Journal of the Faculty of Forestry, Istanbul University 2013, 63 (2): 1-10

Endemic Plants of Taşlıyayla and Kızık (Bolu-Seben) Surrounding

Bilge Tunçkol[1*], Ünal Akkemik[2]

[1] Bartın University BartınVocational School Department of Forestry Forestry and Forest Products Program, 74100 Bartın
[2] İstanbul University Faculty of Forestry Department of Forest Botany, 34473 Bahçeköy / İstanbul

[*] Tel: +90 378 227 99 39, Fax: +90 378 227 88 75, E-mail: btunckol@bartin.edu.tr

Abstract

This study that was prepared at the University of İstanbul Institute of Sciences, Forest Engineering Department, Program of Forest Botany, covers endemic plants identified in the master thesis entitled "The Flora of Taşlıyayla and Kızık Surroundings." Research field is located between Bolu and Seben, it is in the A3 square according to the grid system of Davis and it is located in an area in which it is seen the effects of Euro-Siberian, Mediterranean and Irano-Turanian Floristic Regions. As a result of "35 times fieldwork" to research area, 1750 plant samples were collected. As a consequence of identification of the collected plant specimens 573 taxa belonging to 295 genera and 85 families have been determined. 66 of these taxa are determined as endemic for the A3 square and the endemism ratio is %11,51.

Keywords: Turkey, Bolu, A3, endemic, flora, botany

Taşlıyayla ve Kızık (Bolu-Seben) Çevresinin Endemik Bitkileri

Kısa Özet

Bu çalışma; İ.Ü. Fen Bilimleri Enstitüsü, Orman Mühendisliği Anabilim Dalı, Orman Botaniği Programı"nda, "Taşlıyayla ve Kızık (Bolu-Seben) Çevresinin Florası" adlı Yüksek Lisans Tezi kapsamında saptanan endemik bitkileri kapsamaktadır. Araştırma alanı; Bolu ili ile Seben ilçesi arasında, Davis'in Karelaj Sistemine göre A3 karesi içerisinde yer almakta olup, Avrupa-Sibirya, Akdeniz ve İran-Turan Floristik Bölgeleri'nin etkilerinin görüldüğü bir noktada bulunmaktadır. Araştırma alanına yapılan 35 arazi çalışması sonucunda toplam 1750 bitki örneği toplanmıştır. Toplanan örneklerden 85 familyaya ait 295 cins ve bu cinslere ait toplam 573 takson tespit edilmiştir. Teşhis edilen taksonlardan 66'u Bolu ilinin de içerisinde bulunduğu A3 karesi için endemik olup çalışma alanının endemizm oranı %11,51 olarak belirlenmiştir.

Anahtar kelimeler: Türkiye, Bolu, A3, endemik, flora, botanik

Received: 15.02.2012; accepted: 15.04.2013

1. Introduction

Turkey is regarded as one of the richest floristic centers of the world with such reasons that it is at the cross point of three important flora regions of the world, it has interesting topographic structure shaped by the movements of Eurasia, Africa and Arabia Peninsula, and different climate types in the country come together in a narrow geography.

Floristic studies that have been studied until today have been documented the existence of approximately 11224 natural plant taxa and 4018 of this number are endemic plants in Turkey (Vural, 2009). The endemic and non endemic taxa grow in Turkey are in threat due to industrialization, urbanization, widened agricultural fields, excessive pasture, tourism, construction of hydroelectric power plants, constitution of the artificial lakes, exportation, thoughtless collections from nature, improvements of barren areas, agricultural activities and pollution, planting trees and fires. As a result of these threats, the life area of a number of endemic and non endemic taxa is narrowed and they have gradually disappeared (Ekim et al., 2000).

According to "IUCN Red List Categories"version 2.3 (Ekim et al., 2000). prepared by IUCN Species Survival Commission, in the work entitled as "Red Data Book of Turkish Plants" the condition of rare plants under danger and endemic plants of Turkey are evaluated according to their threat categories. Later, in the version 3.1 publicated in 2001, the threat categories of rare and endemic plants are evaluated again and some changes are made (IUCN 2001). Our plant list is prepared according to the lastest version. As endemic plants have generally narrow distribution, the positions of endemic plants in the threat category should absolutely be explained.

During the fieldwork to reserach area in 2010-2011, it is determined that there is a rapid increase in the touristic and uncontrolled constructions and second-house construction in the alms and pastures around Taşlıyayla Lake. Taşlıyayla Lake that has alms around it and that will cover 8.32 km field (almost 8 times bigger than Abant Lake) will change the climatic characteristics of the area in the future. Tourism activities that may directly damage the current biologic structure and climate change threat the distribution of endemic and the other existing plants. This article has been written with the aim of determination of endemic plants and their threat categories, and with the aim of suggesting measures for the protection of these plants.

2. Materials and Methods

Research field is located in an area in which it is seen the effects of Euro-Siberian, Mediterranean and Irano-Turanian Floristic Regions together with Sub-Euxine and Xero-Euxine zones. It is in between the area of 40^0 32' 00''–40^0 34' 03'' north latitudes and 31^0 27' 33''–31^0 41' 53'' east longitudes (Figure 1). The research area is 10,5 ha size and it is between 880 and 1732 m. a.s.l. It covers Solaklar, Nimetli, Dedeler, Ayman, Korucuk, Hacıoğlan, Bozyer, Alpagut, Kozyaka, Keskinli and Demirciler alms together with Kızık, Dereceören, Kuzgölcük and Kabak villages.

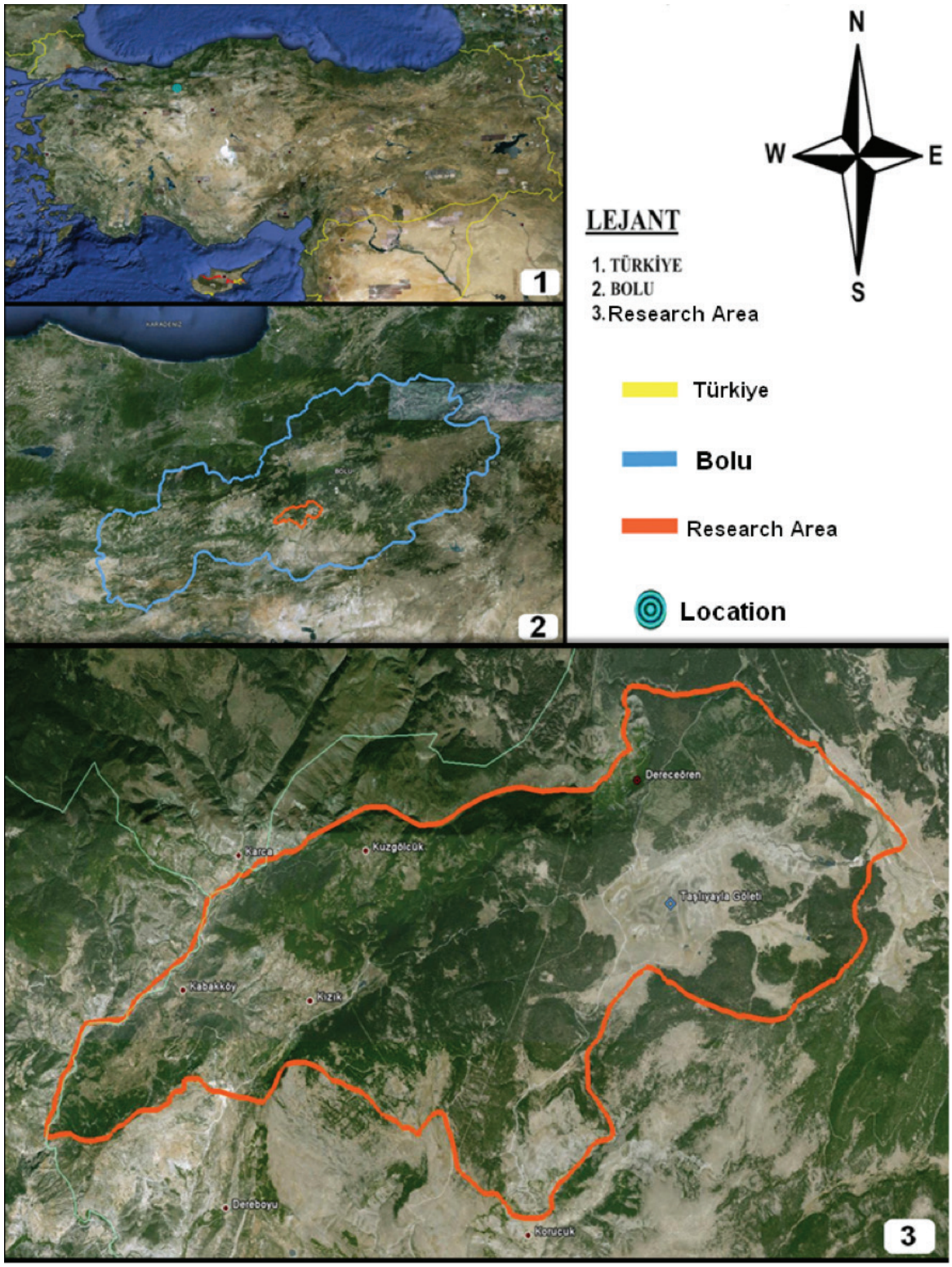

Figure 1. Geographic location of research area

During 2010-2011 vegetation period (march-october) with the aim of identification of flora in the first year 2010 the research field was visited 23 times in every 15 days and in 2011 it was totally visited 12 times. As a result of "35 times fieldwork" to research area, 1750 plant samples were collected. After the collecting samples were dried according to herbarium techniques, it was taken the necessary protection measures and they were put into ISTO Herbarium. The works Flora of Turkey and the East Aegean Islands (Davis 1965-1985; Davis ve diğ., 1988; Güner ve diğ., 2000), Flora Orientalis (Boisser, 1867-1888), Türkiye Bitkileri Listesi (Güner, A. ve diğ., 2012.), Chek-List of Additional Taxa to the Supplement Flora of Turkey (Özhatay, N., Kültür, Ş., Aksoy, Ş., 1994, 1999) were used in the identification of the plants. Also it is benefited from ISTO (Istanbul University Faculty of Forestry Herbarium), ISTE (Istanbul University Faculty of Pharmacy Herbarium) and GAZI (Gazi University Herbarium) herbariums.

In the presentation of the plant list, families and genera were arranged in evolutionary order in accordance with the Flora of Turkey. In determination of the threat categories it is benefited from the works entitled as "Red Data Book of Turkish Plants" and "IUCN Red List Categories" (IUCN 2001). The abbreviations used in the floristic list: ISTO: Istanbul University Faculty of Forestry Herbarium, TC: Threat Category, PN: Plant Name, CR: Critically Endangered EN: Endangered, VU: Vulnerable, NT: Near Threatened, LC: Least Concern, DD: Data Deficient.

3. Findings

As a consequence of identification of the collected plant specimens, in Taşlıyayla-Kızık 573 taxa belonging to 295 genera and 85 families have been identified. 66 of these taxa belonging to 26 families are endemic and its rate of endemism is determined as 11,51%. As the research field is under the effect of Euxine and Irano-Turanian Floristic Regions, in the regional distribution of endemic plants, these two region is important. Irano-Turanian Floristic Region is represented more endemic taxa (Figure 2).

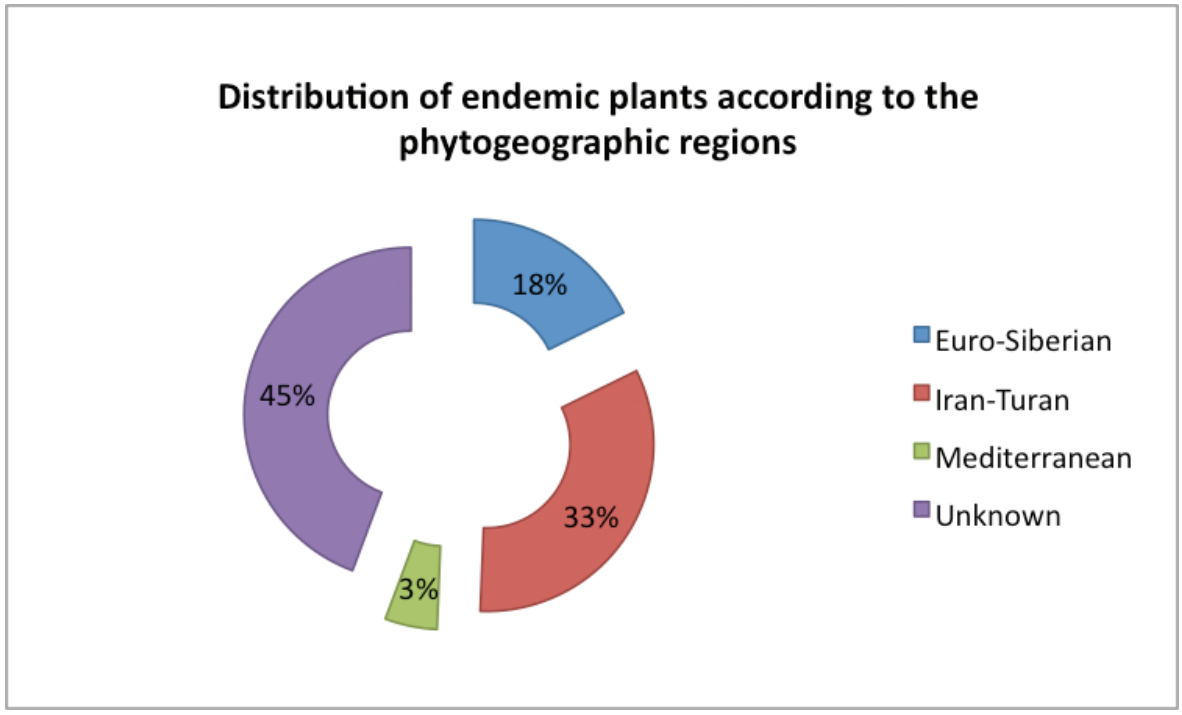

Figure 2. Distribution of endemic plants according to the phytogeographic regions

Threat categories of endemic plants (all) Table 1, name of taxa and threat categories (individually) is given in Table 2.

Table 1. The numbers of endemic plants according to threat categories

Threat Category	The number of taxa
CR	1
EN	1
VU	3
NT	7
LC	54

Table 2. Endemic taxa and their threat categories in Taşlıyayla- Kızık Surrounding

Family	Plant Name	Threat Category
SPERMATOPHYTA		
GYMNOSPERMAE		
Pinaceae	*Abies nordmanniana* (Steven) Spach subsp. *bornmuelleriana* (Asch. & Sint. ex Boiss) Coode & Cullen	LC
ANGIOSPERMAE		
DICOTYLEDONES		
Ranunculaceae	*Delphinium venulosum* Boiss.	LC
	D. fissum Waldst. & Kit. subsp. *anatolicum* Chowdhuri & P.H.Davis	LC
Papaveraceae	*Papaver pilosum* Sibth. & Sm. subsp. *pilosum*	VU
Cruciferae	*Isatis floribunda* Boiss. ex Bornm.	LC
(Brassicaceae)	*Thlaspi lilacinum* Boiss. & Huet	LC
	Barbarea trichopoda Hausskn. ex Bornm.	NT
	Bornmuellera cappadocica (Willd.) Cullen & T.R.Dudley	LC
	Aubrieta canescens (Boiss.) Bornm. subsp. *canescens*	LC
Caryophyllaceae	*Minuartia anatolica* (Boiss.) Woronow var. *arachnoidea* McNeill	LC
	Dianthus ancyrensis Hausskn. & Bornm.	VU
	Saponaria prostrata Willd. subsp. *prostrata*	LC
	Gypsophila brachypetala Trautv.	VU
	Paronychia beauverdii Czeczott	NT
Guttiferae	*Hypericum heterophyllum* Vent.	LC
(Hypericaceae)	*H. adenotrichum* Spach	LC
Linaceae	*Linum flavum* L. subsp. *scabrinerve* (Davis) Davis	LC
	L. hirsutum L. subsp. *anatolicum* (Boiss.) Hayek var. *anatolicum*	LC
Rhamnaceae	*Rhamnus thymifolia* Bornm.	LC
Geraniaceae	*Geranium sintenisii* Freyn	LC
Leguminosae	*Genista aucheri* Boiss.	LC
(Fabaceae)	*Astragalus trichostigma* Bunge	EN
	A. macrocephalus Willd. subsp. *macrocephalus*	NT
	A. lydius Boiss.	LC
	A. karamasicus Boiss. & Balansa	LC
	A.amoenus Fenzl	LC
	Lathyrus brachypterus Čelak	LC
	L. tukhtensis Czeczott	LC
	Trifolium elongatum Willd.	LC
	Melilotus bicolor Boiss. & Balansa	NT
	Onobrychis tournefortii (Willd.) Desv.	LC

Rosaceae	*Crataegus tanacetifolia* (Poir.) Pers.	LC
Crassulaceae	*Sempervivum armenum* Boiss. & A.Huet. var. *armenum*	LC
Umbelliferae	*Astrantia maxima* Pall. subsp. *haradjianii* (Grintz) Rech.f.	LC
(Apiaceae)	*Eryngium bithynicum* Boiss.	LC
Compositae	*Helichrysum arenarium* (L.) Moench	
(Asteraceae)	subsp. *aucheri* (Boiss.) Davis & Kupicha	LC
	Rhaponticoides amasiensis (Bornm.) M.V.Agab. & Greuter	LC
	Centaurea olympica (DC.) K.Koch	LC
	C. consanguinea DC.	LC
	C. inexpectata Wagenitz	LC
	Tragopogon aureus Boiss.	LC
Campanulaceae	*Asyneuma limoniifolium* (L.) Janch.	
	subsp. *pestalozzae* (Boiss.) Damboldt	LC
	A. rigidum (Willd.) Grossh.	
	subsp. *sibthorpianum* (Roem. & Schult.) Damboldt	LC
Apocynaceae	*Vincetoxicum fuscatum* (Hornem.) Reichb.f.	
	subsp.*boissieri* (Kusn.) Browicz	LC
Boraginaceae	*Echium orientale* L.	LC
	Alkanna orientalis (L.) Boiss. var. *leucantha* (Bornm.) Hub.-Mor.	NT
	Anchusa leptophylla Roem.& Schult. subsp. *incana* (Ledeb.) Chamb.	LC
	Nonea monticola (Rech.f.) Selvi & Bigazzi	LC
Plantaginaceae	*Linaria corifolia* Desf.	LC
	Digitalis lamarckii Ivan.	LC
Labiatae	*Ballota larendana* Boiss. & Heldr.	LC
(Lamiaceae)	*Stachys iberica* M.Bieb. subsp. *iberica*	
	var. *densipilosa* R.Bhattacharjee	LC
	Salvia cadmica Boiss. var. *cadmica*	LC
	S. absconditiflora (Montbret & Aucher ex Benth.)	
	Greuter & Burdet	LC
Euphorbiaceae	*Euphorbia cardiophylla* Boiss. & Heldr.	LC
Fagaceae	*Quercus macranthera* Fisch. & C.A.Mey. ex Hohen.	
	subsp. *syspirensis* (C. Koch) Menitsky	LC
M O N O C O T Y L E D O N E S		
Araceae	*Arum hygrophilum* Boiss. subsp. *euxinum* (R.R.Mill) Alpınar	LC
Asparagaceae	*Allium olympicum* Boiss.	LC
	A. huber-morathii Kollmann, Özhatay & Koyuncu	LC
	Muscari aucheri (Boiss.) Baker	LC
Liliaceae	*Gagea bithynica* Pasch.	LC
Iridaceae	*Iris kerneriana* Asch. & Sint. ex Baker	LC
	Crocus biflorus Mill. subsp. *pulchricolor* (Herb.) B.Mathew	NT
	C. ancyrensis (Herb.) B.Maw	LC
Gramineae	*Festuca cyllenica* Boiss. & Heldr. subsp. *uluana* Markgr.-Dann.	NT
(Poaceae)	*F. rubra* L. subsp. *pseudorivularis* Markgr.-Dann.	CR

Some of the endemic plants from research field is given in Figure 3 and 4.

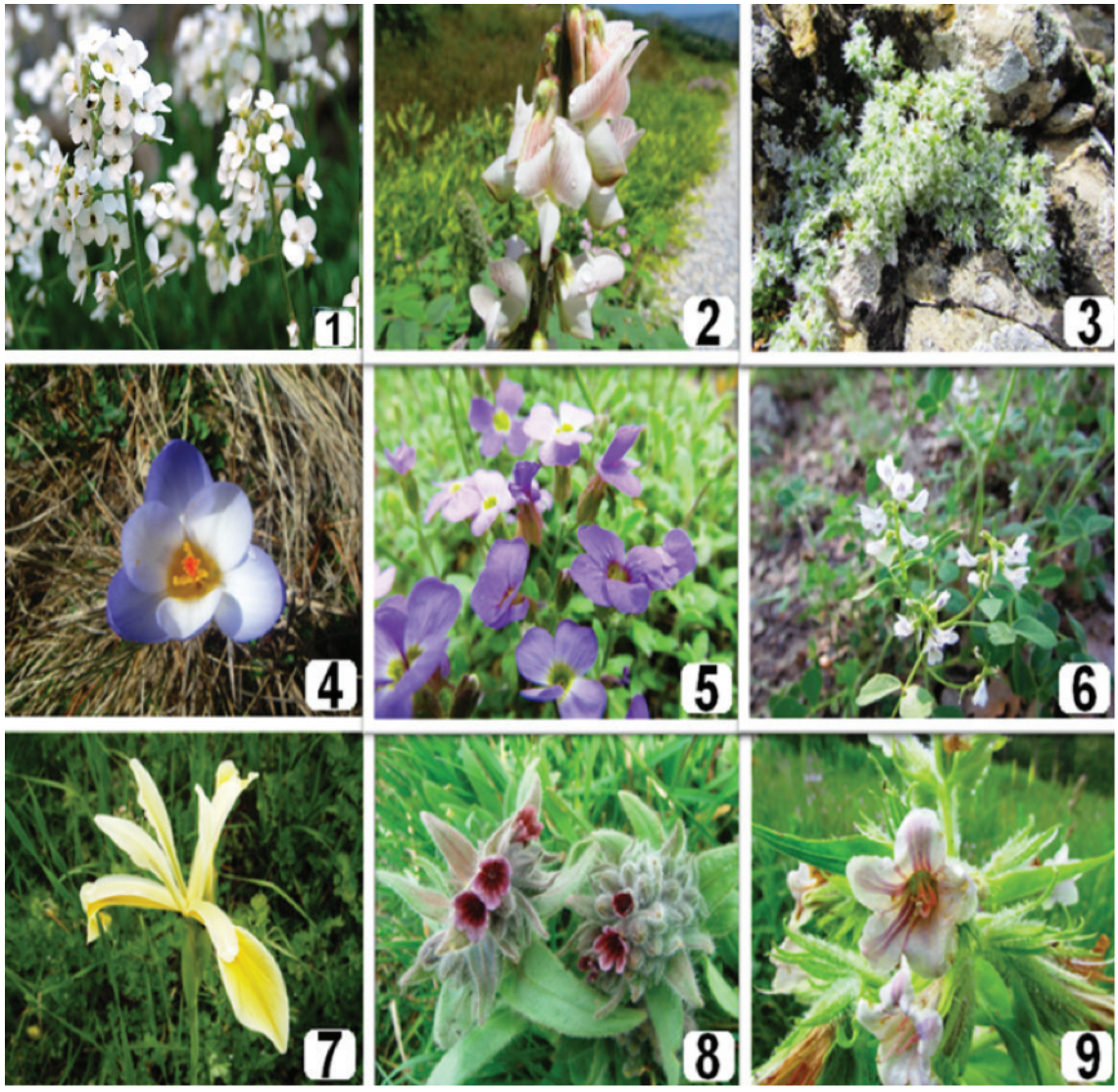

Figure 3. 1. *Bornmuellera cappadocica* 2. *Onobrychis tournefortii* 3. *Paronychia beauverdii* 4. *Crocus biflorus* subsp. *pulchricolor* 5. *Aubrieta canescens* subsp. *canescens* 6. *Melilotus bicolor* 7. *Iris kerneriana* 8. *Nonea monticola* 9. *Echium orientale*

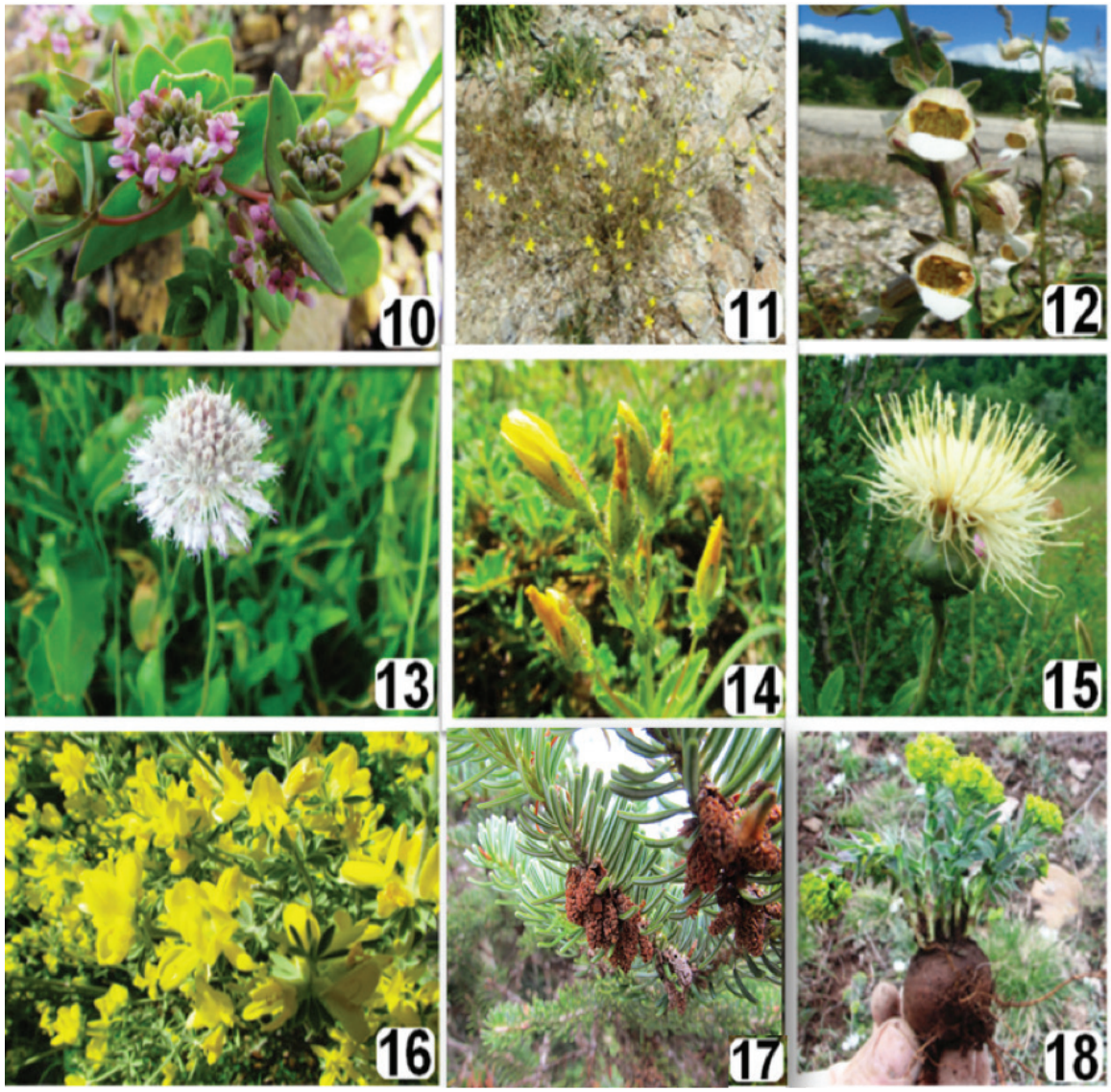

Figure 4. 10. *Thlaspi lilacinum* 11. *Hypericum heterophyllum* 12. *Digitalis lamarckii* 13. *Allium olympicum* 14. *Hypericum adenotrichum* 15. *Rhaponticoides amasiensis* 16. *Genista aucheri* 17. *Abies nordmanniana* subsp. *bornmuelleriana* 18. *Euphorbia cardiophylla*

4. Result and Discussion

In the research field, 66 endemic taxa belonging to 26 families were identified. The phytogeographical distribution of determined endemic taxa are as fallows; Irano-Turanian 22 Euro-Siberian 12 and Mediterranean 2. When the threat categories of these taxa are evaluated, the 54 of these are in the least concern category and there is no problem for these taxa. 7 of these taxa are in the near threatened category. In the field, there are 3 taxa in the category of vulnerable (*Papaver pilosum*, *Dianthus ancyrensis*, *Gypsophila brachypetala*), there is 1 taxa in the endangered category (*Astragalus trichostigma*) and there is 1 taxa in the critically endangered category (*Festuca rubra* subsp. *pseudorivularis*). Therefore, it is very necessary and important to protect these species.

Also, 13 of these identified taxa, (*Papaver pilosum* subsp. *pilosum*, *Isatis floribunda*, *Aubrieata canescens* subsp. *canescens, Gypsophila brachypetala*, *Paronychia beauverdii*, *Astragalus karamasicus*,

Lathyrus brachypterus, Melilotus bicolor, *Rhaponticoides amasiensis*, *Centaurea olympica*, *Anchusa leptophylla* subsp. *incana*, *Bornmuellera cappadocica*, *Salvia cryptantha*) are endemic taxa and besides this they are new records for the A3 square. As the new distribution areas belonging to these endemic taxa are found, threat categories should be reevaluated.

When the researches were began in February 2010, the water level of the lake is 6.3 m, whereas when the researches were finished in October 2011, the water level increased and became 11 m. During the flora researches in the area, in the field that remained under increasing water of the lake (4.7 m. difference in the water level) it is seen that a number of taxa grow up around the lake remained under water. 11 of these taxa are endemic. (*Dianthus ancyrensis* VU, *Bornmuellera cappadocica* NT, *Trifolium elongatum* LC, *Nonea monticola* LC, *Muscari aucheri* LC, *Gagea bithynica* LC, *Crocus biflorus* subsp. *pulchricolor* NT, *Crocus ancyrensis* LC, *Festuca cyllenica* NT, *Festuca rubra* subsp. *pseudorivularis* CR, *Allium* spp. section *Melanocrommyum*).

Second-house constructions in the alms and pastures negatively affects the distribution area of these 11 taxa. Also, one of the identified taxa is collected from the shore of Taşlıyayla Lake during the revision study of *Melanocrommyum* section carrying out with the supervision of Prof. Dr. Neriman Özhatay. The same sample was collected by me and identified by Prof. Dr. Neriman Özhatay. The identification of this new taxa has been completed and it will be introduced to science community. The field on which this taxa is distributed completely remained under water.

When the floristic studies around the research area are examined, 66 endemic taxa are determined in this research field (Table 3). When the other 5 compared studies are examined, the studies number 5 and 6 are comletely Euro-Siberian, and the studies number 2, 3 and 4 are in the Irano-Turanian Floristic Region. The most important reason of the high number of taxa in the research field is that the research field is under the effect of Euxine and Irano-Turanian Floristic Regions. While the Black Sea climate characteristics are completely dominant at the north side of the research field, the south and the west sides of the research field are under the effects of Central Anatolia terrestrial climate. The closest meteorology station is at the same height with the research field and it is in the Şerif Yüksel Research Forest at 1550 m a.s.l. This station is at the north side of the research area in which the Black Sea climate is dominant and the annual avarage precipitation is 882, 6 mm. At the south side of the research field, the closest meteorology station is in the center of Seben District. This station is at the 700 m a.s.l, and the annual avarage precipitation is 444,0 mm.

Also, the reason of the identification of the endemic taxa belonged to Mediterranean flora is Aladağ Brook Valley that constitutes the north and the west borders of the research field. This valley has a rich floristic diversity thanks to warm air coming from Sakarya Valley which penetrates into this valley. In the research field, the abundance of the pasture, alms and unforested areaalso increase the floristic diversity.

Table 3. Comparing research field with other floristic studies carried on surroundings in terms of taxa number and endemism

	Research Fields					
	1	2	3	4	5	6
Endemic taxa number	66	69	64	65	55	15
Rate of endemism (%)	11,51	13,40	21,19	18,55	8,1	3,4
Total taxa number	573	511	302	354	672	438

1. Tunçkol, (2012) Flora of Taşlıyayla and Kızık (Bolu-Seben) Environment; 2. Aksoy, (2001) Flora of Karakiriş Mountain; 3. Güner, (2000) Flora of Doğan Dede Hill and Environment; 4. Doğan, (2000) Flora of Nallıhan Bird Lake, 5. Uçar, (1996) Flora of Abant; 6. İkinci, (2000) Flora of Gölcük (Bolu)

The studies of flora identification, vegetation and revision provide to reveal natural flora, they help introduction and protection of endemic plants as well. These studies also show that endemic plants is our natural richness and it is important to save them. It is very necessary to continue such researches to show Turkey's natural richness.

Thanks

This study was supported by the Research Found of Istanbul University (Project number: 12802) as a master thesis project. We thank Prof. Dr. Neriman ÖZHATAY, Prof. Dr. Zeki AYTAÇ, Assist. Prof. Dr. Zafer KAYA, Dr. Hatice YILMAZ, Dr. Gülay GENÇ ECEVİT, Dr. Mine KOÇYİĞİT, Dr. Sırrı YÜZBAŞIOĞLU and Forest Engineer Hasan YAŞAYACAK for their helps in the identification of some species and samples, and for their helps in the control of some identified species and samples.

References

Aksoy, N., 2001. Karakiriş Dağı (Seben-Nallıhan) Florası. Yüksek Lisans Tezi, İ.Ü. Fen Bilimleri Enstitüsü, İstanbul.

Boisser, E., 1867- 1888. Flora Orientalis Volume: 1-5. Suplement by Buser, R. Geneve, Switzerland.

Davis, P. H., 1971. *Plant Life of South-west Asia*, The Botanical Society of Edinburgh, Edinburgh.

Davis, P. H., 1965-1985. Flora of Turkey and East Aegean Islands vol. 1-9. Edinburg University Press, Edinburgh.

Davis, P. H., R.R. Mill and K. Tan, 1988. Flora of Turkey and East Aegean Islands vol. 10 (suppl. 1). Edinburg University Press, Edinburgh.

Doğan, E., 2000. Nallıhan Kuş Cenneti Florası (Ankara), Yüksek Lisans Tezi, G.Ü. Fen Bilimleri Enstitüsü-Ankara

Ekim, T., M. Koyuncu, M. Vural and N. Adıgüzel, 2000. Türkiye Bitkileri Kırmızı Kitabı, Eğrelti ve Tohumlu Bitkiler (Red Data Book of Turkish Plants. Pteridophyta and Spermatophyta). Barışçan Ofset, 246 s., Ankara.

Güner, A., S. Aslan, T. Ekim, M. Vural and M.T. Babaç (edlr.), 2012. Türkiye Bitkileri Listesi (Damarlı Bitkiler). Nezahat Gökyiğit Botanik Bahçesi ve Flora Araştırmaları Derneği Yayını. İstanbul.

Güner, A., N. Özhatay, T. Ekim and K.H.C. Başer, 2000. Flora of Turkey and East Aegean Islands vol. 11 (suppl. 2). Edinburgh University Press, Edinburgh.

Güner, M.B., 2000. Doğandede Tepe ve Çevresi (Beypazarı-Ankara) Florası. Yüksek Lisans Tezi, G.Ü. Fen Bilimleri Enstitüsü, Ankara.

IUCN. "Red List Categories".,2001. Version 3.1. Prepared by the IUCN Species Survial Commission. IUCN, Gland Switzerland and Cambridge, UK.

İkinci, N., 2000. The Flora of Gölcük Area (Bolu). MSc Thesis, A.İ.B.U. Department of Biology, Bolu

Özhatay, N., Ş. Kültür and Ş. Aksoy, 1994. Chek-List of Additional Taxa to the Supplement Flora of Turkey. *Turkish Journal of Botany.* Vol. 18,6:497-514, Ankara

Özhatay, N., Ş. Kültür and Ş. Aksoy, 1999. Check-List of Additional Taxa to the Supplement Flora of Turkey. *Turkish Journal of Botany.* Vol. 23,3:151169, Ankara.

Uçar, A., 1996. Flora of Abant. A.İ.B.U. Department of Biology, Bolu.

Vural, M., 2009. Biyoçeşitlilik Sözleşmesi ve Türkiye'nin Florsitik Yapısı. *Bağbahçe Dergisi.* 24. Sayı, sayfa 8-9.