

# “Small Protected Areas” for Conservation Priorities in South Anatolia (Başkonuş Mountain-Kahramanmaraş)

Mine Kocyigit<sup>1\*</sup> , Serpil Demirci Kayıran<sup>2</sup> 

<sup>1</sup>Istanbul University, Faculty of Pharmacy, Department of Pharmaceutical Botany, Istanbul, Turkey

<sup>2</sup>Cukurova University, Faculty of Pharmacy, Department of Pharmaceutical Botany, Adana, Turkey

**ORCID IDs of the authors:** M.K. 0000-0002-7831-0151; S.D.K. 0000-0001-8340-3347.

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## ABSTRACT

**Objective:** The Başkonuş Mountain (Kahramanmaraş) is located in the transition zone of Irano-Turan and Mediterranean plant geographical regions and in the southern part of the Anatolian Diagonal. A specific region in the East Mediterranean basin consists of an area that holds great biological importance and is a world hotspot. In this study, the small protected areas of the Başkonuş Mountain were determined.

**Materials and Methods:** A total of 17 endemic and 9 rare taxa were selected based on their IUCN statutes, altitudes, and habitats. Their GPS coordinates were loaded on a computer and digitized in a map projection system. Distributions of the selected taxa were marked on a topographic map in the scale of 1/25.000. The 26 maps were overlapped so that the areas of plant biodiversity could be observed on the map.

**Results:** Six small protected areas were defined on the Başkonuş Mountain. Several threats and conservation suggestions were presented in this study.

**Conclusion:** Local data about biodiversity sources are limited. Thus, conservation biologists and government offices should play active roles in formal educational settings and employ alternative methods to the community in Kahramanmaraş.

**Keywords:** Başkonuş Mountain, small protected areas, biodiversity, Turkey

## INTRODUCTION

The “biodiversity hotspots” term is one of the most successful methods developed to preserve the richest and most endangered areas on the world (1). The Mediterranean Basin is one of the most important area for plant diversity (2,3). The plant diversity is excessive, with approximately 30.000 plant species with 13.000 endemics and many of the endemics plants are local (4). The flora of Turkey has approximately 10.000 vascular plants, so it is the richest flora in the temperate zone (5,6). Also, it has special habitats. But, the incomparable flora and habitats of Turkey have been threatened and have diminished rapidly over the last four decades; Turkey has 144 Important Plant Areas (7) which have contributed much to the origin of many cultivated plant species.

The aim of this study is to reveal the biodiversity of the Başkonuş Mountain and to determine alternatives for the protection of the Small Protected Areas (SPAs).

Kahramanmaraş is a region that is comprised of plains in mountains which is located in the South-East Anatolia region of Turkey (8,9) (Figure 1). The flora of Kahramanmaraş is very rich, almost 2500 taxa and many endemic species (20%) (10-16).

The main reasons for this richness are due to the transition zone of Irano-Turan and Mediterranean plant geography regions, which began in the South of the Anatolian Diagonal and extend to north-eastern Anatolia to the Mediterranean Taurus mountains, this region has been critical for plant diversification (10). The Başkonuş



**Address for Correspondence:** Mine Kocyigit

E-mail: minekocyigit@hotmail.com

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Mountain, Nature Conservation Area, and is in Kahramanmaraş province. The highest point of the examined area is Başkonuş Mountain (1775 m). The research area is located within the Mediterranean phytogeographical region. The three types vegetation basically can be observed in the area are; forest, macchie, and steppe vegetation (13-16).

## MATERIALS AND METHODS

### Study Area

The study area is located in Kahramanmaraş province. According to Equator 37°38'35"- 37°28' 32" north latitudes, according to Greenwich 36 028'48"- 36° 41' 54" east meridians on the topographic map with in scaled to 1/25.000 (Figure 2). This area has a surface area of 203.084 km<sup>2</sup> (118.258 km<sup>2</sup> forest, 84.826 km<sup>2</sup> opened forest) and varies in height from 345 m to the peak of the Başkonuş mountain (1779 m). The Başkonuş Mountain is studied because;

1) Some observations on the vegetation in the Başkonuş Mountain (13-16), and detailed floristic studies in this area during the Project of KANBK (Conservation for Rare and Endemic Plants of Kahramanmaraş and Ardahan was carried out in 2007-2011 and funded by BTC-UNDP (SGP) (10-12).

2) The study area is a promenade area.



Figure 1. Map of the study area; Başkonuş Mountain

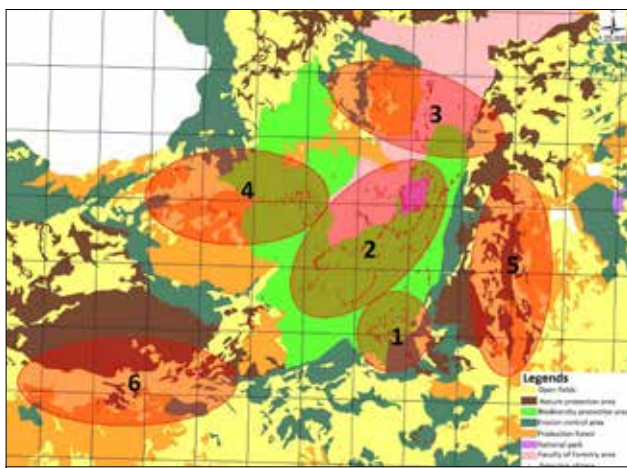


Figure 2. Small Protected Areas of Başkonuş Mountain: 1. Tower of fire observation and around, 2. Locality of Yediardıç, 3. Pond and castle around, 4. Ziyaret Hill, 5. Locality of Rahmacılar, 6. Locality of Topcalı and Sersem

3) Phytogeographic location of Başkonuş Mountain and Anatolian Diagonal (17).

### Selection of Taxa

The Flora of Başkonuş Mountain consists of 66 endemic taxa (18). In the study, 17 endemic and 9 rare taxa (17 threatened endemic taxa and 9 national threatened rare taxa) were selected according to their IUCN (International Union for Conservation of Nature) statutes (19), altitudes and habitats as listed in Table 1. Endemic which includes endemic taxa found solely in Kahramanmaraş and in neighbouring areas (e.g., Ahır Mountain, Binboğa Mountain, Çimen Mountain) (13-16).

### Field Investigations

The field work was carried out in 2011 and information of various data such as GPS (Global Positioning System), altitude, habitat, density of plant population and selected taxa for each 10 km, were recorded. Some newly recorded plants for the Flora of Başkonuş Mountain were collected during the field studies; the plants were identified and kept in ISTE (The Herbarium of Istanbul University Faculty of Pharmacy).

In this study, 13 habitats types were defined and presented in a simplified list as Table 2, where the endemics and rare taxa of the Başkonuş Mountain grow. The numbers of endemic and rare plants in the habitats were presented by a chart. Additionally altitudinal distributions of the selected taxa were showed with a chart. During the field work, 610 GPS were loaded on the computer and digitized in Map Projection System; ED 1950 UTM Zone 37 N which is a GIS program (Geographic Information Systems). Distributions of the selected taxa were marked on the topographic map in scaled to 1/25.000. Afterwards the 26 maps were overlapped so that the areas of plant biodiversity were occurred on the last map could be seen on Figure 3. As the results of there, six SPAs were defined in Başkonuş Mountain.

## RESULTS

The results identified six sites which were based on one or more of the following criteria: 1. Presence of rare species, 2. Presence of botanical diversity, 3. Presence of threatened habitats. The six determined SPAs were described using altitudes, size (km<sup>2</sup>), habitats, selected taxa and other plants. Descriptions of the SPAs were presented in Table 3.

### Habitat Types and Altitude Differentiation

Habitat types were grouped as rocks, grasslands, meadows, shrubs, woods, cultivated area, waste and then 13 habitats types were defined. *Pinus brutia*, *P. nigra*, *Cedrus libani*, *Abies cilicica*, *Taxus baccata*, *Alnus glutinosa* are the main taxa of forest vegetation. Additionally *Quercus coccifera*, *Styrax officinalis*, *Arbutus unedo*, *Pistacia terebinthus* and *Cotinus coggyria* are the main taxa of shrubby vegetation.

Some endemics and rare plants have been found in several different habitats, these being: *Lathyrus laxiflorus* subsp. *angustifolius*, *Helleborus vesicarius* –in shrubs, scree, cliffs and rocks. Some endemics have been found only in special habitats,

**Table 1.** List of selected taxa and their IUCN statutes (Ekim et al.2000), altitudes and habitats

Taxa	IUCN	Altitudes	Habitats
<b>Threatened Endemic Taxa (17 taxa)</b>			
<i>Acer monspessulanum</i> L. subsp. <i>oksalianum</i> Yalt.	VU	1000-1200	W3, R3, S2
<i>Allium glumaceum</i> Boiss. & Hausskn.	LR (cd)	1500-2200	R2
<i>Astragalus distinctissimus</i> Eig	EN	1200-1520	W1
<i>Astragalus leporinus</i> Boiss. var. <i>hirsutus</i> (Post) D.F.Chamb.	LR (lc)	600-1500	W2, C1
<i>Centaurea lycopifolia</i> Boiss. & Kotschy	LR (nt)	50-2000	R1, S1
<i>Colchicum davisii</i> C.D. Brickell	EN	1000-1950	R2, G1
<i>Crataegus aronia</i> (L.) Bosc. ex DC. var. <i>minuta</i> Browicz	LR (lc)	600-1300	G1
<i>Cyclamen pseudoibericum</i> Hildebr.	EN	550-1500	G1, W1, W2, W3
<i>Fritillaria alfredae</i> Post subsp. <i>glaucoviridis</i> (Turrill) Rix	VU	500-1600	S1
<i>Helleborus vesicarius</i> Aucher	LR (nt)	550-1300	S1, W4, G2
<i>Kitaibelia balansae</i> Boiss.	EN	1900-2000	R1, G1, C2
<i>Lathyrus laxiflorus</i> (Desf.) Kuzntze subsp. <i>angustifolius</i> (Post ex Dinsm.) P.H.Davis	VU	1200-1400	R1, S1, W3
<i>Michauxia tchihatchewii</i> Fisch. et Mey.	LR (nt)	500-1800	R1
<i>Rhamnus nitidus</i> P.H.Davis	LR (cd)	700-1300	W1
<i>Verbascum amanum</i> Boiss.	VU	400-2000	R1, S1, W1
<i>Verbascum pinetorum</i> (Boiss.) Kuntze	VU	370-1000	S1, W1
<i>Hyacinthus orientalis</i> L. subsp. <i>chionophilus</i> Wendelbo	LR (nt)	1900-2000	R1, R3, G1
<b>National Threatened Rare Taxa, nonendemic (9 taxa)</b>			
<i>Anemone blanda</i> Schott & Kotschy	VU	150-2600	R1, S1
<i>Allium opacum</i> Rech. fil.	EN	800-1700	R1, R2
<i>Allium dodecanasii</i> Karavokyrou & Tzanoud.	EN	400-1000	R3, W1
<i>Anacamptis pyramidalis</i> (L.) Rich.	LR (lc)	200-1500	W4, G1, C1, C2
<i>Cephalanthera rubra</i> (L.) Rich.	LR (lc)	200-1500	W1, W2, S1
<i>Comperia comperiana</i> (Steven) Asch. & Graebn.	EN	500-1600	W1, W2, W3
<i>Epipactis condensata</i> Boiss.	LR (lc)	600-1600	W1
<i>Eranthis hyemalis</i> (L.) Salisb.	VU	1300-1800	G2
<i>Lathyrus variabilis</i> (Boiss. & Ky.) Maly	VU	1000-1700	R1, S1, W3
<b>IUCN statutes:</b> VU: Vulnerable; EN: Endangered; LR (cd): Lower Risk/conservation dependent; LR (lc): Lower Risk/least concern; LR (nt): Lower Risk/near threatened. Grasslands and meadows (G), Shrubs (S), Woods (W), Cultivated and waste (C)			

these being: *Allium glumaceum*- in screes, *Fritillaria alfredae* subsp. *glaucoviridis* - in shrubs.

plants of Başkonuş Mountain develop densely in 1200-1400 m and in 600-1000 m.

The relationship between the selected taxa and altitudinal zones has been reported (Figure 3). The endemics and rare

Ziyaret Hill has maximum habitats although it is the smallest SPA. Its altitude zone and the richness of the habitat provide a

**Table 2.** Habitat types of the selected plants from the Başkonuş Mountain

Habitats	Habitats	Number of endemics	Number of rare plants	Total	%
Rocks (R)				31	23.66
R1 High and Mid altitued cliffs and rocks	R1	12	2	14	11.69
R2 Screes	R2	10	2	12	9.16
R3 Moist rocks	R3	4	1	5	3.82
Grasslands and meadows (G)				13	9.92
G1 Calcareous rocky grasslands at mid and high altitude	G1	2	1	3	2.29
G2 Alpine grasslands, snow beds	G2	9	1	10	7.63
Shrubs (S)				10	7.63
S1 Shrubby places	S1	4	1	5	3.82
S2 River bed shrubs	S2	4	1	5	3.82
Woods (W)				61	46.56
W1 Low and mid altitude needle-leaved forest	W1	16	5	21	16.03
W2 Low and mid altitude broad-leaved forest	W2	7	2	9	6.87
W3 Low and mid altitude mixed forest	W3	12	2	14	10.69
W4 Forest edges	W4	14	3	17	12.98
Cultivated and waste (C)				16	12.21
C1 Traditionally cultivated fields	C1	6	1	7	5.34
C2 Fallows, roadsides	C2	8	1	9	6.87
TOTAL		108	23	131	100

high level biodiversity, so the smallest size SPA competes with the largest size SPA (Locality of Yediardıç) about in number of contained endemic and rare taxa.

### Endemism

The flora of Başkonuş Mountain has 565 taxa of which 66 are endemics with an overall endemism of 11.68%. According distributions of the selected endemic and rare taxa, Small Protected Area 2 (Locality of Yediardıç) has the highest number of selected endemic and rare taxa (Figure 4). Firstly, the selected endemic and rare plants were found in a woody habitat (W1 and W4) with a rate of 29.01%. Secondly, they were found in a rock habitat (R1 and R3) with a rate of 20.85% (Figure 5).

### Threats and Conservation State

The main factor responsible for the threats to plants in the Başkonuş Mountain is human pressure. Intensive grazing of sheep and goats in the meadows and grasslands, uncontrolled plant collection, especially some orchids (*Anacamptis pyramidalis*, *Comperia comperiana*), and working on road and forestry activities (uncontrolled tree cutting or silviculture) are the most important threats to the flora of Başkonuş Mountain.

According to IUCN categories, 7 taxa is EN (endangered), 8 taxa is VU (vulnerable), 4 taxa is LR (nt) (near threatened), 2 taxa is LR (cd) (conservation dependent) and 5 taxa is LR (lc). The endangered and vulnerable taxa are distributed in the second SPA (Figure 6). This is not surprising due to the fact that the most numerous endemic taxa observed are in this area.

The Başkonuş Mountain has various types of rock slides and screes. This habitat is a biotope of most numerous endemic geophytes (*Allium glumaceum*, *Colchicum davisii*, *Fritillaria alfredae* subsp. *glaucoviridis*, *Cyclamen pseudoibericum*, *Hyacinthus orientalis* subsp. *chionophilus*).

### DISCUSSION

Başkonuş Mountain has specific habitat such as medium-height steep slopes and forest edges. This habitat is also a refuge for endemics. Habitat loss is thought to lead to endemic species extinctions. Many studies use species-area relationships and predict substantial extinctions when levels of habitat loss exceed approximately 70-80% (16).

<b>Table 3.</b> Descriptions of the Small Protected Areas				
<b>SPA 1: Tower of fire observation and around</b>				
Coordination:	37°33'00"N 36°35'00"E	<b>Size:</b>	0.5 km <sup>2</sup>	<b>Altitude:</b> 1700-1800 m
Habitat types:	Cliffs and rocks, scree, calcareous rocky grasslands, alpine grasslands, snowbeds and needle leaved forest			
Threatened endemic taxa:	<i>Centaurea lycopifolia</i> , <i>Colchicum davisii</i> , <i>Crataegus aronia</i> var. <i>minuta</i> , <i>Cyclamen pseudoibericum</i> , <i>Helleborus vesicarius</i> , <i>Lathyrus laxiflorus</i> subsp. <i>angustifolius</i> , <i>Verbascum amanum</i> , <i>Verbascum pinetorum</i> ,			
Threatened rare taxa:	<i>Allium opacum</i> , <i>Anemone blanda</i>			
Threats:	Working on forest road, uncontrolled tree cutting, and plant collection.			
<b>SPA 2: Locality of Yediardic</b>				
Coordination:	37°34'00"N 36°35.5'00"E	<b>Size:</b>	1 km <sup>2</sup>	<b>Altitude:</b> 1400-1500 m
Habitat types:	Forest, shrubby places, scree and alpine grasslands			
Threatened endemic taxa:	<i>Acer monspessulanum</i> subsp. <i>oksalianum</i> , <i>Allium glumaceum</i> , <i>Astragalus distinctissimus</i> , <i>Astragalus leporinus</i> var. <i>hirsutus</i> , <i>Centaurea lycopifolia</i> , <i>Colchicum davisii</i> , <i>Crataegus aronia</i> var. <i>minuta</i> , <i>Cyclamen pseudoibericum</i> , <i>Fritillaria alfredae</i> subsp. <i>glaucoviridis</i> , <i>Helleborus vesicarius</i> , <i>Lathyrus laxiflorus</i> subsp. <i>angustifolius</i> , <i>Rhamnus nitidus</i> , <i>Verbascum amanum</i> , <i>Verbascum pinetorum</i> ,			
Threatened rare taxa:	<i>Anemone blanda</i> , <i>Cephalanthera rubra</i> , <i>Comperia comperiana</i> , <i>Lathyrus variabilis</i> , <i>Anacamptis pyramidalis</i> , <i>Epipactis condensata</i>			
Threats:	human pressure, uncontrolled grazing, and construction			
<b>SPA 3: Pond and Castle Around</b>				
Coordination:	37°34.5'00"N 36°35'00"E	<b>Size:</b>	0.83 km <sup>2</sup>	<b>Altitude:</b> 1300-1400 m
Habitat types:	Cliffs and rocks, moist rocks, river bed shrubs, forest			
Threatened endemic taxa:	<i>Acer monspessulanum</i> subsp. <i>oksalianum</i> , <i>Allium glumaceum</i> , <i>Astragalus distinctissimus</i> , <i>Centaurea lycopifolia</i> , <i>Crataegus aronia</i> var. <i>minuta</i> , <i>Cyclamen pseudoibericum</i> , <i>Helleborus vesicarius</i> , <i>Kitaibelia balansae</i> , <i>Lathyrus laxiflorus</i> subsp. <i>angustifolius</i> , <i>Verbascum amanum</i> , <i>Verbascum pinetorum</i> ,			
Threatened rare taxa:	<i>Cephalanthera rubra</i> , <i>Comperia comperiana</i> , <i>Lathyrus variabilis</i> , <i>Eranthis hyemalis</i>			
Threats:	Working on highway, uncontrolled grazing, and plant collection.			
<b>SPA 4: Ziyaret Hill</b>				
Coordination:	37°34.5'00"N 36°35'00"E	<b>Size:</b>	0.4 km <sup>2</sup>	<b>Altitude:</b> 1200-1300 m
Habitat types:	Cliffs and rocks, moist rocks, river bed shrubs, alpine grasslands, forest			
Threatened endemic taxa:	<i>Acer monspessulanum</i> subsp. <i>oksalianum</i> , <i>Astragalus distinctissimus</i> , <i>Centaurea lycopifolia</i> , <i>Colchicum davisii</i> , <i>Crataegus aronia</i> var. <i>minuta</i> , <i>Fritillaria alfredae</i> subsp. <i>glaucoviridis</i> , <i>Helleborus vesicarius</i> , <i>Lathyrus laxiflorus</i> subsp. <i>angustifolius</i> , <i>Rhamnus nitidus</i> , <i>Verbascum amanum</i> , <i>Verbascum pinetorum</i>			
Threatened rare taxa:	<i>Comperia comperiana</i> , <i>Lathyrus variabilis</i> , <i>Epipactis condensata</i>			
Threats:	Uncontrolled grazing and plant collection. human pressure			
<b>SPA 5: Locality of Rahmaçılar</b>				
Coordination:	37°33'00"N 36°35.5'00"E	<b>Size</b>	0.7 km <sup>2</sup>	<b>Altitude</b> 1200-1300 m

**Table 3.** Descriptions of the Small Protected Areas (Continue)

Habitat types:	Shrubby places and forest				
Threatened endemic taxa:	<i>Acer monspessulanum</i> subsp. <i>oksalianum</i> , <i>Allium glumaceum</i> , <i>Centaurea lycopifolia</i> , <i>Crataegus aronia</i> var. <i>minuta</i> , <i>Cyclamen pseudoibericum</i> , <i>Fritillaria alfredae</i> subsp. <i>glaucoviridis</i> , <i>Helleborus vesicarius</i> , <i>Hyacinthus orientalis</i> subsp. <i>chionophilus</i> , <i>Lathyrus laxiflorus</i> subsp. <i>angustifolius</i> , <i>Rhamnus nitidus</i> , <i>Verbascum amanum</i>				
Threatened rare taxa:	<i>Anemone blanda</i> , <i>Lathyrus variabilis</i> .				
Threats:	Working on road, uncontrolled plant collection. human pressure,				
<b>SPA 6: Locality of Topcalı and Sersem</b>					
Coordination:	37°33'00"N 36°35.5'00"E	<b>Size:</b>	0.79km <sup>2</sup>	<b>Altitude:</b>	1300-1400 m
Habitat types:	Shrubby places, alpine grasslands, snowbeds, screes and forest				
Threatened endemic taxa:	<i>Acer monspessulanum</i> subsp. <i>oksalianum</i> , <i>Allium glumaceum</i> , <i>Centaurea lycopifolia</i> , <i>Crataegus aronia</i> var. <i>minuta</i> , <i>Helleborus vesicarius</i> , <i>Lathyrus laxiflorus</i> subsp. <i>angustifolius</i> , <i>Michauxia tchihatchewii</i> , <i>Rhamnus nitidus</i> , <i>Verbascum amanum</i>				
Threatened rare taxa:	<i>Allium dodecanesii</i> , <i>Epipactis condensata</i> , <i>Lathyrus variabilis</i> .				
Threats:	Opening agricultural area, working on road, uncontrolled plant collection. human pressure,				

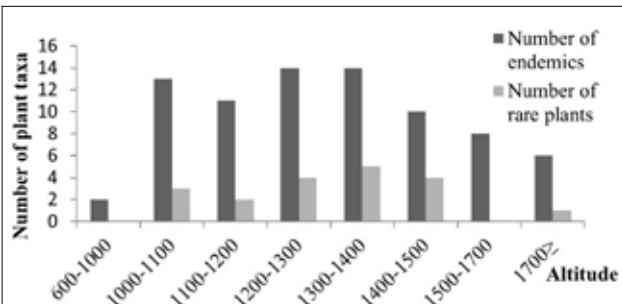


Figure 3. Altitudinal distribution of endemic and rare vascular plant taxa in Bařkonuř Mountain.

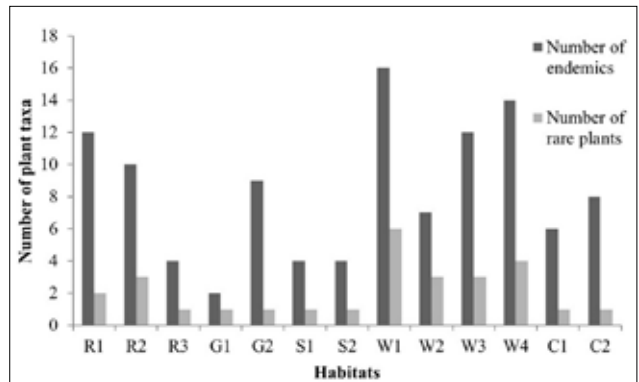


Figure 5. Number of endemic and rare vascular plant taxa according to habitats in Bařkonuř Mountain.

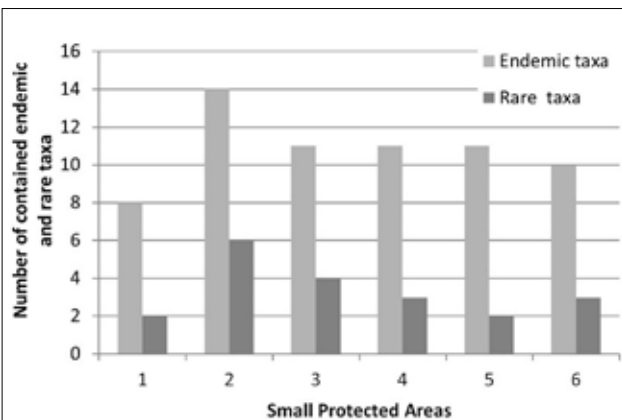


Figure 4. Numbers of endemic and rare taxa in the Small Protected Areas.

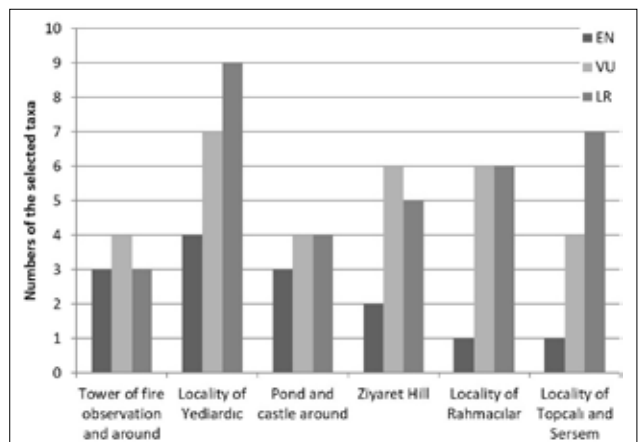


Figure 6. IUCN categories of selected taxa



**Table 4.** Comparison of endemism from Europe and Mediterranean areas

Region	Number of endemics	Endemism	Total number of taxa	Total area (km <sup>2</sup> )	Endemic taxa/area rate	References
Italian Maritime Alps	107	3.40	3137	5000	0.627	Casazza et al. 2005
French Maritime Alps	108	3.80	2867	4500	0.637	Casazza et al. 2005
Maritime Alps (southwestern France)	115	3.20	3605	9500	0.379	Casazza et al. 2005
Pyrenees (France - Spain)	174	5.00	3480	94300	0.037	Villar and Garcia 1989
Andalucía Mountains (Spain)	125	36.00	347	82800	0.004	Favarger 1972
Peloponnesus (Greece)	300	12.50	2400	5425	0.442	Iatrou 1986
Başkonuş Mountain (Turkey)	66	10.62	565	203	0.325	The present study

Selected endemic taxa which include endemic plants found only in Kahramanmaraş and in neighbouring areas (e.g., Ahır, Binboğa, Çimen Mountains) (17-20). In fact most endemism grow in high stress level populations, such as screes (R2), cliffs and rocks high and mid altitude (R1) and alpine grasslands (G2) (16,21), but it should be emphasized that endemics and rare plants are found in woody habitats, especially coniferous habitats in the study.

The flora of the Başkonuş Mountain is comparable with data from the literature for mountainous areas in the Mediterranean recognized as one of the most important centers of endemism on Earth (22,23). Besides, the relationship is considered biodiversity, habitats and endemic plants is remarkable compared to other Mediterranean hotspots (24-26). For example, although the Başkonuş Mountain has a smaller area than the Alps and the Pyrenees, its endemism rate is higher than them. Additionally, the ratio of endemic species per unit area is higher than Pyrenees and the Andalucía Mountains could be seen on Table 4.

Ecologists recognize that the Earth's biota is now experiencing the sixth great extinction wave (27). The conversion of native forest and grasslands, to plantation crops is one of the largest threats to terrestrial biodiversity and a key of the global extinction crisis (28). Additionally, intensive grazing causes transformation of the vegetation in scrub communities and in the woods (21).

While people have become more aware of environmental problems recently, most do not get actively involved in movements that support a more liveable future (3). Many people reach limited data about environmental from sources that may be reached, especially the media. Thus ecologists should be more active in educational settings and alternative methods of biodiversity in the community of Kahramanmaraş. In 2010, the tenth meeting of the Conference of Parties to the Convention on Biological Diversity led to the adoption of a global strategic plan for biodiversity for the period of 2011-2020. The EU follows a similar policy. The new Biodiversity Strategy purposes to stop the loss of biodiver-

sity and the degeneracy of ecosystem services in the EU by 2020 (29,30). The strategy should be carried out in Turkey.

An agreement among politicians and managers of the local administrations and parks (City Councils, Government and National Parks) is necessary in Kahramanmaraş and Turkey.

Major threats to biodiversity include human-associated factors, such as habitat destruction and degradation, over profiteering, invasive species, incidental mortality, pollution, climate change diseases and human population growth (31).

## CONCLUSION

Six SPAs were defined in Başkonuş Mountain. Some threats and conservation suggestions were presented in this study. Local people reach limited information about biodiversity issues from sources that may be biased. Thus conservation biologists and government offices should be much more active in formal educational settings and via alternative methods to a diversity of audiences in Kahramanmaraş.

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