Biodivers Conserv
DOI 10.1007/s10531-016-1172-0

ORIGINAL PAPER

An overview of biodiversity and conservation status of steppes of the Anatolian Biogeographical Region

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Received: 17 October 2015 / Revised: 2 May 2016 / Accepted: 21 June 2016

Abstract The Anatolian Biogeographical Region is unique in the Palearctic realm, with high plant and butterfly species richness and populations of globally threatened birds, mammals and herptiles (amphibians and reptiles). It is a place of diverse land-use practices, dating back to the earliest farming practices in the world. Among 10,930 species of vascular plants, birds, butterflies, mammals and herptiles distributed in Turkey, we identified 1130 living predominantly in steppic environments and being classified either as threatened, near-threatened or data deficient at the national level, if not globally. A total of

Communicated by Dr. Jürgen Dengler and Dr. Johannes Kamp.

Electronic supplementary material The online version of this article (doi:10.1007/s10531-016-1172-0) contains supplementary material, which is available to authorized users.

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Published online: 21 July 2016

28 effective protected areas were present in the region, covering 1.5 % of the 391,597 km^2 land area. Only 16.2 % of the threatened and near-threatened species ($n = 809$) were distributed within the protected area network, ranging from 94.1 % for birds to as low as 12.9 % for vascular plants. The total area of steppe and steppe forest vegetation has been reduced by at least 44 % of its former extent due to diverse habitat destructive activities. The most significant threats arise from unsustainable agricultural activities including overgrazing, conversion to croplands and afforestation. To maintain steppe diversity, we propose a "to-do list", including mainstreaming biodiversity, effective implementation of Turkey's Rangeland Act, conducting effective environmental impact assessments, establishing an effective site network for steppe biodiversity conservation and filling gaps in scientific knowledge.

Keywords Dry grassland · Land use · Protected area · Threat · Turkey · Vascular plants

Introduction

Turkey is a country of high species richness in the Palearctic realm, exemplified through its share in three biodiversity hotspots: Mediterranean basin, Caucasus and Irano-Anatolian (Mittermeier et al. 2011). Anatolia (Asian part of Turkey = Asia Minor and adjacent eastern areas) owes its diversity to a wide range of abiotic factors (Şekercioğlu et al. 2011), land-use history (Ambarlı and Bilgin 2014) and its position at the biological crossroads of Asia, Europe and Africa. It also played an evolutionary role as the southeastern refugium of some of the European plants and animals during the last glacial maximum and thus is a centre of intraspecific diversity (Bilgin 2011). The Anatolian Biogeographical Region (European Environment Agency 2015), i.e. the inner part of the Anatolia, still holds large areas of species-rich semi-natural steppes and steppe forests. The region overlaps with the territory of the Irano-Anatolian biodiversity hotspot in Turkey, which is one of the seven identified grassland hotspots of the Palearctic realm (Dengler et al. 2014).

Globally temperate grassland is the most threatened biome (Hoekstra et al. 2005) and the least protected with only 0.69 % being under protection (Davis et al. 1995). Similarly, conservation efforts in terms of establishing legal protected areas are biased towards forest ecosystems on coastal regions in Turkey (based on the maps provided by General Directorate of Nature Conservation and National Parks 2015a). Steppes are experiencing the tragedy of commons and are not perceived as conservation targets at the national scale. This landscape has long suffered from deforestation, overgrazing and conversion to croplands, followed by dramatic soil loss due to erosion (Çetik 1985), yet still maintained semi-natural, species-rich habitats managed in traditional ways (Ambarlı and Bilgin 2014). Since the mid of the 20th century, we witnessed another array of changes in land use: (i) agricultural intensification (Kazgan 2003), (ii) abandonment of marginal lands (Akgündüz 2008), (iii) afforestation of "bare" lands (General Directorate of Combating Desertification and Erosion 2016) and (iv) recent large-scale modification of natural environments with a developmentalist approach (Şekercioğlu et al. 2011). The effects of

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these human activities on steppe biodiversity at different levels and scales have not been documented yet.

Studies on the biological wealth of the Anatolian steppes and steppe forests date back to the 19th century and focused on taxonomy, syntaxonomy, vegetation productivity and rangeland improvement methods. They are available mostly as scientific papers and reference books (see e.g. the list of taxonomic and floristic references in Aslan 2014). However, scientific information in those resources is not readily available for decision makers and conservation practitioners. The aim of this study is to synthesise available key information about biodiversity, threats and conservation status of steppes and related steppe forests in the Anatolian Biogeographical Region in Turkey. Specific objectives are to reveal (i) the conservation status of vascular plants, birds, butterflies, herptiles (amphibians and reptiles) and mammals that depend on steppic ecosystems and are threatened now or will be in the near future, (ii) the extent of steppe vegetation destruction and degradation, (iii) conservation gaps in the national protected area network, (iv) threats acting on steppes and the biodiversity they host and (v) to propose conservation recommendations.

Materials and methods

Study region

In this study we targeted terrestrial non-wetland vegetation adapted to arid and semi-arid conditions and dominated by herbaceous plants with more than 10 % cover. We used the term "steppe" for vegetation with <10 % woody cover and the term "steppe forest" for dry and open woodlands with 11–40 % canopy cover. The boundaries of the Anatolian Biogeographical Region (European Environment Agency 2015) were adapted for this regional study. We used Emberger's classification (Dufour-Dror and Ertas 2004) on Bioclim layers (Worldclim 2015) as the main data source to refine the boundaries of the study area, and included arid, semi-arid and dry-subhumid areas, but excluded humid and sub-humid areas. In order to exclude humid forests of *Abies nordmanniana* subsp. *nordmanniana* and *Fagus orientalis* in the Black Sea region as well as *Abies cilicica* and *Cedrus libani* forests in the transitions to the Mediterranean region, we conducted a further detailed study with 1/25,000 forest stand maps of the General Directorate of Forestry (2015). A belt running from the provinces Şırnak and Hakkari to Erzurum and Tunceli was excluded only for the vegetation analyses, as it is under the effect of humid climate extending towards Zagros Mountains. This boundary defines the area of potential steppe vegetation in Turkey (Fig. 1).

The resulting area of steppes and steppe forests comprises a land area of 391,597 km^2 (36–42° N, 30–45° E), including the belt dominated by humid oak forests mentioned above (Fig. 1). In the rain shadow of the Black Sea and Taurus mountains, the region covers the central Anatolian plateau, the eastern Anatolian highlands and the southeastern Anatolian lower plateau. Central Anatolia is composed of the Tuz Gölü (Salt Lake) in the centre and plains, plateaus, rolling hills and scattered mountains of sedimentary or volcanic origin. It is fractured by branches of the Kızılırmak and Sakarya rivers. The altitude varies between (600–)800 and 1600 (−2900) m a.s.l. Eastern Anatolia is a plateau of 1000–3000 m a.s.l., but with numerous mountains higher than 3000 m a.s.l. In addition, various depressions including Van Gölü (Van Lake; 3712 km^2) as well as branches of the rivers Aras, Karasu and Euprathes give rise to a rugged terrain where topography changes over short distances.

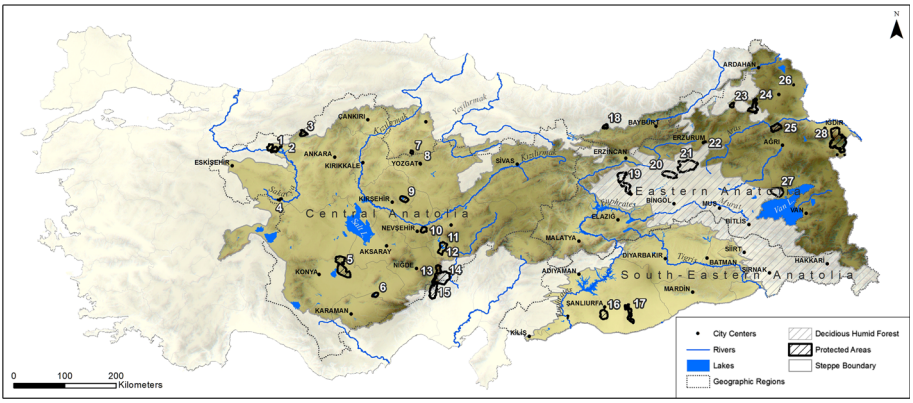

Fig. 1 Map showing the study region with strict nature reserves (SNR), national parks (NP) and wildlife reserves (WR): *1* Ankara Nallıhan Emremsultan WR, *2* Ankara Nallıhan Davutoğlan WR, *3* Ankara Beypazarı Kapaklı WR, *4* Eskişehir Sivrihisar Balıkdamı WR, *5* Konya Bozdağ WR, *6* Akgöl (Ereğli Sazlığı) SNR, *7* Boğazköy–Alacahöyük NP, *8* Yozgat Çamlığı NP, *9* Seyfe Gölü SNR, *10* Göreme Historical NP, *11* Sultan Sazlığı NP, *12* Niğde Çamardı Demirkazık WR, *13* Aladağlar NP, *14* Adana Pozantı Karanfildağı WR, *15* Gümüşhane Şiran Kulaca WR, *16* Munzur Vadisi NP, *17* Birecik Fırat WR, *18* Şanlıurfa Kızılkuyu WR, *19* Tektek Dağları NP, *20* Bingöl Kiğı Şeytandağları WR, *21* Erzurum Çat WR, *22* Nenehatun NP, *23* Erzurum Oltu WR, *24* Sarıkamış-Allahuekber Dağları NP, *25* Kars Kağızman WR, *26* Kars Kuyucuk Gölü WR, *27* Bitlis Adilcevaz Süphandağı WR, *28* Ağrıdağı NP. *Source* General Directorate of Nature Conservation and National Parks (2015a)

Southeastern Anatolia is a large and productive plain at about 300–1000 m a.s.l. in the northernmost part of Mesopotamia. It is dissected by two large rivers, Tigris and Euphrates, the volcanic Karacadağ Mountain (1919 m a.s.l.) and the Mardin Mountains (around 1200 m a.s.l.).

The study region has a continental climate that is under the effect of Mediterranean macroclimate in central and southeastern Anatolia. In eastern Anatolia it varies from arid or semi-arid cold or very cold up to semi-continental climate in the province Kars (Hamzaoğlu 2006). Average monthly temperatures for Kars and Şanlıurfa are −10.2 and 5.7 °C, respectively, for January and 17.6 and 39.1 °C, respectively, for July. Annual precipitation ranges between 363 mm at Konya and 1254 mm at Bitlis (Turkish State Meteorological Service data).

A complex geology and various soil types changing over short distances are the major drivers of plant diversity and communities of steppes in Turkey (Kurt et al. 2006). Central Anatolia largely consists of soft bedrock–chalk, clay and marl (Okay 2008; General Directorate of Mineral Research and Exploitation 2015). The majority of eastern Anatolia consists of basic igneous rocks of various kinds. A gypsum zone runs through the northern part of the study region (provinces Ankara, Çankırı, Sivas and Erzincan). Southeastern Anatolia, most of which is part of the Arabian platform, is dominated by neritic limestone of various ages in the south and undifferentiated continental clastic rocks in the north. Common soil types in the study region are brown soils, brown forest and podzolic soils, reddish brown soils; alluvial soils, hydromorphic alluvial soils, hydromorphic saline soils around rivers and lakes, chesnut soils, red podzolic soils and non-calcic brown soils (Oaeks and Arikök 1954).

Literature survey and data analysis for target species

The actual steppe cover within the boundaries of the potential steppe and forest steppe region was revealed by using data of grassland, pasture, sparse vegetation and agriculture mixed with significant portion of natural vegetation land cover classes (the latter two interpreted manually) of the CORINE Land Cover Map (European Environmental Agency 2011). We also included "sparse forests" with less than 10 % tree cover from forest stand maps (General Directorate of Forestry 2015). To find out the total area of the steppe forests, we used national forestry maps and extracted information on the woodlands with more than 10 % woody cover, dominated by oak, juniper and/or pine species (General Directorate of Forestry 2015).

To find out the conservation status of biodiversity, we focused on the species that are dependent on steppe ecosystems, i.e. steppic species. We selected vascular plants, butterflies, birds, mammals and herptiles because these were the taxa with the best data availability. For all taxonomic groups, we selected species whose main habitat is described as steppe. Additionally for plants, following the terminology of the Flora of Turkey and East Mediterranean Islands (Davis 1965–1985), we included species found in fields (waste, fallow, disturbed), edges of fields, roadsides and open and dry woodlands, as species living in such habitats do also occur in steppes. For butterflies, we selected species of open habitats of the study region; however, we eliminated those whose food plants are found in forest habitats, even if the butterfly's habitat was recorded as steppic. Steppe birds were defined using the method of Ambarlı and Bilgin (2014), based on a scoring system that takes into account the species' adaptations to steppic environments (cryptic coloration and ground nesting) and reported habitats in Turkey. When very limited or no information about the habitat preferences of a species was available, we included it if the majority of its distribution in Turkey was in the study region (i.e. >80 %).

Taxonomic status, habitat and distribution information of the species were extracted from the reviewed literature (see Online Resource 1 for complete list of literature used for vascular plants, Online Resource 2 for mammals and Online Resource 3 for herptiles in addition to the section References). To gather data on the distribution of species and vegetation types, we reviewed published literature and thesis dissertations. The basic information sources were as follows: For vascular plants we used the nine volumes of the Flora of Turkey and East Mediterranean Islands (Davis 1965–1985), supplements and follow-up checklists, the new checklist (Güner et al. 2011) for the recent nomenclature and regional distribution information. The butterfly database of the Nature Conservation Centre (Doğa Koruma Merkezi; DKM) was used to obtain most up-to date and complete data on butterflies. For herptiles we used Baran and Atatür (1998) and Baran et al. (2012). We followed the BirdLife Checklist Version 5.1 (BirdLife International 2012) for bird taxonomy and nomenclature. Finally, for mammals we used three reference books (Kryštufek and Vohralík 2005, 2009; Yiğit et al. 2006).

National Red Lists based on criteria and categories of the International Union for Conservation of Nature (IUCN 2015) were used to extract threat categories for all species defined as steppic species: Ekim et al. (2000) for vascular plants, Karaçetin and Welch (2011) for butterflies and Kılıç and Eken (2004) for birds. For herptile and mammal species, there are no national Red Lists, so global threat categories were used (IUCN 2015). Additionally, expert opinions were used to evaluate the national threat status of the species that are not threatened or assessed globally, but have a restricted range in Turkey. We included data deficient (DD), conservation dependent (CD) (only for vascular plants due to the use of IUCN Red List Categories and Criteria Version 2.3 in the Red List), vulnerable (VU), near threatened (NT), endangered (EN) and critically endangered (CR)

species in our lists. Vascular plants and butterflies with DD category were evaluated separately and not included in the protected area gap analysis due to limited data. We accepted steppic species categorised as data deficient, near-threatened or threatened as target species for steppe conservation. For vascular plant species that were described after the publication of Ekim et al. (2000) and thus not covered by the Red List (see Online Resource 1 for publications related to those species), we evaluated the distribution and added those with a restricted distribution range of <100 km^2 to our target species list. There were Red List category proposals for these new plant species as well as modifications for several others in the literature. However, we did not yet adopt these proposals because of (i) the standard IUCN evaluation missing from some of the assessments and (ii) inconsistencies in data collection efforts or methodology. Yet, in case of the rediscovery of a DD species, we included the proposed IUCN category. For all taxonomic groups, we focused on the species level. For species with more than one variety or subspecies, we considered the lowest threat category.

For an analysis of threats to biodiversity and conservation recommendations, we reviewed reports of regional or national nature conservation projects in addition to the literature in the Online Resources 1, 2 and 3. Additionally, we gathered expert opinions for threats acting on certain taxonomic groups.

Gap analysis

In Turkey, most of the land is under the ownership and authority of the state. Therefore, the major tool of biodiversity conservation is designation of legally protected areas. We assessed the degree of protection for each threatened and near-threatened species by conducting an analysis we hereafter will call "protected area gap analysis". We assumed that a species occurring in one of the protected areas with effective conservation measures benefits from those measures and is thus under protection, even if the measures are not specifically targeting this species. Species not found in any of the protected areas were considered as "conservation gaps".

At the first step, we obtained information on the protected area network of 2013 from the Ministry of Forestry and Water Affairs Head of the Information and Technology Department (General Directorate of Nature Conservation and National Parks 2015a). There are 14 different types of protected areas in Turkey, covering 7.2 % of the country (see Online Resource 4 for the list and section Conservation Gaps and Activities for other details); however, their conservation effectiveness varies drastically depending on the status of the protected area (Avcıoğlu et al. 2011). Therefore we gathered expert opinions from the authors of this study on the types of protected areas that are the most effective in protecting biodiversity. Factors taken into account were size, management objectives and legal restrictions acting on the use of natural resources. As a result, National Parks (NPs), Wildlife Reserves (WRs) and Strict Nature Reserves (SNRs) were selected as protected areas with the most effective conservation measures in Turkey. NP and SNR correspond to category II and Ia in the IUCN protected areas categories system, respectively, while WR is similar to the habitat/species management area category of IUCN, designated usually for game animals (Dudley 2008). We included reserves of the named three categories whose boundaries overlapped by more than 10 % with the study region. The recently established Sakarya Meydan Muhaberesi NP could not be included as its boundary was not available at the time of the study.

In the next step, we evaluated our target species' distributions within the protected areas. The overall goal was to identify target species that were present inside the boundaries of selected protected areas and thus potentially benefited from the conservation measures taken

in them. The remaining species were considered as "conservation gaps" in the protected area network. For this aim, we assessed the distribution of our target steppic species in protected areas by using existing distribution maps and records, and we also took into account their habitat requirements by the use of available information as indicated above. For vascular plants and butterflies, we only used point records since distribution maps were not available. For some species of mammals, herptiles and birds, we also used distribution maps provided in the literature. When available, management plans and inventories of protected areas were used in order to find target species distributed within the boundaries of each protected area. Records of a species from a protected area and the presence of suitable habitat were both assessed to identify whether a target species would be considered as present or absent. Google Earth satellite images as well as CORINE Land Cover Maps were used together with expert judgment to assess the habitats inside the protected areas. We accepted a species to occur in a protected area even if there was only one reliable record.

Results

An overview of Turkey's steppe biodiversity

Steppe and steppe forest vegetation

In terms of geography and floristic composition, the vegetation of the study region is close to the western Eurasian steppes classified in the Pontic-Kazakh steppe subregion by Smelansky and Simonov (2008) and three provinces of the West-Asian subregion of the Irano-Turanian phytogeographical region by Zohary (1973): Central Anatolia, East Anatolia-Iran and Mesopotamia. Non-halophytic steppes are classified in the phytosociological class *Astragalo-Brometea*, halophytic vegetation in the *Salicornietea fruticosae*. So far such vegetation has been classified under four orders with 25 alliances and many associations, including steppes of the Taurus Mountains in the Mediterranean region (Kurt et al. 2014) (see Online Resource 5 for the list of steppe-related alliances). There is a regional, altitudinal, geological and topographic differentiation of the vegetation. In addition, soil types and land use are important drivers of community composition. There is still a long way to go for a complete list of syntaxa as there are many spatial gaps in studies, especially in eastern and southeastern Anatolia (compare the map of available vegetation-plot data in Chytrý et al. 2016).

The Anatolian Biogeographical Region is a potential steppe and steppe forest region with a land area of approximately 321,765 km^2 (excluding the humid belt extending from the provinces Şırnak and Hakkari to Erzurum and Tunceli in eastern Anatolia); however, the CORINE 2006 Land Cover Map (European Environment Agency 2011) reveals that the actual total figure for steppes and steppe forests is 180,316 km^2 (56 % of the potential distribution). The remainder (44 %) has been converted predominantly into croplands. Most of the steppes in central and southeastern Anatolia now occur as isolated patches, whereas steppes of eastern Anatolia are rather continuous and cover large areas.

The vegetation once hosted wild cereal stands in extensive fire-maintained grasslands, enabling first farming practices (Turner et al. 2010). Since Neolithic times steppes have experienced a strong anthropogenic influence: Great civilisations such as Hittite, Phrygians, Greek, Roman, Persian, Byzantine and Ottoman modified the landscape and used its natural resources (Çetik 1985). Halophytic vegetation in central Anatolia was recently destroyed due to agricultural practices and degraded by overgrazing (Özhatay et al. 2003). Steppes of the

plains in central Anatolia, assumed to be *Bromus-Stipa* steppes, have been invaded by *Artemisia* and *Thymus* spp. due to anthropogenic effects, especially overgrazing (Walter and Breckle 1985; Kürschner and Parolly 2012; Zohary 1973). Mountain steppes in central Anatolia, most of which are secondary vegetation following forest destruction, are dominated by perennial grasses of *Bromus*, *Festuca* and *Stipa* as well as tragacanthic forms of *Astragalus* spp. and *Onobrychis cornuta*, accompanied by a great diversity of forbs (Kurt et al. 2014). Two studies showed that grazing caused drastic changes in the vegetation structure and composition, e.g. tall-grass vegetation was replaced by short-grass and dwarf-shrub dominated types, and the former abundance and richness of plant species declined (Fırıncıoğlu et al. 2007, 2009). In eastern Anatolia, where the major source of income is livestock production, there is no study reporting significant effects of grazing. In addition, there are many areas for which we do not have any information about steppe vegetation, e.g. Tunceli, Malatya, Siirt and Hakkari (see the map in Hamzaoğlu 2006). Even less is known about steppes of southeastern Anatolia: Zohary (1973) lists a few species such as *Artemisia sieberi* (recorded as *A.herba-alba* erroneously), *Phlomis bruguieri*, *Cousinia stenocephala*, *Teucium polium*, *Phlomis armeniaca*, *Astragalus caprinus* subsp. *caprinus* and *Centaurea rigida* based on Handel-Mazzetti (1914). However, probably most plains with such vegetation have meanwhile been converted into irrigated croplands (pers. comm. Ömer Faruk Kaya). Recently, studies of Kaya (2010, 2013) from the province Şanlıurfa reported vegetation types from mountainous parts dominated by *Astragalus diphtherites* var. *diphtherites*, *Convolvulus dorycnium* subsp. *oxysephalus*, *Asphodeline brevicaulis* and *Phlomis bruguieri;* rich in annuals and unpalatable species due to overgrazing.

According to Avcı (2014), only four areas are covered by steppes naturally: around Tuz Gölü (Salt Lake), Konya Plain, an area south of Şanlıurfa and the Iğdır plain. The rest of the study region has been converted to steppes due to continuous deforestation and following grazing activities. Today steppe forests cover 0.7 % (2369 km^2) of the study region. They are composed of oak and juniper formations, which are concentrated along the periphery of central Anatolia, on the mountainous area between central and east Anatolia and on the mountains of southeastern Anatolia (Mayer and Aksoy 1998). In central Anatolia, oak shrublands (*Quercus pubescens*, *Q. infectoria*), juniper formations (*Juniperus oxycedrus*, *J. excelsa*) and wild orchards (sensu stricto Wodlring and Cappers 2001) are common (Kürschner and Parolly 2012). Steppe forests dominated by *Quercus brantii* and *Quercus petraea* subsp. *pinnatiloba* are distributed along the mountains of eastern Anatolia. In southeastern Anatolia, both *Q. brantii* and *Pistacia terebinthus* subsp. *palaestina* can form woodlands (Zohary 1973; Kaya 2013, 2014). At higher altitudes and along the northern boundary of the study region, pine forests occur: *Pinus nigra* subsp. *pallasiana* forests in central Anatolia and *Pinus sylvestris* in eastern Anatolia, though the latter is much rarer. Due to anthropogenic use, such as livestock grazing, cutting for fuel or charcoal production, canopy cover and height has been decreasing, and vegetation structure and composition has been changing (Akman 1974; Çetik 1973).

Vascular plants

Of the 9753 native vascular plant species recorded in Turkey, more than 3035 are endemic to the country (Güner et al. 2011). It is assumed that half of those endemics occur in Anatolian steppes (Vural and Adıgüzel 2006). Among these, *Cyathobasis*, *Necranthus*, *Phryna*, *Physocardamum*, *Pseudodelphinium*, *Tchihatchewia* and *Vuralia* are of special interest as they represent monotypic genera. Anatolia represents the centre of evolution for most of the Irano-Turanian genera, especially cushion-forming species, whose distribution

extends eastwards to Mongolia and Afghanistan, such as *Astragalus*, *Verbascum*, *Salvia*, *Acantholimon*, *Acanthophyllum*, *Cicer*, *Dianthus*, *Onosma*, *Euphorbia*, *Gypsophila*, *Minuartia*, *Noaea*, *Onobrychis*, *Oxytropis* and *Scorzonera* (Kürschner 1986). The Anatolian steppe is a centre for secondary adaptive radiation, giving rise to numerous groups of closely related, often vicarious, neo-endemic species, explained with the recent neogenesis of Anatolia (Pils 2013). Furthermore, it is important as a centre of crop genetic diversity, known for hosting wild relatives of many legume and cereal crops such as einkorn, emmer, barley and rye (Willcox 2005).

Serpentine, limestone, gypsum rocks and saline soils host high numbers of endemic and rare plant species. For example, in the gypsiferous steppes of Sivas, 36 % of the plant species are endemic to Turkey, and 12 % are threatened at the national level (Akpulat and Çelik 2005). In the saline steppes of the driest depressions of central Anatolia, the endemism rate reaches 22 % (Kurt et al. 2004). The Anatolian Diagonal, a chain of mountains dividing central and eastern Anatolia, represents both a distribution border of plant species in east–west direction and a centre of endemism (Davis 1971; Ekim and Güner 1986).

Of 1027 target species found in the study region (Online Resource 1), we identified 755 threatened or near-threatened species (51 CR, 168 EN, 391 VU, 73 NT and 72 CD) occurring in steppes and steppe forests (Table 1). Of those, 503 (66.6 %) are endemic to Turkey. *Astragalus* and *Verbascum* are genera with a high number of threatened steppic species (59 and 47, respectively). Furthermore, among the 207 DD taxa listed in the Red List (Ekim et al. 2000), we identified 101 species as steppic. Most of the DD species are known only from specimens of 19th century collections. As they have not been recorded for decades in spite of many surveys conducted by botanists, it is assumed that most of them are either very rare or extinct in the wild. Remainder 171 rare species are without any threat category due to recent discovery, rediscovery or for some other reasons.

Table 1 Summary of conservation status of steppe-dependent threatened, near-threatened, data deficient and other rare vascular plant species in the Anatolian Biogeographical Region

National threat categories	Total number of species	Number of species in protected areas	Number of species with special protection
CR	51	4	4
EN	168	14	1
VU	391	49	4
NT	73	13	1
CD	72	17	0
DD	101	NA	NA
Rare species without a threat category	171	15	2
Total	1027	112	12

CR critically endangered, *EN* endangered, *VU* vulnerable, *NT* near threatened, *CD* conservation depended, *DD* data deficient, *NA* not applicable. Information on the national threat categories was derived from Ekim et al. (2000)

Butterflies

Turkey is the richest country for butterflies in Europe, with around 380 species and 45 endemics recorded (Karaçetin and Welch 2011). The diversity in steppes in the study region is especially high for Lycaenids (hairstreaks, blues and coppers) with 160 species. Almost one-third of them (52 species) are placed in the subgenus *Agrodiaetus*, a taxonomically difficult but species-rich group of blues particularly well-represented in Turkey and Iran. In the Anatolian Biogeographical Region, they are closely associated with steppes, and many are restricted to altitudes between 900 and 1800 m a.s.l.

The identification of Turkey's Prime Butterfly Areas (PBAs) revealed the importance of steppes of the Anatolian Biogeographical Region for butterfly diversity, with 33 of the country's core set of 65 PBAs located there, all including a considerable area of steppe (Karaçetin et al. 2011). Those areas hold populations of several endemic and threatened species.

In our study we concentrated on threatened, near-threatened and data deficient butterfly species and found that 50 species can be considered as obligate steppic species (see Online Resource 6 for the complete list). Of these species, one is listed as CR, eight are listed as EN, two as VU, two as NT, and 37 as DD (Table 2). Among the 13 threatened and near-threatened butterfly species, *Plebejus rosei* is the only CR species highly dependent on the steppes of eastern Anatolia. It has been recorded from only one location in Turkey, and that area is threatened by construction of roads (Karaçetin and Welch 2011). Of the red-listed species, three are endemics (*Aricia torulensis*, *Polyommatus dama* and *Hyponephele urartua*) and another three near-endemics (*Plebejus rosei*, *Callophrys mystaphia* and *Polyommatus diana*) with more than 60 % of their global populations occurring in Turkey.

Table 2 List of steppe-dependent threatened and near-threatened butterfly species in the Anatolian Biogeographical Region

No.	Scientific name	Endemism	National threat category	Number of protected areas species occur (percentage in 28 sites)
1	*Plebejus rosei*	Near endemic[a]	CR	0 (0)
2	*Aricia torulensis*	Endemic	EN	0 (0)
3	*Polyommatus dama*	Endemic	EN	0 (0)
4	*Callophrys mystaphia*	Near endemic[a]	EN	0 (0)
5	*Polyommatus diana*	Near endemic[a]	EN	0 (0)
6	*Apharitis cilissa*		EN	0 (0)
7	*Euphydryas orientalis*		EN	0 (0)
8	*Satyrium hyrcanicum*		EN	1 (4)
9	*Spialia osthelderi*		EN	0 (0)
10	*Hyponephele urartua*	Endemic	VU	0 (0)
11	*Polyommatus ciloicus*		VU	0 (0)
12	*Zegris eupheme*		NT	3 (11)
13	*Satyrus parthicus*		NT	0 (0)

CR critically endangered, *EN* endangered, *VU* vulnerable, *NT* near threatened. List is sorted by the national threat categories. Information on the endemism and national threat categories was derived from Karaçetin and Welch (2011)

[a] Near endemics are species with more than 60 % of their global distribution occurring inside Turkey

Birds

Turkey has one of the richest bird faunas in the Western Palearctic Region: Species occurring in European deciduous forests, Mediterranean scrubs and wetlands, Arabian semi-deserts, Caucasian mountains and central Asian steppes all meet in Turkey (Rosalear 1995). Of the 482 bird species recorded in Turkey (unpublished data), 43 are related to open grassy habitats (del Hoyo et al. 2013; Kirwan et al. 2008). Among these we have identified 18 steppe-dependent bird species that are near-threatened, threatened or data deficient at the national scale (Table 3). The list includes 14 regular breeding species, two irregular breeding species, one possible breeding species and one non-breeding species (Kirwan et al. 2008). Seven of the species are CR (*Aquila nipalensis*, *Circus macrourus*, *Falco cherrug*, *Tetrax tetrax*, *Vanellus gregarious*, *Pterocles alchata* and *Ammomanes deserti*), four are EN, and six are listed as VU at the national level (Kılıç and Eken 2004; Eken et al. 2006; Kirwan et al. 2008). Although widespread in the Asian steppes and not considered seriously threatened globally, the very small and apparently decreasing Turkish breeding populations of only one or two pairs of both *Aquila nipalensis* and *Circus macrourus* qualify them as CR nationally. Additionally, *Cursorius cursor*, listed as DD nationally, is icluded in this list as its population size is estimated to be decreasing in Turkey (Kılıç and Eken 2004; Kirwan et al. 2008).

Steppes of Turkey support a significant percentage of the western Palearctic breeding populations of several species in our list (Table 3, information based on BirdLife International 2004; Kılıç and Eken 2004; Eken et al. 2006; Kirwan et al. 2008). *Emberiza cineracea* is one of the least known breeding birds of the Western Palearctic, and Turkey supports the majority of the world population with a significant proportion breeding in southeast Anatolian rocky steppes (Albayrak et al. 2002). Although *Ammomanes deserti* is mainly distributed in the Middle East, Asia and Africa, its northernmost distribution occurs in Turkey (Barış 1989). *Otis tarda* and *Tetrax tetrax* are both characteristic steppe species and are among Turkish breeding birds whose populations are in long-term decline (Kirwan et al. 2008; Karakaş and Akarsu 2009).

Mammals

Turkey hosts 151 mammal species (Kryštufek and Vohralik 2009; Yiğit et al. 2006). Of the six endemic mammal species in Turkey, two (*Microtus anatolicus* and *M. dogramacii*) live at steppe sites neighbouring the Taurus Mountains, which served as a refuge during the last glacial maximum (Bilgin 2011). Both species possibly originated from this refuge and then expanded their distribution area toward steppic areas in central Anatolia.

We identified 27 steppe-dependent species, representing 18.5 % of the mammal fauna of the country (22 species of rodents, one hedgehog, three ungulates and one bat species; see Online Resource 2). There are 13 mammal species listed as threatened, near threatened or data deficient globally (1 EN, 4 VU, 4 NT and 4 DD; Table 4). In addition, *Gerbillus dasyurus*, a restricted-range steppe-dependent species listed as Least Concern (LC) globally is included in our list. In Turkey it is restricted to a small area of 3–4 km^2 (Yiğit et al. 1997). Among the target species, *Microtus anatolicus* is endemic to Turkey, and two other species, *Meriones dahli* and *Mesocricetus auratus*, are regional endemics (Table 4). *Meriones dahli* lives in a very small area in steppic mountain slopes in Iğdır and adjacent parts of Armenia. It is the most spatially restricted species in and around Turkey and is classified as EN. All three large herbivores of the Anatolian steppes, *Gazella gazella*, *Gazella subgutturosa* and *Ovis orientalis*, are VU at global scale, occurring in small populations at

Table 3 List of steppe-dependent bird species of the Anatolian Biogeographical Region that are threatened, near-threatened or data-deficient at the national scale

No.	Common name	Scientific name	European breeding population size	Turkish breeding population size	National threat category	Global threat category	Number of protected sites species occur (percentage in 28 sites)
1	Saker falcon	*Falco cherrug* Gray, 1834	350–500 pairs	3–10 pairs	CR	EN	2 (7)
2	Steppe eagle	*Aquila nipalensis* Hodgson, 1833	800–1200 pairs	2–5 pairs[a]	CR	LC	2 (7)
3	Pin-tailed sandgrouse	*Pterocles alchata* Linnaeus, 1758	4200–6200 pairs	100–500 pairs	CR	LC	2 (7)
4	Desert lark	*Ammomanes deserti* Lichtenstein, 1823	30–120 pairs	30–120 pairs	CR	LC	3 (11)
5	Pallid harrier	*Circus macrourus* Gmelin, 1770	300–1100 breeding females	1–10 breeding females	CR	NT	1 (4)
6	Little bustard	*Tetrax tetrax* Linnaeus, 1758	60,900–120,000 individuals	5–50 males	CR	NT	1 (4)
7	Sociable lapwing	*Vanellus gregarius* Pallas, 1771	11,200 individuals	c 3200 (Oct 2007)—largest flock recorded for >100 years[b]	CR	CR	0 (0)
8	Montagu's harrier	*Circus pygargus* Linnaeus, 1758	54,500–92,200 breeding females	400–800 breeding females	EN	LC	13 (46)
9	Short-eared owl	*Asio flammeus* Pontoppidan, 1763	54,700–186,000 pairs	1–20 pairs	EN	LC	7 (25)
10	Desert wheatear	*Oenanthe deserti* Temminck, 1825	110–1100 pairs	10–100 pairs[a]	EN	LC	1 (4)
11	Great bustard	*Otis tarda* Linnaeus, 1758	17,100–20,800 males	100–200 males	EN	VU	5 (18)
12	See-see partridge	*Ammoperdix griseogularis* Brandt, 1843	4000–6100 pairs	4000–6000 pairs	VU	LC	3 (11)
13	Grey partridge	*Perdix perdix* Linnaeus, 1758	1,380,000–2,670,000 pairs	1000–2000 pairs	VU	LC	14 (50)

Table 3 continued

No.	Common name	Scientific name	European breeding population size	Turkish breeding population size	National threat category	Global threat category	Number of protected sites species occur (percentage in 28 sites)
14	Common quail	*Coturnix coturnix* Linnaeus, 1758	3,320,000–6,720,000 pairs	300,000–800,000 pairs	VU	LC	21 (75)
15	Black-bellied sandgrouse	*Pterocles orientalis* Linnaeus, 1758	10,400–19,100 pairs	5000–10,000 pairs	VU	LC	9 (32)
16	Whinchat	*Saxicola rubetra* Linnaeus, 1758	6,470,000–10,700,000 pairs	2000–8000 pairs	VU	LC	13 (46)
17	Cinereous bunting	*Emberiza cineracea* Brehm, 1855	3200–5700 pairs	3100–5500 pairs	VU	NT	2 (7)
18	Cream-coloured courser	*Cursorius cursor* Latham, 1787	450–2800 pairs	250–500 pairs[c]	DD	LC	2 (7)

CR critically endangered, *EN* endangered, *VU* vulnerable, *NT* near threatened, *DD* data deficient, *LC* least concern. List is sorted by the national and secondly global threat categories. Data on European breeding population sizes were obtained from BirdLife International (2004). Information on breeding populations and threat categories at national level was obtained from Kılıç and Eken (2004). Global threat categories were retrieved from Global IUCN Red List for birds (BirdLife International 2015)

[a] Irregular breeding species

[b] Non-breeding species

[c] Possible breeding species

Table 4 List of steppe-dependent threatened, near threatened or data deficient mammal species in the Anatolian Biogeographical Region

No.	Scientific name	Endemism	Global threat category	Bern Convention appendices species listed	Number of protected areas species occur (percentage in 28 sites)
1	*Meriones dahli*	Regional endemic[a]	EN		1 (4)
2	*Gazella gazella*		VU[c]		0 (0)
3	*Ovis orientalis*		VU[c]	III	2 (7)
4	*Mesocricetus auratus*	Regional endemic[a]	VU		0 (0)
5	*Gazella subgutturosa*		VU	II	1 (4)
6	*Allactaga euphratica*		NT		2 (7)
7	*Mesocricetus brandti*		NT		9 (32)
8	*Prometheomys schaposchnikowi*		NT		0 (0)
9	*Spermophilus xanthoprymnus*		NT		13 (46)
10	*Gerbillus dasyurus*		LC[b]		0 (0)
11	*Microtus anatolicus*	Endemic	DD		1 (4)
12	*Microtus irani*		DD		0 (0)
13	*Nannospalax ehrenbergi*		DD		2 (7)
14	*Nannospalax xanthodon*		DD		21 (75)

EN endangered, *VU* vulnerable, *NT* near threatened, *DD* data deficient. List is sorted by the threat status. Global threat category information was obtained from IUCN (2015). Information on the species in the Bern Convention appendices is based on Council of Europe (1979)

[a] Populations of regional endemic species occur only in Turkey and neighbouring countries

[b] *Gerbillus dasyurus* is listed as LC in IUCN database but included in this list as it is restricted to 3–4 km^2 in Turkey

[c] *Gazella gazella* and *Ovis orientalis* are listed as VU in the IUCN database (IUCN 2015) but included in this list as the population sizes do not exceed 400 and 1000 individuals, respectively, see the text for details

very restricted sites in Turkey due to loss of habitat and hunting pressure in the past. *Gazella gazella* is limited to less than 40 km^2 with a population of around 400 individuals. *Ovis orientalis* has isolated populations with less than 1000 individuals in one native site and three reintroduction sites in central Anatolia and also another population in eastern Anatolia, suspected to be moving between Turkey and Iran at different times of the year (Mertyürek and Baker 2012).

Herptiles

Of the 164 herptile (amphibian and reptile) species living in Turkey, 103 are distributed in the Anatolian steppes, representing 63 % of the herptile fauna of the country (3 urodelan, 8 anuran, 1 tortoise, 4 turtle, 46 lizard and 41 snake species). Among these species, 15 are endemic to the country. We identified 20 of them as threatened, near-threatened or data

deficient at the national level (Table 5, see Online Resource 3 for a complete list of literature used). Additionally, *Asaccus barani which* was first described from southeastern Anatolia in 2011 and has not yet been evaluated by the IUCN globally is included in the list due to its very restricted range in Şanlıurfa province. Ten of them are endemic to Turkey with very small ranges and population sizes.

All genera listed in Table 5, except species from *Eirenis and Letheobia*, are confined to the Palearctic realm. The genera *Neurergus*, *Asaccus*, *Iranolacerta* and *Montivipera* are found only in Turkey and neighbouring countries. Target amphibian species are specialised in slow-flowing, densely-vegetated clean streams on high mountains covered by steppes. On the other hand, habitats of target reptile species are mainly stony and rocky steppes that are not far from freshwater sources providing insect food.

Among the 21 steppe-dependent herptile species, five are listed as CR (*Phrynocephalus horvathi*, *Acanthodactylus harranensis*, *Eremias pleskei*, *Montivipera wagneri* and *Vipera darevskii*), three as EN and three as VU globally (Table 5). Furthermore, three species are listed as NT and five as DD. One species, namely *Darevskia sapphirina*, is LC globally, while in Turkey the species is known only from the vicinity of a small district of the province Van. Finally, *Asaccus barani* is a species that was first described from south-eastern Anatolia in 2011 and has not yet been evaluated by the IUCN globally.

Acanthodactylus harranensis is an example of restricted-range steppic herptiles in Turkey. This species is currently known only from the ruins of the ancient city of Harran in Şanlıurfa, with a total known range of approximately 3.6 km^2 (Baran et al. 2005; Eken et al. 2006). Its habitats are sandy and stony steppes and semi-desert areas with *Peganum harmala* shrubs. It is threatened by touristic activities, overgrazing and possibly also by continuing excavation of ruins (Kaska et al. 2009; IUCN 2015). This species does not tolerate intensive agriculture with excessive use of pesticides, which occurs in the fields surrounding the historic site.

Land use and threats to biodiversity

The drivers of degradation of temperate grasslands as described by Peart (2008) are also valid for the steppe ecosystems of the Anatolian Biogeographical Region. Below we explain the major land use activities and threats posed by human activities.

Livestock grazing

Anatolia hosted some of the first examples of plant and animal domestication with initial steps dating back to 11,500 cal BP for sheep and 10,500 cal BP for crop plants (Zeder 2008). A diverse land use history during the past 10,000 years contributed to rich habitat diversity in Anatolian landscapes (Kürschner and Parolly 2012; Asouti and Kabukcu 2014).

Livestock keeping is one of the oldest livelihood practices in Anatolia; therefore grazing by livestock (mostly sheep and cattle) is part of the dynamics of the steppe ecosystems (Asouti and Kabukcu 2014). Low productivity due to semi-arid conditions and prolonged summer droughts allow only for rangeland grazing in steppes of central and southeastern Anatolia. In the more humid and productive highlands of eastern Anatolia, hay making and transhumance grazing are also commonly practiced. Livestock keeping is usually coupled with cereal and pulse production for subsistence or semi-subsistence in family farms, except for areas with very cold winters in eastern Anatolia (Karagöz 2006).

Table 5 List of steppe-dependent threatened, near-threatened or data deficient herptile species in the Anatolian Biogeographical Region

No.	Scientific name	Endemism	Global threat category	Bern Convention appendices species listed	Number of protected areas species occur (percentage in 28 sites)
1	*Acanthodactylus harranensis* Baran, Kumlutaş (Lanza, Sindaco, Ilgaz, Avci & Crucitti, 2005)	Endemic	CR	III	0 (0)
2	*Phrynocephalus horvathi* (von Mehely, 1894)		CR	III	1 (4)
3	*Montivipera wagneri* (Nilson & Andrén, 1984)	Endemic	CR	II	2 (7)
4	*Vipera darevskii* (Vedmederja, Orlov & Tuniyev, 1986)		CR	III	0 (0)
5	*Eremias pleskei* (Nikolsky, 1905)		CR	III	1 (4)
6	*Darevskia bendimahiensis* (Schmidtler, Eiselt & Darevsky, 1994)	Endemic	EN	III	0 (0)
7	*Darevskia uzzelli* (Darevsky & Danielyan, 1977)	Endemic	EN	III	2 (7)
8	*Montivipera albizona* (Nilson, Andrén and Flärdh, 1990)	Endemic	EN	II	0 (0)
9	*Neurergus strauchii* (Steindachner, 1887)	Endemic	VU	II	1 (4)
10	*Testudo graeca* (Linnaeus, 1758)		VU	II	28 (100)
11	*Vipera (Pelias) eriwanensis* (Reuss, 1933)		VU	III	7 (25)
12	*Salamandra infraimmaculata* (Mertens, 1948)		NT	III	4 (14)
13	*Darevskia unisexualis* (Darevsky, 1966)		NT	III	4 (14)
14	*Montivipera raddei* (Boettger, 1890)		NT	III	2 (7)
15	*Darevskia sapphirina* (Schmidtler, Eiselt & Darevsky, 1994)	Endemic	LC[a]	III	0 (0)
16	*Bufotes variabilis* (Pallas, 1769)		DD	III	28 (100)
17	*Eublepharis angramainyu* (Anderson & Leviton, 1966)		DD	III	0 (0)
18	*Iranolacerta brandtii* (De Filippi, 1863)		DD	III	0 (0)
19	*Eirenis thospitis* (Schmidtler & Lanza, 1990)	Endemic	DD	III	1 (4)
20	*Letheobia episcopus* (Franzen & Wallach, 2002)	Endemic	DD	III	1 (4)

Table 5 continued

No.	Scientific name	Endemism	Global threat category	Bern Convention appendices species listed	Number of protected areas species occur (percentage in 28 sites)
21	*Asaccus barani* (Torki, Ahmadzadeh, Ilgaz, Avcı & Kumlutaş, 2011)	Endemic	NE[b]	III	2 (7)

CR critically endangered, *EN* endangered, *VU* vulnerable, *NT* near threatened, *LC* least concern, *DD* data deficient, *NE* not evaluated. List is sorted by the threat status. Global threat category information was obtained from IUCN (IUCN 2015). Information on the species in the Bern Convention appendices is based on Council of Europe (1979)

[a] *Darevskia sapphirina* (Schmidtler, Eiselt & Darevsky, 1994) listed as LC in IUCN database but included in this list as it is known only from its type locality in Turkey

[b] Species identified in 2011, not yet evaluated by IUCN

Between 1950 and 1980, marginal lands were ploughed extensively in Turkey, resulting in shrinkage of rangelands (Kazgan 2003). At the same period, the number of livestock peaked in Turkey at 81.39 million ruminants, resulting in highest grazing intensities. Overgrazing was cited as the major threat for steppes for that period (Çetik 1985). It was followed by a sharp decrease in the last 30 years to 37.69 million heads (Yılmaz and Wilson 2012). Livestock practices have shifted from using local breeds and small ruminants to breeding large ruminants and more productive new breeds and their crosses. Furthermore, grazing patterns have changed, leading to overgrazing around villages and water sources (Adak et al. 2005). Some of the rangeland-dependent production was replaced with stable-feeding livestock systems (Fırıncıoğlu et al. 2009). Changes in the grazing system favoured the recovery of the overgrazed steppe ecosystems in some areas, although it is a slow process probably due to semi-arid conditions and impoverished soils (Ambarlı 2012).

Overgrazing is an important threat for many species, especially for endemic plants (Ekim et al. 2000). In central and southeastern Anatolia, livestock density is still two times higher than the carrying capacity of most of the rangelands (Adak et al. 2005). Soil erosion takes place in 64 % of the rangelands in Turkey as a consequence of arid and semi-arid climate and overgrazing (General Directorate of Combating Desertification and Erosion 2016). The Rangeland Act, the basis of sustainable use of rangelands, is poorly implemented due to various legislative and administrative mismanagement issues as well insufficient number of personnel. As a result, degradation of rangelands still continues (Adak et al. 2005).

Conversion to cropland and agricultural intensification

Conversion of steppes to croplands has been taking place in Anatolia for thousands of years. The most recent large-scale conversion occurred from the 1950s to the 1980s with subsidies given for agricultural mechanisation, allocation of governmental land for agriculture and opening of marginal lands and rangelands for crop production (Kazgan 2003). In addition, extensive land consolidation activities are carried out in agricultural reform areas and irrigated lands. By 2015, 11,150 km^2 of small and fragmented holdings of agricultural parcels have been consolidated to form larger patches (Yoğunlu 2013). As a consequence, small patches of steppe habitats as well as small-scale farms disappeared in many places. Agricultural intensification and conversion to croplands appear to be the most important threats to many target species. Among the target butterflies, *Apharitis cilissa*

(EN), *Euphydras orientalis* (EN), *Spialia osthelderi* (EN) and *Polyommatus ciloicus* (VU) are restricted to habitat patches within and around agricultural areas. A major range retraction of 98.9 % was observed in the steppe fritillary (*Euphydryas orientalis*) butterfly between 1930 and 1980, which coincides exactly with the period of ploughing marginal lands in Turkey. C*yanus tchihatcheffii* is a well-known rare weed that suffered from herbicide use, frequent ploughing of fallows and stubble burning (Vural et al. 2007). *Otis tarda*, a threatened bird species, has declined dramatically in recent years due to habitat loss to cropland, illegal hunting and disturbance (Karakaş and Akarsu 2009). *Emberiza cineracea* is another bird species for which agricultural intensification and development pose potential future threats (Albayrak et al. 2003).

Rural abandonment

Large-scale rural abandonment is known to have occurred in Anatolia for centuries due to wars, famines or poor livelihood conditions (Clay 1998). Rural abandonment occurring since the 1950s peaked in the 1990s. While the urban population has increased from 29 % of the total population in 1955 to 75 % in 2015, the percentage of the rural population decreased correspondingly (Worldometers 2015). This development has positive effects on the recovery of degraded ecosystems (Karabak et al. 2009). On the other hand, similar to the examples in Europe (van Swaay et al. 2006), cessation of hay meadows and abandonment of pasture land can cause a decline in butterfly diversity (Karaçetin et al. 2011). The effects of land abandonment on steppes of the Anatolian Biogeographical Region are unfortunately not documented in detail, but preliminary studies showed that abandoned croplands supported higher bird diversity compared to semi-natural steppes (Ambarlı and Bilgin 2014).

Afforestation

The Ministry of Forestry and Water Affairs has afforested 24,000 km^2 between 2008 and 2012 for erosion control, rehabilitation, greening and similar purposes (General Directorate of Combating Desertification and Erosion 2016). Yet, in majority of the afforestation efforts, physically suitable growing conditions are the only criterion for the selection of plantation sites and trees have been planted in steppe areas with high species diversity such as Palandöken PBA in Erzurum, Sipikör Pass PBA in Erzincan and Tohma Valley Important Plant Area in Sivas/Malatya. The application of land preparation methods such as mechanised works inappropriate for local soil conditions cause erosion, the loss of soil organic material and the deterioration of other physical and chemical soil properties (Çepel 1985). Clearance of existing vegetation by burning and deep ploughing degrades habitats of rare species such as *Polyommatus dama* and *Euphydryas orientalis* (Karaçetin and Welch 2011). Furthermore, choosing non-local trees for monocultures resulted in failure within a few years (Yılmaz et al. 2013). The impact of afforestation practices on biodiversity remains poorly studied in Turkey.

Illegal harvest and over-exploitation of wild plants and animals

In Turkey, illegal hunting is still one of the main reasons for population declines of some species such as *Otis tarda* and steppic large herbivores (Özbağdatlı et al. 2004; Mallon 2008), even though the Terrestrial Hunting Law regulates hunting activities strictly. Collecting plants for firewood, fodder or medicine is also a very common practice in Anatolia

and can cause vegetation degradation, especially in sites with tragacanthic plants (Zohary 1973). Illegal collection of bulbous, medicinal and aromatic plants for trade purposes also takes place in Turkey and is known to threaten certain local populations of bulbous plants (Özhatay et al. 1998). On top of other threats (e.g. habitat destruction, road construction etc.), collecting rare butterfly species for the international market is known to threaten them with extinction (Karaçetin et al. 2011). Some herptiles, especially vipers, are victims of illegal collection for pet trade or over-exploitation for scientific purposes. *Falco cherrug*, a very rare breeding bird, is very susceptible to disturbance and at the same time the target of illegal and unsustainable collection of chicks from nests to supply the demand for falconry in Arabia. The impacts of these actions have not been measured, yet they continue to occur to different extents in the country.

Climate change

The Mediterranean region is one of the regions expected to be highly impacted by climate change (Solomon et al. 2007), and Turkey is among the countries to be the most negatively affected in it (Kapur et al. 2006). A significant decrease in rainfall and increase in temperature has been predicted for steppe ecosystems in Turkey (Stocker et al. 2013). Calculations for 2070 based on the RCP 4.5 scenario (Clarke et al. 2007; Wise et al. 2009) suggest a 2.9 °C increase for the average temperature of the coolest month in the study region. The highest increase is expected in eastern Anatolia. Similarly, an increase of 6.0 °C for the average temperature of the warmest month, averaged over the study region, is predicted. The highest temperature increase is expected in central Anatolia. Total annual rainfall is expected to decrease by 5 % on average in the study region. Eastern Anatolia and the Anatolian Diagonal are the regions for which the highest decrease in rainfall is expected. The strongest increase in drought risk is expected in central Anatolia (Collins et al. 2011). A recent modelling study simulating IPCC third assessment storylines A2a and B2a with Hadley Centre Coupled Model version 3 suggests that by 2050 the steppic bird species *Calandrella brachydactyla* will experience a range shift of 28 km or 65 km, respectively (Abolafya et al. 2013). The same study suggests a 10 km or 28 km shift for *Melanocorypha calandra*. More studies are needed to estimate or observe the effect of climate change on steppe biodiversity.

Exploitation of mineral resources and civil works

Uncontrolled growth of urban conglomerations threaten many plant species such as *Marrubium depauperatum*. *Plebeius rosei*, *Aricia torulensis*, *Polyommatus dama* and *Polyommatus ciloicus* are among the butterfly species that lost their natural habitats due to extensive road construction projects (Karaçetin and Welch 2011). Mining and energy production (coal, oil/gas, electricity) are assumed to have a major effect on steppic biodiversity by destroying habitats of target species. An example is the Keban Dam in Elazığ which was built on habitats of five endemic plant species known only from its vicinity and are now extinct globally (Ekim et al. 2000). On the steppic part of the Anatolian Diagonal, 10 of the 29 priority sites for conservation are threatened by mining activities (unpublished data).

Conservation gaps and activities

There are 28 protected areas of the selected categories (SNR, NP, and WR) in the study region (Fig. 1, see Online Resource 7 for the list of effectively protected areas in the study region): 10 of the 40 NPs in Turkey (25 %), 16 of 81 WRs (20 %) and 2 of 31 SNRs (6 %). They cover a total of 5948 km^2 (NP 45 %, SNR 3 %, WR 52 %), corresponding to only 1.5 % of the area of our study region.

Our study showed that among 809 threatened and near-threatened species dependent on steppe habitats in the Anatolian Biogeographical Region, only 131 (16.2 %) have been recorded in at least one of the protected areas (Table 6). Recorded proportions of species groups in protected areas vary, with the highest proportion found in birds (94.1 % of the bird species) and the lowest in vascular plants (12.9 % of the vascular plant species). In the case of vascular plants, only 8.5 % of the species in the highest threat categories (CR and EN) and recently discovered rare species were recorded in protected areas (Table 1). In the case of butterflies, we concluded on basis of the available distribution data that only two species were recorded in protected areas (Table 2), *Satyricum hyrcanicum* and *Zegris eupheme*; yet management plans of the protected areas did not include any specific measures for protecting these butterflies. On the other hand, the known distribution of three out of six threatened mammal species (50 %), namely *Gerbillus dasyurus*, *Mesocricetus auratus* and *Gazella gazella* (Table 4), did not overlap with any protected area. In the case of endemic or regional endemic steppe mammals, this ratio is one out of three species. Although 71 % of the threatened and near-threatened herptiles are found in the protected area network, most of these species occur in few areas (less than four) (Table 5). Noticeable gaps in the protected area network were in eastern Anatolia, especially around Van Lake and Hakkari, in southeastern Anatolia, in the steppes on the Anatolian Diagonal Mountains along Sivas, Malatya and Erzincan and south of the Tuz Gölü (Salt Lake).

Despite the protection measures, there are various problems in the protected areas: lack of a proper management plan for some of the protected areas, many problems in implementing and monitoring protection measures, conflicts with local people, lack of management at site level and lacking co-operation among authorised state offices (Avcıoğlu et al. 2011). Although grazing pressure is decreasing, protected areas are facing increasing threats due to construction of dams and hydroelectric power schemes, road constructions, mining activities, residential developments etc. Most of the 28 protected areas in our study region have management plans, which generally focus on habitat protection, visitor management and economic development for local people. Activities related to species

Table 6 Summary of protection status of threatened and near-threatened species of five taxonomic groups dependent on steppe habitats in Anatolian Biogeographical Region

Taxonomic group	Total number of threatened and near-threatened species	Number of steppe species protected in protected areas	Percentage of species under protection
Plants	755	97	12.9
Butterflies	13	2	15.3
Birds	17	16	94.1
Mammals	10	6	60.0
Herptiles	14	10	71.3
Total	89	131	16.2

protection are very limited and usually target charismatic species, economically important game animals and some of the priority bird species. So conservation effectiveness is quite limited in protected areas.

At the national scale, species action plans have been prepared for six of our target species: *Darevskia sapphirina*, *Meriones dahli*, *Gerbillus dasyurus*, *Astragalus beypazaricus* and *Salvia siirtica* by the General Directorate of Nature Conservation and National Parks and *Otis tarda* by Doğa Derneği (Özbağdatlı et al. 2004). Conservation programmes have also been established for enhancing breeding populations of *Ovis orientalis* in Bozdağ, Konya, and *Gazella subgutturosa* in Ceylanpınar, Şanlıurfa. Local conservation activities targeting 12 rare steppic vascular plant species are run by botanists in collaboration with local administrations and non-governmental organisations (NGOs) (see Online Resource 1 for the list of species). Ex situ conservation efforts such as seedling transplantation by the Nezahat Gökyiğit Botanical Garden are also promising for target vascular plants such as *Rhaponticoides iconiensis*.

Recently, pilot projects undertaken by the ministries together with partners from the European Union provided opportunities for practising sustainable land-use planning, agri-environmental schemes, High Nature Value (HNV) farming practices (Redman and Hemmami 2008) and conservation measures complying with European standards, all of which contribute to developing the capacity for steppe biodiversity conservation. One example is the biodiversity sub-measure being prepared under the agri-environmental schemes of the Instrument for Pre-Accession Assistance Rural Development Programme (IPARD) targeting the conservation of *Otis tarda* (Ministry of Food, Agriculture and Livestock 2015a). In addition, ÇATAK (Environmentally-based Agricultural Land Protection Programme), a support scheme of the Ministry of Food, Agriculture and Livestock (2015b), aims at addressing the negative impacts of agriculture on the environment. In steppic ecosystems, this support scheme is especially beneficial in terms of decreasing threats to biodiversity in the vicinity of agricultural areas.

Together with scientists, NGOs have been the leading organisations in identifying conservation priorities through gap analysis projects (Welch 2004; Nature Conservation Centre 2015a), the identification of Important Bird Areas (Yarar and Magnin 1997), Important Plant Areas (Özhatay et al. 2003), Key Biodiversity Areas (Eken et al. 2006) and Prime Butterfly Areas (Karaçetin et al. 2011; Zeydanlı et al. 2012). In addition, NGOs provide good examples of long-term multi-sectoral management planning and implementation. One example is the sustainable use of water resources project in Konya Basin (WWF Turkey 2015). Another example concerns the support of HNV farming and sustainable irrigation systems to cope with climate change in Cihanbeyli and Harran Plain (Nature Conservation Centre 2015b). Furthermore, NGOs are conducting biodiversity surveys and monitoring studies and help to raise awareness at the local level.

Conclusions and conservation recommendations

Only 1.5 % of the Anatolian Biogeographical Region is covered by effective protected areas, which failed to represent 83.8 % of the threatened and near-threatened steppic species, i.e. the conservation gaps. Moreover, the remaining steppe areas are threatened in various ways. In this section, we draw up a "to-do list" for steppe biodiversity conservation in Turkey. All conservation recommendations outlined below, whether they are to be put into practice inside or outside protected areas, are based on the fact that steppes and

steppe forests are dynamic in space and time at various scales and that they have evolved under the effect of non-destructive land use practices for thousands of years. Conservation actions should be based on the assumption of continued non-destructive land use such as grazing and hay making.

1. *Mainstreaming biodiversity* Mainstreaming biodiversity into the activities of all parts of the society is needed to prevent rapid decline of steppes. Conservation of steppe ecosystems' biodiversity should be integrated into activities of all relevant sectors, especially agriculture, forestry, construction, mining and energy. To be able to do so at the national level, two ministries, one responsible for nature conservation, the other for sustainable use of rangelands (i.e. Ministry of Forestry and Water Affairs and Ministry of Food, Agriculture and Livestock), should have units dedicated to the conservation and sustainable use of steppe ecosystems, and the means of collaboration (i.e. regulations, governance system, definition of responsibilities, exclusive roles and responsibilities from site to policy levels, budget) should be put in place. Those units should be responsible for preparing and implementing a national strategy to conserve steppe biodiversity in co-operation with NGOs and scientists. Such a strategy should aim to change the mindset from "steppes as empty places" to "steppes as value" and should be implemented in collaboration with various stakeholders such as villagers, shepherds, NGOs and other organisations.
2. *Effective implementation of the Rangeland Act* The Rangeland Act needs to be revised and updated in order to overcome legislative and administrative problems (see Adak et al. 2005 for details). Grazing plans prepared by rangeland commissions should include biodiversity measures like the conservation of target species listed in this paper. Sufficient ecological knowledge should be gathered on the impact of grazing intensities on each target species. Until then, rangelands hosting such species should be managed in traditional ways with grazing at low to moderate level to prevent loss of diversity and heterogeneity, except for areas in poor condition where grazing rest would be needed. These commissions should include experts from a wide range of subjects including soil, biodiversity and ecology. Plans should incorporate field data to understand rangeland condition, to evaluate grazing season, livestock types or breeds used and to incorporate measures related to carrying capacity and shifts in rangelands. Finally, capacity building and mobilisation of human resources are needed to solve legal and administrative problems related to cadastre and rangeland boundary delineation and to control the proper implementation of grazing plans.
3. *Supporting High Nature Value farming (HNV)* Both land use intensification and complete abandonment have been found to reduce grassland biodiversity in Europe (Cremene et al. 2005). Programmes need to be implemented that will promote HNV farming. Rural development programmes and incentives for farmers are necessary to support livelihood of the farmers and prevent land abandonment. As more than half of the steppes have already been destroyed, lands hosting conservation target species should no longer be ploughed.
4. *Integrating steppe biodiversity conservation into afforestation plans* Afforestation studies should be based on the findings of ecological restoration researches. Afforestation activities in sites hosting target steppic species should be avoided. Patchiness between trees, shrub and herbaceous formations should be maintained to allow steppic species to exist. The sites historically covered by natural and semi-natural steppe vegetation should not be afforested but be allowed to recover by successional restoration in the long term (see Cao et al. 2011).

5. *Establishing an effective site network for steppe biodiversity conservation* Currently there is a great variation in the amount of effort put into biodiversity surveys. This might have in turn affected our evaluation; given the absence of detailed surveys and monitoring efforts, it is possible that species present in protected areas remain unnoticed in our study. Detailed fieldwork should therefore be conducted to identify target steppic species in each protected area. Conservation objectives of management plans should cover all threatened, keystone and ecosystem engineer species as well as key ecological processes. Based on the objectives, conservation and monitoring actions should be defined and implemented using an adaptive management approach (Williams 2011). Current protected areas are inadequate to represent steppe biodiversity. To complement existing protected areas, priority sites for conservation should be identified using systematic conservation planning approach adopted by the Ministry of Forestry and Water Affairs (Zeydanlı et al. 2012). Management and monitoring guidelines of two completed studies in the region, the Anatolian Diagonal Biodiversity Project and the Southeast Anatolia Biodiversity Project (Welch 2004), should be used as a starting point for conservation management and the designation of new protected areas. Such studies must be conducted throughout the rest of the Anatolian Biogeographical Region by incorporating drivers of grassland biodiversity (Dengler et al. 2014). As protected areas show major effectiveness deficiencies in Turkey (Avcıoğlu et al. 2011), we suggest to designate new protected areas only at sites with extraordinary biodiversity and high anthropogenic pressure.
6. *Preventing the destruction and degradation of steppes by local activities* Environmental impact assessments (EIAs) are ineffective in Turkey in assessing and monitoring the environmental effects of the construction and implementation phases of projects on steppic habitats due to (1) insufficient time and methods used for flora, fauna and soil surveys, (2) lack of expertise among conductors of surveys and (3) reports inadequate in revealing the negative effects of the projects due to pressure put on EIA conductors, reviewers and decision makers by developers (Üstün and Büyükgüngör 2003). Legislative and administrative measures need to be taken to enforce proper EIAs. It is necessary to make EIAs obligatory not only for some, but for all habitat destroying projects as well as activities of the ministries themselves, such as local activities of the afforestation campaigns and regional-level irrigation projects causing ploughing of semi-natural steppes. Strategic environmental assessments (SEAs) are needed to evaluate consequences of policies, plans and programmes at the earliest appropriate stage of decision-making (Say and Yücel 2006) for the sectors that are interrelated with the use of natural resources of steppes in Turkey, especially agriculture, construction, forestry, energy and mining sectors. In order to decrease the threats acting on the habitats of target species, e.g. illegal hunting and collection of flora and fauna elements, it is necessary to have a sufficient number of warden teams with expertise and mobility for each province to patrol, detect problems and act in steppes. Collaboration of local communities is essential for this purpose.
7. *Filling gaps in scientific knowledge and making it available* Recently, the General Directorate of Nature Conservation and National Parks initiated biodiversity research and monitoring projects at provincial levels (General Directorate of Nature Conservation and National Parks 2015b). An active national database on biodiversity, following the efforts of establishing Noah's Arc National Biodiversity Database, is needed to provide up-to-date data especially on target species for the use of all relevant parties. Such a database should also incorporate regular monitoring data on biodiversity with clear objectives and a standardised methodology to permit conclusions on the

trends and their drivers to be made. It is crucial to prepare national Red Lists for mammals and herptiles and to renew the out-dated Red List of vascular plants (Ekim et al. 2000) for realistic prioritisation and adequate representation of species. Similarly, the status of the 322 DD species or rare species without a threat category listed in this paper should be clarified through studies on taxonomy, distribution, population biology, natural history and threats. A detailed vegetation map of steppes is needed for similar reasons. More research is needed on community and ecosystem ecology in steppes to provide baseline information for management plans and conservation actions. For various steppe types, the effect of different land-use activities such as grazing, removal of tragacanthic species and afforestation should be assessed with long-term monitoring studies to provide conservation evidence. Such studies should be conducted at different scales, from site level in a farmland to landscape scale (Lemaire et al. 2005). Effects of climate change should be included in most of the subjects above as a cross-cutting issue. To enable most of the research mentioned above, it is crucial to establish long-term monitoring programmes such as Long Term Ecological Research (Hobbie et al. 2003) and the Park Grass Experiment (Silvertown et al. 2006). The results of those ecological studies should be available and comprehensible for practitioners.

8 *Restoring degraded steppes and populations of threatened species* Steppe vegetation susceptible to erosion, soil impoverishment and loss of diversity should be restored based on principles of ecological restoration. In addition, many rare species can benefit from reintroduction studies to restore populations of historical distribution. Such studies should have a scientific focus on population structure and dynamics, dispersal of the species, interactions with other species and natural environment such as herbivore-vegetation dynamics at different spatial scales (Gordon et al. 2004).

Acknowledgments We thank Johannes Kamp, Jürgen Dengler and two anonymous reviewers for valuable comments on the manuscript. We are thankful to the Eurasian Dry Grassland Group for supporting the linguistic revision of the manuscript and to Aiko Huckauf for linguistic editing. We are grateful to Ali Kandemir, Bilal Şahin, Deniz Özüt, Gül Nihan Tuğ, Hüseyin Ambarlı, Hüseyin Dural, Latif Kurt, Melike Kuş, Murat Doğan, Murat Ünal, Mustafa Durmuş, Nezaket Adıgüzel, Osman Erdem, Ömer Faruk Kaya, Serhat Arda, Sıtkı Eraydın, Süreyya İsfendiyaroğlu, Şinasi Yıldırımlı, Tuğrul Körüklü, Yavuz Bağcı for providing expert knowledge and literature.

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Online Resource 1

Table of target plant species

List of references used for distribution information of target plant species

Table: List of threatened, near-threatened and data deficient vascular plant species of Anatolian Biogeographical Region. List is sorted by the national threat categories. CR: Critically Endangered, EN: Endangered, VU: Vulnerable, NT: Near Threatened, CD: Conservation Dependent, DD: Data Deficient, *: Species that all subtaxa are endemic to Turkey, **: Species without threat category as the species is identified or rediscovered after the completion of the national red list study or due to other unknown reasons. Presence in protected areas are given as P: Present and SP: Species with special protection measures (national action plans, special measures taken for the protection of its habitat), NE: Not evaluated because of data deficiency. Taxonomic list and endemisim information was derived from Güner et al. 2012 (see the reference list at the end). National threat categories of the species were obtained from Ekim et. al. 2000. Data in Flora of Turkey (Davis 1965-1985, Davis et al 1988, Güner et al 2001) were used for all species, if available. Other references are listed in the last column. See the Reference List at the end.

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No.	Family	Scientific name	Endemism	National threat category	Presence in protected areas	References
1	Asteraceae	*Cyanus tchihatcheffii* (Fisch. & C.A.Mey.) Wagenitz & Greuter	END	CR	SP	
2	Fabaceae	*Cytisus acutangulus* Jaub. & Spach	END	CR	SP	Vural 2012
3	Amaranthaceae	*Salsola grandis* Freitag, Vural & Adıgüzel	END	CR	P, SP	Personal records of Mecit Vural
4	Asparagaceae	*Muscari adilii* M.B.Güner & H.Duman	END	CR	P, SP	Personal records of Mecit Vural
5	Asteraceae	*Centaurea obtusifolia* (Boiss. & Hausskn.) Wagenitz	END	CR	P	Ekim et al. 2014, personal records of Ömer Faruk Kaya
6	Scrophulariaceae	*Verbascum transcaucasicum* E.Wulff		CR	P	Karavelioğulları and Aytaç 2008, Aytaç et al. 2005
7	Brassicaceae	*Hesperis novakii* Dvorák		CR		Doğan et al. 2011
8	Amaryllidaceae	*Allium czelghauricum* Bordz.	END	CR		Ekim et al. 2014
9	Apiaceae	*Chaerophyllum karsianum* Kit Tan & H.Ocakverdi	END	CR		
10	Asparagaceae	*Scilla mesopotamica* Speta	END	CR		Eker and Akan 2010
11	Asteraceae	*Arcanthemis calcarea* (Sosn.) Lo Presti & Oberpr.	END*	CR		
12	Asteraceae	*Centaurea cariensiformis* Hub.-Mor.	END	CR		
13	Asteraceae	*Centaurea rhizocalathium (K.Koch) Tchich.*	END	CR		Ekim et al. 2014
14	Asteraceae	*Cousinia decolorans* Freyn & Sint.	END	CR		
15	Asteraceae	*Cousinia humilis* Boiss.	END	CR		
16	Asteraceae	*Psephellus brevifimbriatus* (Hub.-Mor.) Wagenitz	END	CR		
17	Asteraceae	*Psephellus straminicephalus* (Hub.-Mor.) Wagenitz	END	CR		

18	Asteraceae	*Rhaponticoides iconiensis* (Hub.-Mor.) M.V.Agab. & Greuter	END	CR		
19	Asteraceae	*Tanacetum germanicopolitanum* (Bornm. & Heimerl) Grierson	END	CR		
20	Asteraceae	*Tanacetum oxystegium* (Sosn.) Grierson	END	CR		Nydegger-Hügli 2002
21	Asteraceae	*Taraxacum leucochlorum* Soest	END	CR		
22	Boraginaceae	*Nonea karsensis* Popov	END	CR		Ekim et al. 2014
23	Boraginaceae	*Onosma affinis* Hausskn. ex Riedl	END	CR		Collected by Nydegger
24	Boraginaceae	*Onosma tschichatschevii* Popov	END	CR		
25	Campanulaceae	*Campanula damboldtiana* PH.Davis & Sorger	END	CR		Özhatay et al. 1999
26	Campanulaceae	*Campanula sorgerae* Phitos	END	CR		
27	Caryophyllaceae	*Gypsophila germanicopolitana Hub.-Mor.*	END	CR		
28	Caryophyllaceae	*Gypsophila lepidioides* Boiss.	END	CR		Kandemir and Makbul 2004
29	Caprifoliaceae	*Cephalaria anatolica* Schchian	END	CR		Göktürk and Sümbül 2014
30	Fabaceae	*Astragalus demirizii* R.Kramer & Podlech	END	CR		
31	Fabaceae	*Astragalus gigantostegius* Podlech	END	CR		Özhatay and Kültür 2006
32	Fabaceae	*Astragalus scabrifolius* Boiss.	END	CR		
33	Fabaceae	*Astragalus stojani* Náběl ek	END	CR		
34	Fabaceae	*Astragalus vestitus* Boiss. & Heldr.	END	CR		Tugay et al. 2014
35	Fabaceae	*Astragalus victoriae* Podlech & Kirchhoff	END	CR		
36	Fabaceae	*Glycyrrhiza iconica* Hub.-Mor.	END	CR		
37	Fabaceae	*Lotus malatayicus* Ponert	END	CR		Bahçecioğlu and Yıldız 2014
38	Lamiaceae	*Marrubium depauperatum* Boiss. & Balansa	END	CR		Akgül et al. 2007, Aytaç et al. 2012
39	Lamiaceae	*Phlomis integrifolia* Hub.-Mor.	END	CR		
40	Lamiaceae	*Salvia freyniana* Bornm. ex Freyn	END	CR		Bagherpour et al. 2009

41	Lamiaceae	*Stachys bayburtensis* R.Bhattacharjee & Hub.-Mor.	END	CR		Özhatay et al. 2011, Martin et al. 2011
42	Lamiaceae	*Thymus pallasicus* Hayek & Velen.	END	CR		
43	Malvaceae	*Alcea acaulis* (Cav.) Alef.		CR		
44	Malvaceae	*Alcea flavovirens* (Boiss. & Buhse) lljin		CR		Aytaç et al. 2005
45	Poaceae	*Agropyron deweyi* A.Löve	END	CR		
46	Scrophulariaceae	*Scrophularia erzincanica* R.R.Mill	END	CR		Aytaç et al. 2005, Uzunhisarcıklı et al. 2015
47	Scrophulariaceae	*Scrophularia gypsicola* Hub.-Mor. & Lall	END	CR		
48	Scrophulariaceae	*Verbascum alyssifolium* Boiss.	END	CR		Kandemir and Makbul 2004
49	Scrophulariaceae	*Verbascum subserratum* Hub.-Mor.	END	CR		
50	Tamaricaceae	*Reaumuria sivasica* Kit Tan & Yıldız	END	CR		
51	Lamiaceae	*Teucrium ozturkii* A.P.Khokhr.	END	CR		
52	Scrophulariaceae	*Verbascum gypsicola* Vural & Aydoğdu	END	EN	SP	
53	Amaryllidaceae	*Allium baytopiorum* Kollmann & Özhatay	END	EN	P	
54	Apiaceae	*Ferulago longistylis* Boiss.	END	EN	P	
55	Asteraceae	*Psephellus aucherianus* (DC.) Boiss.	END	EN	P	
56	Brassicaceae	*Chrysochamela elliptica* (Boiss.) Boiss.	END	EN	P	Personal records of Mecit Vural
57	Brassicaceae	*Hesperis breviscapa* Boiss.	END	EN	P	
58	Brassicaceae	*Isatis undulata* Aucher ex Boiss.	END	EN	P	
59	Brassicaceae	*Tchihatchewia isatidea* Boiss.	END	EN	P	Personal records of Ali Kandemir
60	Fabaceae	*Astragalus beypazaricus* Podlech & Aytaç	END	EN	P	Personal records of Mecit Vural
61	Lamiaceae	*Salvia odontochalmys* Hedge	END	EN	P	Behçet 1989
62	Lamiaceae	*Thymus convolutus* Klokov	END	EN	P	
63	Poaceae	*Elymus sosnowskyi* (Hack.) Melderis	END	EN	P	
64	Ranunculaceae	*Delphinium nydeggeri* Hub.-Mor.	END	EN	P	Database of Nature Conservation Centre
65	Rubiaceae	*Galium aladaghense* Parolly	END	EN	P	Database of Nature Conservation Centre
66	Scrophulariaceae	*Verbascum leiocarpum* Murb.	END	EN	P	

67	Polygalaceae	*Polygala inexpectata* Peşmen & Erik	END	EN		
68	Asteraceae	*Taraxacum erzincanense* R.Doll	END	EN		
69	Boraginaceae	*Onosma obtusifolia* Hausskn. & Sint. ex Riedl	END	EN		
70	Brassicaceae	*Aethionema glaucinum* Greuter	END	EN		
71	Caryophyllaceae	*Dianthus robustus* Boiss. & Kotschy	END	EN		
72	Caryophyllaceae	*Dianthus sessiliflorus* Boiss.	END	EN		
73	Geraniaceaae	*Erodium hakkiaricum* P.H.Davis	END	EN		
74	Amaranthaceae	*Kalidium wagenitzii* (Aellen) Freitag & G.Kadereit	END	EN		
75	Amaryllidaceae	*Allium eldivanense* Özhatay	END	EN		
76	Amaryllidaceae	*Allium nemrutdaghense* Kit Tan & Sorger	END	EN		
77	Amaryllidaceae	*Allium pseudoalbidum* N.Friesen & Özhatay	END	EN		
78	Amaryllidaceae	*Allium turcicum* Özhatay & Cowley	END	EN		
79	Apiaceae	*Echinophora lamondiana* Yıldız & Bahç.	END	EN		
80	Apiaceae	*Ferula huber-morathii* Peşmen	END	EN		
81	Apiaceae	*Ferula longipedunculata* Peşmen	END	EN		
82	Apiaceae	*Trigonosciadium intermedium* Freyn & Sint. ex Sint.	END	EN		
83	Asparagaceae	*Asparagus lycaonicus* P.H.Davis	END	EN		
84	Asparagaceae	*Bellevalia anatolica* B.Mathew & Özhatay	END	EN		
85	Asparagaceae	*Ornithogalum demirizianum* Malyer & Koyuncu	END	EN		
86	Asteraceae	*Achillea brachyphylla* Boiss. & Hausskn.	END	EN		Arabacı and Yıldız 2008
87	Asteraceae	*Centaurea amaena* Boiss. & Balansa	END	EN		
88	Asteraceae	*Centaurea halophila* Hub.-Mor.	END	EN		
89	Asteraceae	*Centaurea longifimbriata* Wagenitz	END	EN		

90	Asteraceae	*Centaurea lycaonica* Boiss. & Heldr.	END	EN		
91	Asteraceae	*Centaurea nydeggeri* Hub.-Mor.	END	EN		
92	Asteraceae	*Cirsium davisianum* Kit Tan & Sorger	END	EN		
93	Asteraceae	*Cirsium hakkaricum* P.H.Davis & Parris	END	EN		
94	Asteraceae	*Cousinia arbelensis* C.Winkl. & Bornm.		EN		
95	Asteraceae	*Cousinia euphratica* Hub.-Mor.	END	EN		
96	Asteraceae	*Cousinia wesheni* Post		EN		
97	Asteraceae	*Crepis hakkarica* Lamond	END	EN		
98	Asteraceae	*Crepis purpurea* (Willd.) M.Bieb.		EN		
99	Asteraceae	*Echinops acantholepis* Jaub. & Spach		EN		
100	Asteraceae	*Echinops phaeocephalus* Hand.-Mazz.	END	EN		Vural and Dadandı 2010
101	Asteraceae	*Helichrysum sivasicum* Kit Tan & Yıldız	END	EN		
102	Asteraceae	*Hieracium argaeum* (Zahn) P.D.Sell & C.West	END	EN		Greuter and Raab-Straube 2007, Vural and Aytaç 2005
103	Asteraceae	*Hieracium cappadocicum* Freyn	END	EN		Greuter and Raab-Straube 2007
104	Asteraceae	*Klasea hakkiarica* (P.H.Davis) Greuter & Wagenitz	END	EN		
105	Asteraceae	*Psephellus pergamaceus* (DC.) Wagenitz	END	EN		
106	Asteraceae	*Scorzonera mirabilis* Lipsch.	END	EN		
107	Asteraceae	*Tanacetum munzurdaghensis* Yıld.	END	EN		
108	Asteraceae	*Taraxacum anatolicum* Soest	END	EN		
109	Asteraceae	*Uechtritzia armena* Freyn & Sint. ex Freyn	END	EN		
110	Campanulaceae	*Asyneuma davisianum* Yıldız & Kit Tan	END	EN		
111	Boraginaceae	*Heliotropium ferrugineogriseum* Nábělek	END	EN		
112	Boraginaceae	*Onosma arcuata* Riedl	END	EN		
113	Boraginaceae	*Onosma davisii* Riedl	END	EN		
114	Boraginaceae	*Onosma helleri* Greuter & Burdet	END	EN		
115	Boraginaceae	*Onosma papillosa* Riedl	END	EN		

116	Boraginaceae	*Paracaryum erysimifolium* Boiss.	END	EN		
117	Brassicaceae	*Aethionema karamanicum* Ertuğrul & Beyazoğlu	END	EN		
118	Brassicaceae	*Aethionema lepidioides* Hub.-Mor.	END	EN		
119	Brassicaceae	*Alyssum niveum* T.R.Dudley	END	EN		
120	Brassicaceae	*Chrysochamela noëana* (Boiss.) Boiss.	END	EN		
121	Brassicaceae	*Erysimum hirschfeldioides* Boiss. & Hausskn.		EN		
122	Brassicaceae	*Erysimum leptocarpum* J.Gay	END	EN		
123	Brassicaceae	*Hesperis hedgei* P.H.Davis & Kit Tan	END	EN		
124	Brassicaceae	*Hesperis kitiana* P.H.Davis	END	EN		
125	Brassicaceae	*Isatis bitlisica* P.H.Davis	END	EN		
126	Brassicaceae	*Isatis constricta* P.H.Davis	END	EN		
127	Brassicaceae	*Isatis huber-morathii* P.H.Davis	END	EN		
128	Brassicaceae	*Physoptychis haussknechtii* Bornm.	END	EN		
129	Campanulaceae	*Campanula sivasica* Kit Tan & Yıldız	END	EN		
130	Caryophyllaceae	*Arenaria commagenae* T.Çelebioğlu & Favarger	END	EN		
131	Caryophyllaceae	*Gypsophila leucochleana* Hub.-Mor.	END	EN		
132	Caryophyllaceae	*Gypsophila peshmenii* Güner	END	EN		
133	Caryophyllaceae	*Minuartia valedictionis* McNeill	END	EN		
134	Caryophyllaceae	*Paronychia kayseriana* Chaudhri	END	EN		
135	Caryophyllaceae	*Paronychia saxatilis* Chaudhri	END	EN		
136	Caryophyllaceae	*Silene oligotricha* Hub.-Mor.	END	EN		
137	Caryophyllaceae	*Silene salsuginea* Hub.-Mor.	END	EN		
138	Cistaceae	*Fumana trisperma* Hub.-Mor. & Reese	END	EN		
139	Cistaceae	*Helianthemum germanicopolitanum* Bornm.	END	EN		
140	Caprifoliaceae	*Cephalaria hakkiarica* Matthews	END	EN		Göktürk and Sümbül 2014

141	Caprifoliaceae	*Dipsacus cephalarioides* Matthews & Kupicha	END	EN		
142	Caprifoliaceae	*Scabiosa sulphurea* Boiss. & Huet	END	EN		
143	Fabaceae	*Astragalus brachystachys* DC.		EN		
144	Fabaceae	*Astragalus cicerellus* Boiss. & Balansa	END	EN		
145	Fabaceae	*Astragalus clavatus* DC.	END	EN		
146	Fabaceae	*Astragalus elazigense* Ekim	END	EN		
147	Fabaceae	*Astragalus erythrotaenius* Boiss.		EN		
148	Fabaceae	*Astragalus gymnalopecias* Rech.f.	END	EN		
149	Fabaceae	*Astragalus simonii* Hub.-Mor.	END	EN		
150	Fabaceae	*Astragalus stenosemioides* Bornm. ex D.F.Chamb. & V.A.Matthews	END	EN		
151	Fabaceae	*Astragalus trichostigma* Bunge	END	EN		
152	Fabaceae	*Cicer reticulatum* Ladizinsky	END	EN		
153	Fabaceae	*Hedysarum laxum* Boiss.	END	EN		
154	Fabaceae	*Hedysarum pycnostachyum* Hedge & Hub.-Mor.	END	EN		
155	Fabaceae	*Hedysarum rotundifolium* Boiss. & Noë	END	EN		
156	Fabaceae	*Onobrychis germanicopolitana* Hub.-Mor. & Simon	END	EN		
157	Fabaceae	*Onobrychis occulta* Hedge & Hub.-Mor.	END	EN		
158	Fabaceae	*Onobrychis ptolemaica* (Delile) DC.		EN		
159	Fabaceae	*Onobrychis sivasica* Kit Tan & Sorger	END	EN		
160	Fabaceae	*Trifolium batmanicum* Katzn.	END	EN		
161	Fabaceae	*Vicia glareosa* P.H.Davis	END	EN		
162	Hypericaceae	*Hypericum pumilio* Bornm.	END	EN		
163	Hypericaceae	*Hypericum sorgerae* N.Robson	END	EN		
164	Iridaceae	*Gladiolus humilis* Stapf	END	EN		
165	Iridaceae	*Iris nectarifera* Güner	END*	EN		

166	Lamiaceae	*Ajuga davisiana* Kit Tan & Yıldız	END	EN		
167	Lamiaceae	*Phlomoides glabra* Boiss. ex Benth.		EN		
168	Lamiaceae	*Marrubium vanense* Hub.-Mor.	END	EN		
169	Lamiaceae	*Nepeta baytopii* Hedge & Lamond	END	EN		Kılıç et al. 2013
170	Lamiaceae	*Nepeta crinita* Montbret & Aucher ex Benth.	END	EN		
171	Lamiaceae	*Origanum munzurense* Kit Tan & Sorger	END	EN		
172	Lamiaceae	*Sideritis gulendamii* H.Duman & Karavel.	END	EN		
173	Lamiaceae	*Sideritis vulcanica* Hub.-Mor.	END	EN		
174	Lamiaceae	*Stachys baytopiorum* Kit Tan & Yıldız		EN		
175	Lamiaceae	*Stachys tundjeliensis* Kit Tan & Sorger	END	EN		
176	Lamiaceae	*Stachys willemsei* Kit Tan & Hedge	END	EN		
177	Lamiaceae	*Thymus canoviridis* Jalas	END	EN		
178	Lamiaceae	*Thymus spathulifolius* Hausskn. & Velen.	END	EN		
179	Liliaceae	*Fritillaria baskilensis* Behçet	END	EN		
180	Orobancheae	*Orobanche armena* Tzvelev	END	EN		
181	Plumbaginaceae	*Acantholimon confertiflorum* Bokhari	END	EN		Doğan and Akaydın 2007
182	Plumbaginaceae	*Limonium tamaricoides* Bokhari	END	EN		
183	Poaceae	*Elymus clivorum* Melderis	END	EN		
184	Poaceae	*Sesleria araratica* Kit Tan	END	EN		
185	Poaceae	*Ventenata eigiana* (H.Scholz & Raus) Doğan	END	EN		
186	Ranunculaceae	*Consolida cornuta* (P.H.Davis & Hossain) P.H.Davis	END	EN		
187	Ranunculaceae	*Consolida staminosa* P.H.Davis & Sorger	END	EN		
188	Ranunculaceae	*Delphinium munzianum* P.H.Davis & Kit Tan	END	EN		
189	Ranunculaceae	*Ranunculus bingoeldaghensis* Engin	END	EN		

190	Ranunculaceae	*Ranunculus poluninii* P.H.Davis	END	EN		
191	Resedaceae	*Reseda tomentosa* Boiss.	END*	EN		
192	Rosaceae	*Potentilla carduchorum* Soják	END	EN		
193	Rubiaceae	*Galium baytopianum* Ehrend. & Schönb.-Tem.	END	EN		
194	Rubiaceae	*Galium zabense* Ehrend.	END	EN		
195	Rutaceae	*Ruta villosa* M.Bieb.		EN		
196	Scrophulariaceae	*Scrophularia serratifolia* Hub.-Mor. ex Lall	END	EN		
197	Scrophulariaceae	*Verbascum afyonense* Hub.-Mor.	END	EN		
198	Scrophulariaceae	*Verbascum ballsianum* Murb.	END	EN		
199	Scrophulariaceae	*Verbascum birandianum* Hub.-Mor.	END	EN		
200	Scrophulariaceae	*Verbascum globiferum* Hub.-Mor.	END	EN		
201	Scrophulariaceae	*Verbascum gracilescens* Hub.-Mor.	END	EN		
202	Scrophulariaceae	*Verbascum murbeckianum* Hub.-Mor.	END	EN		
203	Scrophulariaceae	*Verbascum pumilum* Boiss.- & Heldr.	END	EN		
204	Scrophulariaceae	*Verbascum stepporum* Hub.-Mor.	END	EN		
205	Scrophulariaceae	*Verbascum trichostylum* Hub.-Mor.	END	EN		
206	Violaceae	*Viola odontocalycina* Boiss.	END	EN		Kandemir and Türkmen 2007
207	Colchicaceae	*Colchicum heldreichii* K.Perss.	END	EN		
208	Colchicaceae	*Colchicum paschei* K.M.Perss.	END	EN		
209	Asteraceae	*Helichrysum peshmenianum* S.Erik	END	EN		
210	Brassicaceae	*Thlaspi watsonii* P.H.Davis	END	EN		
211	Campanulaceae	*Asyneuma trichostegium* (Boiss.) Bornm.	END	EN		Vural and Aytaç 2005
212	Campanulaceae	*Campanula ekimiana* Güner	END	EN		
213	Rosaceae	*Pyrus yaltirikii* Browicz	END	EN		
214	Brassicaceae	*Thlaspi aghricum* P.H.Davis & Kit Tan	END	EN		
215	Ranunculaceae	*Delphinium iris* İlarslan & Kit Tan	END	EN		

216	Lamiaceae	*Scutellaria tortumensis* (Kit Tan & Sorger) A.P.Khokhr.	END	EN		
217	Lamiaceae	*Scutellaria porphyrantha* Rech.f.		EN		
218	Poaceae	*Eremopoa mardinensis* R.R.Mill	END	EN		
219	Rosaceae	*Potentilla balansae* Soják	END	EN		Bani and Adıgüzel 2009
220	Rosaceae	*Pyrus oxyprion* Woronow		VU		
221	Asteraceae	*Cyanus germanicopolitanus* (Bornm.) Holub	END	VU	SP	
222	Fabaceae	*Astragalus kochakii* Aytaç & H.Duman	END	VU	SP	
223	Amaryllidaceae	*Allium kossoricum* Fomin		VU	P	
224	Amaryllidaceae	*Allium oltense* Grossh.	END	VU	P	
225	Amaryllidaceae	*Allium tuncelianum* (Kollman) Özhatay, B.Mathew & Şiraneci	END	VU	P	Personal records of Ali Kandemir
226	Apiaceae	*Eryngium ilex* P.H.Davis	END	VU	P	
227	Apiaceae	*Ferula caspica* M.Bieb.		VU	P	
228	Asteraceae	*Centaurea albonitens* Turrill		VU	P	Behçet 1989
229	Asteraceae	*Psephellus erivanensis* Lipsky		VU	P	
230	Asteraceae	*Scorzonera aucherana* DC.	END	VU	P	Ministry of Forestry and Water Affairs 2011a
231	Boraginaceae	*Onosma nigricaulis* Riedl	END	VU	P	Ministry of Forestry and Water Affairs 2012a
232	Boraginaceae	*Onosma sieheana* Hayek	END	VU	P	Dural et al. 2007a
233	Brassicaceae	*Cardamine abchasica Govaërts*		VU	P	
234	Brassicaceae	*Isatis spectabilis* P.H.Davis	END	VU	P	
235	Brassicaceae	*Thlaspi bornmuelleri* (Rech.f.) Hedge	END	VU	P	
236	Caryophyllaceae	*Cerastium kasbek* Parrot		VU	P	
237	Caryophyllaceae	*Gypsophila aucheri* Boiss.	END	VU	P	Personal records of Ali Kandemir
238	Caryophyllaceae	*Silene eremitica* Boiss.		VU	P	
239	Euphorbiaceae	*Euphorbia fistulosa* M.L.S.Khan		VU	P	Personal records of Ömer Faruk Kaya

240	Euphorbiaceae	*Euphorbia oxyodonta* Boiss. & Hausskn. ex Boiss.		VU	P	Personal records of Ömer Faruk Kaya
241	Fabaceae	*Astragalus arguricus* Bunge		VU	P	
242	Fabaceae	*Astragalus longisubulatus* Podlech	END	VU	P	Özhatay and Kültür 2006
243	Fabaceae	*Astragalus onobrychioides* M.Bieb.		VU	P	
244	Fabaceae	*Onobrychis major* (Boiss.) Hand.-Mazz.		VU	P	Behçet 1989
245	Fabaceae	*Onobrychis stenostachya* Freyn		VU	P	Ministry of Forestry and Water Affairs 2012a
246	Iridaceae	*Gladiolus halophilus* Boiss. & Heldr.	END	VU	P	Personal records of Hüseyin Dural
247	Iridaceae	*Crocus sieheanus* Barr ex B.L.Burtt	END	VU	P	
248	Lamiaceae	*Marrubium vulcanicum* Hub.-Mor.	END	VU	P	
249	Lamiaceae	*Salvia aytachii* Vural & Adıgüzel	END	VU	P	
250	Lamiaceae	*Salvia eriophora* Boiss. & Kotschy	END	VU	P	
251	Lamiaceae	*Thymus transcaucasicus* Ronniger		VU	P	Ministry of Forestry and Water Affairs 2012a
252	Plumbaginaceae	*Limoniopsis owerinii* (Boiss.) Lincz.		VU	P	
253	Poaceae	*Secale ciliatoglume* (Boiss.) Grossh.		VU	P	Behçet 1989
254	Ranunculaceae	*Consolida olopetala* Hayek	END	VU	P	
255	Ranunculaceae	*Thalictrum sultanabadense* Staptf		VU	P	Personal records of Ali Kandemir
256	Rosaceae	*Alchemilla oriturcica* B.Pawl.	END	VU	P	
257	Rosaceae	*Amygdalus korshinskyi* (Hand.-Mazz.) Bornm.		VU	P	Dural and Ekim 1988, Dural ve Ekim 2007a
258	Rosaceae	*Cotoneaster transcaucasicus* Pojark.		VU	P	
259	Rutaceae	*Haplophyllum schelkovnikovii* Grossh.		VU	P	Behçet 1989
260	Scrophulariaceae	*Verbascum helianthemoides* Hub.-Mor.	END	VU	P	Personal records of Hüseyin Dural
261	Scrophulariaceae	*Verbascum heterodontum* Hub.-Mor.	END	VU	P	
262	Scrophulariaceae	*Verbascum suworowianum* (K.Koch) Kuntze		VU	P	
263	Caryophyllaceae	*Dianthus ancyrensis* Hausskn. & Bornm.	END	VU	P	Doğan and Akaydın 2007

264	Plumbaginaceae	*Acantholimon caesareum* Boiss. & Balansa	END	VU	P	Doğan and Akaydın 2007
265	Plumbaginaceae	*Acantholimon capitatum* Sosn.	END*	VU	P	Doğan and Akaydın 2007
266	Plumbaginaceae	*Acantholimon glumaceum* (Jaub. & Spach) Boiss.		VU	P	Doğan and Akaydın 2007
267	Plumbaginaceae	*Acantholimon petraeum* Boiss. & Hausskn. ex Bunge		VU	P	Doğan and Akaydın 2007
268	Rosaceae	*Pyrus salicifolia* Pall.		VU	P	
269	Asteraceae	*Cirsium kosmelii* (Adams) Fisch. ex Hohen.		VU	P	
270	Amaranthaceae	*Anabasis aphylla* L.		VU	P, SP	Personal records of Mecit Vural
271	Amaranthaceae	*Atriplex aucheri* Moq.		VU	P, SP	Personal records of Mecit Vural
272	Brassicaceae	*Sisymbrium runcinatum* Lag. ex DC.		VU		
273	Brassicaceae	*Physocardamum angustifolium* (Hausskn. & Bornm.) Kandemir	END	VU		Kandemir et al. 2014, Rešetnik et al. 2014, Aytaç and Aksoy 2000
274	Brassicaceae	*Clypeola elegans* Boiss. & Huet		VU		
275	Brassicaceae	*Hesperis syriaca* (DC.) Dvorak		VU		
276	Brassicaceae	*Noccaeae tatianae* Bordz.		VU		
277	Campanulaceae	*Campanula ptarmicifolia* Lam.	END	VU		
278	Caprifoliaceae	*Cephalaria tchihatchewii* Boiss.		VU		Göktürk and Sümbül 2014
279	Grossulariaceae	*Ribes nigrum* L.		VU		
280	Caryophyllaceae	*Silene erimicana* Stapf		VU		Kılıç 2007
281	Amaranthaceae	*Cyathobasis fruticulosa* (Bunge) Aellen	END	VU		
282	Amaranthaceae	*Halanthium rarifolium* K.Koch		VU		
283	Amaranthaceae	*Halanthium roseum* (Trautv.) Iljin ex Ulbr.		VU		
284	Amaranthaceae	*Hammada ramosissima* (Eig) Iljin		VU		
285	Amaranthaceae	*Kalidium caspicum* (L.) Ung.-Sternb.		VU		

286	Amaranthaceae	*Microcnemum coralloides* (Loscos & J.Pardo) Font Quer subsp. *anatolicum* Wagenitz		VU		
287	Amaranthaceae	*Noaea minuta* Boiss. & Balansa		VU		
288	Amaranthaceae	*Salsola inermis* Forssk.		VU		
289	Amaranthaceae	*Salsola verrucosa* M.Bieb.		VU		
290	Amaranthaceae	*Seidlitzia florida* (M.Bieb.) Bunge ex Boiss.		VU		
291	Amaranthaceae	*Suaeda cucullata* Aellen	END	VU		
292	Amaranthaceae	*Suaeda eltonica* Iljin		VU		
293	Amaryllidaceae	*Allium cristophii* Trautv.		VU		
294	Amaryllidaceae	*Allium denudatum* F.Delaroche		VU		
295	Amaryllidaceae	*Allium oreophilum* C.A.Mey.		VU		
296	Amaryllidaceae	*Allium pseudoampeloprasum* Miscz. ex Grossh.		VU		
297	Amaryllidaceae	*Allium rhetoreanum* Nábělek	END	VU		
298	Amaryllidaceae	*Allium variegatum* Boiss.	END	VU		
299	Apiaceae	*Bilacunaria boissieri* (Reut. & Hausskn. ex Boiss.) Pimenov & V.N.Tikhom.		VU		
300	Apiaceae	*Bilacunaria scabra* (Fenzl) Pimenov & V.N.Tikhom.		VU		
301	Apiaceae	*Carum leucocoleon* Boiss. & A.Huet		VU		
302	Apiaceae	*Cymbocarpum anethoides* DC.		VU		
303	Apiaceae	*Echinophora chrysantha* Freyn & Sint.	END	VU		
304	Apiaceae	*Eryngium thyrsoideum* Boiss.		VU		
305	Apiaceae	*Ferula halophila* Peşmen	END	VU		
306	Apiaceae	*Ferulago angulata* (Schlecht.) Boiss.		VU		
307	Apiaceae	*Grammosciadium confertum* Hub.-Mor. & Lamond	END	VU		

308	Apiaceae	*Grammosciadium cornutum* (Nábělek) C.C.Towns.		VU		
309	Apiaceae	*Oliveria decumbens* Vent.		VU		
310	Apiaceae	*Pimpinella aromatica* M.Bieb.		VU		
311	Apiaceae	*Pimpinella flabellifolia* (Boiss.) Benth. & Hook ex Drude	END	VU		
312	Apiaceae	*Prangos acaulis* (DC.) Bornm.		VU		
313	Apiaceae	*Prangos corymbosa* Boiss.		VU		
314	Apiaceae	*Rhabdosciadium microcalycinum* Hand.-Mazz.	END	VU		
315	Apiaceae	*Scaligeria glaucescens* (DC.) Boiss.		VU		
316	Apiaceae	*Trigonosciadium viscidulum* Boiss. & Hausskn. ex Boiss.		VU		
317	Asparagaceae	*Bellevalia fominii* Woronow		VU		
318	Asparagaceae	*Bellevalia longistyla* (Miscz.) Grossh.		VU		
319	Asparagaceae	*Bellevalia olivieri* (Baker) Wendelbo		VU		
320	Asteraceae	*Achillea gypsicola* Hub.-Mor.	END	VU		
321	Asteraceae	*Achillea oligocephala* DC.		VU		
322	Asteraceae	*Achillea sieheana* Stapf	END	VU		
323	Asteraceae	*Artemisia alpina* Pall. ex Willd.		VU		
324	Asteraceae	*Centaurea hakkariensis* Wagenitz	END	VU		
325	Asteraceae	*Centaurea demirizii* Wagenitz	END	VU		
326	Asteraceae	*Centaurea gigantea* Sch.Bip. ex Boiss.		VU		
327	Asteraceae	*Centaurea handelii* Wagenitz		VU		
328	Asteraceae	*Centaurea nemecii* Nábělek		VU		
329	Asteraceae	*Centaurea persica* Boiss.		VU		
330	Asteraceae	*Centaurea sclerolepis* Boiss.	END	VU		
331	Asteraceae	*Centaurea tardiflora* Wagenitz	END	VU		

332	Asteraceae	*Cirsium aduncum* Fisch. & C.A.Mey. ex DC. subsp. *bashkalense* P.H.Davis & Parris	END	VU		
333	Asteraceae	*Cirsium kosmelii* (Adams) Fisch. ex Hohen.		VU		
334	Asteraceae	*Cousinia aintabensis* Boiss. & Hausskn. ex Boiss.		VU		
335	Asteraceae	*Cousinia aleppica* Boiss.		VU		
336	Asteraceae	*Cousinia boissieri* Buhse		VU		
337	Asteraceae	*Cousinia grandis* C.A.Mey. ex DC.		VU		
338	Asteraceae	*Cousinia hakkarica* Hub.-Mor.	END	VU		
339	Asteraceae	*Cousinia satdagensis* Hub.-Mor.	END	VU		
340	Asteraceae	*Cousinia sintenisii* Freyn	END	VU		
341	Asteraceae	*Cousinia sivasica* Hub.-Mor.	END	VU		
342	Asteraceae	*Cousinia urumiensis* Bornm.		VU		
343	Asteraceae	*Echinops transcaucasicus* Iljin		VU		
344	Asteraceae	*Helichrysum kitianum* Yıldız	END	VU		
345	Asteraceae	*Inula macrocephala* Boiss. & Kotschy ex Boiss.	END	VU		
346	Asteraceae	*Iranecio paucilobus* (DC.) B.Nord.		VU		
347	Asteraceae	*Kemulariella colchica* (Albov.) Tamamsch.		VU		
348	Asteraceae	*Klasea erucifolia* (L.) Greuter & Wagenitz		VU		
349	Asteraceae	*Onopordum heteracanthum* C.A.Mey.		VU		
350	Asteraceae	*Psephellus gracillimus* (Wagenitz) Wagenitz	END	VU		
351	Asteraceae	*Psephellus huber-morathii* (Wagenitz) Wagenitz	END	VU		

352	Asteraceae	*Psephellus xanthocephalus* (DC.) Fisch & C.A.Mey.		VU		
353	Asteraceae	*Scorzonera davisii* Lipsch.	END	VU		
354	Asteraceae	*Scorzonera dzhawakhetica* Grossh.		VU		
355	Asteraceae	*Senecio fluviatilis* Wallr.		VU		
356	Asteraceae	*Tanacetum canescens* DC.		VU		
357	Asteraceae	*Tanacetum haussknechtii* (Bornm.) Grierson	END	VU		
358	Asteraceae	*Tanacetum heterotomum* (Bornm.) Grierson	END	VU		
359	Asteraceae	*Tanacetum tabrisianum* (Boiss.) Sosn. & Takht.		VU		
360	Asteraceae	*Tanacetum uniflorum* (Fisch. & C.A.Mey.) Sch.Bip.		VU		
361	Asteraceae	*Taraxacum fedtschenkoi* Hand.-Mazz.		VU		
362	Asteraceae	*Taraxacum mirabile* Wagenitz	END	VU		
363	Asteraceae	*Taraxacum scolopendrinum* Heldr. ex Dahlst.		VU		
364	Asteraceae	*Tragopogon vaginatus* Ownbey & Rech.f.		VU		
365	Biebersteiniceae	*Biebersteinia multifida* DC.		VU		
366	Boraginaceae	*Arnebia linearifolia* DC.		VU		
367	Boraginaceae	*Onosma chlorotricha* Boiss. & Noë		VU		
368	Boraginaceae	*Onosma decorticans* Riedl		VU		
369	Boraginaceae	*Onosma halophila* Boiss. & Heldr.	END	VU		
370	Boraginaceae	*Onosma hebebulba* DC.		VU		
371	Boraginaceae	*Onosma sintenisii* Hausskn. ex Bornm.	END	VU		
372	Boraginaceae	*Onosma tinctoria* M.Bieb.		VU		
373	Boraginaceae	*Paracaryum corymbiforme* (DC. & A.DC.) Boiss.	END	VU		

374	Boraginaceae	*Paracaryum kurdistanicum* (Brand) R.R.Mill	END	VU		
375	Boraginaceae	*Solenanthus formosus* R.R.Mill	END	VU		
376	Brassicaceae	*Aethionema virgatum* (Boiss.) Hedge		VU		
377	Brassicaceae	*Alyssum anatolicum* Hausskn. ex Nyár.	END	VU		
378	Brassicaceae	*Alyssum bornmuelleri* Hausskn. ex Degen	END	VU		
379	Brassicaceae	*Alyssum trichocarpum* T.R.Dudley & Hub.-Mor.	END	VU		
380	Brassicaceae	*Brassica deflexa* Boiss.		VU		
381	Brassicaceae	*Chorispora iberica* (M.Bieb.) DC.		VU		
382	Brassicaceae	*Crambe alutacea* Hand.-Mazz.		VU		
383	Brassicaceae	*Eutrema parvulum* (Schrenk) Al-Shehbaz & Warwick		VU		
384	Brassicaceae	*Isatis demiriziana* Mısırdalı ex P.H.Davis	END	VU		
385	Brassicaceae	*Isatis kozlowskyi* Grossh.		VU		
386	Brassicaceae	*Matthiola ovatifolia* (Boiss.) Boiss.		VU		
387	Brassicaceae	*Parlatoria cakiloidea* Boiss.		VU		
388	Campanulaceae	*Campanula argentea* Lam.	END	VU		
389	Campanulaceae	*Campanula persica* A.DC.		VU		
390	Campanulaceae	*Michauxia laevigata* Vent.		VU		
391	Caryophyllaceae	*Allochrusa versicolor* (Fisch. & C.A.Mey.) Boiss.		VU		
392	Caryophyllaceae	*Allochrusa bungei* Boiss.		VU		
393	Caryophyllaceae	*Gypsophila antari* Post & Beauverd		VU		
394	Caryophyllaceae	*Gypsophila festucifolia* Hub.-Mor.	END	VU		
395	Caryophyllaceae	*Gypsophila nodiflora* (Boiss.) Barkoudah	END	VU		
396	Caryophyllaceae	*Gypsophila patrinii* Ser.		VU		
397	Caryophyllaceae	*Gypsophila simonii* Hub.-Mor.	END	VU		
398	Caryophyllaceae	*Paronychia angorensis* Chaudhri	END	VU		

399	Caryophyllaceae	*Paronychia cataonica* Chaudhri	END	VU		
400	Caryophyllaceae	*Paronychia euphratica* (Chaudhri) Chaudhri	END	VU		
401	Caryophyllaceae	*Silene cserei* Baumg. subsp. *aeoniopsis* (Bornm.) Chowdhuri	END	VU		
402	Cistaceae	*Fumana grandiflora* Jaub. & Spach	END	VU		
403	Convolvulaceae	*Convolvulus chondrilloides* Boiss.		VU		
404	Crassulaceae	*Sedum inconspicum* Hand.-Mazz.	END	VU		
405	Caprifoliaceae	*Cephalaria kotschyi* Boiss. & Hohen.		VU		Göktürk and Sümbül 2014
406	Caprifoliaceae	*Cephalaria media* Litv.		VU		Göktürk and Sümbül 2014
407	Caprifoliaceae	*Cephalaria stapfii* Hausskn.		VU		
408	Caprifoliaceae	*Pterocephalus brevis* Coult.		VU		
409	Caprifoliaceae	*Pterocephalus canus* Coult. ex DC.		VU		
410	Caprifoliaceae	*Pterocephalus kurdicus* Vatke		VU		
411	Caprifoliaceae	*Pterocephalus strictus* Boiss. & Hohen.		VU		
412	Euphorbiaceae	*Euphorbia craspedia* Boiss.		VU		
413	Euphorbiaceae	*Euphorbia physocaulos* Mouterde		VU		
414	Euphorbiaceae	*Euphorbia sintenisii* Boiss. ex Freyn		VU		
415	Fabaceae	*Argyrolobium crotalarioides* Jaub. & Spach		VU		
416	Fabaceae	*Astragalus albertshoferi* Podlech	END	VU		
417	Fabaceae	*Astragalus aleppicus* Boiss.		VU		
418	Fabaceae	*Astragalus ancistrocarpus* Boiss. & Hausskn.		VU		
419	Fabaceae	*Astragalus argyroides* Beck		VU		
420	Fabaceae	*Astragalus aydosensis* Peşmen & Erik	END	VU		
421	Fabaceae	*Astragalus barboides* Zarre & H.Duman	END	VU		
422	Fabaceae	*Astragalus bashkalensis* D.F.Chamb.	END	VU		
423	Fabaceae	*Astragalus brachycarpus* M.Bieb.		VU		

424	Fabaceae	*Astragalus caudiculosus* Boiss. & Huet	END	VU		
425	Fabaceae	*Astragalus cornutus* Pall.		VU		
426	Fabaceae	*Astragalus daenensis* Boiss.		VU		
427	Fabaceae	*Astragalus drusorum* Boiss.		VU		
428	Fabaceae	*Astragalus eriopodus* Boiss.		VU		
429	Fabaceae	*Astragalus garaensis* Širj.		VU		
430	Fabaceae	*Astragalus gevashensis* D.F.Chamb. & V.A.Matthews	END	VU		
431	Fabaceae	*Astragalus jodostachys* Boiss. & Buhse		VU		
432	Fabaceae	*Astragalus kirshehiricus* D.F.Chamb.	END	VU		
433	Fabaceae	*Astragalus longivexillatus* Podlech & Ekici	END	VU		Özhatay and Kültür 2006
434	Fabaceae	*Astragalus macrouroides* Hub.-Mor.	END	VU		
435	Fabaceae	*Astragalus malatyaensis* Podlech	END	VU		Özhatay and Kültür 2006, Podlech 1999
436	Fabaceae	*Astragalus mardinensis* Nábělek	END	VU		
437	Fabaceae	*Astragalus nigrifructus* Podlech & Aytaç	END	VU		
438	Fabaceae	*Astragalus ovalis* Boiss. & Balansa	END	VU		
439	Fabaceae	*Astragalus paradoxus* Bunge		VU		
440	Fabaceae	*Astragalus polhillii* Podlech	END	VU		Özhatay and Kültür 2006, Podlech 1999
441	Fabaceae	*Astragalus pulchellus* Boiss.		VU		
442	Fabaceae	*Astragalus roussaeanus* Boiss.		VU		
443	Fabaceae	*Astragalus russelii* Banks & Sol.		VU		
444	Fabaceae	*Astragalus shelkovnikovii* Grossh.		VU		
445	Fabaceae	*Astragalus subsecundus* Boiss. & Hohen.		VU		
446	Fabaceae	*Astragalus surugensis* Boiss. & Hausskn.		VU		
447	Fabaceae	*Astragalus talasseus* Boiss. & Balansa	END	VU		
448	Fabaceae	*Astragalus trachytrichus* Bunge	END	VU		
449	Fabaceae	*Astragalus viridis* Bunge		VU		
450	Fabaceae	*Astragalus zahlbruckneri* Hand.-Mazz.	END	VU		

451	Fabaceae	*Cicer echinospermum* P.H.Davis	END	VU		
452	Fabaceae	*Ebenus macrophylla* Jaub. & Spach	END	VU		
453	Fabaceae	*Hedysarum aucheri* Boiss.	END	VU		
454	Fabaceae	*Hedysarum kotschyi* Boiss.		VU		
455	Fabaceae	*Hedysarum pannosum* (Boiss.) Boiss.		VU		
456	Fabaceae	*Hedysarum vanense* Hedge & Hub.-Mor.	END	VU		
457	Fabaceae	*Lathyrus gloeospermus* Warb. & Eig		VU		
458	Fabaceae	*Lathyrus satdaghensis* P.H.Davis	END	VU		
459	Fabaceae	*Lathyrus trachycarpus* (Boiss.) Boiss.	END	VU		
460	Fabaceae	*Lens montbretii* (Fisch. & C.A.Mey.) P.H.Davis & Plitmann		VU		
461	Fabaceae	*Lotus armeniacus* Kit Tan & Sorger	END	VU		
462	Fabaceae	*Medicago shepardii* Post ex Boiss.	END	VU		
463	Fabaceae	*Onobrychis araxina* Schischk.	END	VU		
464	Fabaceae	*Onobrychis argaea* Boiss. & Balansa	END	VU		
465	Fabaceae	*Onobrychis elata* Boiss. & Balansa	END	VU		
466	Fabaceae	*Onobrychis paucijuga* Bornm.		VU		
467	Fabaceae	*Onobrychis shahpurensis* Rech.f.		VU		
468	Fabaceae	*Onobrychis subacaulis* Boiss.		VU		
469	Fabaceae	*Oxytropis aucheri* Boiss.		VU		
470	Fabaceae	*Oxytropis karjaginii* Grossh.		VU		
471	Fabaceae	*Oxytropis kotschyana* Boiss. & Hohen.		VU		
472	Fabaceae	*Trigonella isthmocarpa* Boiss. & Balansa	END	VU		
473	Fabaceae	*Vicia aintabensis* Boiss. & Hausskn. ex Boiss.		VU		
474	Fabaceae	*Vicia esdraelonensis* Warb. & Eig		VU		
475	Fabaceae	*Vicia rafigae* Tamamsch.		VU		
476	Fabaceae	*Vicia splendens* P.H.Davis	END	VU		
477	Geraniaceaae	*Erodium gaillardotii* Boiss.		VU		

478	Hypericaceae	*Hypericum scabroides* N.Robson & Poulter	END	VU		
479	Iridaceae	*Iris bakeriana* Foster		VU		
480	Iridaceae	*Iris barnumae* Foster & Baker		VU		
481	Iridaceae	*Iris gatesii* Foster		VU		
482	Iridaceae	*Iris lycotis* Woronow		VU		
483	Iridaceae	*Iris masia* Dykes		VU		
484	Iridaceae	*Iris paradoxa* Steven f. *choschab* (Hoog) B.Mathew & Wendelbo		VU		
485	Iridaceae	*Iris pseudocaucasica* Grossh.		VU		
486	Iridaceae	*Iris sprengeri* Siehe	END	VU		
487	Iridaceae	*Iris taochia* Woronow ex Grossh.	END	VU		
488	Iridaceae	*Iris urmiensis* Hoog		VU		
489	Lamiaceae	*Clinopodium congestum* (Boiss. & Hausskn. ex Boiss.) Kuntze		VU		
490	Lamiaceae	*Cyclotrichium leucotrichum* (Stapf ex Rech.f.) Leblebici		VU		
491	Lamiaceae	*Cyclotrichium longiflorum* Leblebici		VU		
492	Lamiaceae	*Cyclotrichium niveum* (Boiss.) Manden & Scheng.	END	VU		
493	Lamiaceae	*Cyclotrichium stamineum* (Boiss. & Hohen) Manden & Scheng.		VU		
494	Lamiaceae	*Marrubium catariifolium* Desr.		VU		
495	Lamiaceae	*Marrubium persicum* C.A.Mey.		VU		
496	Lamiaceae	*Phlomis physocalyx* Hub.-Mor.	END	VU		
497	Lamiaceae	*Phlomis sintenisii* Rech.f.	END	VU		
498	Lamiaceae	*Salvia halophila* Hedge	END	VU		
499	Lamiaceae	*Salvia kronenburgii* Rech.f.	END	VU		
500	Lamiaceae	*Salvia modesta* Boiss.	END	VU		

501	Lamiaceae	*Salvia reeseana* Hedge & Hub.-Mor.	END	VU		
502	Lamiaceae	*Salvia vermifolia* Hedge & Hub.-Mor.	END	VU		
503	Lamiaceae	*Satureja boissieri* Hausskn. ex Boiss.		VU		
504	Lamiaceae	*Satureja spinosa* L.		VU		
505	Lamiaceae	*Sideritis akmanii* Aytaç, Ekici & Dönmez	END	VU		
506	Lamiaceae	*Stachys araxina* Kopell.		VU		
507	Lamiaceae	*Stachys inanis* Hausskn. & Bornm.	END	VU		
508	Lamiaceae	*Thymus cappadocicus* Boiss.	END	VU		
509	Lamiaceae	*Thymus eriocalyx* (Ronniger) Jalas		VU		
510	Lamiaceae	*Thymus syriacus* Boiss.		VU		
511	Liliaceae	*Fritillaria imperialis* L.		VU		
512	Liliaceae	*Fritillaria straussii* Bornm.		VU		
513	Liliaceae	*Gagea tenera* Pascher		VU		
514	Liliaceae	*Tulipa aleppensis* Boiss. ex Regel		VU		
515	Linaceae	*Linum peyronii* Post		VU		
516	Linaceae	*Linum seljukorum* P.H.Davis		VU		
517	Linaceae	*Linum triflorum* P.H.Davis	END	VU		
518	Malvaceae	*Alcea guestii* Zohary		VU		
519	Malvaceae	*Alcea kurdica* (Schltdl.) Alef.		VU		
520	Orobancheae	*Orobanche sintenisii* Beck ex Bornm.		VU		
521	Papaveraceae	*Corydalis angustifolia* (M.Bieb.) DC.		VU		
522	Papaveraceae	*Glaucium cappadocicum* Boiss.	END	VU		
523	Plantaginaceae	*Veronica allahuekberensis* A.Öztürk	END	VU		
524	Plantaginaceae	*Veronica cetikiana* A.Öztürk	END	VU		
525	Plantaginaceae	*Veronica polium* P.H.Davis	END	VU		
526	Plumbaginaceae	*Acantholimon dianthifolium* Bokhari		VU		Doğan and Akaydın 2007
527	Plumbaginaceae	*Acantholimon petuniiflorum* Mobayen		VU		Doğan and Akaydın 2007
528	Plumbaginaceae	*Acantholimon quinquelobum* Bunge		VU		Doğan and Akaydın 2007

529	Plumbaginaceae	*Acantholimon saxifragiforme* Hausskn. & Sint. ex Bokhari		VU		Doğan and Akaydın 2007
530	Plumbaginaceae	*Acantholimon strigillosum* Bokhari	END	VU		Doğan and Akaydın 2007
531	Plumbaginaceae	*Limonium anatolicum* Hedge	END	VU		
532	Plumbaginaceae	*Limonium vanense* Kit Tan & Sorger	END	VU		
533	Poaceae	*Aegilops crassa* Boiss.		VU		
534	Poaceae	*Aegilops tauschii* Coss.		VU		
535	Poaceae	*Crithopsis delileana* (Schult.) Roshev.		VU		
536	Poaceae	*Elymus gentryi (Melderis) Melderis*		VU		
537	Poaceae	*Leymus cappadocicus* (Boiss. & Balansa) Melderis		VU		
538	Poaceae	*Puccinella bulbosa* (Grossh.) Grossh.		VU		
539	Poaceae	*Stipa kurdistanica* Bor		VU		
540	Poaceae	*Triticum dicoccoides* (Körn. ex Asch. & Graebn.) Schweinf.		VU		
541	Polygalaceae	*Polygala stocksiana* Boiss.		VU		
542	Polygonaceae	*Polygonum rottboellioides* Jaub. & Spach		VU		
543	Ranunculaceae	*Aconitum anthora* L.		VU		
544	Ranunculaceae	*Adonis dentata* Delile		VU		
545	Ranunculaceae	*Consolida armeniaca* (Stapf ex Huth) Schrödinger	END	VU		
546	Ranunculaceae	*Consolida persica* (Boiss.) Schrödinger		VU		
547	Ranunculaceae	*Delphinium macrostachyum* Boiss. ex Huth		VU		
548	Ranunculaceae	*Nigella lancifolia* Hub.-Mor.	END	VU		
549	Ranunculaceae	*Ranunculus sintenisii* Freyn	END	VU		
550	Resedaceae	*Reseda aucheri* Boiss. subsp. *rotundifolia* (Kotschy ex Müll.-Arg.) Rech.f.		VU		

551	Rhamnaceae	*Rhamnus alpina* L. subsp. *fallax* (Boiss.) Maire & Petitm.		VU		
552	Rosaceae	*Amygdalus kotschyi* Boiss. & Hohen.		VU		
553	Rosaceae	*Cerasus hippophaeoides* (Bornm.) Bornm.	END	VU		
554	Rosaceae	*Cotoneaster meyeri* Pojark.		VU		
555	Rosaceae	*Potentilla armeniaca* Siegfr. ex Th.Wolf	END	VU		
556	Rosaceae	*Potentilla pimpinelloides* L.		VU		
557	Rosaceae	*Sorbus luristanica* (Bornm.) Schönb.-Tem.		VU		
558	Rubiaceae	*Crucianella kurdistanica* Malin.		VU		
559	Rubiaceae	*Galium angustissimum* (Hausskn. ex Bornm.) Ehrend.	END	VU		
560	Rubiaceae	*Galium runcinatum* Ehrend. & Schönb.-Tem.	END	VU		
561	Rubiaceae	*Mericarpaea ciliata* (Banks & Sol.) Eig		VU		
562	Rutaceae	*Haplophyllum vulcanicum* Boiss. & Heldr.	END	VU		
563	Santalaceae	*Chrysothesium stelleroides* (Jaub. & Spach) Hendrych	END	VU		
564	Santalaceae	*Thesium bertramii* Aznav.	END	VU		Yıldız et al. 2011
565	Santalaceae	*Thesium scabriflorum* P.H.Davis	END	VU		
566	Scrophulariaceae	*Scrophularia bitlisica* Lall	END	VU		
567	Scrophulariaceae	*Scrophularia crenophila* Boiss.		VU		
568	Scrophulariaceae	*Scrophularia lepidota* Boiss.	END	VU		
569	Scrophulariaceae	*Scrophularia subaequiloba* Lall	END	VU		
570	Scrophulariaceae	*Scrophularia zuvandica* Grossh.		VU		
571	Scrophulariaceae	*Verbascum alepense* Benth.		VU		
572	Scrophulariaceae	*Verbascum anastasii* Nábělek	END	VU		
573	Scrophulariaceae	*Verbascum andrusi* Post		VU		

574	Scrophulariaceae	*Verbascum apiculatum* Hub.-Mor.	END*	VU		
575	Scrophulariaceae	*Verbascum biscutellifolium* Benth.	END	VU		
576	Scrophulariaceae	*Verbascum cerinum* Boiss. & Heldr.	END	VU		
577	Scrophulariaceae	*Verbascum charputense* Murb.	END	VU		
578	Scrophulariaceae	*Verbascum diversifolium* Hochst.	END	VU		
579	Scrophulariaceae	*Verbascum euphraticum* Benth.	END	VU		
580	Scrophulariaceae	*Verbascum froedinii* Murb.		VU		
581	Scrophulariaceae	*Verbascum geminiflorum* Hochst.		VU		
582	Scrophulariaceae	*Verbascum hajastanicum* Bordz.		VU		
583	Scrophulariaceae	*Verbascum laetum* Boiss. & Hausskn.		VU		
584	Scrophulariaceae	*Verbascum longipedicellatum* Hub.-Mor.	END	VU		
585	Scrophulariaceae	*Verbascum nudicaule* (Wydler) Takht.		VU		
586	Scrophulariaceae	*Verbascum pyroliforme* (Boiss. & Heldr.) Kuntze	END*	VU		
587	Scrophulariaceae	*Verbascum tenue* Murb.	END	VU		
588	Plantaginaceae	*Veronica polifolia* Benth.		VU		
589	Thymelaceae	*Diarthron magakjanii* (Sosn.) Kit Tan		VU		
590	Violaceae	*Viola pentadactyla* Fenzl		VU		
591	Zygophyllaceae	*Fagonia olivieri* DC.		VU		
592	Scrophulariaceae	*Verbascum iconium* Hub.-Mor.	END	VU		
593	Apiaceae	*Eryngium wanaturi* Woronow		VU		
594	Asparagaceae	*Hyacinthella campanulata* K.Perss. & Wendelbo	END	VU		
595	Asteraceae	*Cota oxylepis* Boiss.	END	VU		
596	Asteraceae	*Echinops heterophyllus* P.H.Davis		VU		
597	Asteraceae	*Erigeron zederbaueri* Vierh.	END	VU		
598	Scrophulariaceae	*Verbascum sphenandroides* K.Koch	END	VU		
599	Fabaceae	*Astragalus fallacinus* Podlech	END	VU		Özhatay and Kültür 2006, Podlech 1999
600	Brassicaceae	*Erysimum huber-morathii* Polatschek	END	VU		

601	Fabaceae	*Astragalus deinacanthus* Boiss.		VU		
602	Fabaceae	*Astragalus petropolitanus* E.Sheld.		VU		Akan and Aytaç 2014
603	Lamiaceae	*Thymus parnassicus* Hal.		VU		
604	Plumbaginaceae	*Acantholimon halophilum* Bokhari	END*	VU		
605	Plumbaginaceae	*Acantholimon huetii* Boiss.	END*	VU		
606	Plumbaginaceae	*Acantholimon lycaonicum* Boiss. & Heldr.	END*	VU		
607	Plumbaginaceae	*Acantholimon wiedemannii* Bunge	END	VU		Doğan and Akaydın 2007
608	Plumbaginaceae	*Acantholimon bracteatum* (Girard) Boiss.		VU		Doğan and Akaydın 2007
609	Rosaceae	*Amygdalus carduchorum* Bornm. subsp. *serrata* Browicz	END	VU		
610	Rosaceae	*Pyrus hakkiarica* Browicz	END	VU		
611	Lamiaceae	*Nepeta trichocalyx* Greuter & Burdet	END	NT		
612	Brassicaceae	*Aethionema turcica* H.Duman & Aytaç	END	NT	SP	Personal records of Mecit Vural
613	Asteraceae	*Cousinia woronowii* Bornm.	END	NT	P	
614	Asteraceae	*Echinops adenoclados* (Hedge) C.Vural	END	NT	P	
615	Asteraceae	*Psephellus bornmuelleri* (Hausskn. ex Bornm.) Wagenitz	END	NT	P	
616	Asteraceae	*Tanacetum cappadocicum* (DC.) Sch.Bip.	END	NT	P	Personal records of Ali Kandemir
617	Boraginaceae	*Paracaryum longipes* Boiss.	END	NT	P	
618	Brassicaceae	*Alyssum caespitosum* Baumg.	END	NT	P	
619	Caryophyllaceae	*Paronychia condensata* Chaudhri	END	NT	P	
620	Caryophyllaceae	*Phryna ortegioides* (Fisch. & C.A.Mey.) Pax & K.Hoffm.	END	NT	P	
621	Fabaceae	*Onobrychis sulphurea* Boiss. & Balansa	END*	NT	P	Özhatay et al. 2003
622	Hypericaceae	*Hypericum uniglandulosum* Hausskn. ex Bornm.	END	NT	P	Ministry of Forestry and Water Affairs 2011a
623	Lamiaceae	*Lamium tomentosum* Willd.		NT	P	
624	Lamiaceae	*Marrubium trachyticum* Boiss.	END	NT	P	

625	Amaryllidaceae	*Allium shatakiense* Rech.f.		NT	P	Fritsch and Maroofi 2010
626	Apiaceae	*Laserpitium carduchorum* Hedge & Lamond	END	NT		
627	Apiaceae	*Pimpinella anisetum* Boiss. & Balansa	END	NT		
628	Asparagaceae	*Hyacinthella siirtensis* B.Mathew	END	NT		
629	Asparagaceae	*Scilla leepii* Speta	END	NT		
630	Asteraceae	*Achillea cucullata* Bornm.	END	NT		
631	Asteraceae	*Achillea magnifica* Heimerl ex Hub.-Mor.	END	NT		
632	Asteraceae	*Centaurea kurdica* Reichardt	END	NT		
633	Asteraceae	*Centaurea stapfiana* Freyn & Sint.	END	NT		
634	Asteraceae	*Centaurea tomentella* Hand.-Mazz.	END	NT		
635	Asteraceae	*Cousinia cataonica* Boiss. & Hausskn.	END	NT		
636	Asteraceae	*Cousinia nabelekii* Bornm.	END	NT		
637	Asteraceae	*Jurinea brevicaulis* Boiss.	END	NT		
638	Asteraceae	*Jurinea cataonica* Boiss. & Hausskn.	END*	NT		Doğan et al. 2011
639	Asteraceae	*Scorzonera inaequiscapa* Boiss.	END	NT		
640	Asteraceae	*Taraxacum pseudonigricans* Hand.-Mazz.	END	NT		
641	Boraginaceae	*Onosma lycaonica* Hub.-Mor.	END	NT		
642	Boraginaceae	*Onosma procera* Boiss.	END	NT		
643	Brassicaceae	*Alyssum blepharocarpum* T.R.Dudley & Hub.-Mor.	END	NT		
644	Brassicaceae	*Alyssum tetrastemon* Boiss.	END	NT		
645	Brassicaceae	*Hesperis schischkinii* Tzvelev	END	NT		
646	Campanulaceae	*Campanula scoparia* (Boiss. & Hausskn.) Damboldt	END	NT		
647	Caryophyllaceae	*Silene akmaniana* Ekim & Çelik	END	NT		
648	Euphorbiaceae	*Euphorbia smirnovii* Geltman.	END	NT		
649	Euphorbiaceae	*Euphorbia sanasunitensis* Hand.-Mazz.	END	NT		

650	Fabaceae	*Astragalus germanicopolitanus* Bornm.	END	NT		
651	Fabaceae	*Astragalus cryptocarpos* DC.	END	NT		
652	Hypericaceae	*Hypericum spectabile* Jaub. & Spach		NT		
653	Hypericaceae	*Hypericum thymopsis* Boiss.	END	NT		
654	Lamiaceae	*Ballota rotundifolia* K.Koch	END	NT		
655	Lamiaceae	*Salvia blepharochlaena* Hedge & Hub.-Mor.	END	NT		
656	Lamiaceae	*Salvia longipedicellata* Hedge	END	NT		
657	Lamiaceae	*Sideritis caesarea* H.Duman, Aytaç & Başer	END	NT		
658	Lamiaceae	*Thymus haussknechtii* Velen.	END	NT		
659	Lamiaceae	*Thymus pectinatus* Fisch. & C.A.Mey.	END	NT		
660	Amaryllidaceae	*Allium sintenisii* Freyn	END	NT		
661	Amaryllidaceae	*Allium stearnianum* Koyuncu, Özhatay & Kollmann	END*	NT		
662	Orobancheae	*Rhynchocorys kurdica* Nábělek	END	NT		
663	Plumbaginaceae	*Acantholimon hypochaerum* Bokhari	END	NT		Doğan and Akaydın 2007
664	Plumbaginaceae	*Acantholimon reflexifolium* Bokhari	END	NT		
665	Poaceae	*Bromus armenus* Boiss.	END	NT		
666	Poaceae	*Elymus erosiglumis* Melderis	END	NT		
667	Polygonaceae	*Rumex gracilescens* Rech.f.	END	NT		
668	Ranunculaceae	*Delphinium carduchorum* Chowdhuri & P.H.Davis	END	NT		
669	Ranunculaceae	*Delphinium laxiusculum* (Boiss.) Rouy		NT		
670	Resedaceae	*Reseda germanicopolitana* Hub.-Mor.	END*	NT		Özhatay et al. 2009
671	Rhamnaceae	*Rhamnus kayacikii* P.H.Davis & Yalt.	END	NT		
672	Rubiaceae	*Galium xylorrhizum* Boiss. & A.Huet	END	NT		
673	Rutaceae	*Haplophyllum cappadocicum* Spach	END	NT		
674	Rutaceae	*Haplophyllum telephioides* Boiss.	END	NT		

675	Santalaceae	*Thesium tauricolum* Boiss. & Hausskn.	END	NT		
676	Scrophulariaceae	*Verbascum krauseanum* Murb.	END	NT		
677	Scrophulariaceae	*Verbascum melitenense* Hub.-Mor.	END	NT		
678	Scrophulariaceae	*Verbascum oreodoxum* Hub.-Mor.	END	NT		
679	Scrophulariaceae	*Verbascum stachydifolium* Boiss. & Heldr.	END*	NT		
680	Scrophulariaceae	*Verbascum urceolatum* Hub.-Mor.	END	NT		
681	Apiaceae	*Bupleurum turcicum* Snogerup	END	NT		
682	Brassicaceae	*Arabis carduchorum* Boiss.	END	NT		
683	Brassicaceae	*Pseudosempervivum sempervivum* (Boiss. & Balansa) Pobed.	END	NT		
684	Asteraceae	*Cousinia halysensis* Hub.-Mor.	END	CD	P	
685	Asteraceae	*Cousinia iconica* Hub.-Mor.	END	CD	P	Dural and Ekim 2007a
686	Asteraceae	*Cousinia intertexta* Freyn & Sint.	END	CD	P	Personal records of Ali Kandemir
687	Asteraceae	*Echinops melitenensis* Hedge & Hub.-Mor.	END	CD	P	
688	Asteraceae	*Tanacetum albipannosum* Hub.-Mor. & Grierson	END	CD	P	Personal records of Ali Kandemir
689	Asteraceae	*Tanacetum eginense* (Hausskn. ex Bornm.) Grierson	END	CD	P	Personal records of Ali Kandemir
690	Brassicaceae	*Aethionema dumanii* Vural & Adıgüzel	END	CD	P	
691	Brassicaceae	*Alyssum thymops* (Hub.-Mor. & Reese) T.R.Dudley	END	CD	P	Dural and Ekim 2007a
692	Caryophyllaceae	*Dianthus zederbaueri* Vierh.	END	CD	P	Personal records of Ali Kandemir
693	Caprifoliaceae	*Cephalaria sparsipilosa* V.A.Matthews	END	CD	P	Ministry of Forestry and Water Affairs 2012a
694	Lamiaceae	*Salvia euphratica* Montbret & Aucher ex Benth.	END*	CD	P	
695	Liliaceae	*Fritillaria michailovskyi* Fomin	END	CD	P	

696	Ranunculaceae	*Delphinium vanense* Rech.f.	END	CD	P	Behçet 1989
697	Ranunculaceae	*Ranunculus crateris* P.H.Davis	END	CD	P	Behçet 1989
698	Resedaceae	*Reseda armena* Boiss.	END*	CD	P	
699	Santalaceae	*Chrysothesium aureum* (Jaub. & Spach) Hendrych	END	CD	P	
700	Scrophulariaceae	*Verbascum wiedemannianum* Fisch. & C.A.Mey.	END	CD	P	Personal records of Ali Kandemir
701	Amaranthaceae	*Petrosimonia nigdeensis* Aellen	END	CD		
702	Apiaceae	*Bupleurum koechelii* Fenzl	END	CD		
703	Apiaceae	*Eryngium bornmuelleri* Nábělek	END	CD		
704	Apiaceae	*Heracleum argaeum* Boiss. & Balansa	END	CD		
705	Asparagaceae	*Hyacinthella acutiloba* K.Perss. & Wendelbo	END	CD		
706	Asparagaceae	*Muscari discolor* Boiss. & Hausskn. ex Boiss.	END	CD		
707	Asteraceae	*Achillea pseudoaleppica* Hub.-Mor.	END	CD		
708	Asteraceae	*Achillea sintenisii* Hub.-Mor.	END	CD		
709	Asteraceae	*Achillea sipikorensis* Hausskn. & Bornm.	END	CD		
710	Asteraceae	*Centaurea derderiifolia* Wagenitz	END	CD		
711	Asteraceae	*Centaurea sivasica* Wagenitz	END	CD		
712	Asteraceae	*Psephellus schischkinii* (Tzvelev) Wagenitz	END	CD		
713	Boraginaceae	*Onosma neglecta* Riedl	END	CD		
714	Boraginaceae	*Onosma proballanthera* Rech.f.	END	CD		
715	Boraginaceae	*Paracaryum stenolophum* Boiss.	END	CD		
716	Brassicaceae	*Alyssum harputicum* T.R.Dudley		CD		
717	Brassicaceae	*Hesperis bottae* E.Fourn.	END	CD		
718	Brassicaceae	*Matthiola anchoniifolia* Hub.-Mor.	END	CD		

719	Campanulaceae	*Campanula kirikkaleënsis* Dönmez & Güner	END	CD		Özhatay et al. 1999, Dönmez and Güner 1993
720	Campanulaceae	*Campanula oligosperma* Damboldt	END	CD		
721	Caryophyllaceae	*Eremogone angustisepala* (McNeill) Ikonn.	END	CD		
722	Caryophyllaceae	*Gypsophila bitlisensis* Barkoudah	END	CD		
723	Caryophyllaceae	*Gypsophila pinifolia* Boiss. & Hausskn.	END	CD		
724	Caryophyllaceae	*Gypsophila tuberculosa* Hub.-Mor.	END	CD		
725	Caryophyllaceae	*Paronychia beauverdii* Czeczott	END	CD		
726	Caryophyllaceae	*Paronychia dudleyi* Chaudhri	END	CD		
727	Caryophyllaceae	*Paronychia galatica* Chaudhri	END	CD		
728	Caryophyllaceae	*Silene cartilaginea* Hub.-Mor.	END	CD		
729	Caprifoliaceae	*Scabiosa pseudograminifolia* Hub.-Mor.	END	CD		
730	Caprifoliaceae	*Scabiosa rufescens* Freyn & Sint.	END	CD		
731	Geraniaceaae	*Geranium palmatipartitum* (Hausskn. Ex Knuth) Aedo	END	CD		
732	Hypericaceae	*Hypericum capitatum* Choisy		CD		
733	Hypericaceae	*Hypericum thymbrifolium* Boiss. & Noë	END	CD		
734	Iridaceae	*Crocus leichtlinii* (Dewar) Bowles	END	CD		
735	Lamiaceae	*Nepeta obtusicrena* Boiss. & Kotschy ex Hedge	END	CD		Dirmenci et al. 2004
736	Lamiaceae	*Nepeta sorgerae* Hedge & Lamond	END	CD		Dirmenci et al. 2004
737	Lamiaceae	*Origanum haussknechtii* Boiss.	END	CD		
738	Lamiaceae	*Sideritis armeniaca* Bornm.	END	CD		
739	Lamiaceae	*Sideritis hispida* P.H.Davis	END	CD		
740	Lamiaceae	*Thymus argaeus* (Fisch & C.A.Mey) Boiss. & Balansa	END	CD		
741	Amaryllidaceae	*Allium brevicaule* Boiss. & Balansa	END	CD		
742	Plantaginaceae	*Plantago euphratica* Decne. ex Barnéoud	END	CD		

743	Plantaginaceae	*Veronica fridericae* M.A.Fisch.	END	CD		
744	Plantaginaceae	*Veronica oltensis* Woronow ex Elenevsky	END	CD		
745	Plumbaginaceae	*Acantholimon damassanum* Mobayen		CD		Doğan and Akaydın 2007
746	Plumbaginaceae	*Acantholimon spirizianum* Mobayen	END	CD		
747	Ranunculaceae	*Delphinium dolichostachyum* Chowdhuri & P.H.Davis	END	CD		
748	Ranunculaceae	*Ranunculus munzurensis* Erik & Yıld.	END	CD		
749	Ranunculaceae	*Ranunculus vanensis* P.H.Davis	END	CD		
750	Scrophulariaceae	*Verbascum ancyritanum* Bornm.	END	CD		
751	Scrophulariaceae	*Verbascum campestre* Boiss. & Heldr.	END	CD		
752	Scrophulariaceae	*Verbascum heterobarbatum* Hub.-Mor.	END	CD		
753	Scrophulariaceae	*Verbascum macrosepalum* Boiss. & Kotschy ex Murb.	END	CD		
754	Scrophulariaceae	*Verbascum vanense* Hub.-Mor.	END	CD		
755	Plumbaginaceae	*Acantholimon multiflorum* (Bokhari) Doğan & Akaydın		CD		Doğan and Akaydın 2007
756	Asteraceae	*Tanacetum sericeum* (Adams) Sch.Bip.		DD	NE	
757	Liliaceae	*Fritillaria viridiflora* Post		DD	NE	Güner et al. 2012
758	Amaranthaceae	*Atriplex olivieri* Moq.		DD	NE	
759	Amaranthaceae	*Spinacia tetrandra* M.Bieb.		DD	NE	
760	Amaryllidaceae	*Allium armerioides* Boiss.	END	DD	NE	
761	Amaryllidaceae	*Allium schergianum* Boiss.		DD	NE	
762	Amaryllidaceae	*Allium woronowii* Miscz. ex Grossh.		DD	NE	
763	Apiaceae	*Bunium cylindricum* (Boiss. & Hohen.) Drude		DD	NE	
764	Apiaceae	*Chaerophyllum roseum* M.Bieb.		DD	NE	
765	Apiaceae	*Ferulago bracteata* Boiss. & Hausskn.	END	DD	NE	
766	Apiaceae	*Johrenia aurea* Boiss. & Balansa		DD	NE	
767	Apiaceae	*Szovitsia callicarpa* Fisch. & C.A.Mey.		DD	NE	

768	Apiaceae	*Tordylium cappadocicum* Boiss.	END	DD	NE	
769	Apocynaceae	*Vincetoxicum funebre* Boiss. & Kotschy		DD	NE	
770	Xanthorrhoeaceae	*Asphodeline prolifera* (M.Bieb.) Kunth		DD	NE	
771	Asteraceae	*Anacyclus nigellifolius* Boiss.		DD	NE	
772	Asteraceae	*Anthemis melanacme* Boiss. & Hausskn.		DD	NE	
773	Asteraceae	*Artemisia haussknechtii* Boiss.		DD	NE	
774	Asteraceae	*Centaurea chaldaeorum* Nábělek	END	DD	NE	
775	Asteraceae	*Centaurea laxa* Boiss. & Hausskn.		DD	NE	
776	Asteraceae	*Cota fulvida* (Grierson) Holub.	END	DD	NE	
777	Asteraceae	*Echinops polyacanthus* Iljin		DD	NE	
778	Asteraceae	*Echinops tournefortii* Trautv.		DD	NE	
779	Asteraceae	*Filago palaestina* (Boiss.) Chrtek & Holub		DD	NE	
780	Asteraceae	*Hieracium subvandasii* (Bornm. & Zahn) P.D.Sell & C.West	END	DD	NE	
781	Asteraceae	*Inula discoidea* Boiss.	END	DD	NE	
782	Asteraceae	*Jurinea eriobasis* DC.		DD	NE	
783	Asteraceae	*Jurinea mesopotamica* Hand.-Mazz.		DD	NE	
784	Asteraceae	*Jurinea multiflora* (L.) B.Fedtsch.		DD	NE	
785	Asteraceae	*Klasea bornmuelleri* (Azn.) Greuter & Wagenitz	END	DD	NE	
786	Asteraceae	*Lactuca rechingeriana* (Tuisl) N.Kilian & Greuter		DD	NE	
787	Asteraceae	*Psephellus eugenii* (Sosn.) Wagenitz	END	DD	NE	
788	Asteraceae	*Taraxacum kalchiainum* Soest		DD	NE	
789	Asteraceae	*Taraxacum sintenisii* Dahlst.		DD	NE	
790	Asteraceae	*Tripleurospermum heterolepis* (Freyn & Sint.) Bornm.	END	DD	NE	

791	Boraginaceae	*Onosma rigida* Ledeb.		DD	NE	
792	Boraginaceae	*Paracaryum montbretii* (Riedl) R.R.Mill	END	DD	NE	
793	Brassicaceae	*Camelina anomala* Boiss. & Hausskn.		DD	NE	
794	Brassicaceae	*Erysimum armeniacum* (Sims) J.Gay		DD	NE	
795	Brassicaceae	*Matthiola odoratissima* (M.Bieb) R.Br.		DD	NE	
796	Brassicaceae	*Sameraria glastifolia* (Fisch. & C.A.Mey.) Boiss.		DD	NE	
797	Campanulaceae	*Campanula phyctidocalyx* Boiss. & Noë		DD	NE	
798	Caryophyllaceae	*Cerastium haussknechtii* Boiss. & Hausskn.	END	DD	NE	
799	Caryophyllaceae	*Dianthus inamoenus* Schischk.		DD	NE	
800	Caryophyllaceae	*Dianthus raddeanus* Vierh.		DD	NE	
801	Caryophyllaceae	*Dianthus schemachensis* Schischk.		DD	NE	
802	Caryophyllaceae	*Eremogone szowitsii* (Boiss.) Ikonn.		DD	NE	
803	Caryophyllaceae	*Minuartia formosa* (Fenzl) Mattf.		DD	NE	
804	Caryophyllaceae	*Paronychia boissieri* Rouy	END	DD	NE	
805	Caryophyllaceae	*Silene caucasica* (Bunge) Boiss.		DD	NE	
806	Convolvulaceae	*Cuscuta obtusata* (Engelm.) Traub		DD	NE	
807	Caprifoliaceae	*Cephalaria salicifolia* Post	END	DD	NE	
808	Caprifoliaceae	*Dipsacus strigosus* Willd. ex Roem. & Schult.		DD	NE	
809	Fabaceae	*Astragalus aegobromus* Boiss. & Hohen.		DD	NE	
810	Fabaceae	*Astragalus balkisensis* Širj. & Rech.f.	END	DD	NE	
811	Fabaceae	*Astragalus basianicus* Boiss. & Hausskn. ex Boiss.		DD	NE	
812	Fabaceae	*Astragalus bracteosus* Boiss. & Noë		DD	NE	
813	Fabaceae	*Astragalus delanensis* Širj. & Rech.f.	END	DD	NE	
814	Fabaceae	*Astragalus meyeri* Boiss.		DD	NE	
815	Fabaceae	*Astragalus pseudoutriger* Grossh.		DD	NE	

816	Fabaceae	*Astragalus tuus* Kit Tan	END	DD	NE	
817	Fabaceae	*Astragalus viridiformis* Širj.	END	DD	NE	
818	Fabaceae	*Hedysarum formosum* Fisch. & C.A.Mey. ex Basin.		DD	NE	
819	Fabaceae	*Hedysarum sericeum* M.Bieb.		DD	NE	
820	Fabaceae	*Onobrychis halysensis* Širj.	END	DD	NE	
821	Fabaceae	*Onobrychis haussknechtii* Boiss.		DD	NE	
822	Fabaceae	*Oxytropis pilosa* (L.) DC.		DD	NE	
823	Fabaceae	*Trifolium meironense* Zohary & Lern.		DD	NE	
824	Fabaceae	*Vicia biennis* L.		DD	NE	
825	Fabaceae	*Vicia semiglabra* Rupr. ex Boiss.		DD	NE	
826	Hypericaceae	*Hypericum salsolifolium* Hand.-Mazz.	END	DD	NE	
827	Lamiaceae	*Dracocephalum ruyschiana* L.		DD	NE	
828	Lamiaceae	*Pentapleura subulifera* Hand.-Mazz.		DD	NE	
829	Lamiaceae	*Stachys brantii* Benth.	END	DD	NE	
830	Lamiaceae	*Stachys huetii* Boiss.	END	DD	NE	
831	Liliaceae	*Gagea chanae* Grossh.		DD	NE	
832	Linaceae	*Linum ciliatum* Hayek	END	DD	NE	
833	Linaceae	*Linum persicum* Boiss.		DD	NE	
834	Malvaceae	*Alcea fasciculiflora* Zohary		DD	NE	
835	Orobancheae	*Necranthus orobanchoides* Gilli	END	DD	NE	
836	Papaveraceae	*Papaver acrochaetum* Bornm.		DD	NE	
837	Plantaginaceae	*Linaria sintenisii* P.H.Davis	END	DD	NE	
838	Plumbaginaceae	*Limonium pycnanthum* (K.Koch) Kuntze	END	DD	NE	
839	Poaceae	*Stipa araxensis* Grossh.		DD	NE	
840	Poaceae	*Triticum timopheevi* (Zhuk.) Zhuk.		DD	NE	
841	Polygonaceae	*Polygonum cappadocicum* Boiss. & Balansa	END	DD	NE	
842	Polygonaceae	*Pteropyrum olivierii* Jaub. & Spach		DD	NE	

843	Ranunculaceae	*Consolida saccata* (Huth) P.H.Davis		DD	NE	
844	Ranunculaceae	*Ranunculus obesus* Trautv.		DD	NE	
845	Resedaceae	*Reseda microcarpa* Müll.Arg.		DD	NE	
846	Resedaceae	*Reseda saadae* Abdallah & de Wit	END	DD	NE	
847	Scrophulariaceae	*Scrophularia atropatana* Grossh.		DD	NE	
848	Scrophulariaceae	*Scrophularia macrobotrys* Ledeb.		DD	NE	
849	Scrophulariaceae	*Scrophularia scariosa* Boiss.		DD	NE	
850	Scrophulariaceae	*Verbascum elegantulum* Hub.-Mor.	END	DD	NE	
851	Scrophulariaceae	*Verbascum globiflorum* Boiss. & Noë	END	DD	NE	
852	Scrophulariaceae	*Verbascum josgadense* Murb.	END	DD	NE	
853	Scrophulariaceae	*Verbascum racemiferum* Boiss. & Hausskn. ex Boiss.		DD	NE	
854	Asteraceae	*Erigeron daënensis* Vierh.		DD	NE	
855	Brassicaceae	*Physoptychis gnaphalodes* (DC.) Boiss.		DD	NE	
856	Poaceae	*Helictotrichon armeniacum* (Schischk.) Grossh.		DD	NE	
857	Asteraceae	*Achillea membranacea* (Labill.) DC.		**	P	
858	Fabaceae	*Astragalus spectabilis* Schischk.	END	**	P	
859	Papaveraceae	*Glaucium haussknechtii* Bornm. & Fedde		**	P	Ocak et al. 2012, Ünal and Behçet 2007
860	Plantaginaceae	*Plantago loeflingii* L.		**	P	
861	Fabaceae	*Astragalus yildirimlii* Aytaç & Ekici	END	**	SP	Özhatay and Kültür 2006, Aytaç and Ekici 2002
862	Asteraceae	*Achillea ketenoglui* H.Duman	END	**	P	Personal records of Mecit Vural
863	Fabaceae	*Astragalus physodes* L. subsp. *acikirensis* Ekim	END	**	P	
864	Fabaceae	*Astragalus nigrocalycinus* Podlech	END	**	P	Özhatay and Kültür 2006, Podlech 1999
865	Grossulariaceae	*Ribes anatolicum* Behçet	END	**	P	Özhatay & Kültür 2006, Behçet 2001
866	Fabaceae	*Astragalus sarikamishensis* Podlech	END	**	P	Podlech 2004

867	Plumbaginaceae	*Acantholimon avanosicum* Doğan & Akaydın	END	**	P	Doğan & Akaydın 2002a
868	Plumbaginaceae	*Limonium smithii* Doğan & Akaydın	END	**	P	Akaydın 2007
869	Scrophulariaceae	*Verbascum tuna-ekimii* Karavel., A.Duran & Hamzaoğlu	END	**	P	Özhatay & Kültür 2006, Karavelioğulları et al. 2004
870	Fabaceae	*Astragalus subhanensis* F.Ghahrem. & Behçet	END	**	P	Özhatay and Kültür 2006, Ghahremani-Nejad and Behçet 2003
871	Brassicaceae	*Erysimum ketenoglui* Yıld.	END	**	P	Özhatay et al. 2011
872	Plumbaginaceae	*Acantholimon anatolicum* Doğan & Akaydın	END	**	P, SP	Doğan and Akaydın 2002b, Doğan and Akaydın 2007
873	Ranunculaceae	*Delphinium anatolicum* Mısırdalı, Malyer & Başer	END	**		
874	Crassulaceae	*Sedum ince* 't Hart & Alpınar	END	**		
875	Fabaceae	*Astragalus kirchhoffiae* Podlech	END	**		
876	Boraginaceae	*Anchusa konyaensis* Yıld.	END	**		Yıldırımlı 2010
877	Boraginaceae	*Onosma discedens* Hausskn. ex Bornm.	END	**		Kandemir 2009
878	Amaryllidaceae	*Allium eginense* Freyn	END	**		
879	Apiaceae	*Ferula parva* Freyn & Bornm.	END	**		
880	Iridaceae	*Iris farashae* Güner	END	**		Güner et al. 2012
881	Fabaceae	*Astragalus demirizii* R.Kramer & Podlech	END	**		Özhatay and Kültür 2006, Podlech 1999
882	Asparagaceae	*Muscari sirnakense* Yıld.	END	**		Özhatay et al. 2011, Yıldırımlı 2010
883	Apiaceae	*Trigonosciadium tuberosum* Boiss.	END*	**		Güner et al. 2012
884	Amaranthaceae	*Salsola turcica* Yıld.	END	**		Özhatay et al. 2011
885	Amaranthaceae	*Corispermum anatolicum* Sukhor.	END	**		Özhatay et al. 2011
886	Liliaceae	*Gagea sivasica* Hamzaoğlu	END	**		Özhatay et al. 2011, Hamzaoğlu et al. 2008
887	Liliaceae	*Tulipa koyuncui* Eker & Babaç	END	**		Özhatay et al. 2011, Eker & Babaç 2010

888	Linaceae	*Linum ertugrulii* Tugay, Bağcı & Uysal	END	**		Özhatay et al. 2011, Tugay et al. 2010
889	Poaceae	*Poa bussmannii* H.Scholz	END	**		Özhatay et al. 2011
890	Fabaceae	*Astragalus yilmazii* Aytaç & Ekici	END	**		Özhatay and Kültür 2006, Aytaç et al. 2001
891	Rubiaceae	*Galium cankiriense* Yıld.	END	**		Özhatay et al. 2011
892	Scrophulariaceae	*Verbascum ozturkii* Karavel., Uzunh & S.Çelik	END	**		Özhatay et al. 2011, Karavelioğulları et al. 2008
893	Caryophyllaceae	*Gypsophila turcica* Hamzaoğlu	END	**		Hamzaoğlu 2012
894	Apocynaceae	*Vinca soneri* Koyuncu	END	**		Koyuncu 2012
895	Apiaceae	*Rhabdosciadium urusakii* Akalın	END	**		Akalın and Akpulat 2012
896	Apiaceae	*Ferula brevipedicellata* Peşmen ex Sağıroğlu & H.Duman	END	**		Sağıroğlu and Duman 2010
897	Apiaceae	*Diplotaenia turcica* Pimenov & Kljuykov	END	**		Pimenov et al. 2011
898	Amaryllidaceae	*Allium purpureoviride* Koyuncu & İ.Genç	END	**		Genç et al. 2012
899	Asteraceae	*Helichrysum yuksekovaense* Yıld.	END	**		Yıldırımlı 2011b
900	Asteraceae	*Crepis gemicii* Yıldırım, Bingol & Armağan	END	**		Yıldırım et al. 2011
901	Asteraceae	*Cirsium sivasicum* Yıldız, Arabacı & Dirmenci	END	**		Yıldız et al. 2011
902	Asteraceae	*Cirsium peshmenianum* Yıldız, Dirmenci & Arabacı	END	**		Yıldız et al. 2011
903	Apiaceae	*Smyrnium galaticum* Czeczott	END	**		Sağıroğlu et al. 2013
904	Fabaceae	*Astragalus nezaketiae* A.Duran & Aytaç	END	**		Duran and Aytaç 2005
905	Cucurbitaceae	*Bryonia flexuosa* Yıld.	END	**		Yıldırımlı 2010
906	Caryophyllaceae	*Silene gevasica* Hamzaoğlu	END	**		Hamzaoğlu et al. 2011
907	Lamiaceae	*Nepeta leptantha* Boiss & Hausskn.	END	**		Özhatay and Kültür 2006
908	Caryophyllaceae	*Silene hamzaogluii* Budak	END	**		Budak and Koç 2011
909	Caprifoliaceae	*Cephalaria davisiana* Göktürk & Sümbül	END	**		Göktürk et al. 2012
910	Lamiaceae	*Salvia cerino-pruinosa* Rech.f.	END	**		

911	Ranunculaceae	*Pseudodelphinium turcicum* H.Duman, Vural, Aytaç & Adıgüzel	END	**		
912	Poaceae	*Psathyrostachys daghestanica* (Alex. & Woronow) Nevski subsp. *erzurumica* Cabi & Doğan	END	**		Cabi et al. 2011
913	Rosaceae	*Crataegus heterophylloides* Pojark. ex K.I.Chr.	END	**		
914	Asteraceae	*Helichrysum yurterianum* Y.Gemici, Kit Tan, Yıldırım & M.Gemici	END	**		Gemici et al. 2008
915	Asparagaceae	*Muscari tuzgoluensis* Yıld.	END	**		Yıldırımlı 2011a
916	Fabaceae	*Astragalus zaraensis* Podlech	END	**		Podlech 2001
917	Caryophyllaceae	*Dianthus aydogduii* Menemen & Hamzaoğlu	END	**		Özhatay and Kültür 2006, Menemen and Hamzaoğlu 2000
918	Iridaceae	*Iris peshmeniana* Güner & T.Hall	END	**		Güner et al. 2012
919	Caryophyllaceae	*Silene acaulis* (L.) Jacq. subsp. *vanensis* Özgökçe & Kit Tan	END	**		Özgökçe et al. 2005
920	Caprifoliaceae	*Cephalaria aytachii* Göktürk & Sümbül	END	**		Göktürk and Sümbül 2003
921	Caprifoliaceae	*Cephalaria elazigensis* Göktürk & Sümbül	END	**		Göktürk et al. 2003
922	Apiaceae	*Peucedanum bupleuroides* (Pimenov & Kljuykov) Menemen	END	**		Pimenov and Kljuykov 2011
923	Caryophyllaceae	*Minuartia aksoyi* Koç & Hamzaoğlu	END	**		Koç et al. 2012
924	Campanulaceae	*Campanula hacerae* İlçim	END	**		İlçim et al. 2011
925	Brassicaceae	*Iberis halophila* Vural & H.Duman	END	**		Vural et al. 2012
926	Fabaceae	*Cicer uludereensis* Dönmez	END	**		Dönmez 2011
927	Fabaceae	*Astragalus chamardiensis* Podlech	END	**		Podlech 2009
928	Caryophyllaceae	*Acanthophyllum oppositiflorum* Aytaç	END	**		Özhatay and Kültür 2006
929	Frankeniaceae	*Frankenia salsuginea* Adıgüzel & Aytaç	END	**		Vural et al. 2012

930	Lamiaceae	*Marrubium sivasense* Aytaç, Akgül & Ekici	END	**		Aytaç et al. 2012
931	Lamiaceae	*Salvia pseudeuphratica* Rech.f.	END	**		
932	Lamiaceae	*Salvia siirtica* Kahraman, Celep & Doğan	END	**		
933	Lamiaceae	*Scutellaria anatolica* Çiçek & Ketenoğlu	END	**		
934	Lamiaceae	*Thymus subcollinus* Klokov	END	**		
935	Papaveraceae	*Papaver yildirimlii* Ertekin	END	**		
936	Plumbaginaceae	*Acantholimon artosense* Doğan & Akaydın	END	**		
937	Brassicaceae	*Draba narmanensis* Yıld.	END	**		Özhatay and Kültür 2006, Yıldırımlı 2000
938	Plumbaginaceae	*Acantholimon bashkaleicum* Doğan & Akaydın	END	**		
939	Plumbaginaceae	*Acantholimon birandii* Doğan & Akaydın	END	**		Doğan and Akaydın 2001a
940	Plumbaginaceae	*Acantholimon evrenii* Doğan & Akaydın	END	**		Doğan and Akaydın 2001b
941	Plumbaginaceae	*Acantholimon hoshapicum* Doğan & Akaydın	END	**		
942	Plumbaginaceae	*Acantholimon turcicum* Doğan & Akaydın	END	**		
943	Plumbaginaceae	*Acantholimon yildizelicum* Akaydın	END	**		
944	Brassicaceae	*Alyssum nezaketiae* Aytaç & H.Duman	END	**		Özhatay and Kültür 2006, Aytaç and Duman 2000
945	Boraginaceae	*Nonea polychroma* Selvi & Bigazzi	END	**		Özhatay and Kültür 2006, Selvi and Bigazzi 2001
946	Fabaceae	*Astragalus longisubulatus* Podlech	END	**		Özhatay and Kültür 2006, Podlech 1999
947	Asteraceae	*Centaurea aksoyi* Hamzaoğlu & Budak	END	**		Özhatay et al. 2011, Hamzaoğlu and Budak 2009
948	Fabaceae	*Astragalus longivexillatus* Podlech & Ekici	END	**		Podlech 1999

949	Fabaceae	*Astragalus hakkariensis* Podlech	END	**		Özhatay and Kültür 2006, Podlech 1999
950	Fabaceae	*Astragalus gigantostegius* Podlech	END	**		Özhatay and Kültür 2006, Podlech 1999
951	Fabaceae	*Astragalus ekicii* H.Duman & Akan	END	**		Özhatay and Kültür 2006, Duman & Akan 2003
952	Fabaceae	*Astragalus bozakmanii* Podlech	END	**		Özhatay and Kültür 2006, Podlech 2001
953	Fabaceae	*Astragalus aytatchii* Akan & Civelek	END	**		Özhatay and Kültür 2006, Akan & Civelek 2001
954	Fabaceae	*Astragalus bakirdaghensis* Podlech	END	**		Özhatay and Kültür 2006, Podlech 1999
955	Asteraceae	*Psephellus yildizii* (Civelek, Türkoğlu, Akan) Greuter	END	**		Özhatay and Kültür 2006, Türkoğlu et al. 2003
956	Fabaceae	*Genista vuralii* A.Duran & Dural	END	**		Özhatay and Kültür 2006, Duran and Dural 2003
957	Asteraceae	*Centaurea cankiriensis* A.Duran & H.Duman	END	**		Özhatay and Kültür 2006, Duran and Duman 2002
958	Asparagaceae	*Muscari sivrihisardaghlarensis* Yıld. & B.Selvi	END	**		Özhatay and Kültür 2006, Yıldırımlı and Selvi 2002
959	Asparagaceae	*Ornithogalum vasakii* Speta	END	**		Özhatay and Kültür 2006
960	Lamiaceae	*Salvia hedgeana* Dönmez	END	**		Özhatay and Kültür 2006, Dönmez 2001
961	Orchidaceae	*Ophrys aramaeorum* P.Delforge	END	**		Özhatay and Kültür 2006
962	Plantaginaceae	*Veronica vanensis* Öztürk	END	**		Özhatay and Kültür 2006
963	Ranunculaceae	*Nigella turcica* Dönmez & Mutlu	END	**		Özhatay and Kültür 2006
964	Fabaceae	*Astragalus turkmenensis* Dural, Tugay & Ertuğrul	END	**		Özhatay et al. 2009, Dural et al. 2007
965	Fabaceae	*Astragalus xerophiloides* Podlech & Ekici	END	**		Özhatay and Kültür 2006, Podlech and Sytin 2002
966	Fabaceae	*Trigonella velutinoides* Hub.-Mor.	END	**		Özhatay et al. 2009
967	Lamiaceae	*Salvia anatolica* Hamzaoğlu & A.Duran	END	**		Özhatay et al. 2009, Hamzaoğlu et al. 2005
968	Colchicaceae	*Colchicum ignescens* K.Perss.	END	**		Özhatay et al. 2009

969	Caryophyllaceae	*Gypsophila osmangaziensis* Ataşlar & Oca*k*	END	**		Özhatay et al. 2009, Ataşlar and Ocak 2005
970	Brassicaceae	*Physoptychis purpurascens* Çelik & Akpulat	END	**		Özhatay et al. 2009, Çelik et al. 2007
971	Asteraceae	*Senecio salsuginea* H.Duman & Vural	END	**		Özhatay et al. 2009, Vural et al. 2006
972	Asteraceae	*Centaurea elazigensis* Kaya & Vural	END	**		Özhatay et al. 2009, Kaya and Vural 2007
973	Asteraceae	*Centaurea tuzgoluensis* Aytaç & H.Duman	END	**		Özhatay et al. 2009, Vural et al. 2006
974	Asparagaceae	*Muscari turcicum* Uysal, Ertuğrul & Dural	END	**		Özhatay et al. 2009
975	Asparagaceae	*Puschkinia peshmenii* Rix & B.Mathew	END	**		Özhatay et al. 2009
976	Colchicaceae	*Colchicum antepense* K.Perss.	END	**		Özhatay et al. 2009
977	Geraniaceae	*Geranium kalenderianum* İlçim & Behçet	END	**		Özhatay et al. 2009, İlçim and Behçet 2006
978	Iridaceae	*Gladiolus attilae* Kit Tan, B.Mathew & A.Baytop	END	**		Özhatay et al. 2009, Tan et al. 2006
979	Malvaceae	*Alcea karsiana* (Bordz.) Litv.	END	**		Özhatay et al. 2009
980	Rosaceae	*Crataegus peshmenii* Dönmez	END	**		Özhatay et al. 2009
981	Rosaceae	*Crataegus yaltirikii* Dönmez	END	**		Özhatay et al. 2009
982	Scrophulariaceae	*Verbascum cicekdagensis* Karavel. & Vural	END	**		Özhatay et al. 2009
983	Asparagaceae	*Ornithogalum chetikianum* Uysal, Ertuğrul & Dural	END	**		Özhatay et al. 2009, Uysal et al. 2005
984	Fabaceae	*Onobrychis cigdemae* Yıld.	END	**		Özhatay et al. 2011
985	Fabaceae	*Astragalus tunceliensis* Podlech & Ekici	END	**		Özhatay et al. 2011, Podlech and Ekici 2008
986	Fabaceae	*Astragalus suserianus* Podlech & Ekici	END	**		Özhatay et al. 2011, Podlech and Ekici 2008
987	Fabaceae	*Astragalus pseudovegetus* Podlech & Ekici	END	**		Özhatay et al. 2011, Podlech and Ekici 2008

988	Fabaceae	*Astragalus munzurensis* Yıld.	END	**		Özhatay et al. 2011, Yıldırımlı 2010
989	Fabaceae	*Astragalus darendensis* Podlech & Ekici	END	**		Özhatay et al. 2011, Podlech and Ekici 2008
990	Geraniaceae	*Erodium aytacii* Yıld. & Doğru-Koca	END	**		Özhatay et al. 2011
991	Lamiaceae	*Lophantus turcicus* Dirmenci, Yıldız & Hedge	END	**		Özhatay et al. 2011, Dirmenci et al. 2010
992	Lamiaceae	*Salvia ekimiana* Celep & Doğan	END	**		Özhatay et al. 2011
993	Caryophyllaceae	*Silene dumanii* Kandemir, G.Ecevit Genç & İ.Genç	END	**		Özhatay et al. 2011, Kandemir et al. 2009
994	Caryophyllaceae	*Silene demirizii* K.Yıldız & Çırpıcı	END	**		Özhatay et al. 2011, Yıldız et al. 2010
995	Fabaceae	*Astragalus ovabaghensis* Akan & Aytaç	END	**		Özhatay and Kültür 2006, Akan and Aytaç 2014
996	Caryophyllaceae	*Silene bayburtensis* Hamzaoğlu & Aksoy	END	**		Özhatay et al. 2011, Hamzaoğlu et al. 2010
997	Caryophyllaceae	*Dianthus aytachii* C.Vural	END	**		Özhatay et al. 2011, Vural 2008
998	Brassicaceae	*Stroganowia leventii* V.I.Dorof.	END	**		Özhatay et al. 2011
999	Brassicaceae	*Pseudosempervivum gurulkanii* (Yıld.) Mutlu & Al-Shehbaz & Dönmez	END	**		Özhatay et al. 2011
1000	Brassicaceae	*Erysimum yildirimlii* Dinç	END	**		Özhatay et al. 2011, Yıldırımlı 2008
1001	Brassicaceae	*Erysimum sivasicum* Yıld.	END	**		Özhatay et al. 2011, Yıldırımlı 2008
1002	Brassicaceae	*Erysimum munzuriense* Polatschek	END	**		Özhatay et al. 2011
1003	Brassicaceae	*Erysimum dincii* Yıld.	END	**		Özhatay et al. 2011
1004	Brassicaceae	*Erysimum euphraticum* Polatschek	END	**		Özhatay et al. 2011
1005	Brassicaceae	*Erysimum kostkae* Polatschek	END	**		Özhatay et al. 2011
1006	Brassicaceae	*Erysimum bagcii* Yıld.	END	**		Özhatay et al. 2011
1007	Brassicaceae	*Erysimum baytopiae* Yıld.	END	**		Özhatay et al. 2011, Yıldırımlı 2008
1008	Brassicaceae	*Brassica beytepeensis* Yıld.	END	**		Özhatay et al. 2011, Yıldırımlı 2010
1009	Boraginaceae	*Onosma beyazoglui* Kandemir & Türkmen	END	**		Özhatay et al. 2011, Kandemir and Türkmen 2010

1010	Asteraceae	*Taraxacum tuzgoluense* Yıld. & Doğru-Koca	END	**		Özhatay et al. 2011, Yıldırımlı and Doğru-Koca 2005
1011	Fabaceae	*Astragalus horasanicus* Podlech	END	**		Özhatay et al. 2011, Podlech and Ekici 2008
1012	Fabaceae	*Astragalus guzelsuensis* F.Ghahrem. Nejad, Behçet & Demir	END	**		Özhatay et al. 2011, Ghahremaninejad et al. 2009
1013	Fabaceae	*Astragalus bahcesarayensis* Akan, Fırat & Ekici	END	**		Özhatay et al. 2011, Akan et al. 2008
1014	Fabaceae	*Astragalus adiyamanensis* Podlech & Ekici	END	**		Özhatay et al. 2011, Podlech and Ekici 2008
1015	Fabaceae	*Astragalus diyarbakirensis* Podlech	END	**		Özhatay and Kültür 2006, Podlech 1999
1016	Asteraceae	*Senecio munzurdaglarensis* Yıld.	END	**		Özhatay et al. 2011, Yıldırımlı 2010
1017	Asteraceae	*Psephellus recepii* Wagenitz & Kandemir	END	**		Özhatay et al. 2011, Wagenitz and Kandemir 2008
1018	Asteraceae	*Psephellus erzincanii* Wagenitz & Kandemir	END	**		Özhatay et al. 2011, Wagenitz and Kandemir 2008
1019	Asteraceae	*Jurinea tortumensis* A.Duran & B.Doğan	END	**		Özhatay et al. 2011, Doğan et al. 2010
1020	Asteraceae	*Cirsium ekimianum* Yıldız & Dirmenci	END	**		Özhatay et al. 2011, Yıldız and Dirmenci 2008
1021	Apiaceae	*Smyrniopsis munzurdaghensis* Yıld.	END	**		Özhatay et al. 2011
1022	Apiaceae	*Pimpinella tunceliana* Yıld.	END	**		Özhatay et al. 2011
1023	Asteraceae	*Achillea sivasica* Çelik & Akpulat	END	**		Özhatay et al. 2011
1024	Asteraceae	*Achillea hamzaoglui* Arabacı & Budak	END	**		Özhatay et al. 2011
1025	Asteraceae	*Anacyclus anatolicus* Behçet & Almanar	END	**		Özhatay and Kültür 2006
1026	Plumbaginaceae	*Acantholimon ekimii* Doğan & Akaydın	END	**		
1027	Plumbaginaceae	*Acantholimon iconicum* (Boiss.) Boiss. & Heldr.	END	**		Doğan and Akaydın 2007

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Online Resource 2

Table of steppe-dependent mammal species in the Anatolian Biogeographical Region.

List of references used for distribution information of target mammal species

Table: List of steppe-dependent mammal species in the Anatolian Biogeographical Region. EN: Endangered, VU: Vulnerable, NT: Near Threatened, DD: Data Deficient, LC: Least Concern. Global threat categories were obtained from IUCN dataset (IUCN 2015). Information on the species in the Bern Convention appendices is based on Council of Europe (1979). List is sorted by the global threat categories.

No.	Order name	Scientific name	Endemism	Global threat category	Bern Convention appendices species listed	Number of protected areas species occur (Percentage in 28 sites)
1	Rodentia	*Meriones dahli*	Regional endemic[1]	EN		1 (4%)
2	Rodentia	*Gerbillus dasyurus*		LC[2]		0 (0%)
3	Artiodactyla	*Gazella gazella*		VU[3]		0 (0%)
4	Artiodactyla	*Ovis orientalis*		VU[3]	III	2 (7%)

No.	Order name	Scientific name	Endemism	Global threat category	Bern Convention appendices species listed	Number of protected areas species occur (Percentage in 28 sites)
5	Rodentia	*Mesocricetus auratus*	Regional endemic[1]	VU		0 (0%)
6	Artiodactyla	*Gazella subgutturosa*		VU	II	1 (4%)
7	Rodentia	*Allactaga euphratica*		NT		2 (7%)
8	Rodentia	*Mesocricetus brandti*		NT		9 (32%)
9	Rodentia	*Prometheomys schaposchnikowi*		NT		0 (0%)
10	Rodentia	*Spermophilus xanthoprymnus*		NT		13 (46%)
11	Rodentia	*Microtus anatolicus*	Endemic	DD		1 (4%)
12	Rodentia	*Microtus irani*		DD		0 (0%)
13	Rodentia	*Nannospalax ehrenbergi*		DD		2 (7%)
14	Rodentia	*Nannospalax xanthodon*		DD		21 (75%)
15	Erinaceomorpha	*Hemiechinus auritus*		LC		2 (7%)
16	Rodentia	*Allactaga elater*		LC		1 (4%)
17	Rodentia	*Allactaga williamsi*		LC		13 (46%)
18	Rodentia	*Ellobius lutescens*		LC		0 (0%)
19	Rodentia	*Meriones crassus*		LC		0 (0%)
20	Rodentia	*Meriones libycus*		LC		0 (0%)
21	Rodentia	*Meriones persicus*		LC		0 (0%)
22	Rodentia	*Meriones tristrami*		LC		8 (29%)
23	Rodentia	*Meriones vinogradovi*		LC		1 (4%)
24	Rodentia	*Microtus dogramacii*	Endemic	LC		0 (0%)
25	Rodentia	*Microtus schidlovskii*		LC		0 (0%)
26	Rodentia	*Microtus socialis*		LC		8 (29%)
27	Chiroptera	*Otonycteris hemprichi*		LC		0 (0%)

[1]Populations of regional endemic species occur only in Turkey and neighbouring countries

[2]*Gerbillus dasyurus* is listed as LC in IUCN database but is included in this list as it should receive a threat category as EN at the national scale.

[3]*Gazella gazella and Ovis orientalis are* listed as VU in IUCN database but they should both receive a higher threat category as EN at the national scale.

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Online Resource 3

List of references used for distribution information of target herptile species

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Online Resource 4

Table Detailed information about the protected areas in Turkey (Status Report on Nature Conservation (2002-2013), 2013, updated as of September 2015)

Protected area type	**Foundation year**	**Responsible institution***	**Number**
National Park	1958	MoFWA	40
Nature Park	1983	MoFWA	203
Strict Nature Reserve	1987	MoFWA	31
Natural Monument	1988	MoFWA	112
Wildlife Reserves	1966	MoFWA	81
Protected Forests	1950	MoFWA	58
Gene Conservation Forests	1994	MoFWA	245
Seed Stands	1969	MoFWA	628
Special Environmental Protection Areas	1988	MoEU	16
Ramsar Sites	1994	MoFWA	14
Natural Heritage Sites	1973	MoEU	2.134
Biosphere Reserve	2005	MoFWA	1
World Heritage Site	1985	MoCT, MoFWA, MoEU	15
Gene Conservation and Management Areas	1993	MoFWA / MoFAL	3

* MoFWA – Ministry of Forestry and Water Affairs; MoEU – Ministry of Environment and Urbanisation; MoFAL – Ministry of Food, Agriculture and Livestock; MoCT– Ministry of Culture and Tourism. Source: National Nature Conservation Report (2013) by Ministry of Forestry and Water Affairs, General Directorate of Nature Conservation and National Parks and updates based on http://www.milliparklar.gov.tr/korunanalanlar/korunanalan1.htm

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Online Resource 5

Table: Phytosociological units of Anatolian steppe vegetation at alliance or higher levels based on Kurt L, Ketenoğlu AO, Vural M, Körüklü T (2014). Bölüm: Vejetasyon. (Eds: Ekim, T., Güner, A.) Resimli Türkiye Florası. Cilt:1. Türkiye İş Bankası Yayınları.

Class	Order	Sub-order	Alliance	Distribution
Astragalo-Brometea (Quezel 1973)	*Onobrychido armanae-Thymetalia leucostomi* (Akman et al. 1985)	*Onobrychido armanae-Thymenelia leucostomi* (Akman et al. 1991)	*Phlomido armeniacae-Astragalion microcephali* (Akman et al. 1984)	Central Anatolia
			Convolvulo holosericei-Ajugion salicifoliae (Akman et al. 1984)	Central Anatolia
			Salvio tchihatcheffii-Hedysarion variae (Akman et al. 1984)	Central Anatolia
			Arenario ledebouriani-Astragalion plumosi (Akman 1990)	Central Anatolia
			Alysso lepidoto-stellati-Astragalion condensati (Aydoğdu et al. 1999)	Central Anatolia
			Phlomido nissolii-Onobrychidion tournefortii (Kurt 2002)	Central Anatolia
			Astragalo karamasici-Gypsophilion eriocalycis (Ketenoğlu et al. 1983)	Central Anatolia
			Achilleo wilhelmsii-Artemision santonicum (Aydoğdu et al. 2004)	Central Anatolia

Class	Order	Sub-order	Alliance	Distribution
Astragalo-Brometea (Quezel 1973)	*Onobrychido armanae-Thymetalia leucostomi* (Akman et al. 1985)	*Onobrychido armanae-Thymenelia leucostomi* (Akman et al. 1991)	*Minuartion juniperino-pestallozae* (Ketenoğlu et al. 1996)	Central Anatolia
			Thymo subisophyllii-Alyssion virgatii (Akman et al. 1994)	Central Anatolia
			Genisto involucrate-Marrubion micranthii (Akman et al. 1996)	Central Anatolia
Astragalo-Brometea (Quezel 1973)	*Onobrychido armanae-Thymetalia leucostomi* (Akman et al. 1985)	*Asperulo phrygiae-Thymenelia chaubardii* (Akman et al. 1991)	*Siderito phrygiae-Centaruion mauculicipis* (Akman et al. 1991)	Central Anatolia
			Verbasco phrygiae-Astrgalion flavescentis (Akman et al. 1991)	Central Anatolia
			Astragalo akscheriensis-Onobrychidion pisidici (Akman et al. 1991)	Central Anatolia
			Micromerio phrygiae-Olympociadion caespitosi (Akman et al. 1991)	Central Anatolia
			Cousinio iconici-Artemision santonici (Geven et al. 2010)	Central Anatolia
Salicornietea fruticosae Braun-Blanquet & Tüxen ex A. & O.Bolos 1950	*Halostachetalia* (Grossh.) E.Topa. 1938		*Lepidio cespitosi-Limonion iconici* (Aydoğdu et al. 2002)	Central Anatolia
			Inulo aucheraneae-Elymion salsi (Aydoğdu et al. 2002)	Central Anatolia
			Alhagi-Suaedion microphyllae (Tatlı and İstanbulluoğlu 1987)	Eastern Anatolia
Astragalo-Brometea (Quezel 1973)	*Festuco oreophilae-Veronicetalia orientalis* (Hamzaoğlu 2006)		*Festuco oreophilae-Veronicion orientalis* (Hamzaoğlu 2006)	Eastern Anatolia
			Tanaceto aucherani -Thymion pubescentis (Hamzaoğlu 2006)	Eastern Anatolia
			Astragalo aurei-Festucion caucasicae (Hamzaoğlu 2006)	Eastern Anatolia
Astragalo-Brometea (Quezel 1973)	*Astragalo-Brometalia* (Quezel 1973)		*Tanacion praeteriti* Quezel 1973	Southwest Anatolia
			Agrophyro-Stachion Quezel 1973	Southern Anatolia
			Thurion capitatae Quezel 1973	Southern Anatolia

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Online Resource 6

Table: List of steppe-dependent threatened, near-threatened or data deficient butterfly species in the Anatolian Biogeographical Region. List is sorted by the national threat categories. CR: Critically Endangered, EN: Endangered, VU: Vulnerable, NT: Near Threatened, DD: Data Deficient. NA: indicates "not applicable". Information on the endemism and national threat category was derived from Karaçetin and Welch 2011.

No.	Scientific name	Endemism	National threat category	Number of protected areas species occur (Percentage in 28 sites)
1	*Plebejus rosei*	Near Endemic[1]	CR	0 (0%)
2	*Aricia torulensis*	Endemic	EN	0 (0%)
3	*Polyommatus dama*	Endemic	EN	0 (0%)
4	*Callophrys mystaphia*	Near Endemic[1]	EN	0 (0%)
5	*Polyommatus diana*	Near Endemic[1]	EN	0 (0%)
6	*Apharitis cilissa*		EN	0 (0%)
7	*Euphydryas orientalis*		EN	0 (0%)
8	*Satyrium hyrcanicum*		EN	1 (4%)
9	*Spialia osthelderi*		EN	0 (0%)
10	*Hyponephele urartua*	Endemic	VU	0 (0%)
11	*Polyommatus ciloicus*		VU	0 (0%)
12	*Zegris eupheme*		NT	3 (11%)
13	*Satyrus parthicus*		NT	0 (0%)
14	*Polyommatus haigi*	Endemic	DD	NA
15	*Polyommatus interjectus*	Endemic	DD	NA
16	*Polyommatus kurdistanicus*	Endemic	DD	NA
17	*Polyommatus dantchenkoi*	Endemic	DD	NA
18	*Polyommatus antidolus*	Endemic	DD	NA
19	*Polyommatus dezinus*	Endemic	DD	NA
20	*Polyommatus anticarmon*	Endemic	DD	NA
21	*Polyommatus erzindjanensis*	Endemic	DD	NA
22	*Pyrgus aladaghensis*	Endemic	DD	NA
23	*Pyrgus bolkariensis*	Endemic	DD	NA
24	*Polyommatus actis*	Endemic	DD	NA
25	*Polyommatus wagneri*	Endemic	DD	NA

No.	Scientific name	Endemism	National threat category	Number of protected areas species occur (Percentage in 28 sites)
26	*Polyommatus sigberti*	Endemic	DD	NA
27	*Polyommatus bilgini*	Endemic	DD	NA
28	*Polyommatus pierceae*	Endemic	DD	NA
29	*Polyommatus putnami*	Endemic	DD	NA
30	*Lycaena euphratica*	Near Endemic[1]	DD	NA
31	*Hyponephele kocaki*	Near Endemic[1]	DD	NA
32	*Colias chlorocoma*		DD	NA
33	*Cupido staudingeri*		DD	NA
34	*Polyommatus firdussii*		DD	NA
35	*Polyommatus eriwanensis*		DD	NA
36	*Polyommatus altivagans*		DD	NA
37	*Polyommatus surakovi*		DD	NA
38	*Tomares callimachus*		DD	NA
39	*Polyommatus zapvadi*		DD	NA
40	*Polyommatus turcicolus*		DD	NA
41	*Polyommatus damocles*		DD	NA
42	*Lycaena lampon*		DD	NA
43	*Pseudochazara schakuhensis*		DD	NA
44	*Coenonympha phryne*		DD	NA
45	*Satyrium marcidum*		DD	NA
46	*Tomares desinens*		DD	NA
47	*Polyommatus cilicius*		DD	NA
48	*Polyommatus karacetinae*		DD	NA
49	*Polyommatus mithridates*		DD	NA
50	*Eogenes lesliei*		DD	NA

[1] Near endemics are species with more than 60% of their global distribution occurring inside Turkey.

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Online Resource 7

Table: List of protected areas in the study area with strict nature reserve, national park and wildlife reserve categories.

No.	Name	Provinces	Total area (ha)	Percentage of the land in the study area
1	Ankara Nallıhan Emremsultan Wildlife Reserve	Ankara	18468	83.5
2	Ankara Nallıhan Davutoğlan Wildlife Reserve	Ankara	456	16.7
3	Ankara Beypazarı Kapaklı Wildlife Reserve	Ankara	10074	81.0
4	Eskişehir Sivrihisar Balıkdami Wildlife Reserve	Eskişehir	1383	100.0
5	Konya Bozdağ Wildlife Reserve	Konya	59700	100.0
6	Akgöl (Ereğli Sazlığı) Strict Nature Reserve	Karaman; Konya	6715	22.2
7	Boğazköy –Alacahöyük National Park	Çorum	2608	81.0
8	Yozgat Çamlığı National Park	Yozgat	268	100.0
9	Seyfe Gölü Strict Nature Reserve	Kırşehir	12577	5.3
10	Göreme Historical National Park	Nevşehir	9638	100.0
11	Sultan Sazlığı National Park	Kayseri	24398	82.3
12	Niğde Çamardı Demirkazık Wildlife Reserve	Niğde	18962	99.2
13	Aladağlar National Park	Adana; Kayseri; Niğde	55160	25.3
14	Adana Pozantı Karanfildağı Wildlife Reserve	Adana; Niğde	31091	11.8
15	Gümüşhane Şiran Kulaca Wildlife Reserve	Gümüşhane	5230	99.5
16	Munzur Vadisi National Park	Erzincan; Tunceli	42674	99.9
17	Birecik Fırat Wildlife Reserve	Gaziantep; Şanlıurfa	180	98.8
18	Şanlıurfa Kızılkuyu Wildlife Reserve	Şanlıurfa	20504	99.7
19	Tektek Dağları National Park	Şanlıurfa	19335	100.0
20	Bingöl Kiğı Şeytandağları Wildlife Reserve	Bingöl; Tunceli	25444	100.0
21	Erzurum Çat Wildlife Reserve	Bingöl, Erzincan;	62549	100.0
22	Nenehatun National Park	Erzurum	387	100.0
23	Erzurum Oltu Wildlife Reserve	Erzurum	4980	100.0
24	Sarıkamış-Allahuekber Dağları National Park	Erzurum; Kars	22543	0.2
25	Kars Kağızman Wildlife Reserve	Kars	19979	100.0
26	Kars Kuyucuk Gölü Wildlife Reserve	Kars	241	27.4
27	Bitlis Adilcevaz Süphandağı Wildlife Reserve	Ağrı; Bitlis; Muş	30793	99.5
28	Ağrıdağı National Park	Ağrı; Iğdır	88454	97.3