Plant Wildlife and Threatened Vascular Flora of Truva (Troy) National Park, Turkey

Truva Milli Parkı (Türkiye)'nın Bitki Yaban Hayatı ve Tehlike Altındaki İletimdemetli Bitki Örtüsü

Research Article / Araştırma Makalesi

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ABSTRACT

This paper deals with the floristic study of Truva National Park (Çanakkale/Turkey). Thus floristic specialization of this area described, including a number of endemic and threatened species. After identification of the specimens, total flora has been determined as 361 taxa belonging to 354 species, 245 genera and 70 families. The endemism rate of the area is 3.32% (12 taxa). In a study of the endangered flora and its protection, 15 taxa are listed as having the most restricted distribution and as being under threat of extinction. Field work for these taxa was undertaken in order to improve knowledge of their habitats, populations, chorology and main threats. Using the new IUCN categories of threat, an analysis was made for each of the taxa, especially those that are critical endangered with very low number of individuals or very narrow areas of occupancy. In order to conserve the biological diversity of Truva, the need for more nature reserves, especially in the Yenikumkale, Orhaniye and Truva region is highlighted. A number of key strategies for protection are proposed.

Key Words
Çanakkale, Truva, Flora, National Park.

ÖZET

Bu makale, Truva Milli Parkı (Çanakkale/Türkiye)'nın floristik çalışması ile ilgilidir. Sonuç olarak bu alanın endemik ve tehlike altında bulunan türlerini içeren floristik özellikleri tanımlandı. Örneklerin teşhisinden sonra, toplam flora 361 takson 354 tür, 245 cins ve 70 familyaya ait olarak tespit edildi. Bölgenin endemizm oranı 3.32% (12 takson)'dir. Tehlike altındaki bitki örtüsü ve korunması konusundaki çalışma sonucunda alanda en dar yayılışa sahip ve yok olma tehdidi altında olan 15 takson listelendi. Bu taksonların habitat bilgileri, populasyon durumu, yayılışları ve başlıca tehdit bilgilerini arttırmak amacıyla alan çalışması yapıldı. Yeni IUCN kategorileri kullanarak, özellikle bireylerinin sayısı çok az veya çok dar alanlarda yayılışa sahip olup tehlike durumları kritik olan taksonların her biri için bir analiz yapıldı. Truva'nın biyolojik çeşitliliğinin korunması amacıyla özellikle Yenikumkale, Orhaniye ve Truva bölgesinde daha fazla doğal rezerv alanına ihtiyaç olduğu belirlendi. Koruma önlemleri için bir dizi kilit strateji uygulaması önerildi.

Anahtar Kelimeler
Çanakkale, Truva, Flora, Milli Park.

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INTRODUCTION

Preserving habitat for in-situ conservation is the primary concern for endangered species, but genetic diversity is also important. In fact many biologists believe that genetic diversity is fundamental to a species' survival [1]. National parks are the best method for nature conservation. Determining of fauna and flora composition, and risk statues of organisms very important to set a protection-usage balance in national parks. This information is very important for Long Term Development Plans too.

There are thirty-five National Parks in Turkey. Investigated Area Truva National Park settled around The Truva Ancient City in 1996. UNESCO announced Truva National Park in World Heritage List in December 1998 (http://whc.unesco.org/en/list/849). This area is situated in the Marmara region of Turkey and located in B1 square according to the grid system, which is adopted in the Flora of Turkey [2]. Its borders are The Aegean Sea in the west, The Çanakkale Throat in the north and Çanakkale State Road in the east (Figure 1).

It has a Mediterranean climate with an average temperature of 14.8ºC, the highest average temperature being 30.8ºC and the lowest 3.1ºC, and annual precipitation of 615 mm [3]. The precipitation regime is typical Mediterranean type with rainy winters. The soils are generally alluvial regasol, brown forest, non-calcareous brown forest, vertisol, and non-calcareous brown type. The dominant soil group is non-calcareous originating from conglomerate, flysch, sandstone and limestone rocks [4].

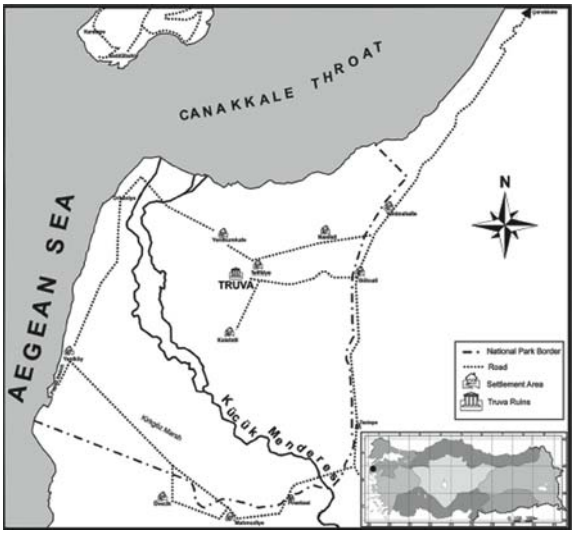

Figure 1. Location of the study area in Turkey.

Agricultural activities are very common in park area. The crop plants of the area include sunflower, pepper, cucumber, tomato, bean and chickpea. Also there are olive grove, vineyard and fruit garden near the settlement area [5].

MATERIALS AND METHODS

The materials of this study are 515 vascular plant specimens that were collected from Truva National Park in 2001. At least one sample for each taxon is deposited at İnönü University Department of Biology Herbarium in Malatya (INU). These specimens were identified basically using the Flora of Turkey [2, 6-14]. The authorities are cited using Author of Plant Names [15].

Phytogeographical regions of the taxa were evaluated according to Davis [2] and Tahtajan

Table 1. IUCN Threat criteria (IUCN, 2001).

IUCN threat category	Area of Occupancy (km^2)	Population Size	Reduction in Population Size over the last 10 years (%)
Extinct (EX)	0	0	100
Critically Endangered (CR)	10-100	50-250	≥ 90-80
Endangered (EN)	500-5.000	250-2.500	≥ 70-50
Vulnerable (VU)	2.000-20.000	1.000-10.000	≥ 50-30
Near Threatened (NT)	> 20.000	> 10.000	< 30
Least Concern (LC)	> 20.000	> 10.000	0

[16], but mainly Davis' records are taken into consideration. The abbreviations used in the text are as follows: Ir.-Tur.: Irano-Turanian; Medit.: Mediterranean; E. Medit.: East Mediterranean; Euro-Sib.: Euro-Siberian.

IUCN criteria [17] were applied for the threatened categories of species. Threat categories have been given in Table 1. Area of occupancy has been calculated used km^2 as the grid square size though like Davis [2]. According to the observations made and the threats detected, categories of danger were assigned to the taxa in accordance with the recent IUCN Red List categories (2001): 'EX' = extinct; 'EW' = extinct in the wild; 'CR' = critically endangered; 'EN'= endangered; 'VU' = vulnerable; 'NT'= near threatened; 'LC' = least concern; 'DD' = data deficient; 'NE' = not evaluated. Although the IUCN Red List categories are primarily meant to applied at worldwide (global) level, in the present paper they are only used within the discrete context of the Turkey; this is in order to estimate the degree of threat faced by many more widely distributed taxa that are relatively exceptional in the Turkey, since the most cases they correspond to relict populations.

The main threats affecting the taxa are indicated in text by means of number in bold type (following Blanca et al. [18] with certain modifications): **1**, natural causes (e.g. very small populations, restricted habitat specificity, hybridization or competition or competition with other species, and climatic changes); **2**, grazing (generally overgrazing); **3**, fires; **4**, collecting; **5**, deforestation, tree-felling and inappropriate forestry practices; **6**, farming and changes in agricultural practices; **7**, recreational activities; **8**, infrastructure, construction and gravel quarrying.

RESULTS AND DISCUSSION

Vegetation properties: The present study since it was the first comprehend floristic study in the area and Long Term Development Plan of Truva National Park. This plan will depend to results of this study. Five main vegetation types, macchie, frigana, forest, wetland and beach dunes can be distinguished in the study are as a result of this research. Characteristics of this vegetation are below.

Macchie vegetation is typical formation of Mediterranean phytogeographic area and includes shrubs and bushes, which also includes low trees reaching a height of 1-2 meters. This vegetation can be seen in Intepe, Orhaniye and Tarassut. Dominant species of this vegetation are *Pistacia terebinthus* L. subsp. *palaestina* (Boiss.) V.Engl., *Myrtus communis* L. subsp. *communis*, *Quercus coccifera* L., *Vitex agnus-castus* L. and *Styrax officinalis* L. Sometimes deciduous species like *Quercus infectoria* Oliver included this formation.

Frigana vegetation forms as a result of destruction of red pine (*Pinus brutia* Ten) and macchie areas. This vegetation exists on hillsides, which are faced to sea in study area. This can be seen in Intepe, Orhaniye, Tarassut and Çardak with macchie vegetation. Dominant species of this formation are *Sarcopoterium spinosum* (L.) Spach, *Cistus creticus* L., *Osyris alba* L., *Thymelaea tartonraira* (L.) All. subsp. *argentea* (Sm.) Holmboe var. *angustifolia* (d'Urv.) Meissner, *Genista anatolica* Boiss. and *Dorycnium hirsutum* (L.) Ser.

Forest vegetation; most common tree species in Truva National Park are *Quercus ithaburensis* Decne. subsp. *macrolepis* (Kotschy) Hedge & Yalt., *Pyrus amygdaliformis* Vill. var. *lanceolata* Diap., *Ulmus minor* Miller subsp. *canescens* (Melville) Browicz & Zielinski, *Amygdalus communis* L., *Cupressus sempervirens* L., *Pinus pinea* L., *Pinus brutia*' Ten'. In these species are *Quercus ithaburensis* Decne subsp. *macrolepis* (Kotschy) Hedge & Yalt. and *Ulmus minor* subsp. canescens (Melville) Browicz & Zelinski form forests. Other species are rare or agricultured. *Quercus ithaburensis* subsp. *macrolepis* forms forest in the east of Yeniköy and *Ulmus minor* subsp. *canescens* forms forest on the hillsides, which are faced to sea in Orhaniye.

Sand vegetation exists on Papaz and Orhaniye beaches. Sand dune vegetation includes herbs, shrubs and sub-shrubs. Dominant species of this formation are *Eryngium maritimum* L., *Centaurea spinosa* L. var. *spinosa*, *Euphorbia helioscopia* L., *Medicago marina* L., *Pseudorlaya pumila* (L.) Grande, *Brassica tournefortii* Govan, *Bolboschoenus maritimus* (L.) Palla var. *maritimus*, *Plantago cretica* L., *Leymus racemosus* (Lam.) Tzvelev subsp. *sabulosus* (Bieb.) Tzvelev and *Tribulus terrestris* L.

Wetland vegetation observed on watery areas with low salinity. This vegetation can be seen on Küçük Menderes River and its branches. Dominant species of this formation are *Bolboschoenus maritimus* (L.) *Palla* var. *maritimus*, *Tamarix smyrnensis* Bunge, *Scirpoides holoschoenus* (L.) Sojak, *Lemna minor* L., *Typha domingensis* Pers. and *Phragmites australis* (Cav.) Trin. ex Steudel.

Floral Properties: A comprehensive study had not done before our study. After an investigation on flora of Turkey [2] and other local flora [5], I found respectively 112 and 33 species that are recorded in Truva by different researchers. After identification of the specimens, total flora has been determinate as 361 taxa belonging to 354 species, 245 genera and 70 families. The endemism rate of the area is 3.32% (12 taxa). The largest three families are Asteraceae (42 species), Fabaceae (38 species), and Poaceae (32 species). The largest genera are *Trifolium* (9 species), *Medicago* (6 species) and *Plantago* (6 species). The phytogeographical spectra of species are as follows: Mediterranean elements 99 (27.42%), Euro-Siberian elements 10 (2.77%) and Irano-Turanian elements 9 (2.49%). The phytogeographical region of 243 taxa (67.31%) is unknown or multiregional. Composition of phytogeographic classification of species is suitable to location of study area. Study area is in Mediterranean phytogeographic region and closer to Euro-Siberian than Irano-Turanian. These results are suitable with Flora of Turkey [2]. Detailed floristic properties of the research area are given Table 2.

Ten species of the total taxa are new records for the square B1. These new records have been published previously [19]. *Carduncellus caeruleus* (L.) A.DC. var. *dentatus* A.DC. was only recorded on Bursa, Turkey before this study [20]. This species is collected in park area and determined as a new record for the B1 squares. Fifteen taxa in the Flora of Truva are identified as threatened [17,21]. The results are summarized in Table 3. The distribution of the threat categories of these taxa is as follows: 2 taxon CR, 2 taxa VU and 101 taxa LC. Of these, 12 species are endemic or regional endemic.

Table 2. Floristic properties of the research area.

	Ferns	Gymno.	Dicots	Monocots	Total
Family	2	2	56	9	69
Genera	2	3	194	42	241
Species	3	4	281	64	354
Subspecies	-	-	3	2	5
Variety	-	-	2		2
Medit.	-	-	52	10	62
E.Medit.	1	1	30	5	37
Euro.-Sib.	-	-	6	4	10
Ir.-Tur.	-	-	6	3	9
Others	2	3	192	46	243
Endemic taxa	-	-	10	2	12
EX	-	-	-	-	-
EW	-	-	-	-	-
CR	-	-	2		2
EN	-	-	-	-	-
VU	-	-	2		2
NT	-	-	-	-	-
LC	-	-	9	2	11
DD	-	-	-	-	-
NE	-	-	-	-	-

Especially, four species under the threatened categories (Table 3) are most important for this area. Threatened statuses of these species are given below;

Beta trojana Pamuk apud Aellen var. *trojana*, which is included in Bern Convention appendix 1 (strictly protected flora species) is growing in wetland vegetation of the stream side of the Park area. These areas are used grazing area by local people. This species is Critically Endangered [CR B2b (i, ii, iii, iv, v); D: area of occupancy less than 10 km^2 (inferred decline in the area: extent of occurrence, area of occupancy, area extend and/or quality of habitat, number of locations or subpopulations, number of mature individuals); population size estimated to number fewer than 50 mature individuals]. This species was only collected in Yenikumkale village.

Aethionema saxatile (L.) R.Br. subsp. *oreophilum* I.A.Anderson et al. is Critically Endangered [CR B1b

Table 3. The threatened flora of the study area and its IUCN Red Data List Categories.

Species	Total population	Area of occupancy (km^2)	Main threats	Conservation status
Endemic species				
Anchusa leptophylla Roemer & Schultes subsp. *incana* (Ledeb.) Cha.	> 60	> 20 000	2, 3, 6, 8	LC
Asperula lilaciflora Boiss. subsp. *lilaciflora*	> 30	> 20 000	2, 6, 7, 8	LC
Beta trojana Pamuk apud Aellen var. *trojana*	< 5	< 10	1, 2, 4, 6, 8	CR B2b(i, ii, iii, iv, v); D
Campanula lyrata Lam. subsp. *lyrata*	> 70	> 20 000	3, 5, 6, 8	LC
Crocus candidus E.D.Clarke	> 10	< 2000	1, 4, 6, 8	LC
Dianthus lydus Boiss	> 10	< 10 000	5, 6, 8	LC
Juncus sparganiifolius Boiss. & Kotschy ex Buchenau	> 25	> 20 000	4	LC
Lamium moschatum Miller var. *rhodium* (Gand.) R.Mill	> 10	< 10 000	6, 8	LC
Onosma armenum DC.	> 85	> 20 000	5, 6, 8	LC
Verbascum syriacum Schrader	> 5	< 2000	5, 6, 8	VU B1ab(iii, v)+2ab(iii, v); D1
Verbascum parviflorum Lam	> 25	> 10 000	5, 6, 8	LC
Stachys cretica L.subsp. *smyrnaea* Rech. fil.	> 10	< 10 000	4, 5, 6, 8	LC
Rare species				
Aethionema saxatile (L.) R.Br. subsp. *oreophilum* I.A.Anderson et al.	< 5	< 100	1, 2, 6, 7,8	CR B1b(i, ii, iii, iv, v); C1
Albizia julibrissin Durazz.	c.v.	> 20 000	-	LC
Carduncellus caeruleus (L.) A.DC. var. *dentatus* A.DC.	< 5	< 20 000	6, 8	VU B1ab(iii, v)+2ab(iii, v); D1

(i, ii, iii, iv, v): area of occupancy less than 100 km^2 (inferred decline in the area: extent of occurrence, area of occupancy, area extend and/or quality of habitat, number of locations or subpopulations, number of mature individuals)]. This species was only collected in Truva ruins.

Verbascum syriacum Schrader and *Carduncellus caeruleus* (L.) A.DC. var. *dentatus* A.DC. are Vulnerable [B1ab (iii, v)+2ab (iii, v); D1: extent of occurrence less than 20 000 km^2, no more than 10 locations, inferred decline in the area (area extend and/or quality of habitat, number of mature individuals) + area of occupancy less than 2000 km^2, known at no more than 10 locations, inferred decline in the area (area extend and/or quality of habitat, number of mature individuals)]. This species was collected in Orhaniye village and Truva ruins.

As a result of this study, it can be expected that gradually the important floristic changes and habitat loss, clearing of the natural vegetation for cultivation, overgrazing and logging are the main causes of threats in the study area. These endangered species and natural vegetation cover will not fully become extinct in the world because of these activities. The principal conservation measures for the flora of the Truva are: (i) the regular monitoring of the most threatened species and development of measures to recover, conserve and restore their habitats; (ii) the control of human impact, particularly through studies on sustainable grazing intensity and tourism in its widest sense; (iii) different grazing area must be displayed to farmer; (iv) strengthening enforcement of the ban on plant collecting; (v): seeds of threatened plants must be sand to germplasm banks; (vi) researching the

artificial multiplication of the species under threat; (vii) cultivating plants in botanical gardens located 'in situ'; and (viii) encouraging the development of new populations of the most seriously threatened species in different areas where the risk factors are lower.

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