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A Suggested Protection Plan for Important Plants, Areas and Habitats of Köprülü Canyon National Park (Antalya)

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Abstract

In this study, the pressures on the endemic, rare, target species and communities, important habitats, vegetations, and vegetation of the Köprülü Canyon National Park were determined. As a result, with this study, the number of main stands: 15, A1 (number of species in dangerous areas at global scale): 5, A2 (number of endangered species in European scale): 39. Total number of taxa of dangerous species: 48, number of endemic vascular taxa in danger: 44, the total number of endemic taxa: 230, number of endemic taxa for the region: 12. The number of total vascular taxa: 950, genus: 390; family: 94, was determined. The site-specific taxa are; ***Gaudiniopsis macra*** *subsp.* ***micropyroides, Hellenocordum psidicum, Nigella arvensis*** *var.* ***oblanceolata, Rosa dumalis*** *subsp.* ***boissieri*** *var.* ***antalyensis, Scrophularia libanotica*** *subsp.* ***libanotica*** *var.* ***antalyensis, Silene deliculata*** *subsp.* ***pisidica, Stachys antalyensis, Stachys chasmosericea, Tanacetum argenteum*** *subsp.* ***canum*** *var.* ***pumilum.*** *Rare plants are:* ***Echinops onopordum, Amphoricarpos paredictus, Bupleurum davisii, Campanula antalyensis, Cerastium pisidicum, Hypericum ternatum, Omphalodes riplyana, Rhamnus nitidus, Crocus asumaniae****? and* ***Iris pamphylica****. In this context, a conservation management plan has been prepared for the national park management according to the social status of the local people and all the findings to protect the biodiversity in the area. The area is estimated to be one of the pilot areas affected by global warming.*

Keywords: *Köprülü Canyon, Kızıldağ, Management plan, Important habitats, Target species*

Köprülü Kanyon Milli Parkı'nın (Antalya) Önemli Bitkileri, Alanları ve Habitatları için Koruma Planı Önerisi

Öz

Bu çalışmada Köprülü Kanyon Milli Parkının endemik, nadir, hedef tür ve toplulukları, önemli habitatları, vejetasyonları ile birlikte bitki örtüsü üzerindeki baskılar tespit edilmiştir. Sonuçta bu çalışma ile ana meşcere sayısı: 15, A1 (küresel ölçekte tehlikeli alandaki tür sayısı): 5, A2 (Avrupa ölçeğindeki tehlikede tür sayısı): 39. Tehlikeli tür toplam takson sayısı: 48, tehlikede endemik damarlı takson sayısı: 44, toplam endemik takson sayısı: 230, bölge için endemik takson sayısı: 12. Toplam damarlı takson sayısı: 950, cins: 390; familya: 94 olarak belirlenmiştir. Alana özgü taksonlar ise; ***Gaudiniopsis macra*** subsp. ***mikropiroidler, Hellenocordum psidicum, Nigella arvensis*** var. ***oblanceolata, Rosa dumalis*** subsp. ***boissieri*** var. ***antalyensis, Scrophularia libanotica*** subsp. ***libanotica*** var. ***antalyensis, Silene deliculata*** subsp. ***pisidica, Stachys antalyensis, Stachys chasmosericea, Tanacetum argenteum subsp. canum*** var. ***pumilum.*** *Nadir bitkiler şunlardır:* ***Echinops onopordum, Amphoricarpos paredictus, Bupleurum davisii, Campanula antalyensis, Cerastium pisidicum, Hypericum ternatum, Omphalodes riplyana, Rhamnus nitidus, Crocus asumaniae?*** ve ***Iris pamphylica****. Bu bağlamda Alanda biyoçeşitliliği korumak için yöre halkının sosyal statüsüne ve tüm bulgulara göre milli park yönetimi için bir koruma yönetim planı hazırlanmıştır. Alan, küresel ısınmadan etkilenen pilot bölgelerden birisi olacağı tahmin edilmektedir.*

Anahtar kelimeler: *Köprülü Kanyon, Kızıldağ, Yönetim planı, Habitatlar, Hedef türler*

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1. Introduction

Türkiye has a distinctly unique and rich flora in the neighboring countries because of situated on the crossroads of three phytogeographical regions; also its vegetation history, different climatical conditions, topographical, altitudes, soil, and rock structures, etc. In this sense, it is like an open-air museum. It is estimated, the number of vascular plant taxa in the Lakes Region is about 4000. According to the statements of the Agriculture and Forestry Ministry; protected areas in Türkiye correspond to 9.5% of the country's surface area. According to the 2023 targets, it is expressed that will be increasing protected areas to 17%. Although it is pleasing to increase the protected areas, alternative livelihoods should be shown to the local people who make a living from these areas and generally earn their living from animal husbandry. Otherwise, anthropogenic pressures on protected areas will increase. On the other hand, due to the concentration of marble quarries in the region in recent years, protected areas are also heavily affected by this pressure (Batanouny, 1995; Özçelik, 1995; 2000; Özçelik et al., 2001).

As a result, while increasing protected areas is a good initiative, its repercussions on local people should be taken into account and pressures should be minimized. Unfortunately, over the last 70 years, the natural richness of the country have been threatened by over-grazing, moving, fires, cutting, construction, urbanization, industrialization, and anthropogenic factors like herbicide use in agriculture in the country. As a result of the above-mentioned reasons while some endemic and rare plants are undergoing a substantial decline in numbers, others are being destroyed (Küçüker, 1995). There is also severe anthropogenic pressure in and around the park. For this reason, the shallow (***Liquidambar orientalis***) forest in the area has suffered great damage (Kırmacı & Özçelik, 2006).

Türkiye is one of the world's leading countries in protecting biodiversity. Biodiversity of a large part of the country has been determined, except for Eastern Anatolia. The biological diversity of each province has been determined by the Ministry of Agriculture and Forestry, and the habitats and species that need to be protected are listed. All biodiversity inventory has been uploaded to the 'Nuhun Gemisi' database of the Ministry. Numerous official and academic studies have been conducted on the importance and protection of biological diversity (Tekeli et al., 2006; Işık, 1999; Işık, 2014). Studies have been carried out on the application of biodiversity to forestry, planning, and rapid assessment in protected areas (Anonymous, 2006-a, b).

The study area was declared a national park on 12.12.1973. Features; archaeological formations, natural plant communities, and geological formations. Distribution maps of target plant species that need to be protected in Türkiye are also given in the book. The national park which is located in the Western Anatolia region has different ecological conditions and high mountainous fields in general. In point of phytogeographical view, the area is located in the Mediterranean phytogeographical region. It has more primary vegetation than other areas of Türkiye. We guess so, there are at least important 50 monumental trees belonging to ***Cupressus sempervirens, Castanea sativa, Cedrus libani, Pinus brutia, P. nigra*** and ***Ficus carica;*** as scarcely ***Myrtus communis, Laurus nobilis, Quercus coccifera, Arbutus andrachne*** and ***Celtis australis*** in the parking area (Özçelik, 2018). Within the scope of the Important Plant Areas of Turkey (IPA) Project (Özhatay et al., 1997; Özhatay et al., 2003). Bozburun Mountain, which includes our area, is an Important Plant Area that needs urgent protection.

The following taxa are domain-specific: ***Gaudiniopsis macra*** subsp. ***micropyroides, Hellenocordum psidicum, Nigella arvensis*** var. ***oblanceolata, Rosa dumalis*** subsp***. boissieri*** var. ***antalyensis, Scrophularia libanotica*** subsp. ***libanotica*** var. ***antalyensis, Silene deliculata*** subsp. ***pisidica, Stachys antalyensis, Stachys chasmosericea, Tanacetum argenteum*** subsp. ***canum*** var. ***pumilum*** (Ayaşlıgil, 1987; Ayaşlıgil, 1990; Duman, 2005; Özhatay et al., 2003).

Rare plants are: ***Echinops onopordum, Amphoricarpos paredictus, Bupleurum davisii, Campanula antalyensis, Cerastium pisidicum, Hypericum ternatum, Omphalodes riplyana, Rhamnus nitidus, Iris pamphylica*** and ***Crocus asumaniae***?

31 species for ***Allium***, 5 for ***Origanum,*** and 14 for ***Sideritis*** genus were recorded previously from the area (Özhatay et al., 2003; Duman, 2005).

This area has been damaged by a recent fire. Forest fires are a major problem in the region. The most important anthropogenic stratum for the national park. The fire in the 2007 year was not extinguished for a week, causing damage to the plant cover and the local people. Pine forests are the most sensitive to Türkiye's forest fires. 950 ha of forest area burned in the forest fire in Bucakşeyhler district on 24.08.2007. In Taşağıl town and Karabük village on 31 July 2008, a big forest fire appeared. The Mediterranean region is generally covered with fire-sensitive, mostly red pine forests. Forest fires peak in June, especially in July and August. If the relative humidity falls below 20%, the wind speed reaches 50 km/h and the temperature reaches 35 °C, the danger dimension is very high. The forest fires that broke out in 17 provinces and 58 areas in the region between 28-29.7.2021 could not be extinguished for days. In the following days, the number of fires exceeded 100. Not only the forest but also the settlements, barns, animal shelters, animals, and people were burned. There are many injured people. Ministry organizations struggled by carrying water with sprinklers, helicopters, and planes. Despite the support from abroad, local people, and soldiers, the fires could not be prevented. Experiences show that this classical struggle method is expensive and inadequate.

In recent years, new determinations have been made and the borders have been changed in the outer borders of the Park and the areas used by the public on the inner side. Some areas and fields close to settlements have been removed from the park boundary. Dedegül Mountain is a very important mountain in terms of biodiversity. It had no protection status. However, in 2018, Dedegül Mountain was taken under protection and added to the Kızıldağ National Park. Köprülü Canyon National Park was also affected by this practice, and Yaka Canyon and its surroundings were included in the Kızıldağ national park. Therefore, the borders of Köprülü Canyon N. Park were narrowed and its area was reduced. The area is a candidate to be one of the pilot areas affected by global warming.

In 2003-2004 and 2018 years, flora, vegetation, important habitats, and endemics of the park were carried out by us. According to the results, a management plan was proposed to protect biological diversity. This article is a part of a big project. The paper is expected that it will be beneficial to practitioner institutions and those interested in the subject. This article is a part of our related works. We hope that the study will help the conservation efforts of the Agriculture and Forestry Ministry.

2. Material and Method

Köprülü Canyon National Park was chosen as the study area, and vascular plants of this park were chosen as the material. The voucher herbarium samples belonging to vascular plants which formed the basis of our research materials were dried, labeled, identified, and written corresponding to the rules. In identifying the samples, it has been used from “Flora of Turkey” (Davis, 1965-1985; Davis, Mill &Tan, 1988).

In the first step, vegetation types and their floras in the park were determined and noted our important observations were in the field. According to the results of observations in the area, vegetation formations, and their vascular plant taxa, important plants and plant centers are determined. Important characteristic taxa were compared with other vegetations and compared with habitat requirements.

Geographical coordinates and altitudes of all the areas were determined by help the GPS instrument by us (Table 1). Pressure factors on important habitats of the park were determined at the area by us. Important plant areas of the park are divided into three groups sensitive, tampon and development zones. The criteria to choose the plants are evaluated in the relevant chapters. Methods to identify the potential of the target species and bioactivities from year to year have been determined.

The general introduction of Köprülü Canyon National Park, which was chosen as the study area, is summarized in Table 1.

Table 1. A summary of geographical and floristical characteristics of the National Park. (Ayaşlıgil, 1987; 1990; Duman, 2005; Ekim et al., 2000; Özçelik 2012; Özhatay et al., 2003).

Geographical Characteristics	Floristic and Vegetational Characteristics
Provinces: Antalya-Isparta	**Total taxa in dangerous:** 48
Geographical division: West Mediterranean	**Endemic vascular taxa in dangerous:** 44
Forest Region Management: Antalya	**Total endemic vascular plant taxa:** 230
Responsible organization:	**Endemic taxa number for the area:** 12
Antalya District Managements of	**Total vascular taxa:** 950, **Genera:** 390, **Families:** 94
Nature Protection and National Parks	**Important stand types in protection for the area:**
Grid square system:	*Cupressus sempervirens, Abies cilicica*
For vascular plants: C3 square	subsp. *isaurica, Castanea sativa.*
For Moss: C12	**Number of main stand types:** 15
The total area: 36.614 ha.	**A1**(Species number in danger of the area on the global
Altitudes: (110-)130-2505 m.	scale): 5
Certified date:12.12.1973	**A2**(Species number in dangerous of the area on a European
Geographic state: 37º 17' N, 31º 06' E	scale): 39
Characteristics:	**C2** (Habitat number in dangerous
Archeological remnants, natural plant Formations,	by Bern Convention): 5
geological formations	**Protection prevents** Critical, fire-sensitive.

The stand types and important habitats of the area were marked on the topographical map of 25.000 scales. Some important photos taken from the area had been added to this knowledge. Furthermore, between 2003-2004 and 2018 important observations were made on vegetation and important areas in an area study carried out within the framework of the GEF II project. In the introduction of vegetation a general classification, dominance, and characteristics of the taxa, their horizontal and vertical distributions, and the distribution of higher categories (class, etc.) in Türkiye were included.

Methods for interpretation and application to the practice of the findings:

In the first step, flora and vegetation of the park were determined and noted important plant areas and critical taxa of the field were. Endemic plants of the area and their IUCN risk categories from the floristic list were determined by help of the literatures (Ayaşlıgil, 1987; Ayaşlıgil, 1990; Duman, 2005; Özçelik, 2012; Özçelik, 2018). Important areas of the park are divided into three groups sensitive, tampon and development zones. As a representative of important habitats and areas, target species were determined by the team. The first zone (sensitive) must be protected at all times and conditions. As a representative of important habitats and areas, target species were determined by the research team. The criteria to choose the plants are evaluated in the relevant chapters. Methods for identifying the potential of the target species and bioactivities from year to year have been determined. Target plant taxa were selected and suggested an observing program to protect important habitats and species of Köprülü Kanyon National Park and its surroundings in light of all works of literature and our observations.

Monitoring Principles for Target Species in National Park:

Türkiye is the gene center of many plants and has rich in biodiversity, but the protection of this biodiversity is too difficult since there are not sufficient enough number of experts who are experienced in this field of science, and most importantly there is not sufficient money specifically allocated for this kind of activities. Therefore, we have to choose candidate species for the plant taxa and habitats. With the present experts and budget, the conduction of such protection studies seems to be impossible. Thus, we have just selected only 5 species as target species, the number can be increased if wanted. A summary of the target species has been given in table 2.

Table 2. Target plant taxa which must be monitored for the National Park and their general characters.

Characters	T a x a
Endemic	***Abies cilicica*** subsp. ***isaurica, Origanum minutiflorum***
Only grown in the study area within Türkiye	***Abies cilicica*** subsp. ***isaurica, Cupressus sempervirens, Origanum minutiflorum, Fritillaria latakiensis***
Forest trees	***Abies cilicica*** subsp .***isaurica, Cupressus sempervirens***
Formings stands	***Abies cilicica*** subsp. ***isaurica, Cupressus sempervirens, Castanea sativa***

The vascular endemic plants of the National Park (consist of 230 taxa) and were published IUCN danger categories (Özçelik, 2012) and its vascular plants (Özçelik, 2018). Also, a list of marshmallows (and a new marshmallow) record was previously published (Kırmacı & Özçelik, 2010). The economic plants of the park were determined and published (Özçelik & Bulut, 2021; Ekim et al., 1991; Duman, 2005). What to protect is outlined in this article. Frequently used terms, names, and measures have been abbreviated.

Abbreviations:

**: The taxon is known from gathering type specimen and only one locality.*

***: The taxon can not be observed in the area by us, because its locality is not determined, only recorded by literature **(**Duman, 2005; Fakir, 2006; Özhatay et al., 2003) in Table 5.*

N: North, E: East, A: Altitude/Altitudes, m: meter(-s), a.s.l.: almost sea level. Repetitive taxa names are abbreviated to be easily understood, other methods are explained where they are mentioned in the findings.

3. Findings and Discussion

Supported by the Global Environment Fund (GEF), the 'National Capacity Evaluation of Türkiye (NCSA) Project within the Scope of Rio Conventions', of which the United Nations Environment Program (UKEP) is the implementing agency), the National Capacity Action Plan started on 23.2.2009, It was finished in 31.1.2011 (Anonymous, 2011-a). The area of habitats and the areas where the species live should be compatible with the area and capacity of the areas where the public will meet their needs. In other words, if the area allocated to the public cannot meet the need, the pressure on the areas to be protected will increase. The most important of these pressures is animal grazing. Areas suitable for grazing may also be inside, outside, or near the park. The grazing capacity of these pasture areas should be increased and a rotational grazing system should be implemented. Thus, the income of the people increases, and the anthropogenic pressure on protected areas and species decreases. Within the Isparta, By the Provincial Directorate of Agriculture (Isparta) Pasture improvement projects were carried out in some highlands in Şarkikaraağaç district (2004-2007). "Göksöğüt-Çiçekpınar Towns (Ş. Karaağaç-Isparta) Pasture Improvement and Management" (TR. Ministry of Agriculture, Forestry and Rural Affairs, Agricultural Production and Development General Directorate, Isparta Provincial Directorate of Agriculture). grass yield increased, animal carrying capacity increased. These projects can be developed and implemented. Türkiye is one of the first countries to identify and complete the Important Crop Areas (IPA). 122 important plant areas were identified (Özhatay, 2003; 2005). After this determination, 22 more important plant areas were identified on the Baku-Ceyhan Oil Pipeline between 2006 and 2007. Thus, the number of IPAs in Türkiye was 144. One of these areas is Köprülü Canyon National Park (Gökyiğit, 2007; Özhatay, 2006). Türkiye has become a party to many international conventions on biodiversity and environmental protection (Algan & Dündar Kaya, 2003; Akarsu et al., 2005; Özçelik, 1995; 2000). For this reason, it is far ahead of other countries in terms of legal regulations and international cooperation.

The vegetation bands changing and named depending on the altitudes have shown good progress of growth and the layers of these vegetations have taken a different characteristic structure. Succession in most of the areas is in the climax. In some locations, it is depressed due to anthropogenic stress factors. The forest trees forming the climax were ***Pinus brutia*** in low altitudes and inner parts which be affected from the sea up to 1000 (-1500 m). ***P. brutia*** is growing in moisture present in the sea areas of the Mediterranean. Moisture coming from the sea is very influenced by altitude. General distribution in the region of ***P. brutia*** is up to 800 m. However, the distribution of an area in the National Park is up to 1500 m. This spread is perhaps exceptional in the world for the cornice. The

proximity to the sea and the effect of the mountains' parallel extension to the sea are numerous. Even though it stands at 1500 m altitude as expected, this stand is weaker than the other stalagmite stalagmites. The best stands of ***Cupressus sempervirens*** occur in 600-1000 m. ***C. sempervirens*** forest in middle altitudes (600-800 m) in the park. This forest is unique in Türkiye. The second forest is in the USA according to mentioned by the Turkish foresters Therefore, protection of this stand is a priority. This forest has been very effective in the construction of the national park. ***Pinus nigra*** subsp. ***pallasiana*** and ***Abies cilicica*** subsp. ***isaurica*** in high altitudes. The plants of the first zone of vegetation are thermophile plants. Maquis vegetation is composed of evergreen xerophytic plants.

Four different ecosystem types can be seen within the area of the national park: Field, Watery, Forest, Maquis, and Alpine ecosystems. The first four ecosystems are greatly under damage as well. This area is also affected by tourism activities, and also forests by local people. The vegetation by physical appearance consists of mainly 3 zones: tree zone, shrub zone, and herbaceous zone. The main stand types in the area are explained in table 3.

Table 3. Important communities and their floristic compositions of the National Park.

Localities and Communities	**Altitudes** (m)	**Important Taxa** (in an important row)	**Other Characteristics**
Gebiz (Serik) town ***Olea europaea*** var. ***sylvestris*** Maquis	180-460	Tree and Shrub Layers ***Olea europaea*** var. ***sylvestris, Ceratonia siliqua, Arbutus andrachne, Rhamnus oleoides, Myrtus communis*** subsp. ***communis, Quercus coccifera, Pistacia terebinthus*** subsp. ***palaestina.*** Herb Layer ***Myosotis refracta*** subsp. ***refracta, Cerastium brachypetalum*** subsp. ***roeseri, Psilurus incurvus, Catapodium rigidum, Alopecurus arundina, Satureja tymbra, Trifolium arvense.***	The association is well growing on calcareous rocks. It forms pure communities in Gebiz town part of the National park.
Quercus coccifera-Juniperus excelsa Maquis	550-960	Tree and Shrub Layers ***Quercus coocifera, Juniperus excelsa, Pistacia terebinthus*** subsp. ***palaestina, Daphne sericea.*** Herb Layer ***Legousia falcata, Bromus madritensis, Trifolium scabrum, Lens orientalis, Galium setaceum, Ranunculus cuneatus, Dactylis glomerata*** subsp. ***hispanica, Conringia perfoliata, Phlomis lunariifolia, Origanum onites, Valantia hispida.***	The association is well growing on calcareous rocks.
Altınkaya, Beşkonak villages and Güller district (Manavgat) ***Quercus coccifera*** Maquis	150-860	Tree and Shrub Layers ***Quercus coccifera, Phyllyrea latifolia, Arbutus andrachne, Cotinus coggyria, Pistacia terebinthus*** subsp. ***palaestina, Myrtus commnunis*** subsp. ***communis, Laurus nobilis, Smilax aspera, Juniperus excelsa.*** Herb Layer ***Filago eriocephala, Euphorbia falcata, Micromeria myrtifolia, Datura stramonium, Phlomis lunariifolia, Saponaria pamphylica, Astragalus densifoliua, Hyperrhenia hirta, Ceratocaphalus testiculatus, Teucrium chamaedrys*** subsp. ***chamaedrys, Origanum onites, Trifolium scabrum, Legousia falcata.***	It well grow on conglomerate rocks
Pure Communities			
Between Beşkonak and Altınkaya villages, Sace stream. ***Pinus brutia*** Stand	160-1100	Tree and Shrub Layers ***Pinus brutia***, ***Phillyrea latifolia, Arbutus andrachne, Cotinus coggyria, Quercus coccifera, Myrtus commnunis*** subsp. ***communis, Pistacia terebinthus*** subsp. ***palaestina, Cistus creticus, Laurus nobilis, Smilax aspera, Juniperus excelsa.*** Herb Layer ***Crucianella latifolia, Phlomis lunariifolia, Silene otites, Silene vulgaris*** var. ***vulgaris, Erysimum kotschyanum, Ptilostemon chamaepeuce, Onosma oreodoxum, Fumana arabica*** var. ***arabica, Polygala anatolica, Ornithogalum nivale, Teucrium polium, Glycyrrhiza asymetrica, Diplotaxis tenuifolia, Micromeria myrtifolia, Satureja tymbra.***	It well grow on deep soils between 600-800 m.

Bozburun mountain. ***Pinus nigra*** subsp. ***pallasiana*** Stand	1250-1360	Tree and Shrub Layers ***Pinus nigra*** subsp. ***pallasiana, Juniperus excelsa, Phyllyrea latifolia, Quercus coccifera, Pistacia terebinthus*** subsp. ***palaestina.*** Herb Layer ***Filago eriocephala, Euphorbia falcata, Datura stramonium, Saponaria pamphylica, Astragalus densifoliua, Hyperrhenia hirta, Ceratocaphalus testiculatus, Teucrium chamaedrys*** subsp. ***chamaedrys, Origanum onites, Trifolium scabrum, Legousia falcata. Myosotis refracta*** subsp. ***refracta, Cerastium brachypetalum*** subsp. ***roeseri, Psilurus incurvus, Catapodium rigidum, Alopecurus arundina, Trifolium arvense.***	It well grow on conglomerate and limestone rocks.
Bozburun mountain. ***Cedrus libani*** Stand	1540-1750	Tree and Shrub Layers ***Cedrus libani, Phyllyrea latifolia, Pistacia terebinthus*** subsp. ***palaestina, Daphne oleoides*** subsp. ***oleoides.*** Herb Layer ***Euphorbia kotschyana, Genista tinctoria, Viola heldreichiana, Lamium garganicum*** subsp. ***reniforme, Lathyrus laxiflorus*** subsp. ***laxiflorus, Salvia tomentosa, Fumaria microcarpa, Potentilla reptans, Teucrium chamaedrys*** subsp. ***chamaedrys, Polygala anatolia.***	It well grow on conglomerate and limestone rocks.
Ballıbucak-Olukköprü villages, Kestanelik locality. ***Juniperus excelsa*** Stand	740-1460	Tree and Shrub Layers ***Juniperus excelsa, Quercus coccifera, Daphne oleoides*** subsp. ***oleoides, Juniperus foetidissima, Fraxinus ornus*** subsp. ***cilicica.*** Herb Layer ***Crepis sancta, Bromus tectorum, Sedum hispanicum*** var. ***hispanicum, Potentilla humifisa, Eragrostis minor, Salvia tomentosa, Viola heldreichiana.***	It well grow on conglomerate and limestone rocks.
		Mixed Stands:	
Pinus brutia–Quercus coccifera Stand	180-1240	Tree and Shrub Layers ***Pinus brutia, Quercus coccifera, Arbutus andrachne, Phyllyrea latifolia, Pistacia terebinthus*** subsp. ***palaestina, Cistus creticus, Quercus cerris, Myrtus communis*** subsp. ***communis, Cistus salviifolius.*** Herb Layer ***Lens ervoides, Bolanthus minuartioides, Senecio vernalis, Clinopodium vulgare*** subsp. ***arundanum, Trifolium physodes, Sideritis lanata, Calepina irregularis, Verbascum olympicum, Crepis reuterana*** subsp. ***reuterana, Bromus tectorum, Cephalaria aristata, Teucrium chamaedrys*** subsp***. chamaedrys, Smilax aspera, Legousia falcata.***	It show widely distribution in the area and attract attention.
Bozburun mountain ***Pinus nigra*** subsp. ***pallasiana–Cedrus libani*** Stand	1300-1520	Tree and Shrub Layers ***Pinus nigra*** subsp. ***pallasiana, Cedrus libani, Abies cilicica*** subsp. ***isaurica, Quercus cerris, Pistacia terebinthus*** subsp. ***palaestina, Arbutus andrachne, Phyllyrea latifolia, Cistus creticus, C. salviifolius, Quercus cerris.*** Herb Layer ***Salvia tomentosa, Solanum dulcamara, Valerianella vesicaria, Silene aegyptiaca*** subsp. ***aegyptiaca, Consolida glandulasa, Geranium lucidum.***	It well grow on conglomerate and limestone rocks.
Pinus nigra subsp. ***pallasiana-Abies cilicica*** subsp. ***isaurica*** Stand	1310-1450	Tree and Shrub Layers ***Pinus nigra*** subsp. ***pallasiana, Abies cilicica*** subsp. ***isaurica, Quercus cerris, Pistacia terebinthus*** subsp. ***palaestina. Arbutus andrachne, Phyllyrea latifolia, Cistus creticus, Crataegus*** spp***., Quercus cerris.*** Herb Layer ***Silene fabaria, Crepis sancta, Echinophora tournefortii, Salvia tomentosa, Euphorbia kotschyana.***	It well grow on conglomerate and limestone rocks of Bozburun mountain.
Pinus nigra		Tree and Shrub Layers ***Pinus nigra*** subsp. ***pallasiana, Cedrus libani, Abies cilicica*** subsp***. isaurica, Juniperus foetidissima, Pistacia terebinthus***	It well grow on conglomerate and

subsp. ***pallasiana -Cedrus libani-Abies cilicica*** subsp. ***isaurica*** Stand	1000-1600	subsp. ***palaestina, Arbutus andrachne, Phyllrea latifolia, Cistus creticus, Crataegus*** spp***., Quercus cerris.*** Herb Layer ***Euphorbia rigida, Epilobium lanceolatum Salvia tomentosa, Xeranthemum annuum.***	limestone rocks of Bozburun mountain.
Pinus nigra subsp. ***pallasiana-Cedrus libani-Abies cilicica*** subsp. ***isaurica-Pinus brutia*** Stand	1350-1450	Tree and Shrub Layers ***Pinus nigra*** subsp. ***pallasiana, Cedrus libani, Abies cilicica*** subsp. ***isaurica, Juniperus foetissima, Pistacia terebinthus*** subsp. ***palaestina. Arbutus andrachne, Phyllrea latifolia, Cistus creticus, Crataegus*** spp***., Quercus cerris.*** Herb Layer ***Salvia tomentosa, Clinopodium vulgare*** subsp. ***arundanum, Leontodon oxylepis*** var. ***oxylepis, Euphorbia kotschyana.***	It well grow on conglomerate and limestone rocks of Bozburun mountain. It forms pure groups in Bozburun mountain (Gebiz) and Sümbültepe stream bads and its upper parts.
Pinus nigra subsp. ***pallasiana–Pinus brutia*** Stand	1000-1350	Tree and Shrub Layers ***Pinus nigra*** subsp. ***pallasiana, Pinus brutia, Rosa canina, Pistacia terebinthus*** subsp. ***palaestina, Arbutus andrachne, Phyllrea latifolia.*** Herb Layer ***Euphorbia rigida, Epilobium lanceolatum, Salvia tomentosa, Xeranthemum annuum.***	It well grow on conglomerate and limestone rocks of Sanlı plateu, upper parts of Sümbültepe locality and its fired area
Pinus nigra subsp. ***pallasiana-Juniperus excelsa*** Stand	1100-1310	Tree and Shrub Layers ***Pinus nigra*** subsp. ***pallasiana*****,** ***Juniperus excelsa, Rosa canina, Pistacia terebinthus*** subsp. ***palaestina, Arbutus andrachne, Phyllrea latifolia, Cistus creticus, Crataegus*** spp. Herb Layer ***Echinophora tournefortii, Ranunculus argyreus, Galium peplidifolium, Origanum minutiflorum, Asperula setosa.***	It well grow on conglomerate and limestone rocks of Sanlı plateu.
Cedrus libani-Pinus nigra subsp. ***pallasiana*** Stand	1400-1700	Tree and Shrub Layers ***Cedrus libani*****,** ***Pinus nigra*** subsp. ***pallasiana, Pistacia terebinthus*** subsp. ***palaestina, Arbutus andrachne, Phyllyrea latifolia, Cistus creticus, Crataegus*** spp***., Rosa canina.*** Herb Layer ***Viola heldreichiana, Euphorbia kotshyana, Fumaria microcarpa, Verbascum orgyale, Potentilla reptans, Salvia tomentosa.***	It well grow on conglomerate and limestone rocks of Sanlı plateu, Bozburun mountain.
Cedrus libani-Pinus nigra subsp. ***pallasiana -Abies cilicica*** subsp. ***isaurica*** Stand	1480-1750	Tree and Shrub Layer***s*** ***Cedrus libani-Pinus nigra*** subsp. ***pallasiana, Abies cilicica*** subsp. ***isaurica, Pistacia terebinthus*** subsp. ***palaestina, Arbutus andrachne, Phyllrea latifolia. Cistus creticus, Crataegus*** spp***. Rosa canina.*** Herb Layer ***Euphorbia kotshyana, Verbascum orgyale, Sideritis libanotica*** subsp. ***linearis, Lotus corniculatus*** var. ***tenuifolius, Salvia tomentosa, Origanum minutiflorum.***	It well grow on conglomerate and limestone rocks in upper parts of Hasdümen village
Juniperus excelsa -Cedrus libani Stand	1210-1490	Tree and Shrub Layers ***Juniperus excelsa, Cedrus libani, Pistacia terebinthus*** subsp. ***palaestina, Arbutus andrachne, Phyllrea latifolia, Cistus creticus, Crataegus*** spp***., Rosa dumalis, R. canina, Phlomis grandiflora*** var. ***grandiflora.*** Herb Layer ***Festuca valesiaca, Salvia tomentosa, Teucrium polium, Sedum hispanicum*** *var.* ***hispanicum, Bromus madritensis.***	It well grow on conglomerate and limestone rocks in upper parts of Hasdümen village

Within forest areas, the cypress forest is of a special importance. This area is largest cypress forest in the world. Conglomerate, calcareous and limestone rocks covered by typical maquis, rocky shadows and lower parts have pure and mixed types of ***Cupressus sempervirens.*** The forest area has a very rich biodiversity because of various ecosystems. In the conglomerate rocks around Bozburun Mountain, Ovacık Mountain and Burmahan village ***Abies cilicica*** subsp. ***isaurica*** (relict endemic) are rarely present

due to the less humidity. The firs in this area are old and cannot form cones. Therefore, the stand must be protected. Because it cannot create a new stand in its place.

Table 4. Important forest habitats in dangerous which must protect for the National Park by Bern Convention (Ayaşlıgil, 1987; Özhatay et al., 2003; 2005).

Code	Important Stand Types and Habitats in Dangerous
42.A17	Anadolu cypress ***(Cupressus sempervirens)*** forests
421951	Fir ***(Abies cilicica*** subsp. ***isaurica)*** forests
42B12	Cedar forests in Middle Taurus Mountains ***(Cedrus libani)***
45.11	Wild olive ***(Olea europea)*** forest communities
42.6643	Black Pine (***Pinus nigra*** subsp. ***pallasiana)*** forests
42.B12; 4285B1:	Red Pine ***(Pinus brutia)*** forests
Newly suggested	Chestnut (***Castanea sativa)*** forest.

Table 5. Other habitats in dangerous which must protect for the National Park by Bern convention (Ayaşlıgil, 1987; 1990; Özhatay et al., 2003; 2005).

Code	Important Habitats and Communities in Dangerous
44.72	*Liquidambar orientalis* communities
44811	*Nerium oleander* gallery forests
44812	*Vitex agnus-castus* groups
4512	*Ceratonia siliqua* forest groups
44.714	*Platanus orientalis* forest groups
Protection status of the area	Vulnerable

Table 6. Endemic taxa which must be protect previously (Familias and species are in alphabetic rows).

Taxa	Familias	Localities	Habitats	Altitudes (meters)
****Bupleurum davisii***	Apiaceae	Bozburun mountain, between Tazlıyayla-Tozludere	Limestone rocks and forest clearings	1600 m
*****Amphoricarpos paredictus***	Asteraceae	Bozburun Mountain	Limestone rocks	1600 m
Echinops onopordum	Asteraceae	Beşkonak village surroundings	Limestone rocks and forest clearings	150-450 m
Echinops pannosus	Asteraceae	The Canyon environs	Limestone rocks and redpine forest clearings	150-775m
Tanacetum argenteum subsp. ***canum*** var. ***pumilum***	Asteraceae	Bozburun mountain, Tozluçukur plateu	Alpinic steppe	1900 m
Omphalodes riplyana	Boraginaceae	Bozburun mountain, Kurucaova, Taşlı yayla	In shadows of limestone and conglomerate rocks	1700-1900m
*****Campanula antalyensis***	Campanulaceae	Bozburun mountain	Conglomerate rocks	1200 m
*****Cerastium pisidicum***	Caryophyllaceae	Bozburun mountain	Alpinic steppe	1700 m
****Silene delicatula*** subsp. ***pisidica***	Caryophyllaceae	North parts of Bozburun mountain	Alpinic steppe	2000 m

**Silene guerbuezii*	Caryophyllaceae	Aksu, Pınargözü and Yaka stream environs	Pine forest clearings and sides	1300-1750m
Hypericum ternatum	Hypericaceae	The Kanyon environs, Altınkaya /Zerk village, and its environs	Conglomerate rocks	200-600 m
*****Crocus asumaniae***	Iridaceae		Oak forest clearings and sides, Macquis	900-1200 m
*****Iris pamphylica***	Iridaceae	Sütçüler, Müezzinler village environs	Oak and pine forests clearings and sides	700-850(1500) m
****Stachys antalyensis***	Lamiaceae	Altınkaya/Zerk village, Kestanelik locality	Conglomerate rocks	150-950 m
****Stachys chasmosericea***	Lamiaceae	Upper parts of Oluk ward, Altınkaya / Zerk village, Sümbültepe and Kestanelik localities	Conglomerate rocks	800-1100 m
****Gaudiniopsis macra*** subsp. ***micropyroides***	Poaceae	Beşkonak village, Özüztaşı	Macquis	1500 m
*****Nigella arvensis*** var***. oblanceolata***	Ranunculaceae			
Rhamnus nitidus	Rhamnaceae	Bozburun mountain, Kozludere locality	Pine forest clearings and limestone rocks	700-1300 m
Rosa dumalis subsp. ***boissieri*** var. ***antalyensis***	Rosaceae	Bozburun mountain, plateu, Pınargözü	Alpinic steppe and Black Pine forest	1500-1700 m
*****Scrophularia libanotica*** subsp. ***Libanotica*** var. ***antalyensis***	Scrophulariaceae			

The economic plant potential of Köprülü Kanyon National Park (based on our observations, in order of importance for the area):

Forest Trees and Bushes:

Group Gymnospermae: ***Abies cilicica*** subsp. ***isaurica, Cupressus sempervirens, Cedrus libani, Pinus brutia, Juniperus drupacea, Pinus nigra*** subsp. ***pallasiana, Juniperus excelsa, J. foetidissima, J. oxycedrus*** subsp. ***oxycedrus.***

Group Angiospermae: ***Castenea sativa, Liquidambar orientalis, Fraxinus ormus*** subsp. ***ornus, Acer hyrcanum*** subsp. ***sphaerocaryum, A. monspessulanum*** subsp. ***monspessulanum, Alnus orientalis, Buxus sempervirens, Populus tremula, Tilia platyphyllos, Ulmus glabra, Quercus cerris, Q. coccifera, Juglans regia, Laurus nobilis, Pyrus eleagnifolia, Crataegus*** spp., ***Sorbus umbellata, Rhamnus*** spp., ***Cotinus coggryria, Fontanesia phillиraoides*** subsp. ***phillиraoides, Phillyrea latifolia.***

Medicinal and Aromatic Plants:

Anthemis spp., ***Helichrysum*** spp., ***Achillea*** spp., ***Artemisia*** spp., ***Taraxacum*** spp., ***Paliurus spina-christi***, ***Alcea*** spp., ***Juniperus drupacea*** and other ***Juniperus*** spp., ***Nigella*** spp., taxa of **Orchidaceae, *Origanum*** spp., ***Nasturtium officinale***, ***Papaver*** spp., ***Tilia platyphyllos***, ***Hypericum*** spp., ***Salvia*** spp., ***Sideritis*** spp., ***Thymus*** spp., ***Gypsophila*** spp., ***Digitalis*** spp., ***Vincetoxicum*** spp., ***Glycyrrhiza*** spp., ***Gentiana*** spp., ***Sambucus ebulus***, ***Valeriana*** spp., ***Valerianella*** spp., ***Datisca cannabina***, ***Solanum*** spp., ***Datura stramonium***, ***Hyoscyamus*** spp., ***Verbascum*** spp.

Fruits: Natural and Local Varieties:

Castenea sativa, ***Olea europea***, ***Malus sylvestris, Eriolobus trilobatus, Punica granatum, Cydonia oblonga***, ***Vitis vinifera***, ***Ficus carica*** subsp. ***carica, Cornus mas***, ***Myrtus communis*** subsp. ***communis, Crataegus*** spp., ***Cotoneaster nummularia, Rubus*** spp., ***Amygdalus*** spp., ***Prunus*** spp., ***Pyrus*** spp., ***Pistacia*** spp., ***Ribes orientale***.

Farm Plants:

Cicer anatolicum, ***Pisum sativum, Vicia sativa*** subsp. ***sativa, V. sativa*** subsp. ***nigra***, ***V. sativa*** subsp. ***incisa***, ***V. sativa*** subsp. ***amphicarpa***, ***V. narbonensis*** var. ***narbonensis***, ***Lathyrus sativus*** and other ***Lathyrus*** spp.

Vegetable Plants:

Daucus spp., ***Portulaca oleracea***, ***Rumex*** spp., ***Polygonum*** spp., ***Tragopogon*** spp., ***Scorzonera*** spp.

Industrial Plants:

Pimpinella spp., ***Papever*** spp., ***Linum*** spp., ***Gypsophila*** spp., ***Rumex*** spp., ***Reseda lutea***, ***Rhus coriaria***, ***Alkanna*** spp., ***Pimpinella*** spp., ***Papever*** spp., ***Linum*** spp., ***Gypsophila*** spp., ***Rumex*** spp., ***Reseda lutea***, ***Rhus coriaria***.

Hazy Ornamental Plants:

Saponaria spp., ***Thalictrum orientale***, ***Paeonia mascula***, ***Hesperis*** spp., ***Malcolmia*** spp., ***Viola*** spp., ***Ricotia*** spp., ***Fibigia*** spp., ***Aethionema*** spp., ***Aubrieta*** spp., ***Rosa*** spp., ***Glaucium*** spp., ***Papaver*** spp., ***Eranthis hyemalis***, ***Colchicum*** spp., ***Crocus*** spp., ***Fritillaria*** spp., ***Iris*** spp., ***Muscari*** spp., ***Tulipa*** spp., ***Dianthus*** spp., ***Allium*** spp., ***Gladiolus*** spp., ***Ornithogalum*** spp., ***Veronica*** spp., ***Geranium*** spp., ***Silene*** spp., ***Scorzonera*** spp., ***Tragopogon*** spp., ***Helichrysum*** spp., ***Jurinea*** spp., ***Centaurea*** spp., ***Sympphytum orientale***, ***Corydalis rutifolia*** subsp. ***erdelii***, ***Dianthus*** spp., ***Alcea*** spp., ***Lonicera*** spp., ***Rosularia*** spp., ***Sedum*** spp., ***Sempervivum*** spp., ***Parnassia palustris***, ***Anemone*** spp., ***Consolida*** spp., ***Delphinium*** spp., ***Ranunculus*** spp., ***Cyclamen*** spp., ***Galanthus*** spp., ***Sternbergia*** spp.

Table 7a. Important Plant Centers of the National Park.
***:** Numbers of endemic or important nonendemic(rare) plant taxa growing in the park

No:	Localities	Important Plant Groups Growing in the Localities as due to Ecological Conditions	Total Taxa Numbers*
1.	***Yaka (Kapiz) Stream, Sanlıbeli and its environs***	*Maquis, shrubs, rock vegetations, Pinus nigra stands, and hydrophytes on particular limestone rocks:* (N: 045-77-167; E: 025-19-997; A: 1000-1800 m).	275
2.1.	***Yeşil Vadi*** (Green Valley in English)	*Coniferous woodlands and partly oak forest on limestone and conglomerate rocks:* (N: 37-10765; E: 031-08-185; A: 1140-1780 m).	72
2.2.		*Xeromorphic dwarf shrubs and cushion forms on steppe vegetation and some geophytes like Asphodeline on conglomerate slopes:* (N: 37-10765; E: 031-08-185; A: 1630-1950 m).	
2.3.		*Rock vegetation on conglomerate rocks and their ridges:* (N: 37-10765; E: 031-08-185, A: 800-1380 m).	
2.4.		*Meadows on colluvial soils of subalpine belts:* (N: 37-10765; E: 031-08-185; A: 1300-1900 m).	
3.1.	***Villages of Delisarnıç, Sümbültepe, Altınkaya, Oluk and Çaltepe; Yokuşbaşı and Kestanelik villages' environs***	*on Conglomerate and limestone rock:* (N: 37-12-596; E: 031-08-509; A: 280-1900 m).	70
		Maquis vegetation on conglomerate rocks: (N: 37-12-596; E: 031-08-509; A: 280-760 m).	
3.2.		*Pinus brutia* stands mixed with oak and cedar and fire clearings on conglomerate rocks: (N: 37-12-596; E: 031-08-509; A: 800-1150 m).	
3.3.		*Coniferous woodland, cedar, juniper, fir on conglomerate rocks:* (N: 37-12-596; E: 031-08-509; A: 1140-1450 m).	

3.4.		*Rock vegetation on conglomerate rocks:* (N: 37-12-596; E: 031-08-509; A: 700-1900 m).	
3.5.		*Chesnut trees in cultural areas:* (N: 37-12-596; E: 031-08-509; A: 1000-1200 m).	
4.	***Köprü River and its environs***	*Maquis, rock vegetations and hydrophytes:* (N: 37-11-241; E:031-10; A: 150-1400 m).	55
5.		*Dwarf shrub communities, maquis vegetation, dry grasslands, and Pinus brutia stands on limestone and conglomerate rocks:* (N: 37-08; E: 031-11; A: 150-500 m).	37
6.1.	***Bozburun Mountain***	*Xeromorphic dwarf shrubs and steppe vegetations belonging to genera mainly Astragalus, Bromus on conglomerate and limestone rocks and their ridges:* (N: 37-20; E: 031-01; A: 1600-2380 m a.s.l.).	30
6.2.		*High mountain steppes:* (N: 37-20; E: 031-01; A: 2000 m).	
7.	**Bozburun Mountain**	*Xeromorphic dwarf shrubs, mainly in the form of spiny cushions, and high mountain meadows on conglomerate rocks:* (A: 1700-2380 m).	**15**
8.1.	***Güller village; Koç and Kısık streams and their environs***	*Maquis vegetation on conglomerate rocks* (200-760 m).	**12**
8.2.		Cupressus sempervirens stands and its monumental trees on conglomerate rocks (460-700 m).	
8.3.		*Rock vegetation on conglomerate rocks* (130-700 m).	

Table 7b. Target taxa which must be monitored in the Park and its environs suggested by a floristic researching team.

Plant taxa	**Reasons to be selected target plants**	
	Importance for the national park	**Ecologic and floristic reasons**
Abies cilicica subsp. ***isaurica*** **Family:** Pinaceae **Vernacular names:** İledin Köknar, Göknar	-A coniferous forest tree. -Represent the family Pinaceae in the area -Its stands cover higher localities of the park -Forming mixed stands together with ***Cedrus libani*** and sometimes ***Pinus nigra*** subsp. ***pallasiana*** between 1000-2000 m.s.l.; so it can represent also ***Cedrus libani***. -Branches are used as animal feed and so it may be under pressure more than ***Pinus nigra*** subsp. ***pallasiana.*** It forms a transition zone to alpine vegetation in Bozburun Mountain. Thus, biotic pressure factors may affect this tree at first. For this reason, there is no reason to determine other plants for the alpine vegetation zone of the mountain	-Relict endemic -East Mediterranean element -Distributed in only Western, Taurus in Türkiye. -Ecological tolerance is less than other taxa in the family, thus can give an opinion for sudden environmental changes. It forms mixed stands with ***Cedrus libani, Pinus nigra,*** and ***Juniperus excelsa*** in the environs of Burmahan village (Gebiz) and slopes of Ovacık Mountain between 1140-1780 m. asl on conglomerate rocks. In addition, it is grown on conglomerate and limestone between 1200-1800 m on the mountain.

Cupressus sempervirens **Familia:** Cupressaceae **Vernacular names:** Karaservi, Selvi, Mezarlık servisi	- A coniferous forest tree. - Only representative of its genus and family in Türkiye, - Cultured especially in cemeteries, parks, and gardens, and also it is a hedge plant in Western and Southern Turkey, - Populations show genetic variation in the area, - Forms strong stands, - Only stand in Türkiye, - The biggest stand of ***C. sempervirens*** in the world, - Many monumental trees of the species in the area, - Dominant forest tree for stream beds and low altitudes in the parking area, - May become a symbol for the national park.	- Chorotype is East Mediterranean, only in the Lake district (Antalya – Isparta). - Vertical distribution on conglomerates and limestones among 300-1200 m.
Castanea sativa **Familia:** Fagaceae **Vernacular Name:** Kestane, Anadolu Kestanesi	-Angiosperm forest and fruit tree, -Representative of Fagaceae, -Cultured by Romans in the past around the locality of Kestanelik between Ballıbucak-Olukköprü villages for economic purposes and also protected as a small grove by local people, -Many monumental trees of the species in the area, -Represent the forest formations of middle altitudes like 850 m.in the national park.	- Euro-Siberian element, - Common in Turkey, - Not a natural species in the region, - Seeds are edible and therefore protected by the villagers, - No new generations in the area. **Flowering period:** 6-7 **Fruiting period:** 9-10
Origanum minutiflorum **Familia:** Labiatae (Lamiaceae) **Vernacular names:** Sütçüler kekiği, Tota kekiği**,** Yayla kekiği, Aşkekiği, Çorba kekiği)	- Medicinal and aromatic species, - Export products by villagers in Lakes District and the park area, - A herbaceous dicot plant is present in the open land and understorey. Labiatae is the most important family of medicinal and aromatic plants. Its gene center is in the Mediterranean region The species may represent its own family.	- Rare and endemic (it is grown in national parks and environs), - East Mediterranean element, - Vertical distribution on crevices and limestone between 1200 to 1800 m with other Labiatae taxa, - Well growing in the area. **Flowering period:** 7-8.
Fritillaria lakakiensis **Familia:** Liliaceae **Vernacular names:** Gupkup otu, Ağlayan gelin	- A herbaceous geophyte plant present in the open land and understorey of ornamental value, - Monitoring is not difficult throughout the year because its habitats are very near to the village (Altınkaya), - It is well known by local people.	- Rare and East Mediterranean element, - Grown only in Antalya (doubtfully also in Hatay), - On limestone rocks under the deciduous trees and clearings (specially in ***Quercus*** stands) at middle altitudes (like800-1200 m). **Flowering period:** 3-4
Cicer incisum	- Wild chickpea (foodstuff), - Its fruits are bigger than other ***Cicer*** species.	- It is seen in alpine vegetation and rocky places
Lens ervoides	- Wild lentil(foodstuff)	- On rocky places of ***P. brutia*** forest, - Mediterranean element.
Lens orientalis	- Wild lentil(foodstuff), - It is allied to ***L. culinaris*** Medik. which is cultured.	- Under oak and pine forests, on destroyed places, vineyards, and field sides
Pisum sativum subsp. ***elatius*** var. ***elatius***	- Wild pea (foodstuff), - Wild form of the pea which is cultured.	- On rocky places and field sides up to 1700 m.
Pisum sativum subsp. ***elatius*** var. ***pumilio***	- Wild pea (foodstuff), - Wild form of the pea which is cultured.	- On rocky places of maquis and field sides between 700-1800 m.
Vavilovia formosa	- Wild, but an important fodder plant, - Important in gardening and flowering.	- It is grown on stone piles of high mountain vegetation (after 2000 m).
Vicia sativa subsp. ***sativa***	- Fodder plant	- It is a cosmopolitan plant up to 1600 m. in different habitats
Vicia sativa subsp. ***nigra***	- Fodder plant	- It is a cosmopolitan plant up to 2000 m. in different habitats

Liquidambar orientalis	- *Medicinal and aromatical* - Forest tree	- Relict endemic - In and around stream beds
Triticum baeoticum subsp. ***baeoticum***	- Wild wheat(foodstuff)	- Present in intense grazing places, field margins, and roadsides, under forest, at 100-1600 m. - Scattered throughout Türkiye
Cicer isauricum	- Wild chickpea(foodstuff)	- **Endemic,** East Mediterranean element; - It grows under ***P. nigra*** forest (on volcanic rocks only in Antalya district and its environs)
Vicia narbonensis	- Fodder plant - It is cultivated	- It can be grown in field sides, limestone, and volcanic areas up to 1500 m**.**

Table 7c. Potentially important other target plants which must be monitored year to year.

Plant taxa	Economic Importance	Geographical and Ecological Characteristics
Lathyrus sativus	Field plant (accepted also as weed)	- It is grown around the cultivated land up to 1600 m.
Cedrus libani	- It is a very important forest tree in the Mediterranean region - Medicinal plant, - It is naturally represented own genus in Türkiye	- It is a dominant forest tree formed as mixed and pure stands up to1000-2000 m.
Juniperus drupacea	- A typical forest tree in the Taurus Mountains and the Mediterranean region, - It is used for purposing Medicinal, Food and - Fodder	- It is grown seldom in forests and shrubs on general limestone between 700-1600 m.
Juniperus oxycedrus subsp. ***oxycedrus***	- A forest tree is sometimes in shrub form in Türkiye. - Medicinal plant	-It is grown abundantly in maqui shrubs, oak, and conifer forests at middle altitudes
Juniperus excelsa	- A forest tree in sometimes shrub form of Türkiye in general - Medicinal plant	-Its populations are often or seldomly appear in forests and maquis on general limestone up to 1300-2400 m. It is among forest trees showing tolerance to cold and drought
Pinus nigra subsp. ***pallasiana***	- It is a very important forest tree of Mediterranean region, - Medicinal plant.	-It is a dominant forest tree formed as mixed and pure stands up to 300-1000 m. -After red pine zone, it is the dominant pine species in Western Anatolia
Pinus brutia	- It is an important forest tree in the Mediterranean - Medical plant.	- It is dominantly grown as a forest tree up to 1200 m.
Prunus x domestica	- It is a fruit tree - It is wild species specific to Turkey	- Grown in Kozludere nearby the North part of Bozburun mountain (1200 m).
Cerasus prostrata var. ***prostrata***	- It is a fruit tree - It is wild species-specific to Turkey	- Grown in Bozburun mountain, Taşlı Yayla, and rocky places up to 1800-2000 m.
Amygdalus orientalis	- It is a fruit tree - It is wild species-specific to Turkey	- Grown in Kozludere nearby the northern part of Bozburun Mountain on limestone rocks (1200 m).
Pyrus amygdaliformis	- It is a fruit tree - It is wild species-specific to Turkey	- Grown on maques areas and open fields within the forests up to 1500 m.
Pyrus elaeagnifolia subsp. ***elaeagnifolia***	- It is a fruit tree - It is wild species-specific to Turkey	- Grown in Kozludere nearby the North part of Bozburun mountain (1200 m).
Lactuca intricata	- It is a vegetable plant	- Grown on the sloppy areas and rocky area starting from the middle altitudes up to the high plateau vegetation

4. Conclusion and Suggestions

Many pressure factors influence the National Park:

- The area is in the Mediterranean region, mostly covered with red pine and cypress forests. Therefore, it is very sensitive to fire. Every year, fire breaks out in the region.

- The proposal of building a dam on Köprü ırmağı was stated as a dangerous factor by Özhatay et all., 2003). But nowadays the dam construction is not included in the program, so this danger is not seen.

- Manavgat and Serik cities demand drinking water from the river. The request was denied.

- Constructions for touristic purposes have increased, especially in Mediterranean and Aegean sea coasts.

- Medicinal and ornamental plants, also valuable as gene sources, have generally been over-collected for some economical purposes from the area. Many plants due to their known medicinal properties are grown within the National Park area. These plants are directly collected from nature and a great amount of them are exported, especially from the Isparta part where many non-native residents have been visiting here for tourism, but they are actually involved in the collection and taking away the bulbous plants. ***Orchis*** (wild orchid), ***Cyclamen, Galanthus, Eranthis, Leucojum,*** and ***Anemon***e. ***Fritillaria*** and ***Tulipa*** spp. are very common examples of these plants.

- Intensive animal grazing and harvesting of grass have caused a remarkable reduction in the number of plant species and have caused serious damages to their local populations in some areas of the national park. Some habitats are under several stress factors. Therefore, immediate protection actions are needed. The recommendations on such floristic, economic, and protection actions were given in Table 7.

There are two water sources named Gökçesu in Beşkonak village. One of them has high capacity **(**located in N= 37º10' 481; E= 031º 11' 162; A: 152 m). Drinking water for Karabük village is obtained from this spring. The second one (N= 37º10'803; E= 031º10'970; A: 47 m) has relatively low capacity.

If the waters are taken away for the cities, local people will turn to be against the state. Also, natural hygrophytic vegetation and concerning the situation ecosystem structures will be destroyed. In 1992-1995 years, drinking water for Gebiz town was provided from Kısık Stream (Hatipler part of Hasdümen village belonging to Gebiz town). In Günlüklüyatak and Kızıltaş localities ***Liquidambar orientalis*** stand was suffered from the practices. The ecosystem needs immediate protection efforts. Not only the local people but also the state should cooperate in the protection of natural structures of the national park (Kırmacı & Özçelik, 2006).

Preserving the gene origins of plants became a serious global problem today. Successful protection depends on the determination of the number of gene resources and the determination of risk factors in Türkiye have gone a step further by determining IUCN Risk Categories. In addition, Türkiye signed the agreements on plants and the protection of their habitats (Rio and Bern conventions). However, monitoring studies on a species under risk cannot be done either on a national or international scale. Because of the impossibility of putting live creatures in front of politics all the plant genetic resources cannot be protected at the national level. Basic protection rules are determined as ecosystems at the international level. Setting up national parks and continuing them in a country, in which the environment has been generally damaged in Türkiye, there is a need for international cooperation. Otherwise, no useful outcomes can be expected from such a conservation system. In Türkiye, the people of rural regions can usually regard the government policy on National Parks as troublemakers for their life and see no advantages of such policies with which their life would change. However, our study area attracts the attention of tourists coming to Türkiye for the natural landscape. If the natural life of a country is destroyed it will also be lost its importance for tourism and agriculture. Thus, the gene resources of plants must be protected from the destruction of tourism. To reduce up to minimum degree negative effects of humans (local people and visitors, tourist facilities, etc.) on the area and its

environs using a good management strategy of the national park. To supply new financial sources for local people and to strengthen their socio-economical situations.

- The easiest way of protection is natural protection (in situ) since there is integrity between the living creatures in the natural environment. The following measures must be taken into consideration when attempting the protection of natural habitats:

- Some plant species may exert pressure on rare and site-specific plant species. The pressure of such species should be reduced.

- Determination and protection of the important areas to be protected.

- Determination and monitoring of the target (indicator) species.

- A strategic governmental management plan dealing also with public concerns should be prepared and carried out.

- Fishing by dynamite, electrical current, or poisonous plants like spurge or mullein in some running or steady waters in the park area is common. These dangers should be avoided.

Pressure factors in the field should be identified and monitored:

-The effects of various environmental stress factors on target species,

-The effects of harmful organisms on target species and the methods to fight them off and

-The effects of global changes on target species.

The pressing factors mentioned above on the area must be eliminated:

- Gökçesu springs must be preserved in their present state (A technical report was prepared on this subject and given to the Nature Conservation and National Parks General Management).

- Overgrazing must be prevented. Grazing plans must fit with the area's ecosystem so that the plants there can flourish. In the early spring and late autumn (seeding season), grazing must not be allowed.

- In the protection area mixing of foreign genes to natural populations or exchange of them must certainly be prevented.

In this plan, nearly all of the programs for the preservation of the genetic diversity of plants contain forest habitats. There is not a program that aims at only cultivated plants, or their natural relatives. In my opinion, it is not true that only to protect wild fruits, vegetables, feed, etc. plants in the area. These are the parts of a forest ecosystem. They continue to exist in the dominance of forest trees that compose the climax. For example, wheat (***Triticum baeoticum***) is a sub-forest plant. Most of the bulbous ornamental plants are among such plants. In this system, dominant forest habitats are just like the head of a state. When the head ceases to exist, the system will collapse, stop functioning properly. It is much easier to protect and watch an individual than the population. There is an economic dimension of this as well; therefore, areas have been selected to protect several species rather than just one species.

To understand that the habitats are protected and to take adequate measures promptly, the indicator plants were selected and called target or flag species. Examining the populations of these species will provide information about the course of important habitats as well as protect the relevant target species. All these efforts are to preserve the genetic diversity in the national park. As these habitats are protected, the animals' homes (home range) will be guaranteed and wildlife will flourish.

- For protecting genetic varieties by distinguishing target species, population size, and distributions throughout the country; plant species and density inventories should be done.

- Negative factors must be determined in such areas and to get rid of these negative factors, precautions must be taken. Methods that are not natural (methods that do not fit the ecosystem) must be avoided. Shaving regions and artificial rejuvenation are the biggest threats in this respect.

- The ***Liquidambar orientalis*** and ***Quercus vulcanica*** forests nearby can be added to the national park or a connection between these forests and the national park should be made.

- Long-term development plans should be accelerated.

- The Mediterranean region is generally covered with fire-sensitive, mostly red pine forests. Forest fires peak in June, especially in July and August months. If the relative humidity falls below 20%, wind speed reaches 50 km/h, and temperature 35 °C, the danger dimension is very high. *Recommendations are:* Sensitive forests and their borders should be determined while planting trees in burned areas. Vegetation of fire-resistant trees should be created with a 1-2 km long cordon at the edge of the settlements. These buffer zones should be irrigated during the fire and sensitive periods, and fire-fighting litter should be cleared. Buffer zones should be created to stop the fire on certain mountain ridges, taking into account the direction of the wind, its speed, and possible localities where sabotage actions can be made. Roads and water wells should be opened to facilitate the movement of land vehicles from these areas.

When a fire breaks out, a forest engineer at the command center should be able to calculate where and how long this fire can be stopped using scientific methods. If the fire passes the first rescue zone, it must be stopped at the second barrier. Engineering projects and calculations should be made for this purpose. Practitioners and academics should do postgraduate studies and research together within the scope of global warming projects. Considering that almost all of the fires were started by carelessness and willful intent, early warning and camera systems that are sensitive to fog, smoke and heat should be installed in the appropriate places, recording sufficiently close-ups. Accommodation in the forest during sensitive periods, picnic and fire, etc. should be banned. The usefulness of fire watchtowers should also be discussed.

Areas of the national park should be divided into three parts:

Main zone (Sensitive Zone):

These zones are very important in floristic terms. The floristic structure of the national park and important vegetation types can be seen in these areas. Therefore, in these zones, the natural structure must not be violated or modified. No biotic or anthropologic pressure factors must be allowed. Such zones, with their present conditions, are very near to their natural state. They must certainly be protected.

These places are:

- Yaka Deresi (Kapiz stream): This is the smallest locality, but very rich in the endemic taxon. As a horizontal, at least 100 m (in some places up to 300 m) along the stream should be kept under protection.

- The old ***Pinus nigra*** forest above the Pınargözü, bordering the national park.

- The canyon, which is 14 km in length, has rich plant diversity and water sources in some parts. At least 100 m (in some places up to 300 m.) along the stream should be kept under protection.

-Cypress ***(Cupressus sempervirens)*** Forest in locality Yeşilvadi (its borders must be determined and preserved).

-Relict endemic ***Abies cilicica*** subsp. ***isaurica*** (Köknar, İledin) forest, boundaries of which must be found by Bozburun Mountain and Burmahan-Gebiz districts.

-High mountain vegetation in Bozburun mountain and other high places.

Second zone (Tampon Zone):

This zone is to be provided with protection of the first zone. It is neither right nor possible to stop people from benefiting from the national park. A tampon zone needs to be established to keep the 1st zone away from pressures. This zone contains some localities to which the local people can benefit without any damage to the natural structure. In these parts, the local people and others (who wish to do so) should be allowed to walk around freely.

Picnic sports, recreational areas, highland activities (animal grazing by nomads) cultivated parts, graveyards, parts belonging to the ministry of forestry (appropriated for logging) should be within the boundaries of this zone. This zone will meet the needs of the local people. This zone contains destroyed forests, bushes, and semi-natural parts.

Semi-natural areas:

-A grove of chestnut.

On the way to Altınkaya (Zerk/Selge), along the canyon, the wood area, which is made up of olive trees and ***Ceratonia siliqua*** trees. The olive and crop trees (***Ceratonia siliqua***) in this part may be grafted under the control of forestry officials and the fruits may be given away to the local people. The ***Pinus brutia*** forest on the south side of the canyon may also be used for cutting or as picnic spots.

-The highlands above Ballıbucak: Highland activities can be allowed in this zone in a restricted way.

In this part, ***Thymus, Origanum*** spp. can be cultivated and apiculture can be done. Plants such as ***Galanthus, Corydalis, Fritillaria*** spp. which grow in the national Park's flora can be cultivated and sold under the guidance of experts.

-Graveyards.

-Satan Rocks in the south of Altınkaya (Zerk / Selge) village

Third zone (Development Zone):

This zone will be accessible to human needs but within the limits of the rules. In this zone, local people can engage commercial activities for the needs of the tourists visiting the area, with the least damage to the zone. Parking shopping markets and information boxes, temples, toilet facilities, paths for mountain sports will be within the boundary of this zone. These areas are:

- The ancient theatre and its neighborhood near the village of Altınkaya,

- Residential places,

- The spots occupied by the tourist facilities on each side of the canyon,

- Paths and

- Tour paths.

Although phytosociological studies have been done in many areas, there is very little recent information about the spread of distinguished associations. Although present floristic and phytosociological studies indicate the genetic diversity; however, they should also deal with the biology, population genetic, and auto ecology of the target species chosen to be protected. These studies should not be restricted to the zone where the concerned species is preserved. At least, the places out of the protected zone should be included.

The production of scientific data should be sustainable, the data should be archived and interpreted. Therefore, within PAMAs a Data Management Unit should be set up and information should be gathered and interpreted. The success of the project depends on the effective evaluation and interpretation of the gathered data. The zone may be kept under surveillance using technology.

Suggestions on the area protect can be summarized as below:

- Annual re-evaluation of management strategies will be helpful.

The areas concerned are natural or semi-natural areas providing sustainability of genetic diversity; defined as plant associations in natural habitats possessing diverse flora with species threatened by extinction and different age classes together, also suitable for selection of target species for protection, economically important zones. The areas are most ideal for the protection of animals and maybe resized according to changing situations.

- Early warning systems must be established and improved.

The sustainability of ecosystems to protect genetic diversity is inevitable. Interspecific competition is an important step for genetic diversity. So the growth areas where the target species (except *Castanea* forest) are dominant must be added to core protection zones, and tampon belts enveloping belts must be formed.

- Realization and successful operation of management are very difficult and complex.

There are many problems with land ownership and use in the area. These problems bring forest organizations and local people face to face. The first principle is to get public support as studies like this cover many localities and have social and economical sides. Although all of the areas are governmental, traditional land use and lifestyles may hinder such programs. Individuals and studies opposing the local people must not be. Total acceptance can not be expected in people, but public support should be formed to rule.

- Education**:** Education is a key to environmental consciousness and protective cautions. We witness damage to biodiversity in the area both by the official way and local people. The reason for this is ignorance. Academic circles and implementing institutions should cooperate. Foresters often do not recognize or care about herbaceous plants. However, most of the biodiversity comes from herbaceous plants. The plant imported plants (*Ailanthus altissima, Robinia pseudoacacia,* etc.) in some places. These species are invasive, disrupting the natural flora.

- Increasing the life standards of local people without some important investments is never possible. The education of people is related to their living standards and without education, the area cannot be protected. Education is a continuous process; education efforts will be ruined if voluntary trainers sent by national park management are confronted by local people due to prejudice. Thus, such education can only be provided by the youth sent to education.

- Underdeveloped countries must be supported as financial and technical by developed countries.

Plant genetic resources are divided into various countries, in other words, protection of these is a global issue and international cooperation is needed. Accordingly, Türkiye, being rich in biological diversity, should improve cooperation with other countries.

Results on the study area in respect to the important habitats and plant localities will be explained under 3 sections; important plant areas, economic plants, and endemics. There are important running waters in the park, like Kapiz (Yaka) stream and the Köprü river. Besides, there are seasonal brooks. All water bodies in the park area have freshwater character and this enabled the formation of freshwater ecosystems around the park. Especially in Yaka (Kapiz) stream endemics, rock, and hydrophytic plants are dominant. *Pinus nigra* stands cover most of the area. Higher parts of stands include older black pine trees (on average 700 years). An important portion of these can be accepted as monumental trees. The area has the richest in floristic means in Lakes Region.

Suggestions of our team on the protection of the national park can be listed as:

We should continue to be in communication with university academicians and they should be asked for consultation whenever it is necessary to do so.

- Biodiversity conservation efforts in the park can be developed and improved by taking some programs of the Botanical Gardens as an example. Educational programs can be organized especially for children (Anonim, 2011-b).

-Finding the actual reasons for anthropogenic stress factors in the area is almost impossible

-Understanding the reasons for forest fires and the best caution methods is necessary.

-Increasing the life standard of local people is very difficult. State promotion for the cultivation of *Origanum minutiflorum* (Oregano) will be promising to local people.

-To find the mistakes results must be controlled. This requires care at each step and national park management must avoid such mistakes. All help possible to be given to poor local people must be served.

-To clarify the situation is very difficult as finding out the real reasons is impossible. To us, real reasons must be unemployment and illiteracy. It cannot be dealt with by local people without a good management plan. This plan should be long-term and should be compatible with the realities of the region.

Suggestions for monitoring target species populations in the National Park

-Protection areas should be as large as to include enough number of the target species to protect biodiversity as target species and other species can conduct an intra- and infraspecific dynamic relation in between.

-Representative populations of target taxa should be chosen from the localities most affected by important environmental factors.

-Observing all populations of the target species may not be possible. Therefore, the populations showing typical characters with enough candidate populations should be protected (on typical main rocks, in ice hollows, etc.).

-If it is possible populations of the target species in extreme sides of the national park should be protected and observed. Central areas of the studied region cannot fully representative of the stress factors and candidate populations

-A complex geographic diversity study should be done for understanding the degree of diversity between the target species present in stands.

-Origin and bio-systematic studies are urgently needed for the stands of target species.

-The best way to protect stands is to protect them together with their ecosystems. But in the circumstances where there are no suitable economic and social conditions, the candidate populations on sampled habitats should be protected.

The first stage of the plan is to watch the target species according to the above-mentioned plan. In the protection of biological diversity, the target is to preserve the ecosystem, species, individuals and to preserve genetic diversity among the species. The protection of plant gene resources and habitats are the same things Because, unless habitats are protected, species and subspecies cannot be protected. It is essential that protect national parks and even the whole country. However, the economic conditions do not render this. At first, the taxa which are important on a global or national scale have been chosen as target species in the perspective of endemic and economic terms. Turkish plan for the protection of plant genetic bio-diversity on its habitat (In Situ) (Kaya et al., 1998) has been chosen as the main criteria.

The main purpose of monitoring and preserving the target species, is to preserve the biological diversity, natural environment, and the wild allies of cultivated and cultured plants. For example, with the protection of ***Abies cilicica*** subsp. ***isaurica*** forest, alpine mountain forest zone mixed stands and their populations, alpine vegetation, and many endemic and economic plants will be under protection as well. Because this forest also consists of Cedrus libani and Pinus nigra trees and other deciduous trees, not only the concerned species but also many other tree species will be under protection. In the upper zone, mostly ***Pinus nigra, Juniperus foetidissima, J. excelsa, J. oxycedrus, Quercus*** spp., ***Ostrya carpinifolia, Acer*** spp., and other plants flourish together. This area is where the pressing factors which pose threats exist. Therefore, the possible stress factors in the upper zone will at first affect this forest. Once this forest gets damaged, the alpine region will be under threat and it will be easier to compare with upper zones.

Cypress (***Cupressus sempervirens***) forest, on the other hand, is another value of biological diversity itself. The species and their ecotypes with rich genetic diversity can more easily adapt to environmental conditions which can be changed by time and location. Species with rich genetic diversity are more effective and beneficial in meeting the human needs that change with scientific and technological developments.

Kuyucak plateau, Ballıbucak to Çatak hill, very degraded juniper forest, no protection required.

There are Sandal trees (*Arbutus andrachne*) under the cypress forest, in the upper parts of Büyrümköprü and Olukköprü. The cypress forest cliffs are rich in endemics. Ekiz Plateau is partially rich in endemics. This area is within the borders of the National Park. Bozburun mountain; south and southeast slopes, Deyneklidere, Bağılovası (Cypress forest) are rich in endemics. Cypress forest (almost 400 ha), Zerk (Altınkaya)-the upper side of Büyrümköprü (hard to damage due to high slope). Delisarnıç village and its surroundings are rich in endemics and are already protected.

Bozburun mountain cliffs (southeast), overlooking Zerk/Altınkaya village, Kilten Plateau is rich in endemics but does not belong to the National Park (it lies within the borders of Bozburun Mountain).

The study area and its surroundings are one of the pilot regions most affected by global climate change. The changes here will create important data for the whole world.

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All authors contributed equally to the research article.

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