

Article

Ex Situ and In Situ Conservation Approaches in Species-Rich Anatolian Steppe Ecosystem: A Case Study from Ankara, Türkiye

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Abstract: Ex situ and in situ conservation are the two most important methods for preserving and sustaining natural species. However, studies that combine in situ and ex situ studies are rather scarce. Ankara, the capital of Türkiye, is a rich biodiversity hotspot with 2353 plant species, 398 of which are endemic. Due to the rapidly growing population, agricultural areas, hobby gardens, and the urban areas of the city center, many plant species, especially local endemics, are at a high risk of extinction in the immediate vicinity of the Ankara city center. Therefore, we aimed to establish a plant protection area with both ex situ and in situ conservation approaches jointly in the Kazan Soda license area in the Kahramankazan county of Ankara. In total, 185 plant taxa belonging to 43 families, 29 of which are local or regional endemic, or rare, have been protected in the area. Although most of the taxa in the protected area grow there naturally, reproductive organs or whole plants of 11 taxa have been translocated from the immediate surroundings and habitat. Detailed information about the flora of the protected area and the license area is given. We also work in the protected area to raise awareness about biodiversity and nature conservation for local people and students.

Keywords: biodiversity; Central Anatolia; conservation; endemic plant species; steppe; Türkiye



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1. Introduction

Plants play a vital role in the Earth's ecosystem, providing food and oxygen for animals and humans, as well as helping to regulate the planet's climate and water cycle [1]. They are also used for a wide range of human purposes, including food, medicine, clothing, building materials, and fuel. Despite their importance, plant diversity is at risk, and every year, the number of threatened species increases dramatically all over the world [2]. The loss of plant populations or even entire plant species and, therefore, of genetic diversity, is usually caused by the destruction and/or alteration of their habitats as a consequence of human overexploitation, and more recently, pollution and climate changes [3–5]. Many of these species are endemic, and often, only a few small, wild populations persist [6,7]. Therefore, endemic species should be carefully monitored and managed, and their conservation considered a global priority [7–9].

To protect plant species, plant conservationists use a variety of methods, such as establishing protected areas, seed banks, and botanical gardens. They also work to raise public awareness about the importance of plant conservation and advocate for policies and regulations that support conservation efforts [10].

Ex situ conservation refers to the conservation of plants and animals outside their natural habitats. It involves the removal of a species or population from its natural environment and its relocation to a controlled setting, such as a zoo or botanical garden, where it can be managed and protected [10]. On the other hand, in situ conservation involves protecting plants and animals in their natural habitats. This approach is essential for maintaining biodiversity and ecological functions, allowing species to thrive in their adapted environments [11]. Rarely, for a more comprehensive conservation approach, ex situ and in situ conservation measures can be used together [12].

Türkiye has a significant bioclimatic and geomorphological diversity and hosts about 12,000 vascular plant taxa, 32% of which are endemic [13,14]. It lies at the intersection of three phytogeographical regions and contains several biodiversity hotspots. Central Anatolia, part of the Irano-Turanian region, is particularly rich in endemic species, but habitat fragmentation due to population growth and human activities is threatening these plants [15–21]. The Central Anatolian steppe, in the Irano-Turanian phytogeographic region, characterized by a continental climate and diverse vegetation, has lost at least 44% of its natural area due to unsustainable agricultural practices, overgrazing, conversion to cropland and afforestation, urbanization, mining, and construction activities (i.e., roads, dams, and industrial areas) in Türkiye [21–23].

Ankara, the capital of Türkiye and in Central Anatolia, is a rich biodiversity hotspot with 2353 plant species belonging to 110 families, 398 of which are endemic [24]. The rapid expansion of urban, agricultural, industrial, and recreational garden areas is rapidly threatening and even destroying the natural habitats surrounding the city center. We therefore need to take urgent action to protect plants that naturally live close to the city center, especially endemic and rare ones.

The aim of this project is to use a combination of in situ and ex situ conservation approaches to protect rare and endemic species, especially those at risk of extinction, as much as possible in the medium and long term in the rapidly growing metropolitan area of Ankara.

2. Material and Methods

2.1. Study Area

The main study area (Kazan Soda license area, 19.071 Hectar = 190,710 m²) is located in the important plant area of the Ayaş Mountains, which is located in the northwest of the Ankara city center, Türkiye (ca. 10 km away from densely populated areas) (Figure 2). Therefore, the area is under very high pressure due to urbanization, industrialization, agricultural areas, hobby gardens, and environmental pollution. The natural habitat of the study area is mostly marl steppe. In this habitat, there are mainly perennial herbaceous flowering plants. However, there are some small areas covered by shrublands (mainly *Quercus pubescens* Willd.) and trees (*Pinus nigra* J.F. Arnold—black pine) (Figure 3). Detailed information about the habitats and plant communities of the area is given in the results section. The study area is mostly mountainous, and its altitude varies between 910 m and 1300 m.

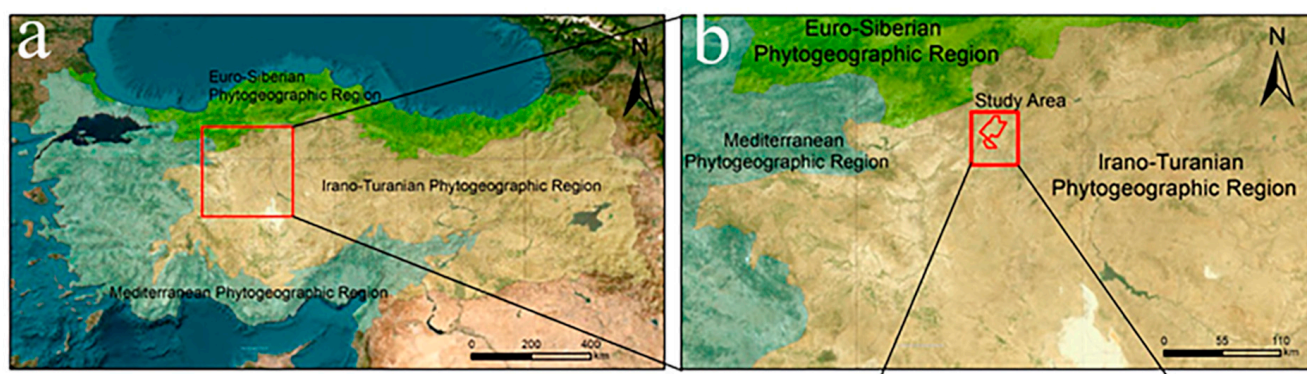


Figure 1. Cont.

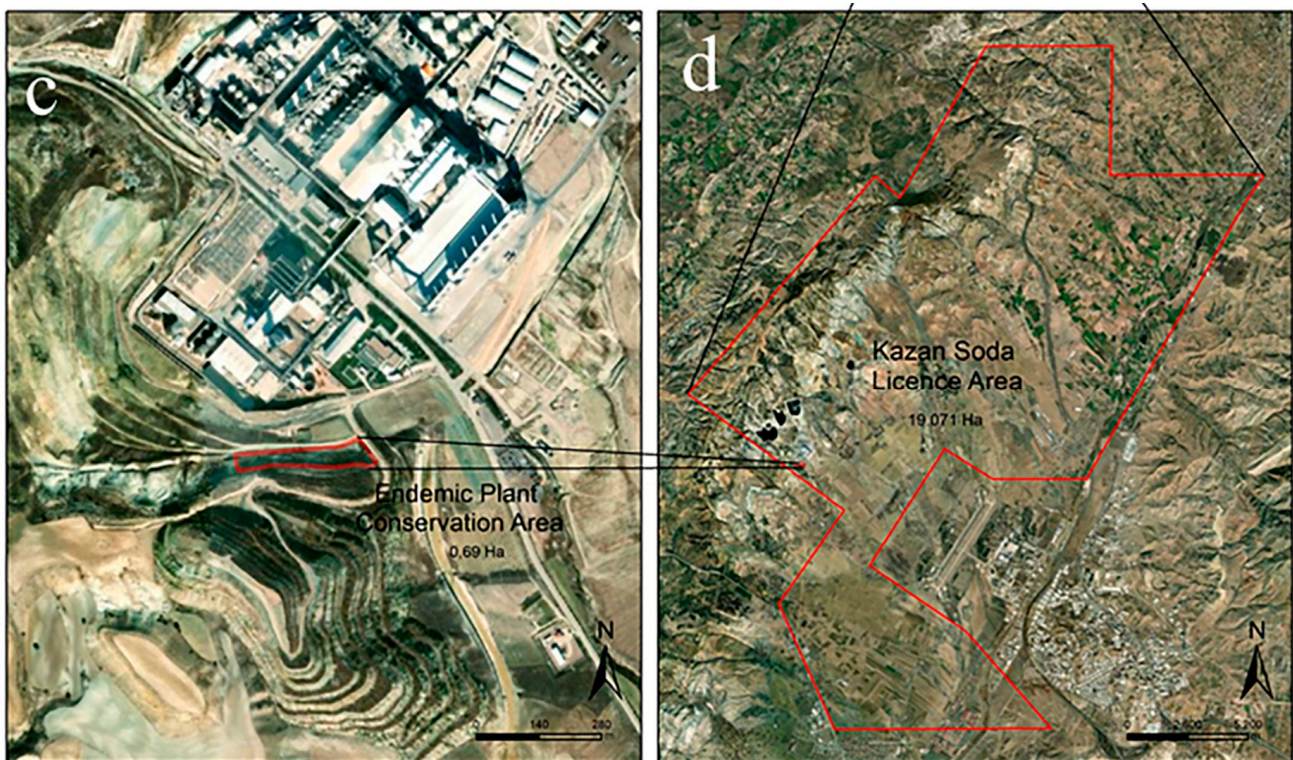


Figure 2. (a) Phytogeographic regions of Türkiye; dark green, Euro-Siberian; light green, Mediterranean; and yellow, Irano-Turanian phytogeographic region. (b) The exact location of the study area (c) Plant protection area. (d) Kazan Soda license area.

According to the Ankara, Etimesgut, meteorological station (34 years of data), the closest meteorological station to the study area, the average annual temperature is 11.3 °C, and the average annual precipitation is 363.7 mm. The precipitation regime is East Mediterranean Rain Regime Type 2 SWAS (Spring, Winter, Autumn, Summer). According to Emburger's Mediterranean bioclimate classification, Etimesgut is classified as "lower semi-arid and very cold" [25–27]. The ombro-thermic climate diagram was drawn using Gaussen's method taken by Töre and Erik [27] (Figure 4).

To determine vegetation structure (plant communities), floristic diversity, endangered plants, and the collection of the plants or their reproductive organs for ex situ conservation, extensive field studies have been done in and around the study area by the first and second authors between February 2016 and December 2022. All the collected plant taxa were identified according to the Flora of Turkey and the East Aegean Islands [28–37] and their Red List categories (CR: Critically Endangered, EN: Endangered, VU: Vulnerable, NT: Near-Threatened, DD: Data Deficient, LC: Least Concern) were evaluated according to the *Turkish Plant Red Data Book* [38] and IUCN 2020 [39]. Some recent conservation studies on our target species were also used [40–45].

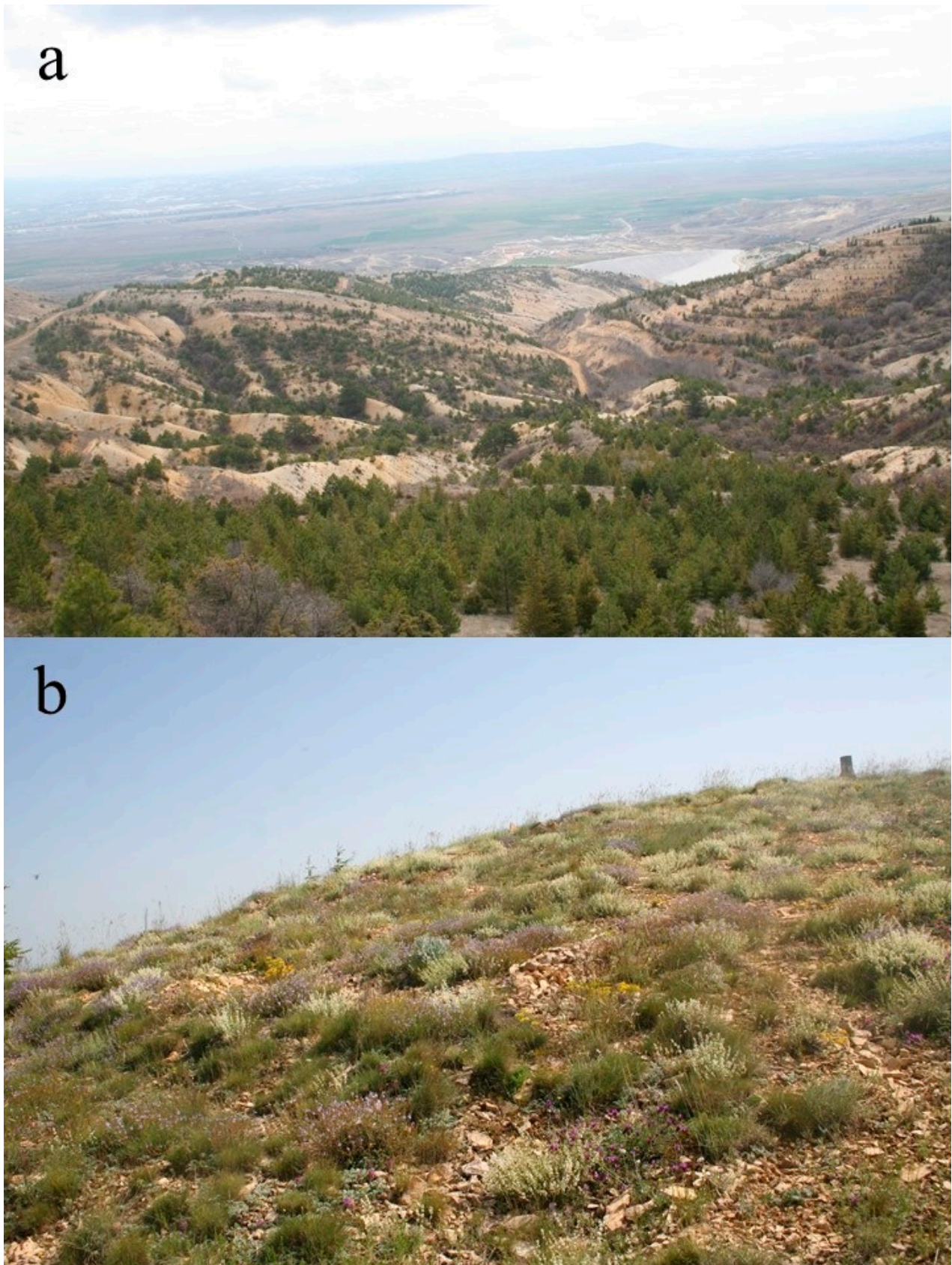


Figure 3. (a) General view of the study area (Kazan Soda license area). (b) Species-rich marl steppe in the study area.

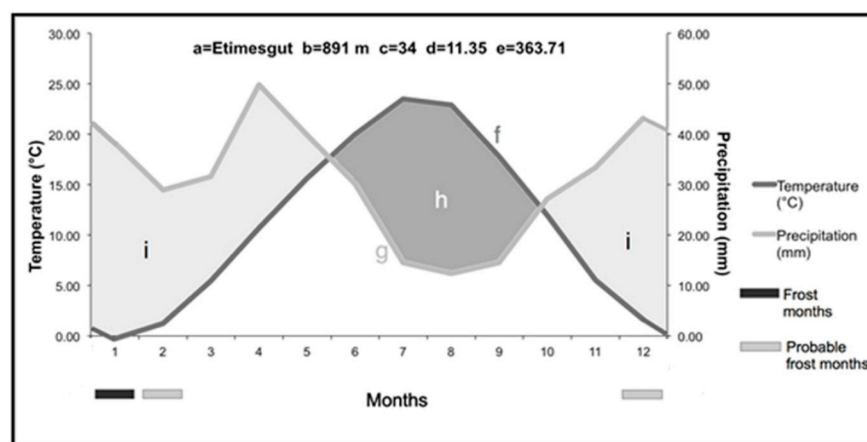


Figure 4. The ombro-thermic climate diagram: (a) meteorological station, (b) altitude, (c) observation (years), (d) average annual temperature (°C), (e) average annual precipitation (mm), (f) temperature, (g) precipitation, (h) dry season, (i) precipitation season; taken by Töre and Erik with permission [27].

2.2. Target Plant Selection

After floristic, habitat, vegetation, and literature studies, we determined the target endemic, rare, and threatened species in the study area. In this process, we mainly used the criteria described in detail by Fenu et al., 2020 [12], which include (1) threat level (given by the International Union for Conservation Nations, IUCN, 2020) [39], (2) the “regional responsibility” criterion, (3) “policy species” criterion, and (4) vascular plants associated with Central Anatolian steppe habitats that are severely threatened by anthropogenic impacts.

2.3. In Situ Conservation

A species-rich marl steppe area (hotspots within a hotspot) (approximately 5360 m², located at 40°06'12.00" N–32°30'05.98" E, at an altitude of 961 m) was selected for further conservation studies in the Kazan Soda license area (Figures 2 and 3). This area is closed to all kinds of residential, commercial, grazing, and agricultural activities. In this way, we protected the natural habitats in order to exclude the access of humans and herbivores. Therefore, this area was surrounded by a fence, and no horticultural treatments were adopted. The area is within the natural distribution range of the conserved taxa. We decided to protect as many natural plant species as possible in this species-rich area; of course, we paid particular attention to endemic, rare, and threatened species. On the other hand, we plan to expand this protected area with the arrival of new specimens every year. Although the visit is free for everyone, no one can visit this protection area without permission and an appointment. In this selected conservation area, we protected both the species (including endemic and rare ones) that are already there and translocated species (see results). Thus, we applied both in situ and ex situ conservation approaches in conjunction.

2.4. Ex Situ Conservation

There are 11 endemic and rare taxa that have been translocated to the plant protection area for ex situ conservation. All these taxa (except *Fritillaria imperialis* Steudel and Hochst.) occur naturally in the same or similar steppe habitats and plant communities in the immediate vicinity of the protected area. Only *Fritillaria imperialis* is naturally distributed in Eastern Anatolia (Türkiye), Afghanistan, Iran, Iraq, Pakistan, and the Western Himalayas, far from our plant protection area.

2.5. Translocation Process

Based on endemism, rareness, threats (both on species and their habitats), population size, and life forms of plants, we carefully translocated (the controlled introduction of plant material into a natural or managed area [46]) plant species (full plant, generative and vegetative organs, fruits, seeds, etc.) to the plant protection area. Only annual, perennial herbaceous, and semi-shrub plants were translocated to the plant protection area. No shrubby or woody species were translocated. While some of the transported plants (i.e., juvenile plants) were first planted in pots, some of them were directly planted in the protected area. The plants developed in pots were then transferred to the protected area (Figure 5).

Many species were already growing naturally in the protected area. Some of these species were endemic and rare, and they were already planned to be protected. In addition, the list of plant species and the number of individuals (either juvenile or mature), bulbs, rhizomes, and achenes (fruit type) transported into the protected area are as follows: *Campanula damboldtiana* P.H. Davis and Sorger (local endemic), 10 individuals in pots and 5 individuals in the protection area; *Aethionema turcica* H. Duman and Aytaç (local endemic), 4 individuals in pots and 10 individuals in the protection area; *Scutellaria yildirimlii* M. Çiçek and Yaprak (regional endemic), 6 individuals in pots; *Aethionema dumanii* M. Vural and N. Adıgüzel (regional endemic), 5 individuals in pots; *Salvia tchihatcheffii* (Fisch. and Mey.) Boiss. (regional endemic), 3 individuals in pots and 5 individuals in the protection area; *Iris schachtii* Markgraf (widely distributed endemic), 5 rhizomes in pots and 250 rhizomes in the protection area; *Linum cariense* Boiss. (widely distributed endemic), 5 individuals in pots; *Sideritis galatica* Bornm. (regional endemic), 3 individuals in pots; *Cyanus tchihatcheffii* (Fisch. and C.A.Mey.) Wagenitz and Greuter (local endemic), about 1000 achenes in the protection area; *Rosa gallica* L., 100 individuals in the protection area; and *Fritillaria imperialis* (not endemic but rare), 30 bulbs in the protection area. Translocations were carried out mainly between autumn and early spring.

The protected area is constantly maintained by gardeners. This prevents the introduction of invasive plants. On the other hand, since translocated plants already grow in similar or identical habitats in nearby areas, they do not require specific soil, climate, or habitat types. Since 2016, the plant protection area has been monitored every season by Prof. Dr. Hayri Duman in order to regularly check whether the plants survived successfully after translocation. If the translocated plant produced flowers and fruits in the following year, the translocation was considered successful [47]. For translocation procedures, the guide given by Commander et al. was used [48].

In addition, seeds of six endemic plants (see results), particularly local endemic ones, were collected for sending to the National Seed Bank of Türkiye (Ankara) and for use in future conservation studies.

A small visitor center was built to give information about our collections and conservation studies and increase public awareness of global biodiversity and conservation studies. Signs showing the scientific and Turkish vernacular names of all taxa and their endemism status were placed next to the plants, and walking paths were built for visitors (Figure 5).

After establishing the protection area, we signed a protocol with the Ministry of Agriculture and Forestry, the Ninth Regional Directorate, to protect Ankara's endemic plants in this protection area.



Figure 5. (a) The plant protection area was prepared for conservation studies. (b) The translocation of plants to the plant protection area. (c) The visitor center and the entrance of the plant protection area. (d) Primary school students visiting the plant protection area. (e–h) Photos from different parts of the plant protection area.

3. Results

With this study, for the first time in Türkiye, a “Plant Protection Area” was established to protect rare and endemic plant species with joint in situ and ex situ conservation approaches.

According to floristic studies in the Kazan Soda license area, we found 258 plant taxa, 41 of which are endemic (Table S1). According to the *Turkish Red Data Book* [38] and the additional literature [24,40–45], these species are classified as 3 Critically Endangered species (CR), 2 Endangered species (EN), 2 Vulnerable species (VU), 3 Near-Threatened species (NT), and 31 Least Concern species (LC) (Table S1). Among the species identified in the Kazan Soda license area, 185 plant species belonging to 43 families, 28 of which are endemic, have been placed under protection in the selected suitable habitat (for in situ conservation) within the license area. In addition, two more plant species (*Cyanus tchihatcheffii* and *Fritillaria imperialis*, cultivated specimen), one of which is endemic (*Cyanus tchihatcheffii*-CR), that naturally grow in the Gölbaşı county of Ankara have been moved into the plant protection area. Therefore, the number of endemic plant species protected in the endemic plant conservation area has reached 29. The list of endemic and rare species protected in the plant protection area is given in Table S1. Photos of some endemic species are also given in Figure 6.

There are basically two plant communities in the study area: the marl steppe and the degraded *Pinus nigra* forest with *Quercus pubescens*. Marl steppe vegetation forms the most common vegetation type of the study area since the soil is largely marl. The dominant species of the habitat are *Thymus sipyleus* Boiss. subsp. *rosulans* (Borbas) Jalas, *Astragalus microcephalus* Willd., *Bromus tomentellus* Boiss., *Hedysarum varium* Willd., *Ferulago galbanifera* (Miller) W. Koch, *Genista albida* Willd., *Genista aucheri* Boiss., *Globularia orientalis* L., *Ajuga salicifolia* (L.) Schreber, *Veronica multifida* L., *Asperula bornmuelleri* Velen, *Salvia absconditiflora* (Montbret and Aucher ex Benth.) Greuter and Burdet, *Salvia hypargeia* Fisch. and Mey., *Salvia tchihatcheffii*, *Moltkia coerulea* (Willd.) Lehm., *Koeleria cristata* (L.) Pers., *Iris schachtii*, and *Euphorbia macroclada* Boiss. Local endemics *Campanula damboldtiana* and *Astragalus densifolius* Lam. subsp. *ayashensis* Aytaç and Ekim are also distributed in this habitat. The marl steppe habitat in the study area is rich in both floristic diversity and endemism. In the study area, natural *Pinus nigra* forests are distributed only around Dedeçam Hill. These remnant forests also indicate that the study area was previously covered with *Pinus nigra* forests. The height of black pines, which do not have a very healthy and closed cover, does not exceed 3–4 m. In this habitat dominated by black pines, *Cotoneaster nummularia* Fisch. and Mey., *Rosa canina* L., *Ferulago aucheri* Boiss., *Scorzonera tomentosa* L., *Prangos meliocarpoides* Boiss., and *Sideritis galatica* are widespread.

Among the protected endemic species, *Campanula damboldtiana*, *Cyanus tchihatcheffii*, *Astragalus densifolius* subsp. *ayashensis*, *Aethionema turcica*, *Erodium sibthorpiatum* Boiss., *Scutellaria yildirimlii*, *Aethionema dumanii*, and *Salvia tchihatcheffii*, in particular, are facing a very high extinction risk due to their very small and/or separated populations that are very close to the Ankara city center, have a small population size, and prefer mainly specific marl steppe habitat. Below, detailed population and habitat information about these species is given. Our very recent field observations in 2024 around marl steppe habitats in Ankara and in Central Anatolia show that natural distribution areas of these species are mostly invaded by urbanization, hobby gardens, agricultural areas, pollution, and industrialization activities.

According to the most recent species conservation action plan, *Campanula damboldtiana* is reported to live only in five small populations close to each other, in disturbed oak woodland and steppe habitats, on gypsum and marly-clay soils in Kahramankazan, Sincan, and Ayaş counties in Ankara. Unfortunately, the numbers of individuals in the populations was not reported in this study. The biggest threats affecting the species were identified as mining, field opening, and road-widening activities. In the most recent IUCN assessment of the species, the threat category was determined as CR. The species is also listed in Annex 1 of the BERN (Convention on the Conservation of European Wildlife and Natural Habitats) convention [42].

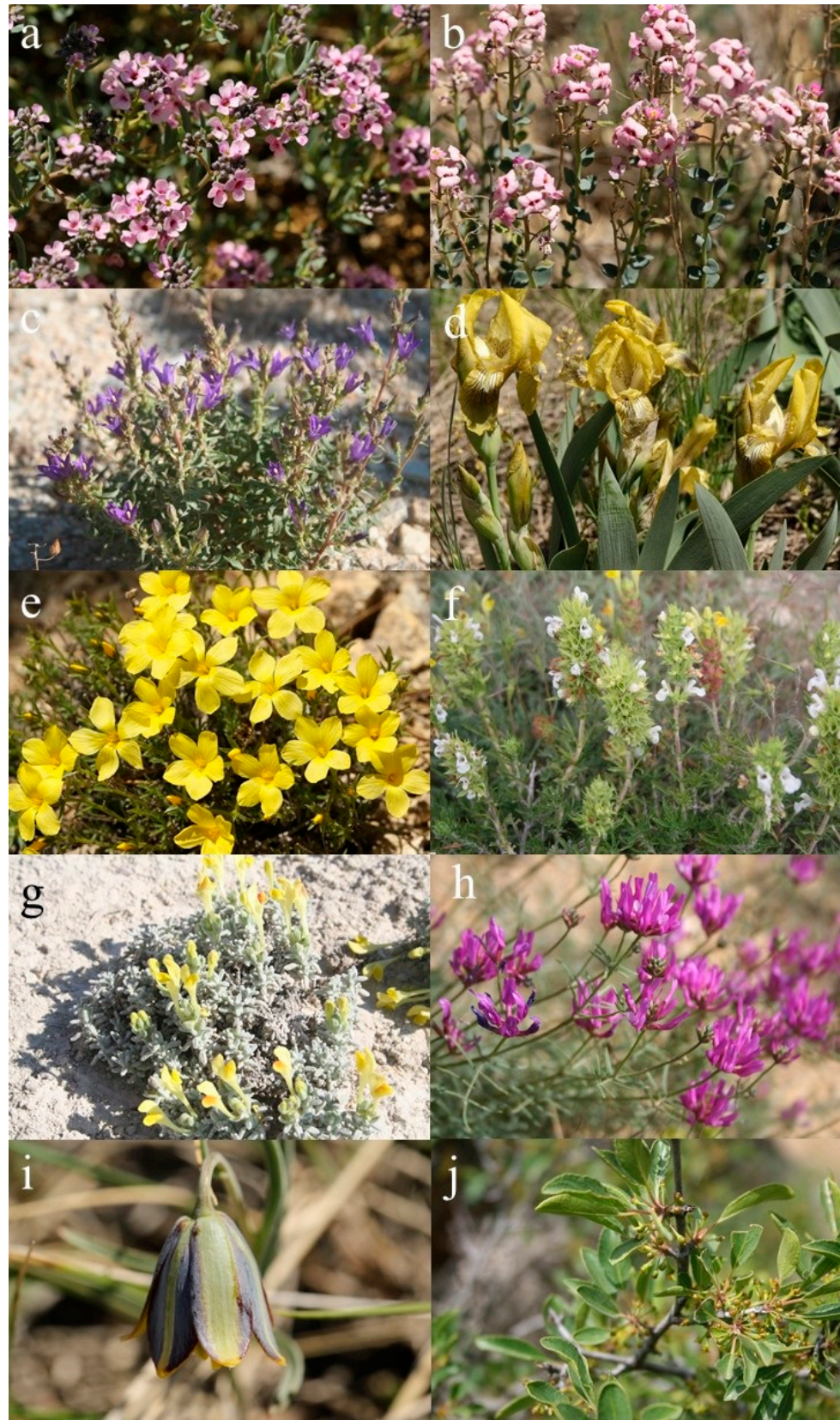


Figure 6. Some protected endemic and rare plant species in the plant protection area. (a) *Aethionema dumanii*. (b) *Aethionema turcica*. (c) *Campanula damboltiana*. (d) *Iris schachtii*. (e) *Linum cariense*. (f) *Salvia tchihatcheffii*. (g) *Scutellaria yildirimlii*. (h) *Astragalus xylobasis* var. *angustus*. (i) *Fritillaria fleischeriana*. (j) *Rhamnus rhodopeus* subsp. *anatolicus* (photos from Prof.Dr. Hayri Duman and Murat Doğan).

According to a recent study on *Cyanus tchihatcheffii*, it is known to occur naturally only in a few small populations in close proximity to each other in the Gölbaşı county of Ankara, although it was more widely distributed in the past. Fields and roadsides, cultivated fields and fallow fields, and clayey, alkaline deep soils constitute the habitat of the species. The number of individuals of the annual *Cyanus tchihatcheffii* in all populations is reported to be less than 20,000. The main factors threatening the populations of the species with showy flowers are as follows: urbanization, habitat degradation, intensive agriculture activities and herbicide use, stubble burning, and collection at the wrong time. In the most recent IUCN assessment of the species, the threat category was CR. The species is also listed in Annex 1 of the BERN (Convention on the Conservation of European Wildlife and Natural Habitats) convention.

Astragalus densifolius subsp. *ayashensis* is known only from the Ayaş district of Ankara province in steppes; gravelly–stony, marly, and calcareous steppes; slopes; and field edges. In recent studies, the number of mature individuals was 1100, and the total distribution area was 4 km². Therefore, the IUCN threat category of this taxon is assessed as CR [24,41].

Aethionema turcica is known only from two weak populations (Polatlı-Acıkır and Ayaş-Aysantibeli) from Ankara. The species grows in steppe ecosystems on gypsiferous and white marl soils, and there are about 600 mature individuals in the two populations. Therefore, the IUCN threat category of this taxon is CR. In particular, field-clearing activities are a significant threat to the species [24].

Although the type locality of *Erodium sibthorpiatum* subsp. *sibthorpiatum* is Bursa (NW Anatolia), only a few localities around Ankara have been recorded. This species has a very narrow distribution and is reported to be distributed in rocky and stony areas. The IUCN threat category of this taxon is EN, though the population size and number of individuals in the populations are not specified [24].

Scutellaria yildirimlii is only known from six localities in the gypsiferous steppes between the Ankara (Ayaş, Polatlı) and Eskişehir (Sivrihisar) provinces. Its area of occupancy (AOO) and Extent of Occurrence (EOO) were calculated as 24 km² and ~1305 km², respectively. In all populations, there are about 92,943 mature individuals that are live. The main threats to the populations are the expansion of agricultural areas, reforestation activities, and overgrazing. Based on all the available data, the IUCN threat category assessed for it is VU [43].

According to the available data, the endemic species *Aethionema dumanii* is distributed in the Eskişehir, Ankara, and Afyonkarahisar provinces in Central Anatolia, with about eight populations in marl and gypsum steppes between an altitude of 840 and 1400 m [24,44]. However, in a recent study, another record of the species was given from the marl steppe ecosystem in Sivas province in the eastern part of Central Anatolia at an altitude of 1600 m [45]. Therefore, the distribution area of the species has expanded considerably with this record. Considering the population number and distribution area, the IUCN threat category of the species was determined as VU.

Salvia tchihatcheffii is only known from several local populations in Central Anatolia. It mainly grows on marl and gypsum steppe, limestone slopes, and other open steppe habitats, rarely open *Pinus* woodland. The main threats to the populations are the expansion of agricultural areas, urbanization, reforestation activities, and overgrazing. Based on all the available data, its IUCN threat category was assessed as VU [22,23].

The three other endemic species (*Sideritis galatica*, *Marrubium trachyticum* Boiss., and *Fritillaria fleischeriana* Steudel and Hochst.) in the study area and the protected area are classified as NT according to the *Turkish Red Data Book* based on the IUCN criteria because they have a higher number of populations and mature individuals, their distribution areas are wide, and their extinction tendency is lower than the other species according to the available data [38,39]. Similarly, 31 endemic and rare species in the study area, 20 of which are also in the protected area, are classified as LC in the *Red Data Book of Turkish Plants* [38] (Table S1). For the remaining taxa (none of them endemic and rare) in the study area and

the protected area, no IUCN threat category assessment has been made in the *Red Data Book of Turkish Plants* [38] (Table S1).

In 2023 and 2024, the compatibility of the translocated species in the protected area was checked and maintenance work continued. The results showed that, except for *Aethionema turcica* (survival rate 50%), almost all other plant taxa were successfully (survival rate ca. 90%) adapted to the protection area, as expected. This may be due to the fact that the translocated specimens had already been moved from the nearby natural habitat of the species to the protection area, and their ecological requirements had been met. Observations from the spring to the fall of 2024 showed that most of the translocated plants produced flowers, fruits, and seeds.

Other taxa already growing naturally in the protected area developed quite well, producing fruits and seeds. This is probably due to the fact that herbivores were prevented from entering the protected area.

Suitable fruits and seeds of the endemic plants were stored to be used for conservation studies in the following years. The seeds of *Aethionema dumani*, *Erodium sibthorpiatum*, *Scutellaria yildirimlii*, *Sideritis galatica*, *Salvia tchihatcheffii*, and *Campanula damboldtiana* were collected (at least 100 seeds per species) and sent to National Seed Bank of Türkiye (Ankara). We plan to collect more seeds from all endemic and rare plants to continue our conservation studies and send the seeds again to the National Seed Bank of Türkiye (Ankara).

In the Kazan Soda license area, floristic studies have shown that there are three conifer families (5.8%) with three genera (2.5%) and five taxa (1.9%). Dicots are the richest group in the Angiosperms with 43 families (84.3%), 164 genera (83.6%), and 217 taxa (84.1%). On the other hand, monocots have five families (9.8%), 27 genera (13.7%), and 36 taxa (13.9%).

According to taxon number, the largest families in the study area are Asteraceae (34 taxa), Fabaceae (27 taxa), Lamiaceae (25 taxa), Poaceae (22 taxa), Brassicaceae (19 taxa), Apiaceae (18 taxa), Boraginaceae (9 taxa), and Liliaceae (9 taxa). This is not a surprising result because these families are also the largest plant families distributed in Ankara and Türkiye.

According to taxon number, the largest genera are *Astragalus* L. (nine taxa), *Salvia* L. (four taxa), *Allium* L. (four taxa), *Centaurea* L. (four taxa), *Bromus* L. (three taxa), *Aegilops* L. (three taxa), *Anthemis* L. (three taxa), *Crepis* L. (three taxa), *Trifolium* Tourn. ex L. (three taxa), *Aethionema* W.T. Aiton (three taxa), *Alyssum* L. (three taxa), and *Helianthemum* Mill. (three taxa).

According to the phytogeographic distribution in the study area, 154 taxa (61%) are widely distributed, 77 taxa (30%) are of the Irano-Turanian element, 13 taxa (5%) are of the Mediterranean element, and 9 taxa (4%) are of the Euro-Siberian element.

4. Discussion and Conclusions

Recent studies have shown that about 40% of plants globally are at risk of extinction, mainly due to diverse anthropogenic activities [49]. Much work has been done in recent years on the conservation of plants and their habitats. These studies have generally been either in situ or ex situ conservation studies [50,51]. However, studies that combine in situ and ex situ studies are rather rare [12,52]. The CARE-MEDIFLORA project is one of the examples of such joint studies [12].

Many studies have been carried out in the Mediterranean basin, especially after 2010, to translocate threatened plants to in situ conservation areas. Most of these studies have been carried out in Spain, Italy, and France. However, only a few studies have been published on such translocation studies from the Mediterranean basin [52].

Mountain steppes in Central Anatolia are mainly dominated by perennial grasses of *Bromus*, *Festuca*, and *Stipa*, as well as the tragacanthic forms of the *Astragalus* species and *Onobrychis cornuta* (L.) Desv., accompanied by a great diversity of herbaceous non-graminoid plants [53]. Anatolia constitutes the center of evolution of most of the large Irano-Turanian genera such as *Astragalus* L., *Verbascum* L., *Salvia* L., *Acantholimon* Boiss.,

Acanthophyllum C.A.Mey., *Cicer* L., *Dianthus* L., *Onosma* L., *Euphorbia* L., *Gypsophila* L., *Minuartia* Loefl., *Noaea* Moq., *Onobrychis* Mill., *Oxytropis* DC., and *Scorzonera* L. [54,55].

As of 2021, the ratio of the total protected areas under the responsibility of the Ministry of Agriculture and Forestry and the General Directorate of Protection of Natural Assets of the Ministry of Environment, Urbanization, and Climate Change to the country's surface area was 12.92% [56]. However, this ratio is much lower in the Anatolian steppe ecosystem. Ambarlı et al. [21] reported that there are 28 effective protected areas (strict nature reserves, national parks, and wildlife reserves) in the steppe vegetation of the Anatolian Biogeographic region (Central Anatolia, Eastern Anatolia, and South-eastern Anatolia). Three of the protected areas are in the Ankara province (Ankara Nallıhan Emremsultan wildlife reserves, Ankara Nallıhan Davutoğlu wildlife reserves, and Ankara Beypazarı Kapaklı wildlife reserves). On the other hand, it is reported that only ca. 2% of the Central Anatolian steppe area is covered by effective protected areas, which means that most steppe species are not under protection in Central Anatolia [57].

There are at least 1375 endemic plant species in the Turkish part of the Iran-Turan phytogeographic region (including all habitat types in Central, East, and South-east Anatolia geographic regions) [58].

In the last decade, some steppic plant species (i.e., *Campanula damboltiana*, *Astragalus beypazaricus* Podlech and Aytaç, *Astragalus bozakmanii* Podlech, and *Vicia parvula* Ziel.), especially local endemics, were monitored by experts for the Ministry of Agriculture and Forestry projects. In these projects, some important characteristics of the target species, such as habitats, distribution areas, population size, habitat, and threats, were determined. Although these studies are very important for understanding the ecology and sustainability of the target species, these studies focused on only one species in each project.

So far, species have been mostly protected in national parks, nature parks, nature reserves, wildlife reserves, gene protection forests, etc., by the central and local authorities in an in situ conservation approach in Türkiye. On the other hand, ex situ conservation studies have been usually done in the National Seed Bank, seed gardens, botanical gardens, and arboretums. There is a total of 13 botanical gardens and arboretums in Türkiye that are members of the International Botanic Gardens Conservation (BGCI) [59]. Therefore, ex situ conservation efforts seem inadequate for Türkiye, which has a very rich flora.

After the COVID-19 outbreak, most of the people in Türkiye changed their lifestyle. Therefore, many people bought fields that are close to the city center for easy transportation, and they built houses and hobby gardens. They use these houses for permanent living or for weekend visits. For this reason, large-scale natural areas were rapidly destroyed in the last few years around the Ankara city center.

In this project, we protected both a species-rich natural steppe habitat (hotspot within a hotspot, in situ conservation) and 11 taxa that live in similar habitats in the immediate vicinity and are threatened with extinction by moving them to the protected area and protecting them with an ex situ conservation approach. There are 29 rare and endemic taxa in the protected area, 8 of which are at high risk of extinction. This project, which is the first study in Türkiye to combine both in situ and ex situ conservation approaches at the same time, has already set an example for other conservation efforts planned for the future. In addition, we collected seeds from six local endemic species and sent them to the National Seed Bank of Türkiye (ex situ conservation). In the coming years, we aim to implement an effective conservation plan by moving other endangered steppe plant species that grow in similar habitats to the plant conservation area.

We are also trying to raise public awareness about the protection of Central Anatolian steppe vegetation and global biodiversity. That is why we bring primary school students to the study area. We teach children about biodiversity, conservation, and why we need to protect steppe areas for a sustainable environment. For this purpose, we published a handbook showing the plants in the protected area and had ornaments showing the endangered plants prepared. We also gave these as gifts to visitors.

Supplementary Materials: The following supporting information can be downloaded at <https://www.mdpi.com/article/10.3390/ecologies5040039/s1>, Table S1: Floristic list from the Kazan Soda license area. * indicates that the taxon was under protection in the plant protection area. The families, taxon name, vernacular name, distribution type, and IUCN threat categories of the studied taxon are given. Endemic and threatened species are given in bold font. Translocated plants are indicated by an exclamation mark (!).

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