Greece signed the "Declaration on the creation of the Prespa Park and the Environmental Protection and Sustainable Development of the Prespa Lakes and their surroundings", which is the first trans boundary agreement for establishing a protected area in the Balkan Peninsula. With that declaration, the entire Prespa Lakes watershed forms **the Transboundary Prespa Park (TPP), the first transboundary protected area in the Balkans**. Based on that declaration, the Prespa Park Coordination Committee (PPCC) and its Secretariat were established, and forwarded important actions to support transboundary cooperation in Prespa. After two years in 2002, a Memorandum of Understanding and Cooperation in the field of environmental protection (MoU), was signed between the Ministry for the Environment, Physical Planning and Public Works of the Hellenic Republic and the Ministry of Environment of the Republic of Albania. The focus of the (MoU), is to especially cooperate in the environmental protection and sustainable development of the Prespa lakes and their surroundings (Kazoglou et al., 2010). A significant step for consolidation of the conservation, revitalization and proper management of habitats and biodiversity at transboundary level was achieved with the latest "Agreement on the protection and Sustainable Development of the Prespa Park Area", signet by the Ministers of the Environment of Albania, Macedonia and Greece and the European Commissioner for the Environment in February 2010.

2. General information on the Prespa Lake watershed

The Prespa lakes' watershed is located in the central-western part of Balkan Peninsula and it is shared between Albania, Greece and the FYR of Macedonia. Geographically, it is divided into two sub-watersheds: the Greater Prespa Lake (synonyms: Macro Prespa Lake, Liqeni i Prespes, Limni Megali Prespa, Golemo Prespansko Ezero) and the Lesser Prespa Lake (synonyms: Micro Prespa Lake, Liqeni i Prespes, Limni Mikri Prespa or Malo Prespansko Ezero). The largest part of the Greater Prespa Lake watershed is situated in the FYR of Macedonia, while Albania and Greece share the smaller part (Fig. 1). The Lesser Prespa Lake watershed is shared between Greece (approx. 80% of the watershed) and Albania (Fig. 1). Prespa watershed territory belongs to three local administrative units, each in one country: municipality of Resen - FYR of Macedonia, the municipality of Korcha (mostly commune Liqenasi) - Republic of Albania and the municipality of Florina - Republic of Greece. About 30,000 inhabitants live in the Prespa region. The total area of the combined sub-watersheds and lakes is 1218.1 km^2 (Perennou et al., 2009). According to Chavkalovski (1997) the total area of the hydrological basin is 1349.2 km^2, out of which 1095.3 kmk^2 belong to Greater Prespa Lake and 254.0 km^2 to Lesser Prespa Lake.
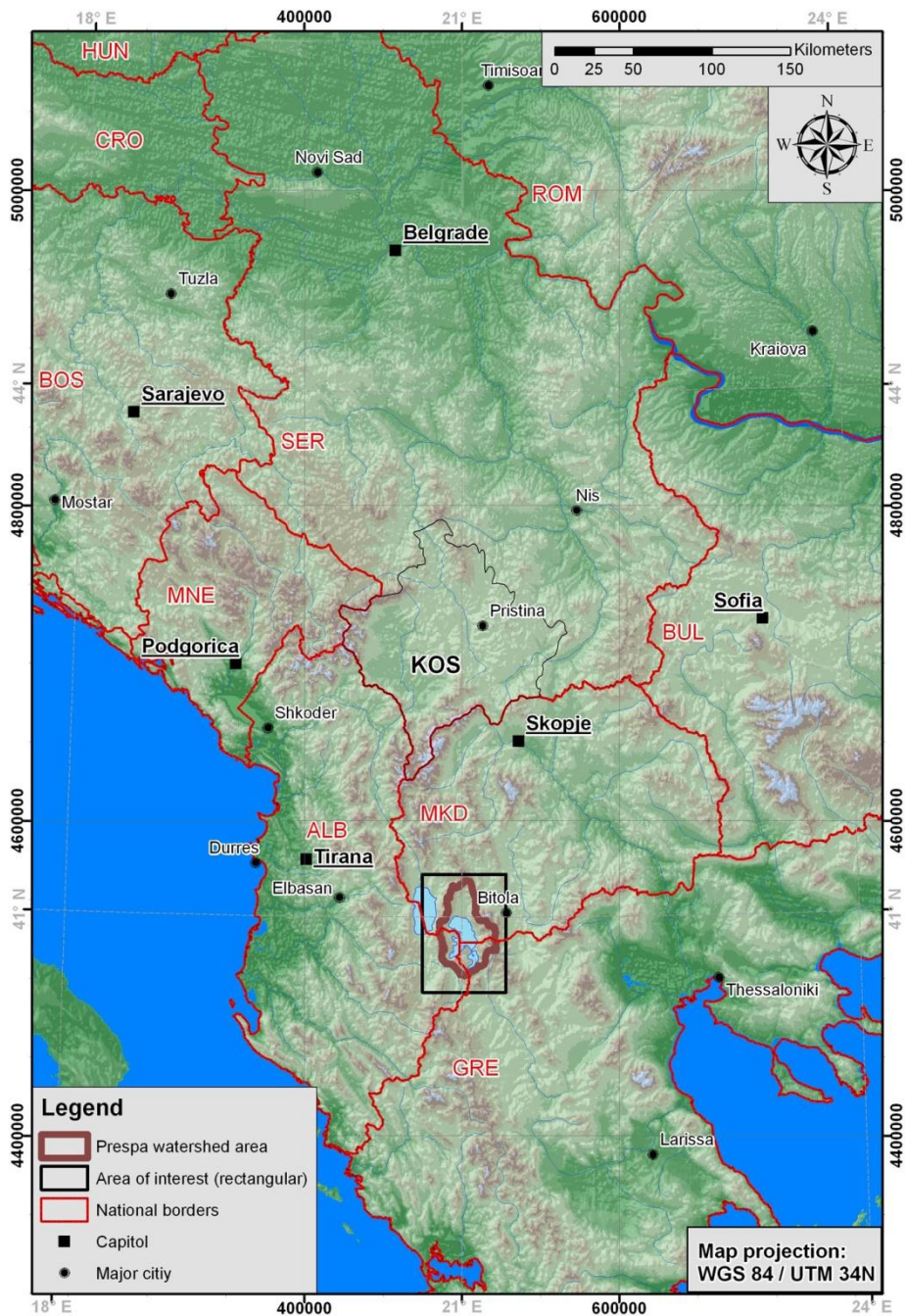
Fig. 1 Balkan Peninsula with emphases on Prespa Lake's watershed

1.1 Area of interest for the brown bear conservation

Brown bears, like other large carnivores, are territorial animals, occupy very large areas and can travel very long distances in search for food, new territories, etc. An individual bear can be present in the mountainous areas within the boundaries of Prespa Lake watershed, but at the same time a part of its home range can be outside these "artificial" boundaries. Therefore, considering the biological and ecological needs of the brown bear, we enlarged the area of interest for this project (Transboundary Prespa Park which is equivalent to Prespa watershed) for the Brown Bear Conservation Action Plan by including the entire

mountain massifs that surround the Prespa lakes watershed – Galichica/Mali e Thatë and Baba/Varnountas/Triclario mountain massifs (Fig. 2). These mountains have stable brown bear populations and serve as core areas. Moreover, on a broader scale, we defined the functional and the potential bear corridors that connect these mountains with the neighbouring brown bear core areas (Polis, Morava, Gramos, Verno, Voras and Nidze Mts.). We consider that brown bear Prespa core area connection to Bigla-Plakenska Planina to north already exists.

1.2 Physical features and hydrology

The two Prespa lakes are situated in a plain of an elevation of about 850-900 m a.s.l. which is surrounded by high mountain ranges that create the Prespa lakes' watershed. These are: the Baba Mountain Range (Pelister, 2601 m) and Mt. Varnountas (2330 m) to the east of the lakes, Plakenska Planina (Stalev Kamen, 1998 m) and Bigla (1656 m) to the north, Galichica (Vir, 2287 m) and Mali Thate / Suva Gora (2284 m) to the west, Mt. Ivan (1770 m) and Triklario / Sfika (1750 m) to the south-southeast.

The Greater Prespa Lake has a surface area of 253.6 km^2 (Perennou et al. 2009) or 273.2 km^2 at water level of 851.83 m a.s.l. (Chavkalovski 1997). The maximum depth of Greater Prespa Leke is 54 m, its average depth 18.8 m and the length of its shoreline 100.1 km. Because water goes downward through the limestone into Ohrid Lake near the locality of Zavir (Vragodupka), the water level and the surface of the lake fluctuate annually and through the years. The annual oscillations vary between 0.5 m and 1.75 m, while periodical oscillations are up to 4.5 m (Chavkalovski 1997). However, for nine years (from 1987 to 1995) the Greater Prespa Lake level dropped by 6.05 m which exceeds the natural variation by 1.55 m (Chavkalovski 1997). Based on hydrological analysis, Chavkalovski (1997, 2000) ascribes the decrease of the water level of 3.29 m to artificial outflow (water for irrigation purposes in the three countries). The water level is currently at approx. 843-845 m a.s.l. (Due to the constant fluctuations of the lake's level throughout time, the absolute elevation, the surface area and the maximum depth is somewhat arbitrary. Additionally, the three countries that share the lake use different system for elevation measurement which also contributes to variation of figures in the existing literature.) The Macro Prespa Lake watershed is characterized by a developed hydrographic network in its eastern and northern part and a less developed hydrographic network in its western and the southern part. On the eastern part there are several permanent watercourses out of which small rivers Kranska Reka and Brajcinska Reka in FYR of Macedonia and Agios Germanos in Greece (Crivelli et al. 2008) are the most prominent. In the northern part the most important permanent river is Golema Reka.

The Lesser Prespa Lake has a surface area of 47.4 km^2 (Perennou et al. 2009). It has a maximum depth of 8.4 m, a maximum length of 13 km and the water level has been at approximately 853-854 m a.s.l. over recent years.

Since 1975, the water level of Lesser Prespa Lake has remained higher than that of Greater Prespa Lake (Hollis and Stevenson 1997). An alluvial isthmus 4 km long and 100-500 m wide separates the two lakes. The lakes are linked by a small channel located at the westernmost part of the isthmus. Water outflows from the former to the latter are controlled by a sluice gate – road bridge system originally built in 1969 (first gate positioned in 1987) on the channel connecting the two lakes. This system was restored in 2004 to allow for control of the water level of the Lesser Prespa Lake (Kazoglou et al. 2010).

1.3 Geology

The rock masses belong to the West-Macedonian geotectonic unit (Klincarov 1997). Mountains to the east are composed of silicate rocks (schist, magmatic and volcanic rocks),

while mountains to the north, south and west are mainly carbonaceous (limestone complex). Due to the porous limestone rocks to the west there is an underground water flow from the Prespa Lakes to the lower Ohrid Lake, where water appears as numerous sub-lacustrine and strong surface springs, such as Drilon in Albania and St. Naum in the FYR of Macedonia. The lowland part of the valley is composed of a clastic complex of sediments (clay sediments, fluvioglacial residues, alluvial sediments, lake-swamp sediments and proluvial deposits).

1.4 Climatic features

The climate of the area is under Mediterranean and continental influences and could be characterized as Continental-Central European. The main climatic modifier is the water mass of the Greater Prespa Lake with its thermodynamic inertia which influences the entire Prespa watershed area. The average annual air temperature was 10.2°C in 1931 - 1960 and 9.6°C in 1961-1987. According to more recent data (for the period 1991-1995) average air temperature in the northern part of the lower part of the watershed is 9.5°C (Resen meteorological station) and 10.8°C in eastern part (Pretor meteorological station) (Ristevski et al. 1997). The warmest month is July, with an average monthly temperature of 19.2°C and the coldest is January, with an average temperature of 0.2°C (Lazarevski 1993). The earliest freezing temperatures occur in October and the latest in May. The average freezing period is 167 days. Rainfalls are under the influence of the Mediterranean pluviometric regime. Rains mainly occur in late autumn and winter, while the least amount of rainfall is recorded in July and August. Average rainfall in 1961-1991 was 730 mm/m^2. In the lower parts of Prespa, precipitation ranges between 600 and 700 mm, in the mountain belt it increases up to 800-900 mm, and in the high-mountain belt it is up to 1000 mm (it can reach 1400 mm in the most humid years) (Ristevski 2000).

Prespa is characterized by a unique regime of local winds conditioned mainly by the Greater Prespa Lake's water mass and by the unequal warming of the air over the lake surface and above the ground.

According to the thermal and pluviometric regime in the Prespa Lake region, the following climate zones exist in the area (Ristevski 2000):

- hot sub-mediterranean climate zone (600-900 m), which is more characteristic for the southern part of the watershed and especially for Lesser Prespa Lake watershed and Albanian part of the Greater Prespa Lake
- cold sub-mediterranean climate zone (900-1100 m)
- submontane climate zone (1100-1300 m)
- mountain sub-mediterranean climate zone (1300-1650 m)
- subalpine climate zone (1650-2250 m)
- alpine climate zone (above 2250 m).

2. Species information

2.1 Species Description

The Brown bear living in the Balkan Peninsula (and consequently in the Prespa Region) belongs to the nominal subspecies *Ursus arctos* L. *arctos*, the same as the whole European Brown bear population (Ruskov and Markov 1974). Recent morphological and genetic studies showed that the bears from the Balkans differ from the Russian-Carpathian populations (Central, Eastern and Northern Europe) and are close to the other Mediterranean populations (Spassov 1997; Taberlet and Bouvet 1994).

Brown bear is the largest carnivore on the European continent. The adult females weigh on average 100 kg, while the average weight of the males is 150 kg. However, sometimes individuals can grow to over 300 kg. During the year, the weight of adult individuals can vary: they are the heaviest in late autumn before hibernation and weigh least at the beginning of summer, after the rutting season. Brown bears have furry coats in shades of brown, blonde, black, or a combination of these colours. According to some unverified observations, the Balkan bear shows remarkable polymorphism regarding its coloration, having a high percentage of rather light (golden) specimens (Spassov 1990). The Brown bear is a plantigrade, as are humans, and can stand up on its hind legs. The forelegs end in massive paws with strong claws 5-6 cm in length which are mainly used for digging. The claws are not retractable as in cat species, and have relatively blunt points and are always visible in footprints.

Bears are solitary and elusive animals. Males and females meet only during the mating period. The family group, composed always of female and cubs, forms a strong nucleus that usually splits after two years. They have a predominantly nocturnal activity pattern which has come mainly as a result of hunting and the high disturbance potential in multi-use landscapes (Swenson et al. 1996; Swenson 1999). There is a difference between the activity pattern of yearling and adult bears, with subadults being somewhat in between (Kaczensky et al. 2005). Adults are mainly nocturnal, whereas the yearling can be found active at any time.

The Brown bear is an omnivore species that adapts its diet according to food availability and human activities in its habitat/home range. As a result of regional differences in the quality and availability of foods, Brown bears have a broad diet range between regions (Krechmar 1995; Jacoby et al. 1999). For instance, in the central part of Sweden Brown bears obtain 44-46% and 14-30% of their total annual energy from berries and ungulates, respectively, and the rest from insects (14-22%, mostly ants) and forbs and graminoids (12-18%) (Dahle et al. 1998). In the central part of Norway they obtain 65-87% from ungulates (mainly sheep), 6-17% from berries and the rest from ants, forbs and graminoids (Dahle et al. 1998). In Croatia bears derive up to 95% of their dietary food energy from plants (Cicnjak, 1991). In Greece the bear's annual diet is dominated by food items of plant origin (87%), followed by animal material (13%), mostly insects (Mertzanis 1994; Mertzanis et al. 2004). Although there is a lack of data on the feeding ecology of bears in Macedonia and Albania, we assume that they have the same food habits as those in Greece, as the Brown bear populations from the Balkan lineage are very close to one another (Taberlet and Bouvet, 1994), and bear populations in Macedonia and Albania constitute the connecting populations between the Brown bear populations of Serbia, Kosovo, Montenegro, Bosnia and Herzegovina, Croatia and Slovenia in the north and the endangered Brown bear population of Greece, where the species reaches its southernmost European distribution (Mertzanis, 1999). Brown bear's food varies seasonally. The main food in spring consists of some remains of acorns and herbaceous plants. During summer the major part of the food consists of soft fruits (fruits from *Pyrus* sp., *Malus* sp., *Prunus* sp., *Vaccinium* sp., etc.), with a maximum in autumn. Besides the fruits, hard masts, mainly acorns and beech masts are essential food for bears in autumn. Animal material consists primarily of ants (maximum consumption in summer), whereas the percentage of other mammal prey (dominance of domestic ungulates, especially cattle, with the highest number of attacks concentrated in autumn) is considerably low – 2% of the total diet (Mertzanis 1994).

Brown bears have relatively low reproductive rates, with females giving birth at most every second year. Bears mate from the end of May until mid-June. The males travel great distances during this period, and fight among themselves when they compete for the same female. The embryo in the uterus has delayed implantation, with the greater part of its development occurring during the last three months of the gestation, which is seven months long. Cubs are born from January to March in the following year. A bear spends the winter in

a specifically selected and prepared den, usually located in small hollows in rocks, which bears adapt to their needs by digging. The female usually gives birth to 1-4 cubs weighing approximately 350 g. They are born blind and hairless. The survival of the cubs is influenced by several factors, grouped as nutritional (food availability, condition of the mother), social (mainly intraspecific predation) and disturbance factors (mainly by humans). Several studies have shown that the factor that most influences cub survival is infanticide (cubs killed by non-related male) (Bunnell and Tait 1985; Swenson 2001). The survival of the cubs has been found to vary within an area (Swenson et al. 1997) and spatially among areas (McLellan 1994; Swenson et al. 1997). The estimated mortality rate of bear cubs in Sweden was 0.35 (n=126) in the south and 0.04 (n=78) in the north (Swenson 2001). The cubs stay with the mother their entire first year of life and separate from her at the age of one and a half years, when the next mating takes place. Brown bears reach sexual maturity at the age of 3-4 years, and can survive in nature until the age of 10-20 years.

2.2 Ecology and habitat requirements

For its biological needs the brown bear has distinct requirements for different habitat characteristics. The Brown bear used to live in lowland forests, flood plains and natural meadows. As the human population spread, bears were pushed into areas less suitable for humans. Thus, in recent times they can be found in mountainous forested areas. The crucial habitats for the Brown bear are the old broadleaf forests (oak and beech forests) and mixed forests with openings and undergrowth of fruit bushes. Occasionally, bears can be found above the upper limit of the forest belt, attracted by the livestock and the blueberries.

The average daily movement of a bear is 1.6 km, while the maximum is over 10 km. There are seasonal differences in Brown bear movement and activity. Bears show increased activity during the mating period (from May to mid-June) when the males and females roam to mate, and in autumn, when bears look for mature forests with large quantities of food, such as beech nuts and acorns. In areas with scarce food (low mast production for example) the home range expands while bears would still use small patches of their home range resulting in an increase in the distance of the core areas. Besides, bears expand their home range not only in width but move to lower elevation (closer to human settlements) in search of alternative foods (Kozakai et al. 2011).

In winter their activity decreases as they retreat to inaccessible, quiet areas to den and for females also to give birth.

The individual territory of Brown bear varies. For instance, in northern parts of Sweden, the size of an adult female home range varied between 171-1,024 km^2, while the size of an adult male home range was considerably bigger and varied between 236-2,364 km^2 (Bjarvall et al. 1990). In Croatia by using radio telemetry the individual territory was estimated to be between 6,000 and 22,400 ha (Huber and Roth, 1993). In Greece, using the same method, up to 31,000 ha was estimated as individual territory for a female with cubs (Mertzanis et al. 2004). The size of a home range depends on many factors, such as: sex, age, body size, food availability and population density (Dahle and Swenson 2003; Dahle et al. 2006). Home-range sizes are larger for males than for females, and home-range size increases with increasing body size, but is not related to individual age. Home-range size is decreasing with the increase of the population density. Males and oestrous females use large ranges in the mating season, but decrease their ranges after the mating season, because both sexes of this species roam to mate. Females with cubs restrict their range size during the mating season in order to avoid contact with infanticidal males and increase their ranges in the postmating season. There are no significant differences between spring, summer and autumn range sizes; average winter range is significantly smaller than other seasonal ranges.

There are facts, like people's statements and findings from winter field work (Melovski et al. 2008) in western Macedonia (bear tracks in deep snow in February) indicating that perhaps some bears are waking up earlier from hibernation or will not start hibernating at all. During the wintertime weather conditions are unsuitable for the bear (very cold temperatures, deep snow cover etc.) and the preferred food articles are scarce or nowhere to find. The above-mentioned situation is extremely difficult for the bears and not so fortunate for people sharing the same habitats with bear. Factors that can disturb the bear's hibernation are sometimes natural, such as unusually high average temperatures during the wintertime, scarce food availability before the bear starts hibernating (autumn); or caused by people, inclluding disturbance and inappropriate management of bear's food resource (hard mast and fruit trees, berries etc.). If a bear does not hibernate during winter they suffer stress and need more food while high energy nutrients (like hard mast and berries) are not available, so, they must turn to food rich in proteins in order not to starve (Vaughan 2009). It means that in such conditions bears must turn to predation and scavenging and the easiest way to obtain such food is the livestock near or in human settlements. In this case conflicts between people and bears are inevitable. To summarise, disturbance in the process of hibernation is a problem for the bear's physical condition and health, it influences the survival rate of adults and especially bear cubs and increases the potential conflicts between bears and humans.

2.3 Population status

Population estimates and the status of the brown bear in Prespa Lake's watershed or the project's study area are uncertain and figures are more or less expert 'guesstimates'. The only systematic population study of the brown bear in the study area is the genetic study conducted by the research team of ARCTUROS with around 18 bears identified by genetic sampling (Karamanlidis 2007; Karamanlidis et al. 2011). Based on the inventories of the Directorate of Forests and Pastures of Korcha district, there are seven bears in the National park Prespa (Albania). The Macedonian share of the population is estimated to be up to 10 bears in NP Galicica and from 20 to 30 bears in NP Pelister (DEKONS-EMA 2010). Summed figures indicate that the population of the Brown bear in the study area numbers around 60 individuals (Tab. 1).

Tab.1 Estimated number of bears in Prespa Lakes' watershed

Subregion/Country	Number bears per subregion/country
Macedonia (NPs Galicica and Pelister)	35
Albania (NP Prespa)	7
Greece (NP Prespa)	18
Sum (total)	60

The 18 bears in the Greek Prespa area is a small part of a great bear population which is distributed at the wider Peristeri Mountain range including the Mountains of Varnountas, Verno, Triklario and Askio. It should be mentioned that according the results from ARCTUROS last genetic analysis research the Peristeri subpopulation has significant genetic differentiation from the Pindos subpopulation in Greece and common genetic characteristic with the bears in Macedonia and Albania.

Having in mind all the above and especially the recent new bear genetic background it is obvious that the bear population of Prespa area plays a very critical role in the genetic continuation of the western Balkan bear population of the Dinaric – Pindus mountain range.

This means that the Prespa Transboundary Park must be a core protection area which with the combination of the neighbouring protected areas as Natura 2000 sites, can create a very important network of protected areas which can be used as a base for the protection of the brown bear in the West Balkans.
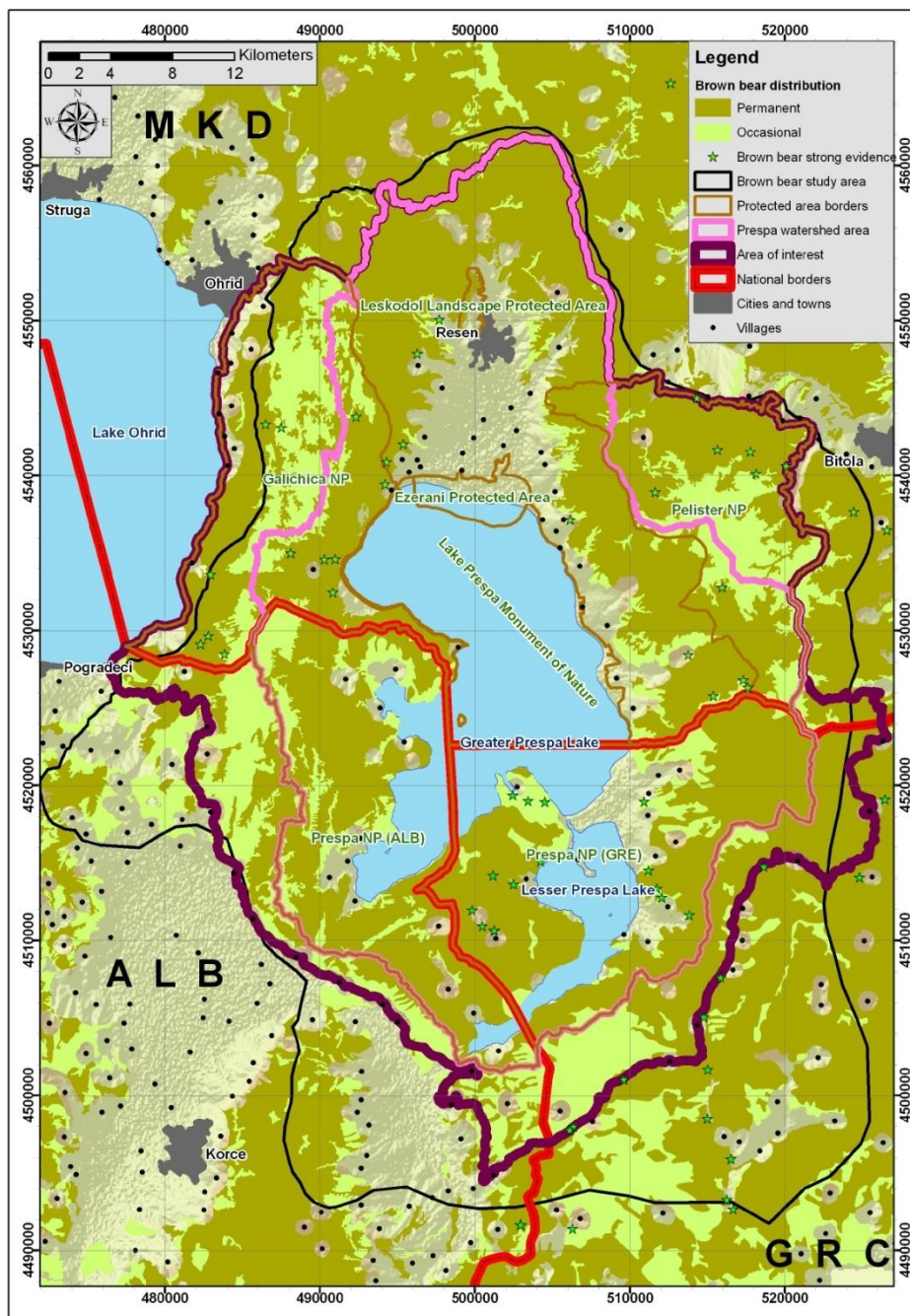

Fig. 2 Brown bear distribution in Prespa Region

Brown bear inhabits the mountainous forested areas that surround the Prespa lakes' watershed (the Baba Mountain Range and Mt. Varnountas to the east of the lakes, Plakenska Planina and Bigla to the north, Galichica and Mali Thate / Suva Gora to the west

and Mt Ivan and Triklario to the south-southeast.). The core areas of the bear population in broader Prespa Lake watershed are Galichica/Mali e Thatë and Pelister/Vicci Mts. (Fig. 2).

2.4 Review of relevant research and conservation projects on the Brown bear

2.4.1. ARCTOS project

The ARCTOS project was implemented by the Greek NGO Arcturos in two phases (first phase 1994-95:LIFE93NAT/GR/010800, second phase 1997-99: LIFE96NAT/GR/003222). In order to conserve the natural areas which act as linkage areas between bear populations in the Balkans, the project has achieved cross-border cooperation with the neighbouring countries (Albania, Serbia, Bulgaria and Macedonia). Project ARCTOS supported the BALKAN NET for conservation of the bear and other large carnivores by organizing meetings, seminars, transborder scientific research and implementing other common conservation actions.

2.4.2. RODOPI-GRAMOS project

The LIFE-Nature project RODOPI-GRAMOS (LIFE99NAT/GR/006498) implemented by the Greek NGO ARCTUROS was aiming at the "Implementation of Management Plans in Gramos and Rodopi Areas, Greece" aiming at the conservation and management of priorities species such as the brown bear and Directive 92/43/EU Habitat Types such as Black Pine habitats (implementation period: March 2000 – February 2002).

2.4.3. Population estimation of brown bear (*Ursus arctos* L.) and lynx (*Lynx lynx* L.) in the wider mountain range of Voras.

In the framework of the project with the title: "Environmental Protection and Sustainable Development", supported and co-financed by the Greek Ministry of Environment ARCTUROS implemented a special conservation project (implementation period: March 2003 – February 2004) for the population estimating of brown bear (*Ursus arctos* L.) and lynx (*Lynx lynx* L.) in the wider mountain range of Voras.

2.4.4. TEDDY project

The TEDDY project (1996-97) was a joint transboundary project initiated by the Greek-based NGO Arcturos, with input from NGOs in neighbouring countries. The overall aim of the project was to create a network for awareness raising and the conservation of wildlife and nature in European countries that are host to bear populations. The method applied in this project was a questionnaire survey among local inhabitants living in the "bear area" (western Macedonia). The questionnaire was disseminated by representatives of MES, Bird Study and Protection Society of Macedonia and students from the Faculty of Natural Sciences and Mathematics (Institute of Biology), during the period September 1996 to February 1997. Another component of the project was raising awareness among the local people about the Brown bear, carried out by a group of journalists from the NGOs "Journalists' Environmental Center" – ERINA. The themes concerned the conservation of the Brown bear, the dancing bear problem, legislation and hunting, and field guides for signs of and damage caused by Brown bears. This project was the first step towards the better study and protection of the Brown bear in this region. The results of the project are compiled in the Compendium on the Status of the Brown bear in the South Balkans.

2.4.5. BALKAN NET project

The BALKAN NET project (1997-98 and 1999-2002) aimed to continue and extend the activities of an established network between the Balkan countries for awareness raising and sustainable nature conservation in areas hosting Brown bear populations and to include Macedonia in its actions. The Network concerns organizations dealing directly or indirectly with the natural environment (non-governmental organizations, organizations of local authorities as well as public services). The main goal of the project was the preservation of the Brown bear population and its habitat in the Balkan area.

2.4.6. ECO-NET, DAC/OECD project

The ECO-NET, DAC/OECD project with the title "Creation of a network for the legal protection and management of protected areas in the Southern Balkans" had a long term aim the legislative harmonisation and management of protected areas in co-operating Balkan countries. The implementation partner was NGOs from Greece, Albania, Macedonia, Bulgaria, and F.R. Yugoslavia. (Implementation period: 2001 –2002).

2.4.7. INTERREG III A/CARDS GREECE – FYR Macedonia project

The INTERREG III A/CARDS GREECE – FYR Macedonia project with the title "Activities for the protection of mountainous ecosystems based on the protection of the Brown Bear" focused on mountainous areas of Vernon and Varnountas in prefecture of Florina. (Implementation period: 2005 – 2006).

2.4.8. Hellenic Bear Register project

Since 2005 ARCTUROS has been implementing the Hellenic Bear Register project which focuses on monitoring of the Brown Bear in Greece using genetic analysis and the establishment of a permanent system to supply hairs in area of Grevena and Florina (Mounts of Verno and Varnountas). In 2010 with the support of the Greek Ministry of Environment, Energy and Climate Change the project was extended to the main bear distribution areas as a 1st Genetic Registration of Brown Bear in Greece giving an estimate of a minimum population of 400 bears.

2.4.9. Balkan Lynx Recovery Programme (2006-2009)

In 2006, the Macedonian Ecological Society together with the Protection and Preservation of Natural Environment in Albania started together with EuroNatur and Kora the partnership project "Balkan Lynx Recovery Programme", which aims to secure the survival of the remaining Balkan lynx population in Macedonia and Albania through the establishment of a series of protected areas as well as through improved wildlife management within and outside future transboundary protected areas where strongholds of the Balkan lynx exist. One of the project tasks was to conduct a lynx baseline survey to assess the distribution and the relative abundance of lynx and its potential prey species, as well as for the Brown bear and wolf by conducting questionnaires in possible lynx distribution areas.

2.4.10. "ECO-INFO II" project

The "ECO-INFO II" project with the title: 'Expanding the cooperation between environmental information centres in the framework of improvement of environmental information services and contribution to the sustainable development of mountain areas' was implemented by the NGO MOLIKA in Macedonia with the main aim of creating the Large Carnivore Information Center in Nizhepole, close to National Park Pelister. Its duration was one year (April 2007-

April 2008) is funded by the Hellenic Aid Agency of Greek Ministry of Foreign Affairs and ARCTUROS.

2.4.11. "Monitoring of fauna in Grammos" project

The project for "Monitoring of fauna in Grammos" in the period 2007-2008 was an activity in the wider project with the title "Joint strategy and collaboration in environmental protection and resource management of Grammos mountain" implemented in the framework of the program INTERREG III A/CARDS GREECE–ALBANIA 2000-2006, with the cooperation of Prefecture of Kastoria.

2.4.12 "Development of National Ecological Network MAK-NEN" (2008-2011)

The project is implemented by the Macedonian Ecological Society (MES) together with ECNC- European Centre for Nature Conservation from the Netherlands, in cooperation with and supported by the Ministry of Environment and Physical Planning of the Republic of Macedonia. The main goal of the project was to develop a national ecological network in the Republic of Macedonia, as part of the Pan-European Ecological Network (PEEN), that will contribute to the country's efforts to halt the loss of biodiversity. The Brown bear has been chosen as a flagship species to promote and further develop the network of ecological corridors for the large carnivores in Macedonia, as well as providing a platform for more efficient work towards biodiversity protection in general.

2.4.13 "Status of brown bears in Albania and FYR Macedonia"

The project was led by the NGO ARCTUROS and implemented through the local cooperation of the NGOs Macedonian Ecological Society (MES) and MOLIKA from Macedonia and Transborder Wildlife Association (TWA) from Albania in the period 2007-2009. The main aim of the project was to collect information that will enable a preliminary assessment of the current status of brown bears in Macedonia and Albania and prepare groundwork for the effective conservation and management of the species in future. The project supported in cooperation with the Institute of Wildlife Biology and Game Management of University of Natural Resources and Applied Life Sciences of Vienna and funded by IBA, ALERTIS, WSPA and ARCTUROS.

2.4.13. Recreation of the BALKAN NET

The project "Recreation of the BALKAN NET, a network of conservation bodies in countries sharing continuous large carnivore populations" implemented with the NGOs ARCTUROS (Greece) aiming at the re-establishment of the network with the participation of the Faculty of Veterinary Medicine University of Zagreb (Croatia), Transborder Wildlife (Albania), Wildlife Conservation Society MUSTELA (Serbia), Faculty of Forestry, University of Sarajevo (Bosnia and Herzegovina), Bulgarian Biodiversity Preservation Society-SEMPERVIVA (Bulgaria) and MOLIKA (Macedonia) as va olunteer. Its duration was nine months (September 2007-June 2008) and it was funded by the SEE.ERA.net project.

2.4.13. The "CALCHAS" project

The Calchas project is a LIFE+ Environment and governance project for the development of an integrated analysis system for the effective fire conservancy of forests. The project intends to install 10 meteorological stations in the area of Grammos in order to ecosystem monitor and prevent forest fire disaster. Coordinating beneficiary is Agricultural University of Athens and partners National Technical University of Athens, Terra Nova Ltd, Marac Electronic S.A. Union of Cyprus Comunities and ARCTUROS. (Implementation period:2010-2013).

2.4.14 "Promoting techniques for reducing conflict between brown bears and humans in Albania"

The project was implemented by the NGO PPNEA with the financial support of the European Association of Zoos and Aquaria (EAZA) in the period 2008-2010. The main aim of the project was to identify the main conservation concerns of brown bears in Albania, the most conspicuous human-brown bear conflicts and promote techniques and measures for conflict reduction. The results of the project revealed that the main conservation concern for brown bears in Albania is their use for human entertainment and public attraction objects, rather more than illegal killings originating from conflicts. Brown bears and other wildlife species are increasingly being used either dead or alive by roadside restaurants or other private enterprises as attraction animals, possibly to attract more clients in their premises.

2.4.15 "Balkan Lynx Recovery Programme – Phase II (2010-2012)"

The project "Balkan Lynx Recovery Programme – Phase II" is a continuation of the programme for lynx conservation in Macedonia and Albania that started in 2006. The activities proposed in Phase II are defined according to the experiences gained so far and they are consistent with the activities proposed in the range-wide "Strategy for the Conservation of the Balkan Lynx in Macedonia and Albania". Thus, the project we present here is a logical continuation of the work conducted so far towards the recovery of the Balkan lynx. Besides the many activities within the project, there is a continuation of the activities regarding the lynx monitoring in Macedonia and Albania, which will result in the collection of new ground data on lynx, but also for the other large mammalian species, including the brown bear.

3. Conservation status

3.1 National and International conservation status

The Brown bear is listed as a protected species or a species with unfavorable conservation status in many international conventions and agreements, including: Annex II and IV of EU Habitat Directive (94/43/EEC), on Appendix II of the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention), Appendix II of the CITES Convention, in the Corine list of Threatened species and in the EMERALD Resolution No. 6 (1998). It is categorized as an LC (Least Concern) species on the IUCN Red List of Threatened Animals (European Threat Category).

In Albania, the Brown bear is classified as a Vulnerable (VU) species according to the Red List of Albania (Misja 2006; MoEFWA 2007). In the National Biodiversity Strategy and Action Plan (Bego et al. 1999) the Brown bear is selected as a priority species and the development of an action plan for its conservation is recommended as an immediate action to take. In 2007 an action plan was compiled and adopted by the Ministry of Environment, however no concrete action has so far been seen in relation to the document.

In the Red Data Book of threatened species in Greece (Karandinos & Legakis 1992) it is considered as an "endangered species".

Although there is still no Red List in Macedonia, the Brown bear is mentioned as an important species for conservation at national level in the Biodiversity Strategy and Action Plan of the Republic of Macedonia (2004).

3.2 National protection status

The Brown bear is listed as a protected species according to the national legislation of all three countries sharing Prespa Lake Basin.

3.2.1 Macedonia

Brown bear in Macedonia has been protected by the Law on Hunting since 1996 (Official gazette of RM 20/96). According to Articles 9 and 13 of the new Law on Hunting adopted in 2009, the bear is considered as a protected game species and its hunting is permanently prohibited. Nevertheless, there is an exception. Hunting might be allowed with permission from the Ministry of Agriculture, Forestry and Water Economy (MAFWE) and the Ministry of Environment and Physical Planning (MEPP) for scientific and educational purposes, for zoos and natural history museums, for breeding and the prevention of contagious diseases, as well as when the species is causing damage (Articles 15, 16 par. 5).

According to the Law on Nature Protection, Article 35 (Official Gazette of RM No. 67/2004) Brown bear is proclaimed as a strictly protected species (Lists for designation of strictly protected and protected species, Official Gazette of RM No. 139/2011).

3.2.2 Greece

Brown bears are fully protected in Greece and according to the Forestry Code (Legislative decree 86/1969, article 258) the killing, capturing, possession and exhibition of bears is illegal. The species is also listed as a priority species in Annex II of the European directive 92/43 EEC.

3.2.3 Albania

The Brown bear in Albania enjoys a full legal protection status sanctioned by the new Law on Wildlife Protection (2008) and Law on Hunting (2010). The species has been considered as fully protected at least since 1956 as it is sanctioned on the respective governmental decrees of the time.

4. Socio-economic role and importance of the species

As the humans changed and pushed out the bears from most of their natural habitats, bears today live in close proximity with humans in more or less human modified landscapes. In these landscapes, bears, in order to satisfy their biological needs, make contacts with humans and their property which results with many conflicts. Therefore, the future of brown bears will mainly depend on their acceptance by humans. Thus, there is a need to focus on people who share the landscape with bears in order to explore their knowledge and perception concerning bears. Accordingly, understanding and documenting the people's attitudes towards bears is as important as ecological issues for defining appropriate management measures for conserving the bear populations.

4.1 Human attitudes towards bears in Prespa Lake Basin

The human dimension surveys carried out in the three neighboring countries of Prespa region (Arcturos 1997; Arsovska 1997; Arcturos 2002; Melovski et al. 2008; Ivanov et al. 2008; Keçi et al. 2008; Krambokoukis 2010; Karamanlidis 2010; Trajçe 2008; Trajçe 2010;

Krambokoukis and Hornigold 2011) have shown that local people have very positive opinions about brown bear and do not consider it as a dangerous or harmful animal (Fig. 3).

People's attitude towards bears in Prespa Basin
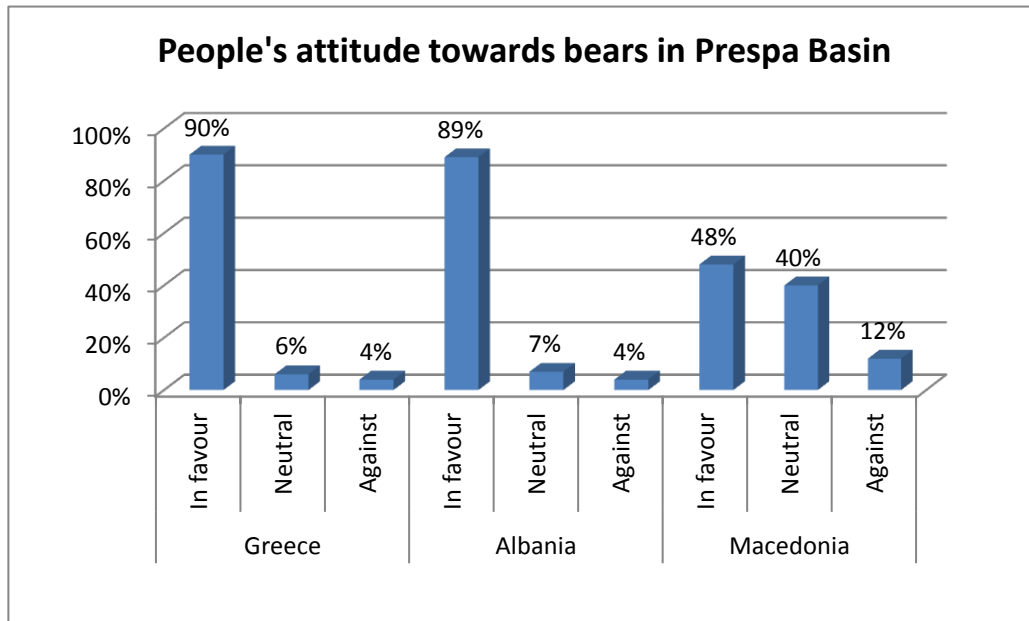
Fig. 3 People's attitude towards bears in Prespa Region

Most of the respondents would like to have bears in their area and believe that bear presence can be beneficial for the area. In all three countries local people are in favour of bear conservation and stated that bears should be protected by law (Fig. 4)

Brown bears should be protected by Law
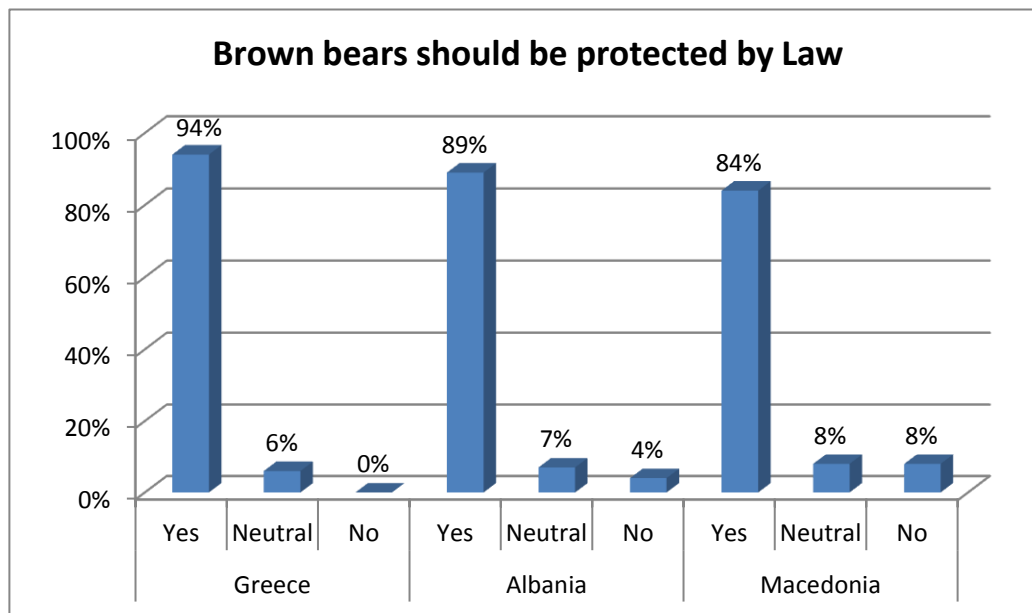
Fig. 4 People's opinion regarding bear protection

4.2 Bear caused damage in Prespa Lake Watershed

Most of the interviewees confirmed at least one type of conflict with bears in their areas, whether attacks on livestock or damage to agriculture. In the Albanian and Greek part of

Prespa Basin, the majority of the respondents claimed that they had suffered damage to livestock caused by bears, whereas in FYR of Macedonia the percentage of people that claimed damage is lower (Fig. 5).

Fig. 5 Presence of Brown bear depredation on livestock

In the Greek part, bears are mainly causing damage to free grazing livestock (Fig. 6) while in Albania and FYR of Macedonia the majority of the respondents suffered damage to cattle, goats and sheep (Fig.7). In all three countries, bears cause significant damage to beehives (Fig. 6 and 7).
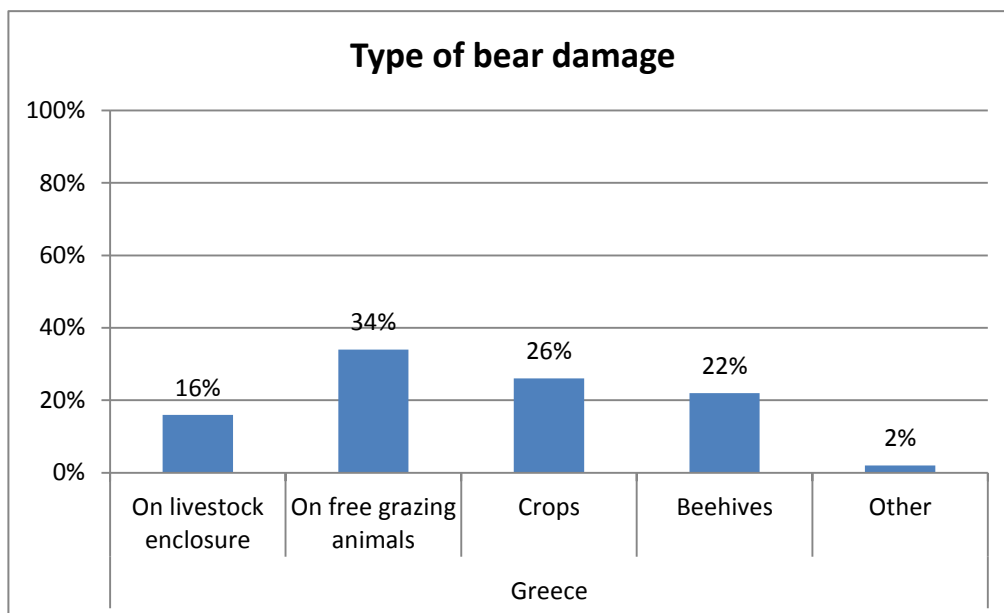
Fig. 6 Type of bear depredation in Greece

Bear depredation per livestock species

Albania: Goats 14%, Cattle 28%, Horses 0%, Donkeys 0%, Sheep 22%, Beehives 36%
Macedonia: Goats 0%, Cattle 26%, Horses 2%, Donkeys 6%, Sheep 11%, Beehives 55%
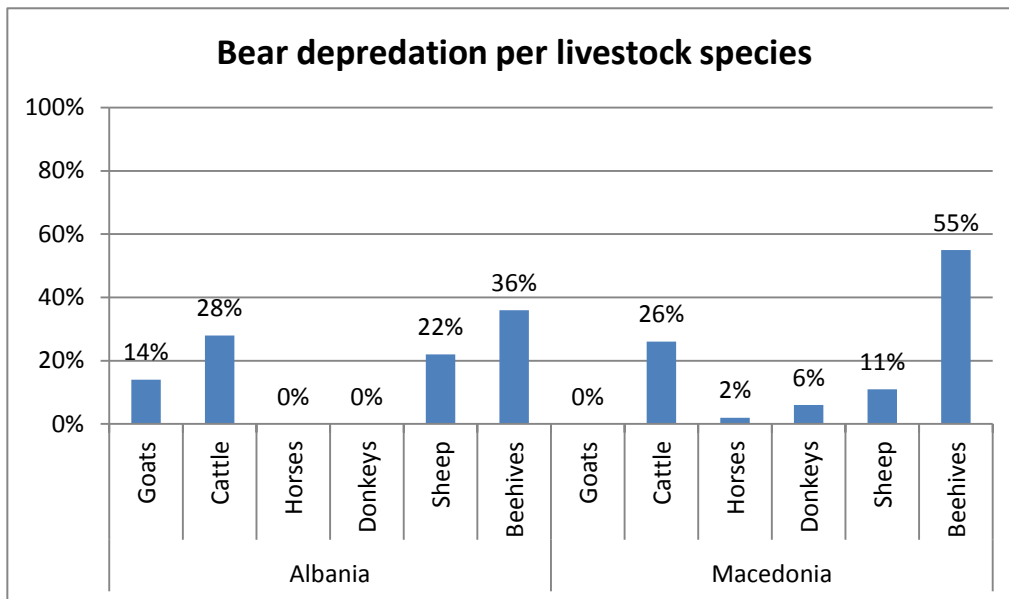
Fig. 7 Type of bear depredation in Macedonia and Albania
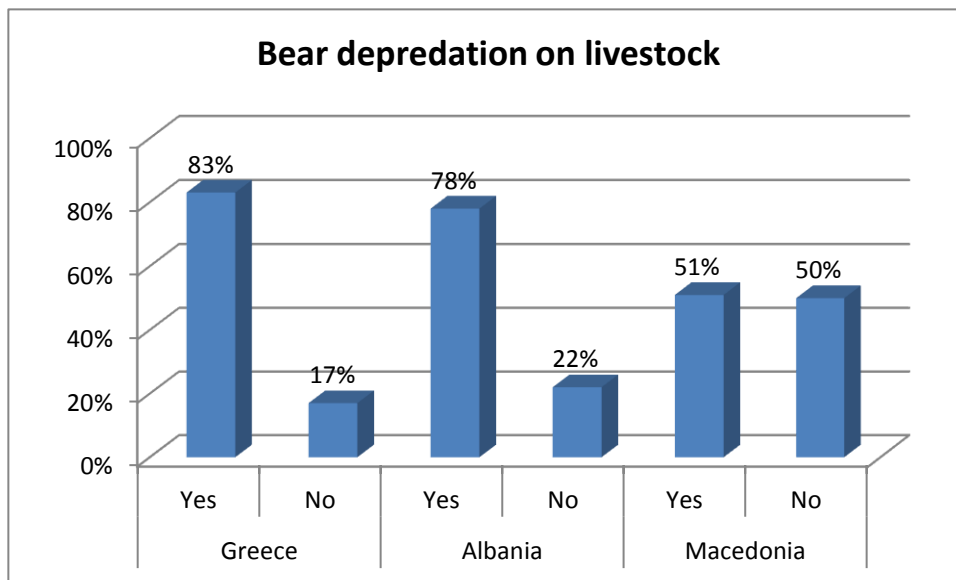
Agricultural damage seems to be another source of conflict between humans and bears in Prespa Region. In the Albanian and Greek part, bears mainly cause damage to crops (mainly wheat), whereas in FYR of Macedonia most of the respondents stated that they had suffered damage to orchards (Fig. 6 and 8).

Agricultural damages by bears

Albania: Crops 72%, Orchands 25%, Vegetable gardens 3%
Macedonia: Crops 28%, Orchands 66%, Vegetable gardens 6%
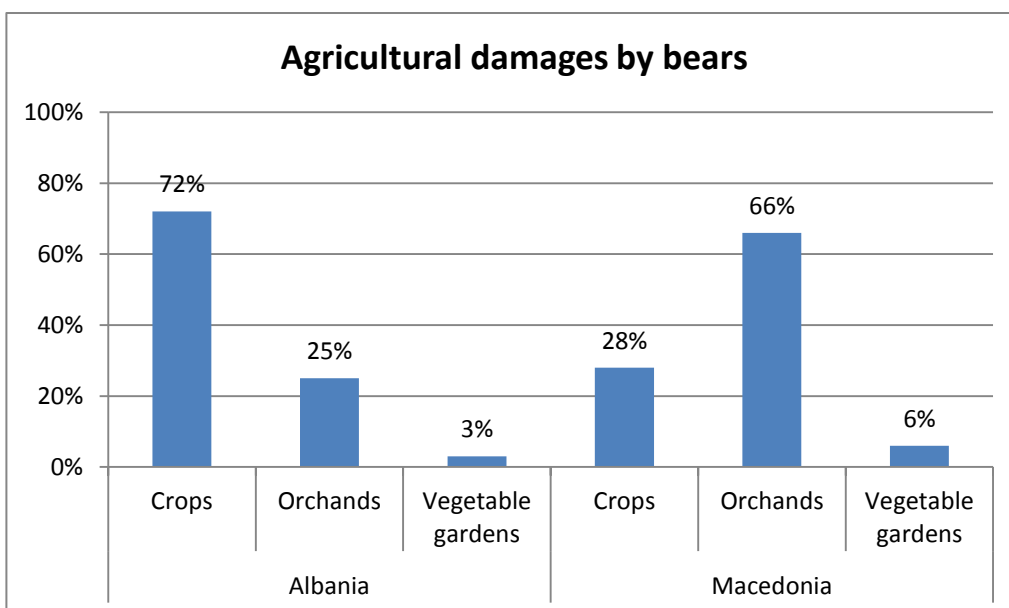
Fig. 8 Bear caused damage on agriculture in Macedonia and Albania

Despite the fact that there are many conflicts between humans and bears, these conflicts are generally tolerated by the local population compared to the conflicts with the wolf (Trajçe, 2010). With some exceptions, most of the locals stated that bears causing conflicts should not be killed, but the ministries and state institutes should apply their instruments in order to solve the problems of conflict.

Part II. CONSERVATION ISSUES AND RECOMMENDED ACTIONS

6. Threats analysis

Aside from the fact that the Brown bear in the study area (Prespa lakes' watershed) is within the transboundary protected area and it is protected by law and the fact that Brown bear has no natural enemy, its existence and movement still depends on human willingness to accept the bear in their environment. The population of Brown bear in Prespa basin is exposed to real threats, most of them due to human activities.

6.1 Poaching and illegal trade

So far, the literature data (ARCTUROS 2002; ARCTUROS 2005; Ivanov et al. 2007; Keçi et al. 2007) and field experience (ARCTUROS 2008, unpublished data) have identified illegal hunting (poaching) as one of the biggest threats to the bear's existence. Bears are hunted, shot, trapped and killed or sold; if a mother is killed the cubs are domesticated, sold or given to zoos or private collections. Poaching occurs everywhere! Somewhere more and somewhere less like in the protected areas (national parks) and heavily kept hunting reserves. The proof for this is the actual distribution: the bear is best distributed in the protected areas because there is no poaching, or at least it is not significant. There are unconfirmed indications of setting poison baits to eradicate "pest" animals such as wolves and others. It is known that bears occasionally scavenge and feed on carcasses, this makes them a "risky link" in the poisoning chain. Dancing bears have not been seen in the Prespa region, but there are a few cases of illegal bear trading in-between neighboring countries (Arcturos 2002). Live or dead (trophy), bears are sold by poachers to private collectors or to private (illegal) zoos etc.

6.2 Habitat fragmentation and connectivity loss

Generally, the habitats presently occupied by the bear in the study area are in more or less good condition (Arcturos 2002). This is mainly because of the rural-urban migration and abandonment of the mountain villages. The best preserved bear habitats occur in FYR of Macedonia and Greece while in Albania forests are heavily used/managed and only partly suitable. Due to fragmentation of bear habitats core areas are distinct and the corridors between are lost or not functional. Such conditions restrict the bear's movement and do not allow extension of their area. Poor road infrastructure and traffic density only slightly fragment the bear's habitat and influence its migration, while for bear – vehicle accidents have been reported at Greek part (Vrontero) of Prespa (ARCTUROS 2005, unpublished data). However, the existing and planned highways and especially in combination with other infrastructure (such as wind-farms) and industrial type of activities (mines) are/will be a potential obstacle for bear migration and will cause fragmentation of their habitat and population. Isolated small bear populations are not viable and with time will decrease in number and eventually become extinct.

In order to assess the current situation concerning the status of habitat fragmentation and connectivity of the brown bear core areas in Prespa, as well as their connectivity with neighbouring core areas out of Prespa region, analyses were done based on GIS methodology. The results are shown in Chapter 7 below and they include: identified corridors

with short descriptions, their function, identified problems and recommended measures for maintenance of their functionality.

6.3 Human-bear conflicts

Due to the high migration rates during the 1950s to the 1970s from rural to urban areas and the parallel decrease in livestock breeding, human–bear conflicts have dropped considerably. Investigations showed that most people – especially permanent residents of rural areas consider bear damage as a "natural part of rural life" and do not perceive it as a threat (Arcturos 2002). However, bears were reported to cause significant damage to crops, fruit trees, and big livestock and to a lesser extent to beehives (Trajce et al. 2008; Keci et. al. 2008). Human-brown bear conflicts are believed to explain to a certain extent the reasons for illegal killing of brown bears. The percentage of people who complained is small but not realistic, as, for various reasons, bear depredation is not always reported. Unsolved and repeated conflicts accumulate anger in people and they usually think that the only solution is killing the animal (revenge). Indeed, very often the wrong bear is shot, because bears are very difficult (almost impossible) to distinguish only by sight alone. Solving human-large carnivores' conflicts requires hard and long-lasting work with local people and the results usually take years to realise.

6.4 Lack of natural food resources

Bears are omnivorous animals that mostly feed on plant food. With this kind of diet, bears need big quantities of food to satisfy their daily need and much more to make adipose reserves for hibernation. The current forestry practices are not so much in the bear's favor. Clear cuts in oak forests and intensive exploitation of beech forests do not allow forests to mature and produce hard mast (acorns). Difficult economic condition and unemployment in rural areas made people dependent on the exploitation of natural resources. Harvesting of non timber forest products and fire wood makes the only income in some areas. This intensive, uncontrolled, and often inappropriate harvesting leaves less food for the bears. With low natural food sources bears are forced to look for food around human settlements (beehives, crops, fruit trees, livestock etc.), and that creates conflicts.

6.5 Disturbance

Bears try to avoid people. Their movement and activities are discrete especially during the reproductive period and while hibernating. Hibernating dens are usually located in rocky areas hardly accessible for people in winter condition, plus people go less in the forests in winter time. The main disturbance comes from poachers and recreationalist. To solve this problem it is important to map the bear dens or to identify possible den areas. Also, the territories of females with yearlings can be identified and publicised so that people are aware of them.

6.6 Lack of knowledge

Lack of knowledge is never a direct threat but always contributes to misunderstanding or mismanagement. With no systematic research and monitoring of the bear's population and ecology in Prespa region (and broadly on Balkans) appropriate activities and measures can't be drafted and most of the time solutions will come from expert experience or compromise rather than from the situation in the field. Monitoring capacity of the local protected area management bodies is weak but improving.

6.7 Poor communication

Several stakeholders can be identified/considered that are connected or influence single bears or even whole local populations. Most important are protected areas' management bodies, local hunters and farmers (bee keepers, livestock breeders, landowners); Local NGO's, tour operators, forestry districts, collectors of non timber forest products etc. are also important. There is a general impression that all these stakeholders barely meet and the communication between them is low or absent. Additionally the general public and locals are not informed of the stakeholder's activities or that information is not available for the public. This is the biggest cause for generating mistrust of the previously-mentioned stakeholders or the institutions they represent.

7. Identified corridors for Brown bear in Prespa Region

In order to identify the core areas and possible corridors for brown bear in the Prespa Region, a large number of digital cartographic data (layers) was used, like:

- National protected areas and areas proposed for protection in FYR of Macedonia, Albania and Greece;

- Internationally proclaimed/designated areas like: Emerald network sites, Ramsar and UNESCO sites, Important Plant Areas, Important Bird Areas, Prime Butterfly Areas etc.

- Distribution of forest, grassland and shrub habitats and agricultural land in FYR of Macedonia based on Corine Land Cover, 2000

- Data on Brown Bear distribution in FYR of Macedonia, Albania and Greece

Additionally, modeling of the suitability of habitats for bear was conducted by application of appropriate software packages.
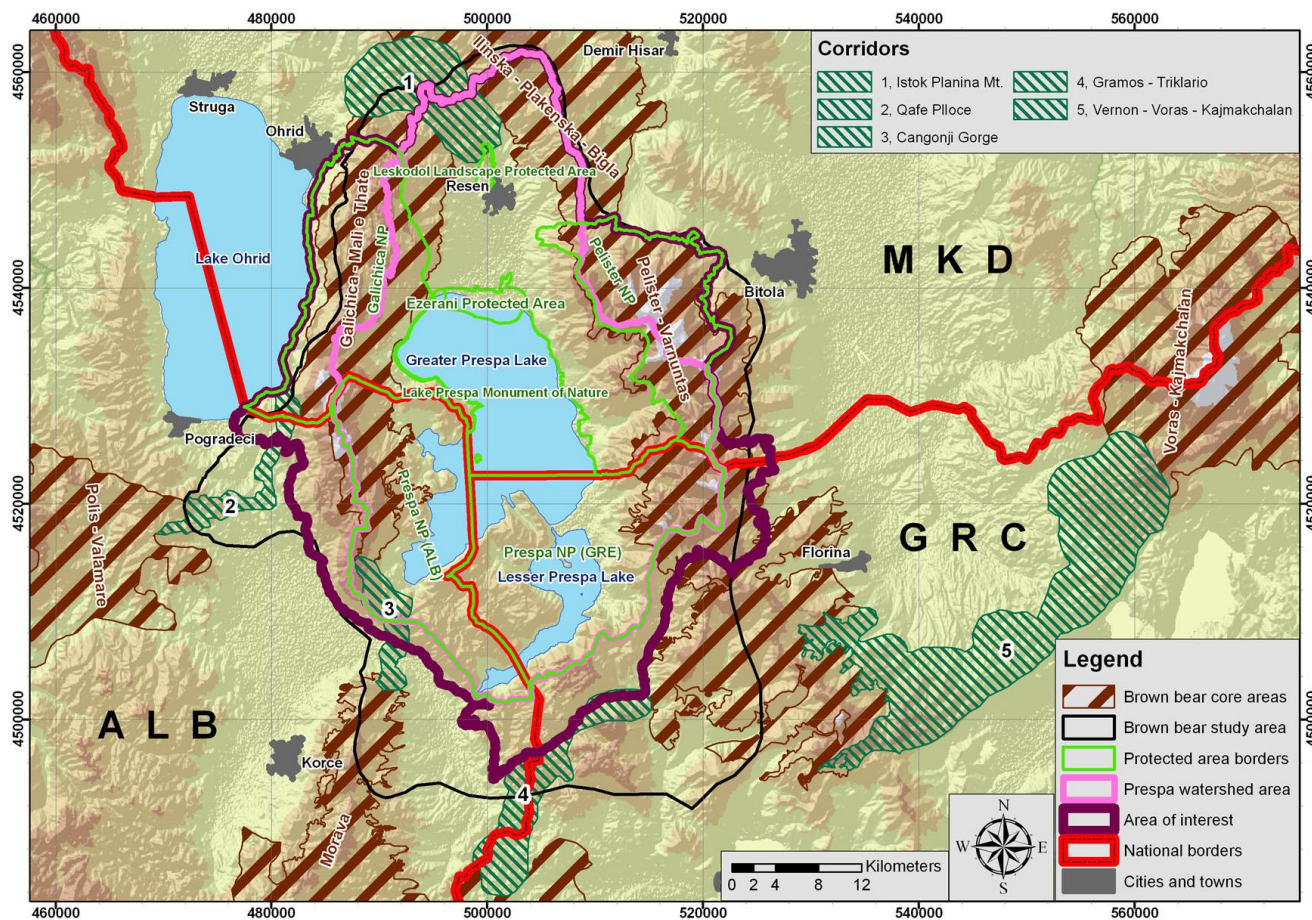
Fig. 9 Identified core areas and corridors for Brown bear in Prespa region

The following corridors were identified:

Linear corridor 1 (Istok Planina) – connects the CA Galichica NP with the CA Ilinska-Plakenska-Bigla Mts.

Description: This corridor occupies the northern slopes of the mountain Galichica and southern parts of Plakenska Planina, i.e. it stretches along the course of the rivers (Openica (Opejnca) and Kriva Reka with a divide at the Bukovo pass (1207 m). The area is well afforested with almost 66% forest. Unfortunately, clear-cut is a frequently practiced method of forest use. Agricultural land (small fields, gardens, orchards and meadows) are represented by 16.3%. The functioning of the corridor is under the influence of several Ohrid and Resen villages, namely: Kosel, Openica, Vapila, Sirula, Rasino, Kuratica, Zavoj, Svinjishta, Rechica, Plake, Gorno Krushje, Dolno Krushje, Leva Reka and Izbishte. Asphalt road extends along the whole length of the corridor in a parallel direction, connecting Ohrid and Resen.

Function: Corridor Istok Planina is the most important corridor for the Brown bear population in core area (CA) Galichica through which connection is established with other core areas in the western part of Macedonia. If this corridor did not exist, then populations

25

from Galichica would be fully isolated (there is a weak connection in the southern parts of Galichica in the Republic of Albania). Certainly, the corridor is important for other animals as well (wolf, roe deer, wild boar, wildcat, lynx and potentially chamois).

Identified problems:

- Existing regional road

- Planned construction of modern highway

- Uncontrolled hunting and poaching

- Inadequate forestry practices

- Inadequate legal protection

Recommendations:

- Restriction of speed

- Measures to mitigate adverse effects of the highway construction

- Restriction and control of hunting (eradication of poaching)

- Sustainable use of forests

- Re-proclamation of the protected area Leskodol

Linear Corridor 2 (Qafë Plloçë) – connects CA Galichica /Mali e Thate with CA Polis/Valamara in Albania.

Description: This corridor stretches from the Galichica/Mali i Thatë mountain chain in the east to the Valamara Mountain in the west. The area is intensively used by humans and the landscape is largely agricultural. Vast areas were transformed into fruit tree plantations in the past, however most of these now seem to be abandoned and destroyed. The natural vegetation is mainly represented by patches of degraded scrubland. Currently there is no indication that this corridor is being used by bears; however the landscape structure and topography assessment imply that the area has high potential for bears to use the corridor, if appropriate measures of landscape management were to be implemented. Several inhabited places and their associated activities influence the functioning of this corridor. These include the villages: Peshkëpi, Alarup, Bletas, Blacë, Çërravë, Leshnicë, Stropckë, Grabovicë, Dardhas, Pretushë, Grunjas, Prenisht. The corridor is also cross-cut by the national road Pogradec-Korçë.

Function: The area of Qafë Plloçë might not have such a conspicuous role as a connecting corridor presently as to date there is no firm indication that brown bears from the core areas of Valamara and Galichica use it to interconnect with each other. However, even if the two sub-populations do not connect at the current stage, Qafë Plloça represents the highest probability corridor for these two sub-populations to connect in the future, based on the area's landscape characteristics and topography.

Identified problems: Currently, the habitats found in Qafë Plloça are not considered suitable for bear movement and dispersal as the area is dominated by human-altered

landscapes and extensively used for agricultural activities. Before the 1990s the hilly areas were ripped off their natural vegetation and transformed to fruit tree plantations (mainly apples), however these plantations were mainly abandoned and destroyed after the 90s. Nowadays Qafë Plloça's landscape is mostly dominated by degraded scrublands, arable land, pastures and erosion areas. The major problems identified for its functioning as a corridor are:

- Existing national motorway

- Planned construction of modern highway

- Uncontrolled hunting and poaching

- Inadequate landscape management

- Extensive and intensive agricultural activities

- Over-grazing

- Over-logging

- Inadequate legal protection

Recommendations:

- Improve landscape management and planning

- Re-forestation of badlands/erosion areas

- Promote natural vegetation regeneration

- Limit grazing and logging activities

- Review infrastructure development plans and adapt them accordingly

Linear Corridor 3 (Cangonji Gorge) – connects CA Galichica/Mali e Thate with the CA Morava Mt.

Description: This corridor stretches from the Galichica/Mali i Thatë mountain chain on the north to the Morava Mountains on the south. The area is intensively used by humans and the landscape is largely agricultural. The natural vegetation is mainly represented by degraded scrublands and the hilly areas were transformed to fruit tree plantations in the past – however latterly these have been abandoned and destroyed (Fig.10). Currently, there is no indication that this corridor is being used by bears; however the landscape and topography assessment imply that the area has the highest potential for bears to use the corridor, if appropriate measures of landscape management were to be implemented. Several inhabited places and their associated activities influence the functioning of this corridor. These include the villages: Zvezda, Burimi, Mançurisht, Zëmblak and Cangonj. The corridor is also cross-cut by the national road Korçë-Bilisht that connects Albania with Greece and by Devolli river.

Function: The area of Cangonji gorge represents a potentially good corridor even though to date there is no firm indication that brown bears from the core areas of Mali i Thatë and Morava use it to interconnect with each other. However, even if the two sub-populations do

not connect at the current stage, Cangonji represents the highest probability corridor for these two sub-populations to connect in the future if landscape management practices are improved and oriented towards the functioning of a natural corridor.

Fig. 10 View of Cangonji gorge and Ivan mt. from Morava mt. (Photo A. Trajce)

Identified problems: Currently, most of the habitats found in Cangonji gorge are not considered suitable for bear movement and dispersal as the area is dominated by human-altered landscapes and extensively used for agricultural activities. The landscape is mostly dominated by degraded scrublands, arable land, pastures and erosion areas in the northern parts, whereas the habitats and forest conditions seem to be in a better condition in the southern parts. The major problems identified for its functioning as a corridor are:

- Existing national motorway

- Planned construction of modern highway

- Planned construction of wind-power turbines along the gorge

- Planned construction of a trans-national gas-pipeline

- Uncontrolled hunting and poaching

- Inadequate landscape management

- Extensive and intensive agricultural activities

- Over-grazing

- Over-logging

- Inadequate legal protection

Recommendations:

- Improve landscape management and planning

- Re-forestation of badlands/erosion areas

- Promote natural vegetation regeneration

- Limit grazing and logging activities

- Review infrastructure development plans and adapt them accordingly

Corridor 4 (Gramos-Triklario) – connects CA Pelister/Varnountas Mt. with CA Gramos Mt.

Description: This corridor connects the main Pindus bear population with the Dinaric bear population (in general). Following the borders between Greece and Albania, this corridor starts at the northern areas of Mount Grammos, has a main section of hilly areas mixed with oak forests and agricultural lands and end at the south slopes of the Triklario Mount. Until the present, agriculture is the main human activity in low land, while at the south slopes of Triklario bauxite mines are active periodically. The main future human intervention in relation to the corridor will be the construction of the highway of Siatista – Kastoria - Krystallopigi as a vertical axis of the Egnatia Highway and connection with Korcha (E45 highway).

Function: According the Greek Bear Register project of ARCTUROS based on genetic analysis the area of the corridor as well the wide area of Korcha and Kastoria has not been functional for long time as the genetic results give a differentiation of bear subpopulations between Peristeri (in mountains Baba – Varnountas – Vernon- Askio) and Grammos. The increasing number of the bears in combination with the changes in the landscape and human activities provides a trend for more intense function of the corridor. At the northern part of the corridor considerable numbers of car accidents increased the dead bears on the roads.

Identified problems:

- Existing national road with high traffic density

- The designing and near future construction of the new high speed highway Kastoria - Krystallopigi

- The coexistence conflict problems especially at cultivation and close to villages areas

- Poaching

Recommendations:

- Low speed limits at the national roads

- Construction of special mitigation measures in the design for the new highway Kastoria – Krystallopigi in combination with the appropriate fence

- Increasing public awareness

- Management of the waste bins and garbage's

- Enforcing prevention measures

- Enforcing hunting control

Corridor 5 (Vernon-Voras-Kajmakchalan) – connects CA Verno with CA Voras-Kajmakchalan.

Description: This corridor connects the Mounts of Verno and Voras/Kajmakchalan. This corridor starts at the eastern areas of Mount Verno, has a main section of lowland hilly areas and end at the west slopes of the Voras Mount. The Verno slopes are covered mainly by oak forest until the Village of Kleidi, while above Kleidi the landscape is characterized by open natural pastures in combination with agricultural fields until the Village of Kelli. Actually, this natural corridor between the two mountain massifs divides the basins of Florina and Amyndeo. South of Kleidi the corridor borders with the lake of Petron. The old and new road which connects Amyndeo with Florina are the regional roads which cross the corridor and create serious fatal cases of bear-vehicles accidents. Important human interventions on the corridor are the coal mine in Vevi and Kleidi, the lime mines in Vevi, while several wind-farms are designed to be established.

Function: The Verno – Voras/Kajmakchalan corridor is very important for the communication of the bear population between the two mountains. It is crucial to mention that there was no bear presence at Voras Mount for at least 20 years and no other bear population in the neighboring areas, this corridor therefore played the main linkage zone role for the reappearance of the bear at the mountain chain of Voras – Vermio – Pieria - Olympus. The Kleidi pass of the new road (Fig. 11) has been a particulary fatal point for wildlife as 4 bears and 2 wolves have been killed due to car collisions the last 5 years. To mitigate the problem ARCTUROS in cooperation with the Region of West Macedonia constructed special road signs about the bear's presence on 45 pass spots across the region. Kleidi pass was one of the most important. The current and future human activities as the extension of the coal mines in combination with the planned wind-farms will need special effort for management for ensuring the functionality of the corridor.

Fig. 11 View of Kleidi pass (Photo: L.Georgiais)

Identified problems:

- The absence of the appropriate mitigation measures at the Amyndeo – Florina national road.

- Existing regional road in parallel way with the new road

- The intensive presence of industrial scale of human activities
- The coexistence conflict problems especially at cultivation and close to villages areas

Recommendations:

- Low speed limits at the national roads

- Construction of special mitigation measures at the new road

- Large scale implementation of Strategic Environmental Assessment of all the human activities especially those with industrial character

- Enforcing the natural and ecological services of the corridor with the appropriate management of the natural areas
- Enforcing prevention measures for bear – human conflicts

8. Overarching goal and overview of aims and objectives

The Brown Bear Conservation Action Plan is the first comprehensive document to systematically offer fundamental guidelines for brown bear management in broader Prespa Region. This plan is based on the recent scientific knowledge about brown bear from all three countries sharing Lake Prespa's watershed. It is also based on the accepted and ratified international conventions, plans and recommendations related to brown bear conservation and protection worldwide. This action plan is not solid and final, but it is an adaptive and flexible tool that can be changed subject to revisions made over periods of time.

The overarching goal of this conservation action plan is **to ensure the long-term favourable conservation status of the European Brown Bear population and the sustainable management, restoration and protection of its habitats and ecological corridors, in the Prespa watershed and beyond, including across trans-national boundaries**.

In order to achieve this overarching goal, aims, objectives and recommended actions were defined according to known threats to brown bear population in Prespa lakes' watershed. All aims, objectives and recommended actions defied for reaching the overarching goal are presented in Chapter 9.

9. Detailed Action Plan

To fulfill the overarching goal of the Brown Bear Conservation Action Plan for Lake Prespa's watershed, 7 main aims were defined: eliminate poaching and trade, safeguard coherent bear range/habitat, reduce the human-bears' conflicts, secure the natural supply and diversity of food production, to have sufficient knowledge, minimize disturbance and Improve communication. To fulfill these aims 20 objectives and 81 recommended actions were elaborated through a participative process involving Brown bear experts from all three countries and external consultants. Some of the objectives/recommended actions may be involved in more than one aim/objective. With very few exceptions, all the objectives and the recommended actions concern all three countries that share the Lake Prespa's watershed. A detailed action plan for Brown bear for the 5–year period is given in Tab.2. All identified actions are elaborated based on their priority for implementation, timeframe and responsible institution for their implementation.

Prioritization is done on 3 levels:

Prioritization is carried out at 3 levels:

- I (first priority) means immediate action is required,
- II (second priority) means the action should be implemented in the frame of this action plan, and
- III (third priority) is given to the actions which implementation should start in the frame of this action plan.

The proposed actions are divided into 3 groups based on the timeframe needed for their implementation:

- ST (short term) – the action can be implemented in the period of one year,
- MT (medium term) – the period of implementation of certain action is between 1-3 years,
- LT (long term) - the period of implementation of certain action is between 3-5 years.

Actions should ideally be implemented on a transboundary level with cooperation among scientists, the local governments, the management bodies of the national parks and other local NGOs, under the umbrella of the Transboundary Prespa Park.

Aim 1: Eliminate poaching and trade. To fulfill this aim, effective enforcement of the existing legislation is necessary (objective 1.1) and a need for raising public awareness among stakeholders was identified (objective 1.2).

In order to effectively enforce the provisions of the existing legislation in the three countries it is important to improve the rangers system in protected areas (through training, empowered authorization, national/transboundary teams etc.); to Increase controls in the Prespa Region to eliminate poaching; to establish monitoring and reporting programme and a database where all information about poaching cases will be registered; as well as to organize special facilities and a system for confiscations, treatment, hospitality and management of captive bears at national level.

For raising awareness among stakeholders it is crucial to prepare information materials and to organize campaigns and educational programmes for the local stakeholders. It is important to organize meetings for awareness raising of different stakeholders (Central Government and relevant Ministries, as well as with hunters, livestock owners, farmers and beekeepers).

Aim 2: Safeguard coherent bear range/habitat. To fulfill this aim, the following three objectives were defined: manage, enhance and protect permeability of corridors within and beyond Prespa (objective 2.1), identify bottlenecks in current ecological networks (objective 2.2) and maintain the natural capacity of the habitat (objective 2.3).

During the preparation of this Conservation action plan the brown bear corridors in the Prespa region were identified, but there is a need for preparation of a detailed study in order to prescribe all requisite activities for management of bear corridors. Identified measures need to be integrated into other sectoral strategic documents/plans (eg.: forest management plans, local development/spatial plans). Monitoring of the functionality of the proposed corridors should be established and all information collected should be shared among key stakeholders. Some of the proposed measures for protection/management of corridors include: building of green bridges/wildlife passages (locations on Bitola-Ohrid, Vernon-Voras Kajmakchalan, Gramos-Askio Cangonji gorge corridors should be identified), planting of native wild fruit trees, limit and control human activities in the identified corridors (eg. mining, quarrying etc.) and appropriate management of forest roads (minimize disturbance).

In the Greek part of Prespa region, it is important to implement the European legal framework for SEA –Strategic Environmental Assessment on corridors level.

Aim 3: Reduce the human-bears' conflicts. To fulfill this aim, the following four objectives were defined: improve the implementation of damage compensation system (only Macedonia & Greece) (objective 3.1), promote preventative measures (objective 3.2), raise awareness of the public (objective 3.3) and increase capacity of the key stakeholders (objective 3.4).

The existing damage compensation system in Macedonia and Greece is not implemented well and needs to be improved. In this respect, there is a need to enforce the existing legislation by the relevant institutions in order to minimize the possible conflicts that appear from bear inflicted damage on human property. Also, it is important to estimate and monitor the real damages occurring in Prespa region, as well as to raise awareness among local farmers for the procedures of the existing compensation systems.

The human-bear conflicts can be also minimized by taking preventative measures, such as to introduce livestock guarding dogs, manage/control dumping of domestic waste that is attractive to bears etc. It is important to take preventative measures because subsidies are

given only in cases where proactive preventative measures were undertaken. In addition, there is na eed for capacity building of the authorities staff through specific training for better management of the existing and possible conflict problems, and if possible to create emergency teams in each country that will directly deal with the conflicts and define protocols for all actions and responsibilities of the teams.

For raising awareness among local stakeholders it is crucial to prepare information materials and to organize campaigns and educational programmes, as well as to organize regular meetings with the local stakeholders (hunters, livestock owners, farmers and beekeepers).

Aim 4: Secure the natural supply and diversity of food production. To fulfill this aim, following two objectives were defined: maintain the natural capacity of the habitat (objective 4.1) and promote sustainable use of natural resources (objective 4.2).

For maintaining the natural capacity of the habitat, it is important to integrate appropriate measures into the forest management plans in all three countries, like: plant native wild fruit trees, introduce appropriate grazing management, reduce the negative impact of the infrastructure development (eg. Hydroelectric plants damaging riverine vegetation) etc.

It is also very important to promote the sustainable use of natural resources by producing information materials, organizing campaigns and educational programmes, as well as organizing regular meetings with the local stakeholders (Forestry Service on central and peripheral-regional level, hunters, livestock owners, farmers and beekeepers).

Aim 5: To have sufficient knowledge. To fulfill this aim, the following four objectives were defined: support scientific research (objective 5.1), support transboundary exchange of information (objective 5.2), collect international/national knowledge and experience (objective 5.3) and Increase capacity of relevant institutions for research and monitoring (objective 5.4).

As the current knowledge for brown bear in Prespa region is not sufficient (especially in Macedonia and Albania) there is a need to support scientific research through establishment of a monitoring and reporting programme in the region. Before the programme starts, a gap analysis should be performed to see what data are available and what data needs to be improved or provided. There should be standardized methodology used between the countries to collect information on population structure, land tenure system, feeding ecology etc., as well as to collect and exchange traditional knowledge and practices. It is important to incorporate the scientific research needs in the future transboundary management plan.

To support transboundary exchange of information, there is need to create a joint monitoring network consisting of local stakeholders that can be involved in the monitoring and reporting programme (game wardens, park rangers, hunters etc.) It is very important to provide regular meetings for the monitoring network members. The data collected through the monitoring network should be stored into a joint database and some of them available on a web portal.

Inform and introducing the monitoring network members with the international/national knowledge and experience is crucial. This can be done by creating a literature database (accessed through the web portal – online library), organizing meetings with international/national experts and conducting study tours and training to best-practice countries/areas.

Before involving interested parties in the research programme and monitoring network, it is very important to increase their capacity for research and monitoring, by providing appropriate training in monitoring techniques and methods to relevant institutions and improving the knowledge in national parks' administration for the importance of brown bear monitoring and conservation.

Aim 6: Minimize disturbance. To fulfill this aim, the following three objectives were defined: ensure optimal conditions for hibernation (objective 6.1), ensure optimal conditions for reproduction (objective 6.2) and ensure safe movement/dispersal corridors (objective 6.3).

To ensure optimal conditions for hibernation and reproduction of brown bears, the den and breeding areas in Prespa region need to be identified, and afterwards to review zoning of protection depending on the findings and increase protection level in hibernation areas (eg. Exclude hunting, logging, etc.).

To ensure safe movement of individual bear through the identified corridors, it is important to take some preventative measures, like: limit and control human activities in the identified corridors (eg. hunting, mining, quarrying etc.) and ban hunting on bottlenecks (eg. green bridges).

Aim 7: Improve communication. To fulfill this aim, following two objectives were defined: make information available to the public, local communities and visitors (objective 7.1) and address and establish trilateral communication (objective 7.2).

It is important to share the information about the bear monitoring and conservation activities with the public, local communities and visitors. This can be done by producing information materials, organizing campaigns and educational programmes, as well as to organizing regular meetings with the local stakeholders (hunters, livestock owners, farmers and beekeepers).

As the smaller, localized and national projects can not be efficient for brown bear conservation in Prespa region, there is a need for transboundary cooperation in development and implementation of coordinated management and conservation plans for the species which will secure its survival for future generations. This includes establising cooperation and networks of responsible authorities such as national parks, forestry services, environmental agencies, municipalities etc., creating a trilateral bear communication group (e.g. to appoint communication officers in each country) which will meet on regular basis, creating a web portal and joint database.

A detailed review of all actions together with their prioritization, timeframe and responsible institutions/organizations for implementations is given in the Tab. 2.

Tab. 2 Detailed review of all aims, objectives and actions

Threat	Aims	Objectives	Actions	Implementation	Timeframe[1]	Prioritization[2]
Poaching/trapping/poisoning and trade (dancing bears, private ZOOs, restaurant bears, trophy etc.; MKD & AL)	**1) Eliminate poaching and stopping illegal captivity of bears and trade**	1.1 Effective enforcement of existing legislation	1.1.1 Improve rangers system	National parks' authorities, hunting associations from the region; scientists LT		1
			1.1.2 Increase controls	National parks' authorities, hunting associations LT		1
			1.1.3 Establish monitoring and reporting programme	Transboundary Prespa Park LT		1
			1.1.4 Establish a database	Transboundary Prespa Park ST		1
			1.1.5 Organizing special facilities and system for confiscations, treatment, hospitality and management of captive bears at national level	National parks' authorities LT		2
		1.2 Rising awareness among stakeholders	1.2.1 Organize campaigns/educational programmes	National parks' authorities, local NGOs, scientists MT		1
			1.2.2 Publication/production of info materials	National parks' authorities, local NGOs, scientists ST		1

[1] ST=Short term action (1 year); MT=Medium term action (1-3 years); LT=Long term action (3-5 years)

[2] 1=Immediate action; 2=Action in the frame of this action plan; 3=Action to start in the frame of this action plan

			1.2.3 Meetings with Central Government and relevant Ministris	National parks' authorities, local NGOs, Transboundary Prespa Park	MT	2
			1.2.4 Meetings with hunters	National parks' authorities, local NGOs, Transboundary Prespa Park	MT	1
			1.2.5 Meetings with livestock owners/farmers/beekeepers	National parks' authorities, local NGOs, Transboundary Prespa Park	MT	1
Habitat fragmentation and loss of connectivity (deforestation, road infrastructure, ineffective cooperation beyond Prespa boundaries etc. ; MKD, AL)	**2) Safeguard coherent bear range/habitat**	2.1 Manage, enhance and protect permeability of corridors within and beyond Prespa	2.1.1 Preparation of study for all requisite activities for management of all bear corridors in Prespa region	Scientists, National parks' authority	MT	1
			2.1.2 Plant native fruit trees within the corridors	National parks' authorities	ST	3
			2.1.3 Monitoring the functionality of the proposed corridors	Scientists, trained NPs stuff	LT	2
			2.1.4 Integrate measures into other strategic plans (eg.: forest management plans, local development/spatial plans)	National parks' authorities, scientists	ST	1
			2.1.5 Share information about the proposed corridors among key stakeholders	Transboundary Prespa Park, local NGOs	ST	1
			2.1.6 Implementation of the European legal framework for SEA –Strategic Environmental Assessment on corridors level (GR)	Relevant ministry, Prespa Park-GR	MT	2
			2.1.7 Limit and control human activities in the identified corridors (eg. mining, quarrying etc.)	National parks' authorities	LT	2

		2.2 Identify bottlenecks in current ecological networks	2.2.1 Identify locations for green bridges/wildlife passages in Bitola-Ohrid corridor	Relevant experts and scientists	ST	1
			2.2.2 Identify locations for green bridges/wildlife passages in Vitsi-Voras corridors	Relevant experts and scientists	ST	1
			2.2.3 Identify locations for green bridges/wildlife passages in Gramos-Askio	Relevant experts and scientists	ST	1
			2.2.4 Identify locations for green bridges/wildlife passages in Cangonji gorge	Relevant experts and scientists	ST	1
		2.3 Maintain the natural capacity of the habitat	2.3.1 Plant native fruit trees	National parks' authorities	ST	3
			2.3.2 Integrate appropriate measures into forest management plans	National parks' authorities, relevant experts and scientists	LT	2
			2.3.3 Appropriate management of forest roads (minimize disturbance)	National parks' authorities	LT	2
Human-bear conflicts (damage to property/production)	**3) Reduce the human-bears conflicts**	3.1 Improve the implementation of damage compensation system (only MKD & GR)	3.1.1 Estimate the real damages	National parks' authorities, local NGOs, scientists	ST	1
			3.1.2 Monitor the damages	National parks' authorities, local NGOs, scientists	LT	2
			3.1.3 Enforce the legislation	Transboundary Prespa Park, National parks' authorities	MT	2
			3.1.4 Awareness raising for farmers	National parks' authorities, local NGOs	MT	1

		3.2 Promote preventative measures		National parks' authorities, Transboundary Prespa Park	3
			3.2.1 Manage/control the dumping of domestic waste that is attractive to bears	MT/LT	
			3.2.2 Link to compensation system (subsidies proactive preventative measures)	Local NGOs, relevant ministries, NPs — LT	2
			3.2.3 Introduce and maintain livestock guarding dogs	Local NGOs — MT	3
			3.2.4 Training the authorities staff for problems management	Transboundary Prespa Park, local NGOs — ST	1
		3.3 Raise awareness of the public		National parks' authorities, local NGOs, scientists	1
			3.3.1 Organize campaigns/educational programmes	MT	
			3.3.2 Publication/production of info materials	National parks' authorities, local NGOs, scientists — MT	1
			3.3.3 Meetings with hunters	National parks' authorities, local NGOs, scientists — ST	1
			3.3.4 Meetings with livestock owners/farmers/beekeepers	National parks' authorities, local NGOs, scientists — ST	1
		3.4 Increase capacity of the key stakeholders		National parks' authorities, hunting associations	3
			3.4 1 Establish an emergency team in each country	ST	
			3.4.2 Establish protocol for actions	National parks' authorities, relevant experts and scientists — ST	2

	4) Secure the natural supply and diversity of food production	4.1 Maintain the natural capacity of the habitat	4.1.1 Plant native fruit trees	National parks' authorities	MT	3
			4.1.2 Integrate appropriate measures into forest management plans	National parks' authorities, scientists	LT	1
			4.1.3 Introduce appropriate grazing management	National parks' authorities, scientists	LT	3
			4.1.4 Reduce the negative impact of infrastructure development (eg. Hydroelectric plants damaging riverine vegetation)	National parks' authorities, scientists, NGOs	LT	2
Lack of food {inappropriate forest management (eg. coppicing and pollarding, stripping fodder/schneiteln)}		4.2 Promote sustainable use of natural resources	4.2.1 Organize campaigns/educational programmes	National parks' authorities, local NGOs, scientists	MT	1
			4.2.2 Publication/production of info materials	National parks' authorities, local NGOs, scientists	MT	1
			4.2.3 Meetings with hunters	National parks' authorities, local NGOs, scientists	ST	1
			4.2.4 Meetings with Forestry Service on central and peripheral-regional level (GR)	Transboundary Prespa Park, NGOs	MT	2
			4.2.5 Meetings with livestock owners/farmers/beekeepers	National parks' authorities, local NGOs, scientists	ST	1
Lack of knowledge (water availability, population status, ecology and biology)	**5) To have sufficient knowledge**	5.1 Support scientific research	5.1.1 Gap analysis	Relevant experts and scientists	ST	1

			Activity	Responsible		Priority
			5.1.2 Collect information on population structure, land tenure system, feeding ecology	Relevant experts and scientists, trained NPs stuff	LT	2
			5.1.3 Standardize methodology between the three countries	Relevant experts and scientists	ST	1
			5.1.4 Incorporate scientific research needs in future transboundary management plan	National parks' authorities, scientists	ST	2
			5.1.5 Establish monitoring and reporting programme	National Parks authority, Transboundary Prespa Park , scientists	LT	1
			5.1.6 Collect and exchange traditional knowledge and practices	NGOs, Transboundary Prespa Park	MT	2
		5.2 Support transboundary exchange of information	5.2.1 Create a joint monitoring network	Transboundary Prespa Park	ST	1
			5.2.2 Create a web portal	Transboundary Prespa Park	ST	2
			5.2.3 Create a joint database	Transboundary Prespa Park	ST	1
			5.2.4 Network meets on regular basis	Transboundary Prespa Park	MT	2
		5.3 Collect international/national knowledge and experience	5.3.1 Invite international/national experts to network meetings	Transboundary Prespa Park	MT	1
			5.3.2 Create literature database (accessed through the web portal – online library)	Transboundary Prespa Park	ST	2
			5.3.3 Conduct study tours and trainings to best-practice countries/areas	Transboundary Prespa Park, NGOs	MT	2

		5.4 Increase capacity of relevant institutions for research and monitoring	5.4.1 Improve knowledge in national parks' administration for brown bear monitoring and conservation	Relevant experts and scientists, NGOs	MT	1
			5.4.2 Provide appropriate training (and include in study tours) to relevant institutions	Relevant experts and scientists	MT	1
			5.4.3 Involve interested parties in the research programme and monitoring network	Transboundary Prespa Park, NGOs	MT	1
Disturbance	**6) Minimize disturbance**	6.1 Ensure optimal conditions for hibernation	6.1.1 Identify den areas	Relevant experts and scientists	MT	2
			6.1.2 Increase protection level in hibernation areas (eg. Exclude hunting, logging, closing of secondary or blind forest roads etc.)	National parks' authorities	MT	3
			6.1.3 Review zoning of protection depending on the findings	Relevant experts and scientists, National parks' authorities	MT	3
		6.2 Ensure optimal conditions for reproduction	6.2.1 Identify breeding areas	Relevant experts and scientists	MT	2
			6.2.2 Increase protection level in breeding areas (eg. exclude hunting, logging, etc.)	National parks' authorities	LT	3
			6.2.3 Review zoning of protection depending on the findings	Relevant experts and scientists, National parks' authorities	MT	3
		6.3 Ensure safe movement/dispersal corridors	6.3.1 Limit and control human activities in the identified corridors (eg. hunting, mining, quarrying etc.)	National parks' authorities, hunting associations	LT	2

			6.3.2 Ban hunting on bottlenecks (eg. green bridges)	National parks' authorities, hunting associations	LT	2
Poor communication	**7) Improve communication**	7.1 Make information available to the public, local communities and visitors	7.1.1 Organize campaigns/educational programmes	National parks' authorities, local NGOs, scientists	MT	1
			7.1.2 Publication/production of info materials (use synergies, existing mechanisms, successful models, etc.)	Transboundary Prespa Park, national park authorities, NGOs	MT	1
			7.1.3 Meetings with hunters	National parks' authorities, local NGOs, scientists	ST	1
			7.1.4 Meetings with livestock owners/farmers/beekeepers	National parks' authorities, local NGOs, scientists	ST	1
		7.2 Address and establish trilateral communication	7.2.1 Ensure full integration with the development and implementation of the management plan	Transboundary Prespa Park	MT	2
			7.2.2 Create a trilateral bear communication group (ex. appoint communication officers in each country)	Transboundary Prespa Park	ST	2
			7.2.3 Establish cooperation and networks of responsible authorities as National Parks, Forestry Services, Environmental Agencies, Municipalities etc.	Transboundary Prespa Park	LT	1
			7.2.4 Create a web portal	Transboundary Prespa Park	ST	1
			7.2.5 Create a joint database	Transboundary Prespa Park	ST	1
			7.2.6 Group meets on regular basis	Transboundary	MT	1

						Prespa Park		

Priority actions:

Action 1.1.1 Improve rangers system

To decrease the level of poaching in broader Prespa lakes' watershed, there is a need to improve the rangers and game warden system in all three countries, especially in Macedonia and Albania. This can be done by increasing the capacity of the park rangers and game warden services, to empower their authorization when dealing with poaching, and eventually forming national or transboundary teams (consisting of park and game wardens, police officers and inspectors from relevant ministries) for preventing and reducing the poaching. A leading organization in fulfilling this activity will be the national parks' authorities and the hunting associations from the region in collaboration with the relevant ministries, environmental and forestry agencies from all three countries. This Action is closely connected with Action 1.1.2 Increased controls – improved rangers/game wardens system will lead to increased field controls.

Time scale: Long term
Prioritization: Immediate action
Approximate costs: 5.000 €

Priority action(s)	Short description	Budget	Stakeholders	Leader(s)/potential implementers	Monitoring	Indicators
Improve rangers system	Need of improving the rangers system in all three countries by increasing the capacity of the rangers and game warden services, giving police powers to park rangers and game wardens, and eventually forming national or transboundary teams for preventing and	5.000€	Rangers from NPs, game wardens, relevant ministries	National parks' authorities, hunting associations from the region; scientists	National parks' authorities	Trainings/works hops organized; empowered authorization obtained; eventually

reducing the poaching.				national/transbo undary teams established.

Action(s) 1.2.1; 3.3.1; 4.2.1 and 7.1.1 Organize campaigns/educational programmes

This action is included in several aims of this conservation action plan due to its importance. Raising awareness among the stakeholders is crucial for Brown bear conservation. For conservation management to be effective, it should be implemented with the full support of the local community. Thus, it is very important to organize campaigns or educational programmes that will increase public awareness on the importance of brown bear as well its ecological role and significance, the threats to brown bear survival and the necessity of management measures for its protection and conservation. These campaigns/educational programmes will include production of information materials like leaflets, brochures and posters for brown bear and its habitats, organizing lectures and forums, creating a webpage as part of the websites of the national parks targeted media work. Local hunters, farmers, beekeepers and livestock breeders will be the main target groups for these campaigns/educational programmes, but the information will also be disseminated also to the general public. The activities should be undertaken by the management bodies of the National Parks (NPs) involved in collaboration with scientists from the NPs, local NGOs and external collaborators.

Time scale: Medium term
Prioritization: Immediate action
Approximate costs: 20.000 €

Priority action(s)	Short description	Budget	Stakeholders	Leader(s)/potential implementers	Monitoring	Indicators
Organize campaigns/educational programmes	Campaigns and educational programmes are important to increase public awareness on the importance of brown bear as well its ecological role and significance, the threats to brown bear survival and the necessity of management measures for its protection and conservation.	20.000 €	Hunters, farmers, livestock breeders	National parks' authorities, local NGOs, scientists	Transboundary Prespa Park	Number of brochures, leaflets and other info materials; number of

These campaigns/educational programmes will include production of information materials like leaflets, brochures and posters for brown bear and its habitats, creating a webpage as part of the websites of the national parks and targeted media work.				TV interviews; number of newspaper articles; organized forums etc.

Action 2.1.1 Preparation of study for all requisite activities for management for all bear corridors in Prespa region

During the preparation of this action plan, 8 brown bear corridors in Prespa region were identified and briefly described (the corridors themselves and the main threats, functionality and short recommendations). The next step will be to prepare a more detailed study for the threats and the actions to be taken for management and conservation of the corridors. Relevant experts/scientists from all three countries will be engaged for the preparation of this study. All relevant sectors (forestry, transport, rural development, energy etc.) will be involved in the process of the preparation of the study.

Time scale: Medium term
Prioritization: Immediate action
Approximate costs: 28.000 €

Priority action(s)	Short description	Budget	Stakeholders	Leader(s)/potential implementers	Monitoring	Indicators
Preparation of study for all requisite activities for management for all bear corridors in Prespa region		28.000€	National parks' authorities, relevant ministries, forestry companies, public	Scientists, National parks' authority	National parks' authority	Prepared study.

Priority action(s)	Short description	Budget	Stakeholders	Leader(s)/potential implementers	Monitoring	Indicators
			enterprises.			

Action 5.1.5 Establish a monitoring and reporting programme

The proper management and conservation of brown bears in Prespa Lakes watershed requires systematic monitoring of the brown bear population and its habitats. Thus, there is a need for the establishment of a transboundary monitoring system for brown bear in Lake Prespa's broader watershed that will continuously provide data on the numbers, distribution, trend, gender and age structure and other ecological and biological parameters of the population, as well as data on condition of the bear habitats. All these data will be used for preparing proper management plans and decision making regarding the brown bear population. Establishment of a monitoring programme includes capacity building (training of staff) and supply of a technical infrastructure for data management, analysis and reporting. Leading organizations for implementing this action are the national parks in collaboration with relevant ministries, environmental and forestry agencies, scientists, local NGOs and other external collaborators. Data collected and analysed as part of the monitoring system should be made regularly available to the site managers, decision-makers and environmental policy makers that require it, and more generally perhaps, to all the public that has any interest in Prespa.

Time scale: Long term
Prioritization: Immediate action
Approximate costs: 118.500 €

Priority action(s)	Short description	Budget	Stakeholders	Leader(s)/potential implementers	Monitoring	Indicators
Establish monitoring and reporting	Proper management and conservation of brown bears in Prespa Region can be assured only by establishment of transboundary monitoring system which will provide reliable	118.500 €	National parks, hunting associations, environmental	National Parks Authority, Transboundary Prespa Park ,	Transboundary Prespa Park	Monitoring programme is established; monitoring

| programme | data on status of brown bear population and its habitats in the area. | | and forestry agencies, NGOs, scientists/bear experts, relevant ministries from all three countries | scientists | | center created and equipped; necessary field equipment provided etc. |

Action 5.2.1 Create a joint monitoring network

This action is very closely connected to the Actions 5.1.5 and 7.2.2. The joint Brown bear monitoring network will consist of all institutions/organizations and individuals participating in the conservation activities and in the monitoring. In addition, these network members help disseminate information to the local population. The leading organization for implementing this action will be the Transboundary Prespa Park.

Time scale: Short term
Prioritization: Immediate action
Approximate costs: 10.000 €

Priority action(s)	Short description	Budget	Stakeholders	Leader(s)/potential implementers	Monitoring	Indicators
Create a joint monitoring	The joint Brown bear monitoring network will consist of all institutions/organizations and individuals participating in the conservation	10.000€	National parks, hunting associations,	Transboundary Prespa Park	Transboundary Prespa Park	Number of monitoring

| network | activities and in the monitoring, as well as in disseminating information to the local population. | | environmental and forestry agencies, NGOs, scientists/bear experts | | | members. |

Action 5.2.3 Create a joint database

This action is very closely connected to the Actions 5.1.5 and 7.2.5. The creation of a joint database is very important for storage and easy access of all collected data from the monitoring programme. It will be constantly fed with data by the transboundary monitoring network members, and will be maintained and updated by qualified persons. The joint database should be available to all network members. The leading organization for implementing this action will be the Transboundary Prespa Park.

Time scale: Short term
Prioritization: Immediate action
Approximate costs: 2.500 €

Priority action(s)	Short description	Budget	Stakeholders	Leader(s)/potential implementers	Monitoring	Indicators
Create a joint database	The joint database will be important tool for data storage and management. It will be constantly fed up with data by the monitoring network, and will be maintained and updated by qualified persons.	2.500 €	National parks, hunting associations, environmental and forestry agencies, NGOs, scientists/bear experts	Transboundary Prespa Park	Transboundary Prespa Park	Fully operational database is created; number of data entered etc.

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