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The endemic plants in Bartın (Turkey), and their conservation status

Original Article

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Abstract:
Bartın province located in the Western Black Sea region of Turkey has been selected as a floristic research unit. Bartın, previously a district of Zonguldak, has earned a provincial status in 1991. Compared to other provinces of Turkey, the flora and vegetation studies in Bartın has been started quite late in detail since the second half of the 1990s. The present study aims to determine endemic taxa in Bartın province and to evaluate their conservation status on the basis of IUCN, CITES and BERN criteria. Turkey has numerous laws, regulations, and programs on biodiversity conservation, but there are many deficiencies and problems in the implementation of these guidelines. Our study was the first report on the endemic taxa and their conservation status in Bartın province of Turkey. We have determined that 36 of Turkey's endemic taxa are also found in Bartın's flora. We state that 3 of Bartın's endemic plant taxa are endangered (EN), 2 is critical (CR), 1 is vulnerable (VU), 7 are near threatened (NT) and the others are least concern (LC) categories.

Key words:
endemic taxa, flora, vegetation, conservation status

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Apstract:
Endemične biljke Bartina, Turska, i njihov conservacijski status
Provincija Bartın, koja se nalazi u zapadnom crnomorskom regionu Turske, izabrana je za floristička istraživačku jedinicu. Bartın, prethodno okrug Zonguldak, stekao je status provincije 1991. godine. U poređenju sa drugim provincijama Turske, detaljnije studije flore i vegetacije u Bartınu započete su prilično kasno, od druge polovine 1990-ih. Cilj ove studije je bio utvrđivanje endemičnih taksona u provinciji Bartın i procena njihovog statusa u zaštiti na osnovu IUCN, CITES i BERN kriterijuma. Turska ima brojne zakone, propise i programe o očuvanju biodiverziteta, ali postoje mnogi nedostaci i problemi u njihovoj primeni. Naša studija predstavlja prvi izveštaj o endemičnim taksonima i njihovom statusu očuvanosti u provinciji Bartın u Turskoj. Odredili smo da se 36 turskih endemičnih taksona nalazi u flori Bartına. Utvrđeno je da su na području Barrtina 3 endemična biljna taksona ugrožena (EN), 2 kritično ugrožen (CR), 1 ranjiv (VU), 7 su skoro ugroženi (NT), a ostali su u kategoriji poslednje brige (LC).

Ključne reči:
endemični taksoni, flora, vegetacija, conservacijski status

Introduction

In terms of biogeography, Turkey is at the crossroads of three different flora region within Holoarctic ecozone (Ketenoğlu et al., 2014) and three biodiversity hotspots (Caucasus, Irano-Anatolian, and Mediterranean) (Şekercioğlu et al., 2011). Because of these and other traits related to its geomorphological and climatic characteristics, Turkey has one of the richest floras of the temperate zone in the world (Özhatay et al., 2003). Ekim (2014) stated that the number of native vascular plant species in Turkey is 9753, and 3035 of them (31.12%) is endemic to the country.

Bartın, previously a district of Zonguldak located in the Western Black Sea Region of Turkey, earned a provincial status in 1991. Flora and vegetation studies in Bartın province has been started in detail since the second half of the 1990s. The first studies in this regard were carried out by Yatkın (1996), Başaran (1999), Sarıbaş et al., (2002) and Sarıbaş et al.,

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(2007). After these small-scale studies carried out in the restricted areas in Bartın, the first flora list for the whole province was published by Kaya & Basaran (2006), and later first biotope maps for coastal habitats between Amasra and Inkum in Bartın were constituted by Nayim (2010). Indeed, Kaya & Basaran (2006) have stated that there are 672 different plant taxa belonging to 368 genera under 97 families in Bartın, and the authors stated that 7 of them (1.04 %) were endemic for Turkey. Afterward, within the scope of Bartın's biodiversity project, Kaya & Yaman (2017) have worked on the flora of the whole province in detail. According to Kaya & Yaman (2017), 35 of Turkey's endemic taxa are also found in Bartın's flora, and 9 of them are geophyte taxa. Recently, Kure Mountains National Park (Bartın section) has been also examined in terms of its flora and vegetation by Tunçkol & Aksoy (2018). However, in 2017, a study related to the distribution of endemic taxa locations in Turkey's flora according to provinces has shown that any endemic taxon location doesn't present in Bartın (Şenkul & Kaya, 2017). Although some studies on the province's partial flora, this review by the authors may be due to the lack of a comprehensive article published on Bartın flora available until then.

The red-list criteria and conservation status of plant species in the world have been determined by different organizations such as IUCN, CITES, and BERN. Based on the IUCN criteria, the plant species of Turkey have been evaluated by the Turkish Association for the Conservation of Nature & Van Centennial University (Ekim et al., 2000). The present study aims to determine the endemic taxa in Bartın, and to evaluate their conservation status on the basis of IUCN, CITES and BERN criteria.

Material and methods

Bartın province determined as a floristic research unit is divided into grids on the map (**Fig. 1**). During the year 2016, 2017 and 2018, we went to the grids representing different habitats to collect plant specimens every week. The photographs of the plants were also taken during the field work. The specimens were pressed and dried between the folds of old newspapers, and the dried specimens are mounted on herbarium sheets of standard size (41x29 cm).

The taxa were identified on the basis of Flora of Turkey and the East Aegean Islands (Davis (ed.), 1965-1982). The nomenclature was harmonized

Fig. 1. The map of Bartın province located on the Western Black Sea region of Turkey.

Table 1. Endemic taxa in Bartın province and their conservation status.

Family	Latin name/Locality, Altitude, Legators	CITES	IUCN
Cupressaceae	*Juniperus oxycedrus* f. *yaltirikiana* Avci & Ziel. A4 Bartın: Hatipler coast,10 m., Z.Kaya & B.Yaman	-	*
Pinaceae	*Abies nordmanniana* subsp. *equi-trojani* (Asch. & Sint. ex Boiss.) Coode & Cullen A4 Bartın:Ulus,Uluyayla plateau, 1000 m., Z.Kaya & B.Yaman	-	NT
Amaryllidaceae	*Allium kastambulense* Kollmann A4 Bartın: Kurucuşile coast, 20 m., Z.Kaya & B.Yaman	-	NT
Amaryllidaceae	*Allium olympicum* Boiss. A4 Bartın: Ulus, Drahna valley, 500-950 m., Z.Kaya & B.Yaman	-	LC
Apiaceae	*Astrantia maxima* subsp. *haradjianii* (Grintz.) Rech.f. A4 Bartın: Ulus, Uluyayla, Gendarme cemetery, 1500 m, Z.Kaya & B.Yaman	-	LC
Apiaceae	*Ferulago platycarpa* Boiss. & Balansa A4 Bartın: Kaynarca, slopes across the municipal park, 30 m., Z.Kaya & B.Yaman	-	LC
Apiaceae	*Seseli resinosum* Freyn & Sint. A4 Bartın: Ulus, Ulukaya waterfall, 310 m., Z.Kaya & B.Yaman	-	**VU**
Araceae	*Arum hygrophilum* subsp. *euxinum* (R.R.Mill) Alpınar A4 Bartın: Kurucaşile, Kapusu coast, 10 m., Z.Kaya & B.Yaman	-	LC
Asparagaceae	*Bellevalia clusiana* Griseb. A4 Bartın: Güzelcehisar, the field edge on the way to the castle ruins, 70 m.,Z.Kaya & B.Yaman	-	LC
Asteraceae	*Centaurea cadmea* subsp. *pontica* Köse & Ocak A4 Bartın: Ulus, Ulukaya waterfall, 310 m., Z.Kaya & B.Yaman	-	LC
Asteraceae	*Centaurea inexpectata* Wagenitz A4 Bartın: Uluyayla plateau, 970 m., Z.Kaya & B.Yaman	-	LC
Asteraceae	*Centaurea kilaea* Boiss. A4 Bartın: Mugada, coast dune, 5 m., Z.Kaya & B.Yaman	-	**EN**
Asteraceae	*Helichrysum arenarium* subsp. *aucheri* (Boiss.) Davis & Cupicha A4 Bartın: Ulus, Uluyayla plateau, 970 m., Z.Kaya & B.Yaman	-	LC
Asteraceae	*Inula helenium* subsp. *orgyalis* (Boiss.) Grierson A4 Bartın: Arıt, Zoni plateau, 841 m., Z.Kaya & B.Yaman	-	NT
Asteraceae	*Turanecio hypochionaeus* (Boiss.) Hamzaoğlu * A4 Bartın: Güzelcehisar, lava columns, 10 m., Z.Kaya & B.Yaman	-	**CR**
Boraginaceae	*Onosma armena* DC. A4 Bartın: Arıt, Zoni plateau, roadside, 800m., Z.Kaya & B.Yaman	-	LC
Boraginaceae	*Onosma intertexta* Hub.-Mor. A4 Bartın: Ulus, Drahna valley, 770 m., Z.Kaya & B.Yaman	-	NT
Brassicaceae	*Alyssum pateri* Nyár. subsp. *pateri* A4 Bartın: Ulus, border between Bartın and Karabük, 1305 m.,Z.Kaya & B.Yaman	-	LC
Brassicaceae	*Aubrieta canescens* subsp. *canescens* A4 Bartın: Ulus, Drahna, in front of Kemerli cave, 850 m., Z.Kaya & B.Yaman	-	LC
Brassicaceae	*Hesperis bicuspidata* (Willd.) Poir. A4 Bartın: Arıt, Çöpbey,Yapıkayası hill, 600 m., Z.Kaya & B.Yaman	-	LC
Campanulaceae	*Campanula grandis* Fisch. & C.A.Mey. subsp. *grandis* A4 Bartın: Ulus,Ulukaya village, 350 m., Z.Kaya & B.Yaman	-	LC
Caprifoliaceae	*Cephalaria paphlagonica* Bobrov. A4 Bartın: Kurucaşile, Kapısuyu village, 80 m., B.Tunçkol	-	NT
Caryophyllaceae	*Minuartia mesogitana* subsp. *flaccida* McNeill A4 Bartın: Arıt, roadside to Zoni plateau, 864 m., Z.Kaya & B.Yaman	-	**EN**
Celastraceae	*Euonymus latifolius* subsp. *cauconis* Coode & Cullen A4 Bartın: from Ulus to Arıt, near to Şahin village, 775 m., Z.Kaya & B.Yaman	-	NT
Fabaceae	*Astragalus bartinense* Aytaç, Tunçkol & N. Aksoy A4 Bartin: Ulus, Küre Mountains National Park, above Abdurrahman village, 550 m, Tunçkol	-	**CR**
Iridaceae	*Crocus ancyrensis* (Herb.) Maw A4 Bartın: Ulus, Uluyayla plateau, near to Inonu cave, 950 m., Z.Kaya & B.Yaman	-	LC

Family	Latin name/Locality, Altitude, Legators	CITES	IUCN
Iridaceae	*Crocus bolensis* (Ruksans) Ruksans A4 Bartın:Uluyayla plateau, near to marble quarry, 970 m., Z.Kaya & B.Yaman		*
Iridaceae	*Iris kerneriana* Asch. & Sint. ex Baker A4 Bartın: Ulus, border between Bartın and Karabük, 1298 m., Z.Kaya & B.Yaman	-	LC
Lamiaceae	*Phlomis russeliana* (Sims.) Lag. ex Benth. A4 Bartın: Ulus, Sarıçiçek Hill, 1500 m., Z.Kaya & B.Yama	-	LC
Lamiaceae	*Sideritis dichotoma* Huter A4 Bartın: Ulus, Ulukaya waterfall, 310 m., Z.Kaya & B.Yaman	-	LC
Orchidaceae	*Dactylorhiza nieschalkiorum* H.Baumann & Künkele A4 Bartın: Ulus, Sarıçiçek Hill, 1500 m., Z.Kaya & B.Yaman	+	LC
Orobanchaceae	*Melampyrum arvense* var. *elatius* Boiss. A4 Bartın: Ulus, near to Çerçi village, 560m., Z.Kaya & B.Yaman	-	NT
Papaveraceae	*Corydalis caucasica* subsp. *abantensis* Lidén A4 Bartın: Arıt, Zoni plateau, 900 m., Z.Kaya & B.Yaman	-	**EN**
Plantaginaceae	*Digitalis lamarckii* Ivanina A4 Bartın: Ulus, Kavakseydibaşı, 910m., Z.Kaya & B.Yaman	-	LC
Ranunculaceae	*Delphinium fissum* subsp. *anatolicum* Chowdhuri & P.H.Davis A4 Bartın: Ulus, Kumluca, road side after Kızıllar, 493m., Z.Kaya & B.Yaman	-	LC
Rubiaceae	*Asperula pestalozzae* Boiss A4 Bartın: Ulus, near to Abdurrahman village, 710 m., Z.Kaya & B.Yaman	-	LC

with NGBB Electronic Herbarium database in Turkey (http://bizimbitkiler.org.tr) and The Plant List database (http://www.theplantlist.org/). After taxonomic identification, they were labeled and stored in the herbarium of Bartın Faculty of Forestry at the foundation stage.

Results and discussion

Bartın province which is determined as a floristic research area is located in the Western Black Sea Region of Turkey, and mainly it shows bio-geographically the characteristics of Euro-Siberian Region; however, some plant species belonging to the Irano-Turanian and Mediterranean Regions occur in the province. According to Kaya & Yaman (2017) and our recent field studies, the number of plant taxa in Bartın province is approximately 1000. 36 of the Turkey's endemic taxa are also found in Bartın's flora, and 9 of them are geophyte taxa. The most of endemic taxa in Bartın is Euro-Siberian element (21 taxa), 7 of them are Irano-Turanian element, and the others are Mediterranean (1 taxon) or common elements (6 taxa) of two or three flora regions. We state that 3 of Bartın's endemic plant taxa are endangered (EN), 2 critically endangered (CR), 1 vulnerable (VU), 7 near threatened (NT) and most of the other least concern categories (LC). The endemic taxa of Bartın province and their conservation status and the photographs of some of them are given **Tab. 1** and **Fig. 2** respectively.

Today there is a concept on a biodiversity crisis worldwide related to global warming and climate change. It is known that more than 30.000 species are threatened with extinction (URL-1). Although plants have strong adaptation capabilities to environmental changes, anthropogenic global warming and climate change have a strong effect on plant life cycles and species' interactions (Settele et al., 2014). In spite of worldwide climate crisis, Turkey has not a comprehensive conservation program for its own endemic plants yet. The most of endemic plant species in Turkey has been threatened by biodiversity-damaging activities such as coal-fired power plant, dam construction, stone and marble quarry, gold mining, clearing grounds for fields, overgrazing, reform of barren lands, urbanization, tourism, wild fires, and afforestation without biodiversity base (Bulut & Yılmaz, 2010, Şekercioğlu et al., 2011).

In terms of conservation importance of each grid square and its threatened endemic plant taxa number in Turkey, A4 grid square has high conservation importance (Türe & Böcük, 2010), and Bartın province is on this grid square. Recently also in Bartın as well as many provinces in Turkey, a coal-fired power plant in Amasra district and a stone and marble quarry in Ulus district have been planned by some private enterprises (Atmiş, 2016, Atmiş & Günsen, 2017, Yaman, 2019). In the province, the potential threats to biodiversity can result in the extinction of endemic plant species as well as habitat loss, habitat fragmentation and habitat degradation. In addition, intense tourism pressure on the extremely limited and exclusive coastal habitat of *Centaurea kilaea* (EN) and *Turanecio hypochionaeus* (CR), which are Bartın's two of five endangered species, can result in the loss of these two species and their habitats. Other endangered plant species in Bartın are *Minuartia mesogitana* subsp. *flaccida* and *Corydalis cau-*

Fig. 2. Some of threatened endemic taxa in Bartın, Turkey, a. *Seseli resinosum*, b. *Centaurea kilaea*, c. *Turanecio hypochionaeus*, d. *Corydalis caucasica* subsp. *abantensis,* e. *Minuartia mesogitana* subsp. *flaccida*

casica subsp. *abantensis*. One of vulnerable species in the province, *Seseli resinosum*, is threatened by the planned stone and marble quarries in Ulus district. The project in a high plateau (Uluyayla) of the district, also threats the habitats of endemic and non-endemic geophyte species such as *Crocus ancyrensis* and *Galanthus elwesii,* respectively as well as *Crocus bolensis* which is a relatively common endemic species (Ruksans, 2017). In addition, *Dactylorhiza nieschalkiorum*, which is not in any threat category based on IUCN, might be under the risk of illegal plant collection due to its commercial ornamental value, thus *D. nieschalkiorum* is on the CITES Appendix II (URL-2). However, in Bartın, there is not any endemic species included in Bern Convention Appendix I (URL-3). Environmental Impact Assessment (EIA) has been applied legally in the industrial projects in Turkey since 1993. However, only 1.58 percent of all EIA decisions (67040) were negative (URL-4). Although Turkey has numerous laws, reg-

ulations, and programs on biodiversity conservation, there are many deficiencies and problems in the implementation of these guidelines (Kaya & Raynal, 2001). In practice, although non-governmental organizations oppose, these rules are often stretched by central and local governments with the idea of economic development and profit (Atmiş & Günsen, 2017, Atmiş, 2018).

Conclusion

Our investigation was the first report on the endemic taxa and their conservation status in Bartın province of Turkey. Based on a long-term conservation program, *in situ* conservation systems should be established urgently for Turkey's plant taxa in the CR, EN and VU categories of IUCN. In addition, while developing the provincial conservation programs for plant species, critical (CR), endangered (EN) and vulnerable (VU) endemic species in the provinces should be considered primarily. Biodiversity-damaging activities cited above must not be allowed in habitats having critical (CR), endangered (EN) and vulnerable (VU) endemic species in Bartın province.

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