RESEARCH ARTICLE / ARAŞTIRMA MAKALESİ
DOI: 10.26650/HT.2023.1241297
Herbarium Turcicum 2023;1:14-25

Contributions to the Flora of Şahinler Natural Park (Kızılcahamam/Ankara)*

Şahinler Tabiat Parkının (Kızılcahamam/Ankara) Florasına Katkılar

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Citation/Atıf: Ozbakir, B., & Tug, G.N. (2023). Contributions to the flora of Şahinler Natural Park (Kızılcahamam/Ankara). *Herbarium Turcicum, 1,* 14–25. https://doi.org/10.26650/HT.2023.1241297

ABSTRACT

Şahinler Natural Park is one of the 262 natural parks in Turkiye and was studied to identify its flora. Şahinler Natural Park is threatened by rapid population growth and rapidly expanding human activities, like all other natural areas. Accordingly, it is important to know and protect existing plant species in the Şahinler Natural Park. The study area is within the boundaries of the Kizilcahamam District of Ankara. According to P.H. Davis's grid system, it is located in the A4 square and Irano-Turanian phytogeographic region. The altitude of the study area varies between 1450 and 1500 m. The general vegetation of the area consists of forests and glades. As a result of the evaluation of the samples collected from the study area, 112 species and sub-species taxa belonging to 84 genera were identified from 40 families. 10 of these taxa are endemic and the endemism ratio is 8.9%. According to the information and data obtained from the List of Threatened Plant Species, the conservation status of 7 species in the area was evaluated. Accordingly, there are 4 species evaluated in the LC (Low Risk) category, 1 species in the NT (Near Threatened) category, 1 species in the VU (Vulnerable) category, and 1 species in the CD (Subject to Conservation) category. When evaluated according to the red book of Turkish plants, 14 taxa were determined to be in the LC category, 1 taxon was determined to be in the NT category, and 2 taxa were determined to be in the VU category. The study area was evaluated according to the EUNIS Habitat classification criteria.

Keywords: Flora, natural park, Ankara, Kızılcahamam

ÖZ

Ülkemizde bulunan 262 tabiat parkından biri olan Şahinler Tabiat Parkı, diğer tüm doğal alanlar gibi, hızlı nüfus artışı ve hızla genişleyen insan faaliyetleri yüzünden tehdit altındadır. Bu anlamda, alandaki mevcut bitki türlerinin bilinmesi ve korunması önem taşımaktadır. Çalışma alanı Ankara İli, Kızılcahamam İlçesi sınırları içerisindedir. P.H. Davis'in grid sistemine göre A4 karesinde ve İran- Turan fitocoğrafya bölgesinde yer almaktadır. Çalışma alanında yükseklik 1450 ve 1500 m aralığında değişiklik göstermektedir. Genel bitki örtüsü orman ve orman açıklıklarından oluşmaktadır. Çalışma alanından toplanan örneklerin değerlendirilmesi sonucu 40 familyadan 84 cinse ait 112 tür ve tür altı seviyede takson tespit edilmiştir. Bu taksonlardan 10'u endemiktir ve alanın endemizm oranı %8,9'dur. Tehdit Altında Bitki Türleri Listesi'nden elde edilen bilgi ve verilere göre alanda bulunan 7 türün koruma statüleri değerlendirilmiştir. Buna göre alanda LC (Düşük Riskli) kategorisinde değerlendirilen 4, NT (Tehdite yakın) kategorisinde 1, VU (Duyarlı) kategorisinde 1 ve CD (Korumaya tabi) kategorisinde değerlendirilen 1 tür bulunmaktadır. Türkiye Bitkileri Kırmızı Kitabı'na göre değerlendirilme yapıldığında ise LC kategorisinde 14, NT kategorisinde 1 ve VU kategorisinde 2 takson belirlenmiştir. Alan EUNIS Habitat Sınıflandırması kriterlerine göre de değerlendirilmiştir.

Anahtar Kelimeler: Flora, tabiat parkı, Ankara, Kızılcahamam

* Professor Ahmet Emre Yaprak, Dr. İsa Başköse and S. Tuğrul Körüklü for their assistance during field trips and identification of the plant specimen.

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Submitted/Başvuru: 23.01.2023 • **Revision Requested/Revizyon Talebi:** 10.02.2023 • **Last Revision Received/Son Revizyon:** 08.04.2023 • **Accepted/Kabul:** 28.04.2023 • **Published Online/Online Yayın:** 12.06.2023

INTRODUCTION

Turkiye is located in one of the world's richest geographies in terms of floristic diversity. The reasons for Turkiye's substantial biological diversity are the existence of different types of soils, variations in topography and climatic diversity, as well as the fact that it is located in a region where three of the world's 37 phytogeographical regions (namely, the Euro-Siberian, Irano-Turanian, and Mediterranean phytogeographical regions) intersect. Another important feature of the flora of Turkiye is that it contains many endemic taxa. The number of endemic taxa in Turkiye is 3,649, and the endemism rate is 31.82% (Guner et. al., 2012).

Wildlife habitats have narrowed due to the increase in human population, urbanization, and industrialization. Therefore, there is negative pressure on protected areas. Research shows that environmental awareness and an increase in the number of protected areas lead to a decrease in this negative pressure (Sezen, 2017). Environmental awareness for protected areas in Turkiye is still in its development phase. In her study, Sezen (2017) concluded that the industrialization and urbanization impact on protected areas should be assessed in detail and policies should be reviewed to eliminate regulatory inconsistencies. The UNEP (United Nations Environment Program), WCMC (World Conservation and Monitoring Center), and IUCN (International Union for Conservation of Nature) have taken a leading role in the recognition and scientific promotion of protected areas in the world. (www.iucn.org/sites/dev/files/important/downloads/natural_solutionturkish.pdf.2016,21.02.2017).

Protected areas in Turkiye are specified in the legislative framework under the relevant ministries. Protected areas that are regulated by the Ministry of Agriculture and Forestry in Turkiye have protected status as national parks, nature parks, nature conservation areas, natural monuments, and wildlife development areas. Special environmental protection areas, natural protected areas, and natural assets (monumental trees, caves) are managed as protected areas by the Ministry of Environment, Urbanization, and Climate Change. As of 2022, there are 634 protected areas registered in Turkiye, including 48 national parks, 262 nature parks, 113 natural monuments, 31 nature protection areas, 95 wetlands, and 85 wildlife development areas (https://www.tarimorman.gov.tr/DKMP). The study area is in the nature park category. Nature parks are natural areas that have vegetation and wildlife characteristics and are suitable for the recreation and entertainment of people in the integrity of the landscape (https://www.tarimorman.gov.tr/DKMP/Menu/34/Temel-Kavramlar). Nature parks, similar to all other natural areas, are threatened by rapid population growth and rapidly expanding human activities. Şahinler Nature Park (see Figure 1), which is one of the 262 nature parks in Turkiye, has had protected status since 17.07.2009 and attracts attention with its natural structure (https://www.tarimorman.gov.tr/DKMP/Menu/28/Tabiat-Parklari). Therefore, it is important to know and protect the existing plant species in the area. This study aims to identify the seed plant flora of the area, reveal the habitat types with respect to EUNIS habitat classification, and develop a foundation for studies regarding the protection of the nature park.

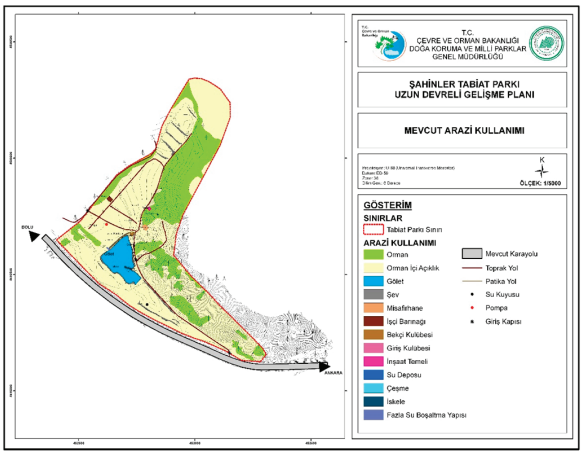

Figure 1. *Şahinler Natural Park Land Use Map (Ministry of Environment, Urbanization and Climate Change).*

No previous study has been conducted in the study area, however, studies have been conducted in nearby regions. Summaries of the studies previously conducted in the area are given below:

Güner and İkinci (2006) investigated the vascular plant flora of the Gölcük (Bolu) region in their study. As a result of the study, 277 genera, 461 species, and a total of 475 taxa belonging to 80 families were identified. The number of endemics in the area was determined to be 16, and the endemism rate was evaluated as 3.5%.

Uçar and Güner (2002) evaluated the plant diversity of Abant Nature Park (Bolu) in their study. As a result of the research, 1,440 plant samples were collected from the area. The number of endemic taxa in the area is 55. Therefore, the endemism rate of the area is 8.1%. As a result of the evaluation of the samples, 332 genera, 664 species, 150 subspecies, and 67 varieties belonging to 84 families were identified.

Tekin, K. (2005) investigated the synecological and syntaxonomic characteristics of the coniferous forests located between Gerede and Çamlıdere in the northwestern part of the Central Anatolia region in his study. It was determined that the research area had a transitional zone characteristic.

Topaloğlu, S. (2005) collected 931 plant samples in his study on the flora of Çamkoru Lake and its surroundings. As a result of the identification of the samples, 59 families, 217 genera, 377 species, 4 subspecies, and 1 variety were identified. According to this study, which provides us with information about the general vegetation of the research area, it was determined that the largest family in the area was Asteraceae, with 42 species.

MATERIAL AND METHODS

Plant Material

Sampling activities were carried out between 2016 and 2019. Şahinler Nature Park was visited during the vegetation period, during which plant samples bearing roots, stems, leaves, flowers, and fruits were collected in doublets. Samples which

were identified to be incomplete were subject to subsequent sampling during the following sampling survey. Samples were registered with respect to their locality information.

The locality information of the samples collected from the field was recorded. All samples were pressed and dried. The dried samples were left for sterilization for 72 hours at -20 degrees to remove parasites. The work titled "Flora of Turkiye and East Aegean Islands" (Davis, 1965-1988) was used for the identification of dried and sterilized samples. Identified specimens were verified in the herbarium ("Herbaryum ANK") located at the Ankara University, Faculty of Science, Department of Biology.

Climate of the Study Area

The climate data of the study area were obtained from the General Directorate of Meteorology of the Ministry of Agriculture and Forestry. Using the climate data, the bioclimatic characteristics of the region were identified and ombrothermic climate diagrams were generated.

Evaluation of the Habitat Types

Habitat types in the study area were identified using the European Nature Information System (EUNIS) database, which provides comparative habitat data (EUNIS, 2012).

Evaluation of the Collected Material

The list of the collected plant samples was generated in accordance with family, genus, species name, author and the distribution in the research area, name of the sampler, date, sample ID, plant's geographic region, and endemism status. The identified taxa were sorted according to the alphabetical order of the family names. Recent modifications in the classification were revised in accordance with the Türkiye Bitkileri Listesi Damarlı Bitkiler Kitabı (Guner et. al., 2012).

The classification of the samples which bear uncertainties was carried out with expert guidance. The identified samples were verified through comparisons with samples in the Herbarium ANK. The sampling date, endemism status, and chorology of each species are given in the flora list.

RESULTS

The study area is located within the Şahinler Nature Park, in the Kizilcahamam district of Ankara province, and lies in grid square A4 according to the grid system set up by P.H. Davis. The Şahinler Nature Park was founded in 2009 and has a total surface area of 40 Ha. The area lies between the longitudes 32º 26´ 24´´- 32º 26´ 49´´ and latitudes 40º 37´ 24´´- 40º 38´ 01´´. The Şahinler Nature Park is located 107 km from Ankara city center, 30 km from the center of the Kizilcahamam district, and 30 km from the Gerede district of Bolu province (http://sahinler.tabiat.gov.tr).

In order to distinguish the samples and facilitate the identification phase, the area was categorized into three stations: forest, pond and its surroundings, and glades. The dominant vegetative cover in the area is *Pinus slyvestris* forests. There is a pond in the study area which is recharged by precipitation and groundwater flow. The pond's surface area is 1.7 Ha and it is located 1465 meters above sea level. The total perimeter of the pond is 682 m, with a maximum depth of 2 meters.

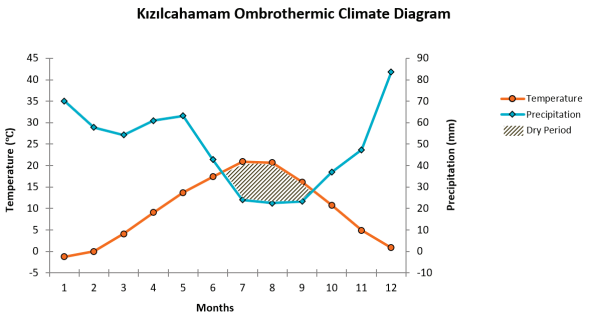

Figure 2. Kizilcahamam Ombrothermic Climate Diagram.

Using the data obtained from the Kizilcahamam meteorological station, mean monthly temperatures, mean monthly precipitation, maximum mean temperature of the warmest month, minimum mean temperature of the coldest month, and summer season mean precipitation values were evaluated to generate ombrothermic (precipitation – temperature) climate diagrams and to identify climate types in accordance with the Emberger method (Figure 1 and Figure 2) (Akman 1999). The following results were achieved:

The annual precipitation in the study area is 586.8 mm.

Maximum precipitation occurs in the winter season, whereas minimum precipitation occurs in the summer season at meteorological station.

The study area shows semi-arid Mediterranean climate characteristics (Table 1).

As a result of the study, 84 genera and 112 taxa belonging to 40 families were identified. One of these taxa (*Asplenium*

Table 1. Bioclimatic Synthesis

Meteorological Station	P (mm)	M (°C)	m (°C)	Q	PE	S	Precipitation Regime	Bioclimate
Kızılcahamam	586.8	27,9	-4,1	64,3	89.3	3,2	W. Sp.Su.F.	Semi-arid upper, very cold Mediterranean climate

P: Annual precipitation M: Maximum mean temperature for the warmest month PE: Summer precipitation (mm)
m: Minimum mean temperature for the coldest month Q: Precipitation-Temperature index S: Drought index **W: winter Sp: spring Su: summer F: fall.**

onopteris) belongs to the Lycopodiophyta division. Three of the taxa belong to the Pinophytina subdivision of Magnoliophyta. The remaining 108 taxa belong to the Magnoliidae class of the Magnoliophytina subdivision of the Magnoliophyta division. The Asteraceae family contains the most taxa in the area, with 12 taxa (10.7%). The Asteraceae family is followed by Brassicaceae and Fabaceae (8.9%), with 10 taxa, Caryophyllaceae and Plantaginaceae (5.4%), with 6 taxa, and Poaceae, Rosaceae, Asparagaceae, and Lamiaceae (4.5%), with the same rate (5 taxa). The remaining families include 48 taxa and 42.9% of the taxa in the area. The taxa numbers and their percent distributions for each family are provided Table 2.

Table 2. Taxa Numbers and Their Percent Distributions for Each Family

Family	Number of Taxa	%
Asteraceae	12	10.7
Brassicaceae	10	8.8
Fabaceae	10	8.8
Caryophyllaceae	6	5.4
Plantaginaceae	6	5.4
Poaceae	5	4.5
Rosaceae	5	4.5
Asparagaceae	5	4.5
Lamiaceae	5	4.5
Others	48	42.9
Total	**112**	**100**

The families which were found to have the most genera in the study area are Asteraceae, with 10 genera (11.9%), Brassicaceae and Fabaceae, with 6 genera (7.1%), Caryophyllaceae and Rosaceae, with 5 genera (5.9%), Boraginaceae and Lamiaceae, with 4 genera (4.8%), and Asparagaceae, Plantaginaceae, and Poaceae, with 3 genera (3.6%). The remaining families include 35 genera, which comprise 41.7% of the total number of genera in the area. The genus numbers and percent distributions for the families are given in Table 3.

According to the evaluation of the collected samples in the research area, the genera containing the most taxa are *Veronica,* with 4 taxa (3.57%) and *Ranunculus*, *Poa*, *Hypericum*, *Trifolium*, *Barbarea,* and *Thlaspi,* with 3 taxa (2.68%). The remaining genera comprise 90 taxa, which corresponds to 80.36%. The number of taxa for the genera and their percent distributions are given in Table 4.

The distribution rates of the taxa according to the phytogeographic regions show that Euro-Siberian, Irano-Turanian and Mediterranean elements comprise 9.82% (11 taxa), 16.07% (18 taxa), and 5.36% (6 taxa). The ratio of widespread taxa or the taxa whose distribution is not known is 68.75%, with 77 taxa. The phytogeographic distribution of the taxa are given in Table 5.

Table 3. Genus Numbers and Their Percent Distributions for Each Family

Family	Number of Genus	%
Asteraceae	10	11.90
Brassicaceae	6	7.14
Fabaceae	6	7.14
Caryophyllaceae	5	5.95
Rosaceae	5	5.95
Boraginaceae	4	4.76
Lamiaceae	4	4.76
Asparagaceae	3	3.57
Poaceae	3	3.57
Plantaginaceae	3	3.57
Others	35	41.67
Total	**84**	**100**

Table 4. Number of Taxa and Their Percent Distribution for Each Genus

Genus	Number of Taxa	%
Veronica	4	3.57
Ranunculus	3	2.68
Poa	3	2.68
Hypericum	3	2.68
Trifolium	3	2.68
Barbarea	3	2.68
Thlaspi	3	2.68
Others	90	80.36
Total	**112**	**100**

Table 5. Distribution of Taxa with respect to Phytogeographic Regions

Phytogeographic Region	Number of Taxa	%
Euro–Siberian	11	9.82
Irano-Turanian	18	16.07
Mediterranean	6	5.36
Widespread / unknown	77	68.75
Total	**112**	**100**

The evaluations show that, following the widespread and unknown taxa, the most common taxa in the study area were identified as belonging to the Irano-Turanian element. 10 of the collected samples were found to be endemic. Accordingly, the endemism rate in the area was estimated to be 8.9%. The list of endemic species and their conservation status are given in Table 6.

Figure 3. *Crocus ancyrensis* (Endemic).

Figure 4. *Eremogone ledebouriana* (Endemic).

Figure 5. *Helichrysum arenarium* (Endemic).

Plant List

Divisio: Lycopodiophyta

Subdivisio: Lycopodidae

1. Aspleniaceae

Figure 6. *Muscari aucheri* (Endemic).

Table 6. Endemic Plants and Their Conservation Status

Species	Conservation Status	Endemism Status
Achillea aleppica subsp. *zederbaueri*	-	+
Barbarea trichopoda	NT	+
Bornmuellera cappadocica	-	+
Crocus ancryrensis (Figure 3)	LC	+
Dianthus ancyrensis	VU	+
Digitalis lamarckii	LC	+
Eremogone ledebouriana (Figure 4)	-	+
Helichrysum arenarium (Figure 5)	-	+
Helianthemum nummularium subsp. *Lycaonicum*	-	+
Muscari aucheri (Figure 6)	LC	+

1. *Asplenium* L.

1. *Asplenium onopteris* L., around pond, B. Erdem 1051-1052, 06.05.2016

Divisio: Spermatophyta

Subdivisio: Gymnospermae

1. Cupressaceae

1. *Juniperus* L.

1. *J. communis* Pall. var. *saxatilis*, B. Erdem 1180, 1014, 1020, 1022, 1121, 1122, 09.04.2016

1. Pinacaea

1. *Pinus* L.

1. *P. sylvestris* L., forest, B. Erdem 1120, 1124, 1189. 10.06.2016, Euro-Siberian

2. *P. nigra* (Lamb.) Holmboe subsp. *pallasiana* forest, B.

Erdem 1015, 1016, 1021, 1123. 09.04.2016.

Subdivisio: Magnoliophytina

Classis: Magnoliidae

1. Adoxaceae

1. *Sambucus* L.

1. *S. nigra* L., Glade, B. Erdem, 08.10.2016, 1198.

2. Apiaceae

1. *Anthriscus* Pers.

1. *A. nemorosa* (M.Bieb.) Spreng., Glade, B. Erdem, 10.06.2016, 1125. 2.

2. *Daucus* L.

1. *D. guttatus* Sibth. & Sm., Glade, B. Erdem, 10.06.2016, 1184.

3. Asparagaceae

1. *Muscari* Mill.

1. *Muscari armeniacum* Leichtlin ex Baker, Glade, B. Erdem, 09.04.2016, 1005-1045-1063.

2. *M. aucheri* (Boiss.) Baker, Glade, B. Erdem, 06.05.2016, 1096, endemic.

2. *Ornithogalum* L.

1. *Ornithogalum armeniacum* Baker, Glade, B. Erdem, 09.04.2016 – 06.05.2016, 1004-1027-1043-1057, East Mediterranean.

2. *O. montanum* Cirillo, Glade, B. Erdem, 06.05.2016, 1041-1049, East Mediterranean.

3. *Scilla* L.

1. *Scilla bifolia* L., Glade, B. Erdem, 09.04.2016, 1023-1018-1003, Euro-Siberian.

4. Asteraceae

1. *Achilliea* L.

1. *A. aleppica* (Hayek) Hub.-Mor. subsp. *zederbaueri*, Glade, B. Erdem, 17.07.2018 - 01.07.2016, 2001-1216, Irano-Turanian, endemic.

2. *Centaurea* L.

1. *Centaurea virgata* Lam., Glade, B. Erdem, 01.08.2016, 1181-1178, Irano-Turanian.

3. *Cyanus* Mill.

1. *Cyanus pichleri* (Boiss.) Holub subsp. *pichleri*, Glade, B. Erdem, 10.06.2016, 1106-1210.

4. *Cota* J.Gay

1. *Cota austriaca* (Jacq.) Sch.Bip., Glade, B. Erdem, 01.07.2016, 1118-1149.

5. *Helichrysum* Mill.

1. *Helichrysum arenarium* (L.) Moench, Glade, B. Erdem, 01.08.2016, 1174, Irano – Turanian, endemic.

6. *Scorzonera* L.

1. *Scorzonera cana* (W.Koch) D.F.Chamb. var. *jacquiniana*, Glade, B. Erdem, 10.06.2016, 1115.

2. *S. mollis* (DC.) D.F.Chamb. subsp. *szowitzii*, Glade, B. Erdem, 06.05.2016, 1083, Irano – Turanian.

7. *Tanacetum* L.

1. *Tanacetum armenum* (DC.) Sch. Bip., Glade, B. Erdem, 06.05.2016, 1038.

8. *Taraxacum* F.H.Wigg.

1. *Taraxacum buttleri* Soest, Glade, B. Erdem, 09.04.2016, 1011.

9. *Tripleurospermum* Sch.Bip.

1. *Tripleurospermum oreades* (Boiss.) Rech. f., Glade, B. Erdem, 09.04.2016 – 06.05.2016, 1055-1030-1031-1048-1010-1054.

10. *Xeranthemum* L.

1. *Xeranthemum annuum* L., Glade, B. Erdem, 01.08.2016 - 17.07.2018, 2013- 2012-1168.

2. *X. longipapposum* Fisch. & C.A.Mey., Glade, B. Erdem, 01.08.2016, 1175-1166, Irano-Turanian.

5. Berberidaceae

1. *Berberis* L.

1. *Berberis crataegina* DC., Glade, B. Erdem, 17.07.2018, 2009.

6. Betulaceae

1. *Betula* L.

1. *Betula pendula* Roth, Glade, B. Erdem, 09.06.2019, 3000.

7. Boraginaceae

1. *Anchusa L.*

1. *Anchusa leptophylla* Roem. & Schult. subsp. *leptophylla*, Glade, B. Erdem, 10.06.2016, 1143-1199-1031-1098.

2. *Buglossoides* Moench

1. *Buglossoides arvensis* (L.) I. M. Johnst., Glade, B. Erdem, 06.05.2016, 1056.

3. *Echium* L.

1. *Echium vulgare* L., Glade, B. Erdem, 01.07.2016, 1188-1137-1133, Euro-Siberian.

4. *Myosotis* L.

1. *Myosotis sylvatica* Hoffm., Glade, B. Erdem, 10.06.2016, 1209-1108-1105.

8. Brassicaceae

1. *Alyssum* L.

1. *Alyssum linifolium* Stephan ex. Willd., Glade, B. Erdem, 06.05.2016, 1081.

2. *Barbarea* W.Aiton

1. *Barbarea plantaginea* DC., Glade, B. Erdem, 09.04.2016, 1006.

2. *B. trichopoda* Hausskn.ex Bornm., Glade, B. Erdem, 06.05.2016, 1065-1067, Akdeniz, endemic.

3. *B. vulgaris* R. Br., Glade, B. Erdem, 06.05.2016, 1073.

3. *Bornmuellera* Hausskn.

1. *Bornmuellera cappadocica* (Willd.) Cullen & T.R. Dudley, Glade, B. Erdem, 1070-1072, Irano – Turanianendemic.

4. *Draba* L.

1. *Draba verna* L., Glade, B. Erdem, 06.05.2016, 1040-1090.

5. *Microthlaspi* F.K. Mey.

1. *Microthlaspi perfoliatum* (L.) F. K. Mey., Glade, B. Erdem, 06.05.2016, 1095.

6. *Thlaspi* L.

1. *Thlaspi arvense* L., Glade, B. Erdem, 06.05.2016, 1088.

2. *T. huetii* Boiss., Glade, B. Erdem, 06.05.2016, 1093.

3. *T. oxyceras* (Boiss.) Hedge, Glade, B. Erdem, 06.05.2016, 1071.

9. Campanulaceae

1. *Campanula* L.

1. *Campanula persicifolia* L., Glade, B. Erdem, 01.07.2016, 1109.

2. *C. rapunculus* L., Glade, B. Erdem, 01.07.2016, 1146.

10. Caryophyllaceae

1. *Arenaria* L.

1. *Arenaria serpyllifolia* L., Glade, B. Erdem, 01.07.2016, 1165, East Mediterranean.

2. *Cerastium* L.

1. *Cerastium diffusum* Pers. subsp. *diffusum*, Glade, B. Erdem, 06.05.2016, 1058.

2. *C. dubium* (Bastard) O. Schwarz, Glade, B. Erdem, 10.06.2016, 1201.

3. *Dianthus* L.

1. *Dianthus ancyrensis* Hausskn. & Bornm., Glade, B. Erdem, 01.07.2016 - 17.07.2018, 2005-1158-1164-1151-1192, Irano – Turanian, endemic.

4. *Eremogone* Fenzl

1. *Eremogone ledebouriana* (Fenzl) Ikonn., Glade, B. Erdem, 09.04.2016 – 06.05.2016, 1064-1112-1079-1160-1009, endemic.

5. *Silene* L.

1. *Silene compacta* Fisch. ex Hornem., Glade, B. Erdem, 01.07.2016, 1134-1135- 1185-2004.

11. Caprifoliaceae

1. *Dipsacus* L.

1. *Dipsacus laciniatus* L., Glade, B. Erdem, 01.08.2016, 1147.

2. *Scabiosa* L.

1. *Scabiosa argentea* L., Glade, B. Erdem, 01.08.2016 – 17.07.2018, 2008-1176-1177- 1195.

12. Cistaceae

1. *Helianthemum* Mill.

1. *Helianthemum nummularium* (L.) Miller subsp. *lycaonicum* Coode & Cullen, Glade, B. Erdem, 10.06.2016, 1097, endemic.

13. Crassulaceae

1. *Sedum* L.

1. *Sedum album* L., Glade, B. Erdem, 17.07.2018, 2003.

2. *S. steudelii* Boiss., Glade, B. Erdem, 01.08.2016, 1167, Irano-Turanian.

2. *Sempervivum* L.

1. *Sempervivum armenum* Boiss. & A.Huet subsp. *armenum*, Glade, B. Erdem, 01.07.2016 - 01.08.2016, 1155, 1169, 2006.

14. Euphorbiaceae

1. *Euphorbia* L.

1. *Euphorbia myrsinites* L., Glade, B. Erdem, 01.07.2016 – 01.08.2016, 2006-1155- 1169.

15. Fabaceae

1. *Astragalus* L.

1. *Astragalus ptilodes* Boiss. var. ptilodes, Glade, B. Erdem, 06.05.2016 – 10.06.2016, 1033-1204-1029.

2. *A. microcephalus* Willd., Glade, B. Erdem, 10.06.2016, 1103, Irano-Turanian

2. *Cytisus* Desf.

1. *Cytisus hirsutus* L., Glade, B. Erdem, 10.06.2016, 1077.

2. *C. pygmaeus* Willd., Glade, B. Erdem, 10.06.2016, 1102-1214, Euro-Siberian.

3. *Dorycnium* Mill.

1. *Dorycnium graecum* (L.) Ser., Glade, B. Erdem, 01.07.2016, 1140, Karadeniz.

4. *Genista* L.

1. *Genista januensis* Viv. subsp. *lydia* (Boiss.) Kit Tan & Ziel., Glade, B. Erdem, 06.05.2016, 1044-1213, East Mediterranean.

5. *Lotus* L.

1. *Lotus aegaeus* (Griseb.) Boiss., Glade, B. Erdem, 01.07.2016, 1138.

6. *Trifolium* L.

1. *Trifolium campestre* Schreb., Glade, B. Erdem, 01.07.16, 1162.

2. *T. nigrescens* Viv., Glade, B. Erdem, 10.06.2016, 1113.

3. *T. pratense* L., Glade, B. Erdem, 10.06.2016 – 01.07.2016, 1110-1196.

16. Gentianaceae

1. *Centaurium* Hill.

1. *Centaurium erythraea* Roth. subsp. *turcicum* (Velen.) Melderis, Glade, B. Erdem, 01.07.2016, 1156.

17. Geraniaceae

1. *Erodium* L'Hér. ex Aiton

1. *Erodium cicutarium* (L.) L Hér., Glade, B. Erdem, 06.05.2016, 1078.

2. *Geranium* L.

1. *Geranium pyrenaicum* Burm.f., Glade, B. Erdem, 10.06.2016, 1130-1104.

18. Hypericaceae

1. *Hypericum* L.

1. *Hypericum elongatum* Ledeb. ex Rchb., Glade, B. Erdem, 01.08.2016, 1173.

2. *H. lydium* Boiss., Glade, B. Erdem, 01.07.2016, 1136.

3. *H. pseudolaeve* N. Robson, Glade, B. Erdem, 01.08.2016, 1171, Irano – Turanian.

19. Iridaceae

1. *Crocus* L.

1. *Crocus ancyrensis* (Herb.) Maw, Forest and forest opening, B. Erdem, 09.04.2016- 25.03.2017, 1218, endemic.

20. Juncaceae

1. *Luzula* DC:

1. *Luzula multiflora* (Ehrh.) Lej., Glade, B. Erdem, 06.05.2016, 1074-1094-1092.

21. Lamiaceae

1. *Lamium* L.

1. *Lamium album* L., Glade, B. Erdem, 10.06.2016, 1129.

2. *L. purpureum* L. var. purpureum, Glade, B. Erdem, 09.04.2016 – 06.05.2016, 1025-1206-1215-1084, Euro-Siberian.

2. *Salvia* L.

1. *Salvia verticillata* L., Glade, B. Erdem, 17.07.2018, 2007.

3. *Stachys* L.

1. *Stachys iberica* M.Bieb., Glade, B. Erdem, 01.07.2016, 1157.

4. *Thymus* L.

1. *Thymus longicaulis* C.Presl subsp. *longicaulis*, Glade, B. Erdem, 01.07.2016, 1187-1159-1161-1170-1172-1202-1150-1154, Euro-Siberian.

22. Liliaceae

1. *Gagea* Salisb.

1. *Gagea reticulata* (Pall.) Schult. & Schult.f., Glade, B. Erdem, 09.04.2016, 1001-1007-1028, Irano – Turanian.

23. Oleaceae

1. *Ligustrum* L.

1. *Ligustrum vulgare* L., Glade, B. Erdem, 08.10.2016, 1194, Euro-Siberian.

24. Onagraceae

1. *Epilobium* L.

1. *Epilobium hirsutum* L., A4, Ankara, Kızılcahamam, Şahinler Natural Park, pond and its near vicinity, B. Erdem, 17.07.2018, 2002.

2. *E. minutiflorum* Hausskn., Glade, B. Erdem, 01.09.2016, 1186-1193, Irano – Turanian.

25. Orobanchaceae

1. *Rhinanthus* L.

1. *Rhinanthus angustifolius* C.C.Gmel., Glade, B. Erdem, 10.06.2016, 1205.

26. Papaveraceae

1. *Corydalis* DC.

1. *Corydalis cava* L. subsp. *marschalliana* (Willd.) Hayek, Glade, B. Erdem, 09.04.2016, 1002-1026-1019, Euro-Siberian.

27. Plantaginaceae

1. *Digitalis* L.

1. *Digitalis lamarckii* Ivanina, Glade, B. Erdem, 01.07.2016, 1141, Irano – Turanian, endemic.

2. *Globularia* L.

1. *Globularia trichosantha* Fisch & C.A.Mey. subsp. *trichosantha*, Glade, B. Erdem, 10.06.2016, 1100, Irano-Turanian.

3. *Veronica* L.

1. *Veronica anagallis-aquatica* L., Glade, B. Erdem, 01.07.2016, 1132.

2. *V. multifida* L., Glade, B. Erdem, 06.05.2016-10.06.2016, 1035-1037-1099, Irano – Turanian.

3. *V. pectinata* L., Glade, B. Erdem, 06.05.2016, 1060-1061-1117.

4. *V. polita* Fr., Glade, B. Erdem, 10.06.2016, 1203.

28. Poaceae

1. *Poa* L.

1. *Poa angustifolia* L., Glade, B. Erdem, 09.06.2019, 3001.

2. *P. pratensis* L., Glade, B. Erdem, 06.05.2016, 1066-1085.

3. *P. sterilis* M. Bieb., Glade, B. Erdem, 09.06.2019, 3002. 39

2. *Dactylis* L.

1. *Dactylis glomerata* L., Glade, B. Erdem, 03.06.2019, 3003, Euro-Siberian.

3. *Bromus* L.

1. *Bromus tomentellus* Boiss., Glade, B. Erdem, 09.06.2019, 3004, Irano-Turanian.

29. Polygonaceae

1. *Rumex* L.

1. *Rumex acetosella* L., Glade, B. Erdem, 10.06.2016 , 1107-1148-1200.

30. Potamogetonaceae

1. *Potamogeton* L.

1. *Potamogeton praelongus* Wulfen., A4, Ankara, Kızılcahamam, Şahinler Natural Park, pond and its near vicinity, B.Erdem, 06.05.2016, 1075-1076.

31. Primulaceae

1. *Lysimachia* L.

1. *Lysimachia vulgaris* L., A4, Ankara, Kızılcahamam, Şahinler Natural Park, pond and its near vicinity, B. Erdem, 17.07.2018, 2015.

2. *Primula* L.

1. *Primula acaulis* subsp. *acaulis* (L.) L., Glade, B. Erdem, 09.04.2016-06.05.2016, 1013-1024-1068-1069, Euro-Siberian.

32. Ranunculaceae

1. *Ranunculus* L.

1. *Ranunculus argyreus* Boiss., Glade, B. Erdem, 10.06.2016, 1101. 40

2. *R. arvensis* L., Glade, B. Erdem, 06.05.2016, 1211-1212.

3. *R. damascenus* Boiss. & Gaill., Glade, B. Erdem, 06.05.2016, 1039-1053-1127, Irano-Turanian.

33. Rosaceae

1. *Cotoneaster* Medik.

1. *Cotoneaster nummularius* Fisch. & C.A.Mey., Glade, B. Erdem, 06.05.2016, 1046-1047.

2. *Crataegus* L.

1. *Crataegus orientalis* Pall. ex M.Bieb. subsp. *orientalis*, Glade, B. Erdem, 01.08.2016, 1182-1183-1191.

3. *Potentilla* L.

1. *Potentilla recta* L., Glade, B. Erdem, 10.06.2016-17.07.2018, 1114-1163-2010.

4. *Pyrus* L.

1. *Pyrus elaeagnifolia* Pall. subsp. *elaeagnifolia*, Glade, B. Erdem, 10.06.2016, 1126.

5. *Rosa* L.

1. *Rosa canina* L., Glade, B. Erdem, 01.07.2016, 1144-1152-1179-1197.

34. Rubiaceae

1. *Cruciata* Mill.

1. *Cruciata taurica* (Pall. ex Willd.) Ehrend., Glade, B. Erdem, 06.05.2016, 1036-1042-1062-1207, Irano – Turanian.

35. Salicaceae

1. *Salix* L.

1. *Salix caprea* L., Glade, B. Erdem, 09.04.2016, 1012, Euro-Siberian.

36. Typhaceae

1. *Sparganium* L.

1. *Sparganium erectum* L. subsp. *neglectum* (Beeby) K. Richt., Glade, B. Erdem, 01.09.2016, 1190, Euro-Siberian.

37. Violaceae

1. *Viola* L.

1. *Viola parvula* Tineo, Glade, B. Erdem, 06.05.2016, 1082.

2. *V. suavis* M.Bieb., Forest, B. Erdem, 06.05.2016, 1032-1059.

Conservation Status

The knowledge on the conservation status of plants provides identification of threatened plants and increases awareness among people, which prevents the collection of plants and improves protection. Therefore, the conservation status was established for the taxa in Şahinler Nature Park. The conservation status was determined using The Red Book of Turkish Plants (Ankara, 2000), the IUCN official website (https://www.iucnredlist.org/), and the List of Threatened Plant Species (Nezahat Gökyiğit Botanical Garden and ANG Foundation official web site http://www.tehditaltindabitkiler.org.tr/v2/).

According to the information and data obtained from the List of Threatened Plant Species, the conservation status of 7 species in the area was evaluated. Accordingly, there are 4 species evaluated in the LC (Low Risk) category, 1 species in the NT (Near Threatened) category, 1 species in the VU (Vulnerable) category, and 1 species in the CD (Subject to Conservation) category. When evaluated according to The Red Book of Turkish Plants, 14 taxa were determined to be in the LC category, 1 taxon was determined to be in the NT category, and 2 taxa were determined to be in the VU category. This paper takes into account the conservation status of the Threatened Plant Species List, since it contains more up-to-date data. Five of the 7 species evaluated according to the List of Threatened Plant Species are endemic.

It does not seem possible to protect biodiversity while meeting the nutritional and shelter needs of people and contributing to economic development at the same time. However, efficient and sustainable use of existing resources can be achieved (Arslan et. al., 2013). In order to achieve this, each country should carry out studies to determine its biodiversity. European Union countries have developed a classification system for this purpose. The goal of this classification system, which they call the European Nature Information System (EUNIS), is to create habitat types with European references and to obtain habitat data comparable to nature conservation by making a hierarchical classification (EUNIS, 2012). The study area was evaluated according to the EUNIS Habitat classification criteria. The evaluation of the research area according to the EUNIS habitat types hierarchical ranking is as follows (https://eunis.eea.europa.eu/habitats/2826):

C: Inland surface waters

C1: Surface standing waters

C1.3 : Permanent eutrophic lakes, ponds, and pools

R: Grasslands and lands dominated by forbs, mosses, or lichens

R1: Dry grasslands

R1B: Continental Dry Grasslands

R1B9: Irano-Anatolian Steppes

T: Forests and other wooded land

T3: Coniferous forests

T36: Temperate and sub-Mediterranean montane *Pinus sylvestris-Pinus nigra* forests

Irano-Anatolian steppes are included in Bern Convention Annex 1 at a higher rank, and conservation measures are needed at the level of Continental Dry Grasslands. Temperate and sub-Mediterranean montane *Pinus sylvestris-Pinus nigra* forests are listed in Bern Convention Annex 1 as an endangered habitat that requires conservation measures.

DISCUSSION

The study area (Şahinler Nature Park) is within the borders specified by the Ministry of Agriculture and Forestry. A large portion of the study area consists of forests and glades. The terrestrial ecosystem is dominant in the Nature Park, which consists of flat areas and gentle and steep slopes. While the terrestrial ecosystem is represented by a forest ecosystem, the aquatic ecosystem is represented by a permanent standing water ecosystem (pond). The dominant vegetation in and around the area consists of coniferous forests. This explains the limited diversity of plant taxa in the area. During field studies carried out from 2016-2019, it was observed that the number of visitors to Şahinler Nature Park increased gradually. Visitors were observed to have picnics and light campfires in the study area. It was observed that visitors did not collect their garbage when leaving the site. For this reason, the increase in the number of visitors causes environmental pollution. As a result, it is believed that the natural vegetation of the nature park will be affected in the future.

Since there is no meteorological station located in the study area, the bioclimatic conditions were identified using the nearest station that has meteorological data spanning over 30 years (Kizilcahamam). The altitude of the study area is around 1,500 m, whereas the altitude of the Kizilcahamam meteorological station is 1,033 m. The temperature decrease (0.5°C on average every 100 m) and location at a higher elevation makes the study area colder and more humid, which further results in a shorter vegetation period.

The study area was evaluated according to the EUNIS habitat types hierarchical sorting. According to this habitat classification, 3 habitat types were in from the area: permanent eutrophic lakes, ponds and pools; Irano-Anatolian steppes; and temperate and sub-Mediterranean montane *Pinus sylvestris-Pinus nigra* forests. EUNIS habitat classification was developed according to the habitats observed in European Union countries. When applied to Turkiye, differences are observed due to characteristic taxa. For this reason, the classification was limited. With more detailed studies, new habitat types that are unique and suitable for Turkiye can be defined. The same applies to the EUNIS classification of the pond in the study area. The classification of stagnant surface waters is carried out according to chemical analysis of the water and its trophy status. As there is no relevant data available for the study area, the classification was kept at the "Surface standing waters" level and could not be carried out to provide further detail. The *Pinus nigra* forest and glades have shaped the general status of the area. In addition, the temporary streams that dry up during the summer season and the pond in the area increases the habitat diversity in the area. As a result of the identification of the samples, the Asteraceae family was determined to have the most taxa in the area. The ratio between the number of taxa in the Asteraceae family and the number of taxa in the other families is 10.7%. A flora study completed in Camkoru Nature Park, which is approximately 7 km southeast of the study area, revealed that the largest family was Asteraceae, with 42 species (Topaloglu, 2005). The remaining families with the highest number of taxa and their percent distributions are Brassicaceae and Fabaceae (8.93%), Caryophyllaceae and Plantaginaceae (5.4%), and Poaceae, Rosaceae, Asparagaceae, and Lamiaceae (4.5%), with the same percentage. The family with the highest number of genera in the area is also the Asteraceae family, whereas the genus containing the most taxa in the area is Veronica. Most of the identified specimens belong to the Irano-Turanian phytogeographic region, with a value of 16.1%. 10 of the taxa are endemic and the endemism rate in the area is 8.9%. A comparison of the families with the highest taxa content of previous studies in the study area and its near vicinity has been carried out and is given in Table 8.

The table shows the ratio of families to the total number of taxa determined in the study area. As seen in this table, the family with the most taxa in the area is Asteraceae, which is similar to other studies. The data presented in Table 8. indicate that the number of taxa belonging to the Asteraceae family has a distribution above 10% in all four studies. While the ratio between the number of taxa for the Caryophyllaceae family and the number of taxa for other families is 5.4%, it varies between 3.4% and 3.5% in studies conducted in the immediate environment. Similarly, the percentage of taxa for the Poaceae family (4.5%) in the study area differs from studies in the immediate environment (8.3-9%). The relatively low percentage of Poaceae is attributed to the altitude and climatic characteristics of the study area, which allows an enhanced floristic diversity at this elevation zone. When compared to other areas, our study area covers a smaller area and also, since the area is largely covered by Pinus nigra forests, it is thought that the proportion of Poaceae family members is low. The conservation status of 7 species identified in the area was determined to be 4 species of LC, 1 species of NT, 1 species of VU, and 1 species of CD. 5 of these 7 species with that conservation status have been determined to be endemic. The remaining species were found to have insufficient data and therefore were registered as "not evaluated." In addition, while only 3 of the remaining taxa are endemic, the fact that the others are widely distributed is also effective in this case. It has been observed that the number of visitors to the area has increased gradually during the field studies carried out over 3 years. It was observed that activities in the field increased especially in the spring months. Visitors camp in the area, have picnics, and leave a significant amount of garbage in the area. In order to prevent impacts on the existing vegetative cover and the other living species in the area, and to improve sustainability, it is recommended that additional studies be conducted. Furthermore, the recommended measures include establishing informative signboards about endemic plants and other living species and placing warning signs regarding environmental damage. Understanding biodiversity is of primary importance for the sustainable and efficient use of resources. Accordingly, studies on biodiversity should be expanded and improved to provide more detail. The data obtained will allow the determination of the flora of the study area, which is a protected area, and will emphasize the importance and value of the area in terms of biodiversity, drawing attention to the importance of its protection. The data will provide the necessary information for visitors about the plant diversity present in the area.

Table 8. Comparison of the Taxa Percentages Between the Study Area and its Surrounding Areas

Family	Erdem (2019)	Uçar (1996)	Topaloğlu (2005)	İkinci et. al., (2007)
Asteraceae	10.7	10.4	11.2	10.3
Brassicaceae	8.9	4.6	6.1	4.7
Fabaceae	8.9	7.1	8.0	6.9
Caryophyllaceae	5.4	3.4	3.4	3.5
Poaceae	4.5	8.3	9.0	8.3
Rosaceae	4.5	5.3	6.9	5.3
Asparagaceae	4.5	3.0	4.2	-
Lamiaceae	4.5	6.7	6.4	6.8
Others	42.9	43.2	35.0	-

Acknowledgement: This research was supported by the Ankara University Research fund (Project no16L0430017). The author sincerely thanks Professor Ahmet Emre Yaprak and S. Tuğrul Körüklü for their support and guidance. The author would also like to thank Dr. İsa Başköse for his assistance in the identification of the samples.

Peer Review: Externally peer-reviewed.

Author Contributions: Conception/Design of Study- G.N.T., B.Ö.; Data Acquisition- B.Ö., G.N.T.; Data Analysis/Interpretation- B.Ö.; Drafting Manuscript- B.Ö. ; Critical Revision of Manuscript- G.N.T.; Final Approval and Accountability- G.N.T., B.Ö.

Conflict of Interest: Authors declared no conflict of interest.

Financial Disclosure: Ankara University Research Fund supported this research (Project number: 16L0430017).

Hakem Değerlendirmesi: Dış bağımsız.

Yazar Katkıları: Çalışma Konsepti/Tasarım- G.N.T., B.Ö.; Veri Toplama- B.Ö., G.N.T.; Veri Analizi/Yorumlama- B.Ö.; Yazı Taslağı- B.Ö.; İçeriğin Eleştirel İncelemesi- G.N.T.; Son Onay ve Sorumluluk- G.N.T., B.Ö.

Çıkar Çatışması: Yazarlar çıkar çatışması beyan etmemişlerdir.

Finansal Destek: Yazarlar finansal destek beyan etmemişlerdir.

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