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Ayvalık (Balıkesir/Turkey) Dune Plant Diversity, Threatening Factors and Solution Proposals

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ABSTRACT: Ayvalık and its environs are unique due to its coastal structure and natural beauties, and particularly the islands belonging to Ayvalık makes up the most important resource values. This study was carried out to determine the plant diversity in the coastal dunes of Ayvalık and its surroundings, to present the threat factors and to offer solutions. The study was conducted between 2016-2017. For this purpose; floristic and ecological observations were made in four seasons. As a result of floristic studies; 88 genera and 115 taxa belonging to 32 families were determined. Fabaceae (15 taxa), Asteraceae (14 taxa) and Amaranthaceae (8 taxa) families are dominant in the flora of the region. The most common taxa in dune areas are; *Matthiola tricuspidata, Malcolmia flexuosa, Salicornia emericii, Cakile maritima, Anthemis rigida, A. tomentosa, Halimione portulacoides, Plantago coronopus* subsp. *commutata, Trifolium subterraneum, Eryngium maritimum, Allium sphaerocephalon* and *Euphorbia paralias*. The role of human factors is particularly notable in a significant part of the coastal dunes in the region. Beach arrangements in dune areas, secondary housing construction in coastal areas, sand extraction from coasts, tourism, wetland drying and fires threaten dune habitats and plant species in the region. Especially due to the extensive use of the coastal areas and beach arrangements; The habitats of Sea daffodil (*Pancratium maritimum*) and Narcissus (*Narcissus tazetta*) have been greatly damaged. Moreover, the fact that *P. maritimum* bulbs were collected by the people there greatly reduced the populations of this species. It also is given solution proposals for protection of dune plants.

Keywords: Balıkesir, biodiversity, ecology, flora

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INTRODUCTION

The coastal areas, which constitute only 4% of the earth, contain about 1/3 of the world's population. The coasts are important transitional areas between water environments and terrestrial environments, represented by areas of different sizes. Coastal areas are defined as actual ecotons due to their own ecological characteristics (Wiedemann, 1984; Odum and Barrett; 2008; Avcı, 2017a,b). Coastal dunes are complex systems in terms of growing conditions of vegetation. Properties such as low amount of plant nutrients and organic matter in sand dunes, high permeability rate, direct sunlight exposure and high temperatures, highly effective wind, mobility of the surface and exposure to seawater with high salt content are some of the important factors limiting the development of vegetation. Turkey has a total of 105 coastal dunes in 23 out of 26 coastal cities and their total area is 3557 ha. The length of the coasts in our country is 8333 km, 2805 km of which is in the Aegean, 1695 km in the Black Sea, 1577 km in the Mediterranean Sea, 1189 km in the Marmara Region, in Çanakkale Strait and Istanbul Bosphorus and 1067 km on the islands (Uslu, 1988; Avcı et al 2015). According to Erinç (2001); Turkey's coastal dunes are observed in 75 different areas. 8 of these coastal dunes are located in Balıkesir province and three of these areas (Çıplak Island, Sarımsaklı and Altınova) are located in Ayvalık district (Table 1).

Table 1. Coastal sand dunes in Balıkesir (Erinç 2001).

No	District	Dune field name
1	Ayvalık	Altınova
2	Ayvalık	Sarımsaklı
3	Ayvalık	Yumra cape (Badavut beach)
4	Burhaniye	Armutova
5	Edremit	Çoruk
6	Erdek	Belkıs tombolo
7	Gönen	Gönen delta
8	Gönen	Karabiga Delta

Apart from the flora of the area between Edremit Bay-Gökova Gulf near the study field (Akyol and Gemici 2017a,b), the flora and vegetation of the surrounding area of Karaburun-Akdağ (Bekat and Seçmen 1988) and vegetation of Foça, Aliağa and Çandarlı region (Bekat 1980), there is a study carried out regarding the dune flora of Ayvalık. The coasts are quite important ecosystems in that they are transitional regions (ecotone) where marine and terrestrial ecosystems intersect. Coastal ecosystems are essential in terms of biodiversity and the balance maintained between sea and land (Akgün and Türk, 2011). This study was carried out to determine the plant diversity in the coastal dunes of Ayvalık and its surroundings, and to offer solutions to the problems by presenting the factors threatening this wealth.

MATERIALS AND METHODS

The study was carried out in Yumra Cape, Sarmısaklı and Altınova coastal dunes located in Ayvalık (Figure 1). In this study, which was carried out between 2016-2017, the plant diversity and environmental problems were determined through the four-season floristic and ecological observations made in the field. In floristic studies, dune and salt plant species in the area were collected and made into herbarium materials.

Figure 1. The map of study area.

Voucher specimens were deposited in the Botany Laboratory, Altınoluk Vocational School, Balıkesir University. The main source for the identification of the collected plants was mainly Flora of Turkey, Mountain Flora of Greece, Flora of Europae and floristic studies done in the region (Davis 1965-1985; Davis et al. 1988; Güner et al. 2000; Strid and Tan 1991; Tutin et al. 1976). Turkish names of identified plants are given according to Güner et al. (2012). In addition, the plant name authors are given according to Brummit and Powell (1992).

RESULTS AND DISCUSSION

In the field; 88 genera and 115 taxa belonging to 32 families were determined (Table 1).Fabaceae (15), Asteraceae (14) and Amaranthaceae (8) are the families with the most taxa (Figure 2). These three families account for about 32% of the taxa found in the area.

The most taxa-containing genus in the field area are *Limonium* (5), *Allium* (5) *Anthemis* (4) and *Plantago* (4) (Figure 3).

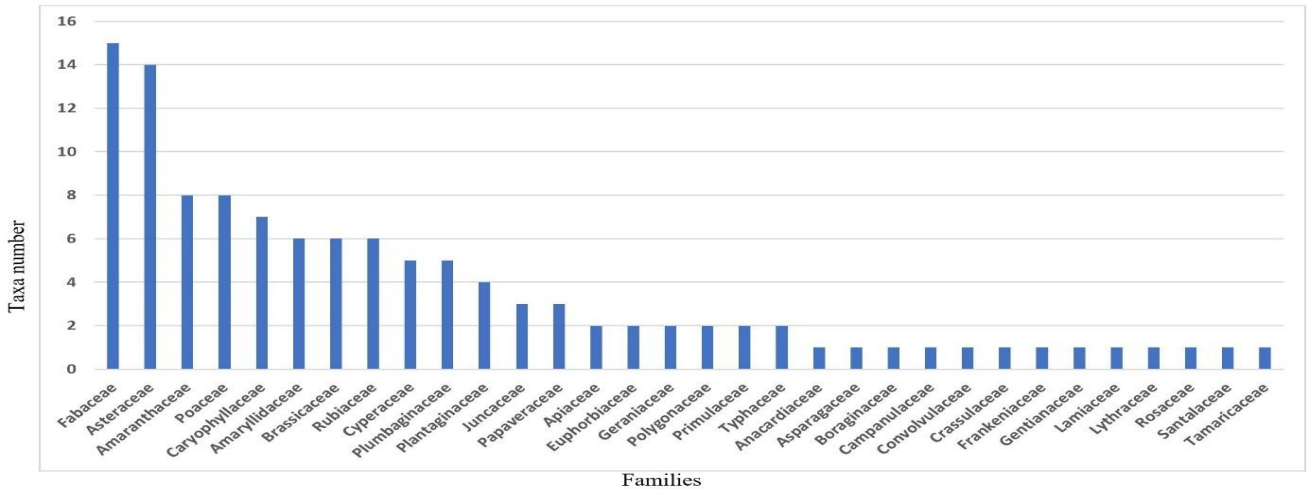

Figure 2. Families identified in the area and taxon numbers

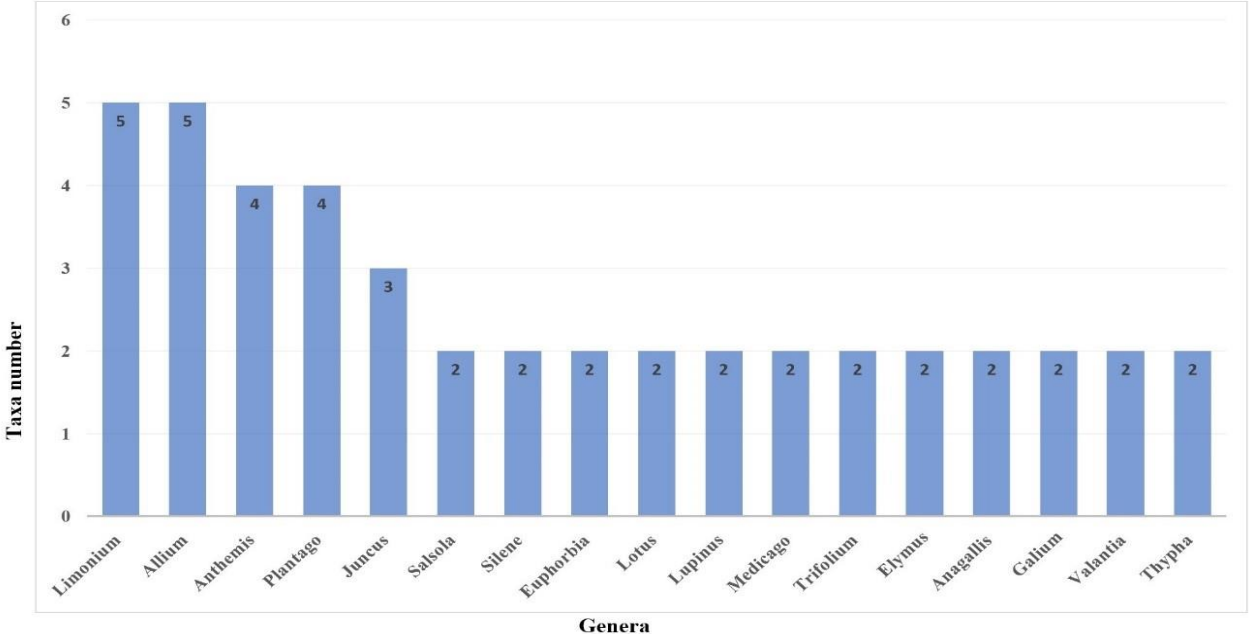

Figure 3. The most genera and taxa found in the region

Table 2. The flora of Ayvalık dunes.

Family	Taxon	Vernacular Name	Locality and the voucher number	Phytogeographical Region
Amaranthaceae	*Amaranthus viridis* L.	Yeşilibik	Southern of Sarımsak Peninsula, 07.05.2016 (SV 1812)	-
Amaranthaceae	*Atriplex lasiantha* Boiss.	Deliunluca	Alibey Island, Çatal Hill, 06.07.2017 (SV 2022)	-
Amaranthaceae	*Beta maritima* L.var. *maritima*	Kıyıpancarı	Small Maden Island, Sarımsak Peninsula, 17.06.2016 (SV 1815)	-
Amaranthaceae	*Halimione portulacoides* (L.) Allen	Kocabetne	All coastline, 06.07.2017 (SV 2023)	-
Amaranthaceae	*Salicornia emericii* Duval-Jouve	Denizbörülcesi	Sarımsak Peninsula, Tuzla, 06.07.2017 (SV 2025)	-
Amaranthaceae	*Salsola kali* L.	Döngele	Alibey Island, Patrice, Çatal Hill, 25.04.2016 (SV 1768)	-
Amaranthaceae	*S. soda* L.	Denizfasülyesi	Alibey Island, Balık Island, 15.04.2016 (SV 1745)	-
Amaranthaceae	*Suaeda prostrata* Pall.	Yatıkcirim	Alibey Island, Patrice, Çatal Hill, 15.04.2016 (SV 1747)	-
Amaryllidaceae	*Allium ampeloprasum* L.	Pırasa	Alibey Island, Hakkıbey Peninsula, 25.04.2016 (SV 1765)	Mediterranean
Amaryllidaceae	*A. commutatum* Guss.	İtdirseği	Kamış Island, 15.04.2017, (SV 1946)	Mediterranean
Amaryllidaceae	*A. roseum* L. subsp. *roseum*	Gülsoğanı	Alibey Island, Alibey Hill, Hakkıbey Peninsula, 15.04.2016 (SV 1740)	Mediterranean
Amaryllidaceae	*A. sphaerocephalon* L. subsp. *sphaerocephalon*	Yılan sarmısağı	Alibey İsland Alibey Tepe, Hakkıbey Peninsula, 15.04.2016 (SV 1738)	Euro-Sibirian
Amaryllidaceae	*Narcissus tazetta* L. subsp. *tazetta*	Nergiz	Alibey Island, Duba, 07.05.2016 (SV 1817)	-
Amaryllidaceae	*Pancratium maritimum* L.	Kumzambağı	Alibey Island, Patrice , 07.05.2016 (SV 1821)	Mediterranean
Anacardiaceae	*Pistacia lentiscus* L.	Sakızağacı	Alibey Island, Çatal Hill, Pınar Island, 25.04.2016 (SV 1769)	Mediterranean
Apiaceae	*Crithmum maritimum* L.	Denizteresi	Southwest of Sarımsak Peninsula, 05.04.2016 (SV 1722)	-
Apiaceae	*Eryngium maritimum* L.	Kumboğadikeni	Sarımsak Peninsula, Tuz cape, 05.04.2016 (SV 1719)	-
Asparagaceae	*Drimia maritima* (L.) Stearn	Kumörümcekotu	Pınar Island, 15.04.2017, (SV 1942)	-

Asteraceae	*Achillea maritima* (L.) Ehrend. & Y.P.Guo subsp. *maritima*	Çocukotu	Eastern of Hakkıbey Peninsula, 05.04.2016 (SV 1715)	-
Asteraceae	*Anthemis rigida* Boiss. ex Heldr.	Diripapatya	Alibey Island, Sarımsak Peninsula, 15.04.2016 (SV 1736)	Mediterranean
Asteraceae	*A. tomentosa* L. subsp. *tomentosa*	Sahilpapatyası	Southern of Sarımsak Peninsula, 05.04.2016 (SV 1710)	Mediterranean
Asteraceae	*Bellis annua* L.	Çayır güzeli	Alibey Island, Patrice, 07.05.2016 (SV 1824)	Mediterranean
Asteraceae	*Cardopatium corymbosum* (L.) Pers.	Kurtludiken	Alibey Island, Duba, 05.04.2016 (SV 1725)	Mediterranean
Asteraceae	*Carthamus caeruleus* L.	Gökaspir	Alibey Island, Duba, 15.04.2016 (SV 1730)	Mediterranean
Asteraceae	*Cladanthus mixtus* (L.) Oberpr. & Vogt	Çirozpapatya	Hakkıbey Peninsula, Cennet cape, 05.03.2016 (SV 1610)	Mediterranean
Asteraceae	*Cota altissima* (L.) J.Gay	Köpek papatyası	Alibey Island, Duba, 25.04.2016 (SV 1772)	-
Asteraceae	*Cota tinctoria* (L) J.Gay var. *tinctoria*	Boyacıpapatyası	Alibey Island Patrice, Sarımsak Peninsula, 15.04.2016 (SV 1734)	-
Asteraceae	*Crepis commutata* (Spreng.) Greuter	Delikıskıs	Çıplak Island, 25.04.2016 (SV 1775)	-
Asteraceae	*Hedypnois rhagadioloides*(L.) Hayek subsp. *cretica*	Sünnetlice	Alibey Island, Duba, Patrice, Çıplak Island, 06.07.2017 (SV 2019)	Mediterranean
Asteraceae	*Helichrysum orientale* (L.) DC.	Sarısolmaz	Alibey Island, Patrice, 07.05.2016 (SV 1826)	Mediterranean
Asteraceae	*Helminthotheca echioides* (L.) Holub.	Billurdüğme	Alibey Island, Duba, 05.03.2016 (SV 1618)	-
Asteraceae	*Senecio vernalis* Waldst. et Kit.	Kanaryaotu	Maden Island, Hakkıbey Peninsula, 25.04.2016 (SV 1781)	-
Boraginaceae	*Echium angustifolium* Mill.	Engerek otu	Sarımsak Peninsula, Şeytansofrası, 05.03.2016 (SV 1605)	Mediterranean
Brassicaceae	*Alyssum umbellatum* Desv.	Şişkinkevke	Badavut, Sarımsaklı Peninsula, 25.04.2016 (SV 1777)	Mediterranean
Brassicaceae	*Cakile maritima* Scop.	Kumteresi	Alibey Island, Çatal Hill, Sarımsak Peninsula, 05.03.2016 (SV 1603)	-
Brassicaceae	*Eruca vesicaria* (L.) Cav.	Roka	Alibey Island, Alibey Hill, 05.03.2016 (SV 1607)	-
Brassicaceae	*Malcolmia flexuosa* (Sibth. & Sm.) Sibth. & Sm.	Kayaşebboyu	Hakkıbey Peninsula, Tımarhane Hill, 29.03.2016 (SV 1705)	Mediterranean
Brassicaceae	*Matthiola tricuspidata* (L.) R. Br.	Öküzşebboyu	Eastern of Alibey Island, Patrice second bay,16.03.2017 (SV 1909)	Mediterranean
Brassicaceae	*Raphanus raphanistrum* L.	Yabani turp	Alibey Island, Duba,Patrice,Sarımsak Peninsula, 17.03.2016 (SV 1635)	-
Campanulaceae	*Jasione montana* L.subsp. *montana*	Dağgökçesi	Southern of Sarımsak Peninsula, 17.03.2016 (SV 1637)	-
Caryophyllaceae	*Arenaria leptoclados* (Reich.) Guss.	Kum otu	Maden Island, 28.03.2017, (SV 1921)	-
Caryophyllaceae	*Paronychia echinulata* Chater	Kıyıkepekotu	Pınar Island, 15.04.2017, (SV 1939)	Mediterranean
Caryophyllaceae	*Sagina maritima* G.Don	Arsızarinotu	Kamış Island, 15.04.2017, (SV 1948)	-
Caryophyllaceae	*Silene behen* L.	Akkıvşak	Alibey Island, Patrice, Kamış Island, 16.03.2017 (SV 1912)	-
Caryophyllaceae	*Silene gallica* L.	Serçeçiçeği	Alibey Island, Patrice Maden Island, 16.03.2017 (SV 1914)	-
Caryophyllaceae	*Spergula arvensis* L.	Tarla kişnişi	Alibey Island, Patrice, 01.05.2016 (SV 1786)	-
Caryophyllaceae	*Spergularia marina* (L.) Besser	Sahilremilotu	Alibey Island, Küçük Maden Island, 01.05.2016 (SV 1790)	-
Convolvulaceae	*Cressa cretica* L.	Reçineçiçeği	Sarımsak Peninsula, Tuzla, 15.06.2016, (SV 1845)	-
Crassulaceae	*Sedum litoreum* Guss. var. *litoreum*	Kıyıkoruğu	Alibey Island Patrice second bay, Maden Island, 25.04.2016 (SV 1782)	Mediterranean
Cyperaceae	*Bolboschoenus maritimus* (L.) Palla subsp. *maritimus*	Sandalyesazı	Sarımsak Peninsula, Şeytansofrası, 29.03.2016 (SV 1700)	-
Cyperaceae	*Carex muricata* L.subsp. *muricata*	Çengelsazı	Alibey Island Patrice Second bay, 01.05.2016 (SV 1792)	Euro-Sibirian
Cyperaceae	*Cyperus capitatus* Vandelli	Şehvetotu	Southern of Sarımsak Peninsula, 29.03.2016 (SV 1698)	-
Cyperaceae	*Eleocharis palustris* (L.) Roem. & Schult.subsp. *palustris*	Delisaz	Hakkıbey Peninsula, 29.03.2016 (SV 1695)	-

Cyperaceae	*Scirpoides holoschoenus* (L.) Soják subsp. *holoschoenus*	Vurla	Eastern of Alibey Island, Sarımsaklı beach, 01.05.2016 (SV 1788)	-
Euphorbiaceae	*Euphorbia paralias* L.	Kumsütleğeni	Alibey Island, Çatal Hill, Pınar Island, 29.03.2016 (SV 1690)	Mediterranean
Euphorbiaceae	*Euphorbia peplis* L.	Kıyısütleğeni	Alibey Island, Çatal Hill, Sarımsak Peninsula, 01.05.2016 (SV 1794)	-
Fabaceae	*Hippocrepis unisiliquosa* L. subsp. *unisiliquosa*	Atnalı	Alibey Island, Sivrice cape, 09.07.2016, (SV 1855)	-
Fabaceae	*Hymenocarpos circinnatus* (L.) Savi	Pulluot	Alibey Island, Sivrice cape, Pınar Island, 09.07.2016, (SV 1851)	Mediterranean
Fabaceae	*Lotus ornithopodioides* L.	Civcivayağı	Southern of Sarımsak Peninsula, 29.03.2016 (SV 1683)	-
Fabaceae	*L. corniculatus* L. var. *corniculatus*	Gazalboynuzu	Hakkıbey Peninsula, Tımarhane Hill, 29.03.2016 (SV 1685)	-
Fabaceae	*Lupinus angustifolius* L. subsp. *angustifolius*	Acıbakla	Alibey Island, Duba, Hakkıbey Peninsula, 17.03.2016 (SV 1680)	-
Fabaceae	*L. angustifolius* (Desv.) Cout.subsp. *reticulatus*	Yahudibaklası	Badavut, 01.05.2016 (SV 1801)	Mediterranean
Fabaceae	*Medicago marina* L.	Sahil yoncası	Southern of Sarımsak Peninsula, 17.03.2016 (SV 1638)	-
Fabaceae	*Medicago orbicularis* (L.) Bart.	Paralık	Hakkıbey Peninsula, Tımarhane Hil, 01.03.2016 (SV 1600)	-
Fabaceae	*Onobrychis caput-galli* (L.) Lam.	Pıtrakkorunga	Alibey Island Alibey Hill, Çıplak Island, 05.03.2016 (SV 1602)	Mediterranean
Fabaceae	*Ornithopus compressus* L.	Kuşayağı	Alibey Island, Duba, Sarımsak Peninsula, 05.03.2016 (SV 1598)	Mediterranean
Fabaceae	*Scorpiurus muricatus* L. var. *subvillosus* (L.) Fiori	Akrep kuyruğu	Alibey Island, Patrice, Çatal Hill, 09.07.2016, (SV 1858)	Mediterranean
Fabaceae	*Trifolium repens* L. var. *repens*	Aküçgül	Southern of Sarımsak Peninsula, 17.03.2016 (SV 1640)	-
Fabaceae	*Trifolium subterraneum* L.	Yeraltıüçgülü	Alibey Island, Patrice, 17.03.2016 (SV 1645)	-
Fabaceae	*Trigonella coerulescens* (M.Bieb.) Halácsy subsp. *ayvalikensis* Erdoğan Selvi& Tümen **(ENDEMIC)**	Ayvalık çemeni	Alibey Island, Duba, Sarımsak Peninsula, 17.03.2016 (SV 1667)	-
Fabaceae	*Vicia villosa* Roth subsp. *eriocarpa* (Hausskn.) P.W.Ball.	Boğala	Alibey Island, Patrice, 17.03.2016 (SV 1669)	-
Frankeniaceae	*Frankenia hirsuta* L.	Tülpembe	Alibey Island Alibey Hill, Sarımsak Peninsula, 17.03.2016 (SV 1665)	-
Gentianaceae	*Centaurium maritimum* (L.) Fritsch	Sarıgelindüğmesi	Alibey Island, Duba, 09.07.2016, (SV 1860)	Mediterranean
Geraniaceae	*Erodium acaule* (L.) Becherer et Thell.	Leylekgagası	Alibey Island, Duba, 25.04.2017 (SV 1955)	-
Geraniaceae	*Geranium molle* L	Yumuşak ıtır	Southern of Sarımsak Peninsula, 21.06.2016 (SV 1855)	-
Juncaceae	*Juncus acutus* L.	Kofa	Alibey Island, Çatal Hill, 15.07.2016 (SV 1870)	-
Juncaceae	*J. capitatus* Weigel	Topak kofa	Hakkıbey Peninsula, 17.03.2016 (SV 1660)	-
Juncaceae	*J. gerardi* Loisel. subsp. *gerardi*	Erkek kofa	Alibey Island, Duba, 09.07.2016, (SV 1862)	-
Lamiaceae	*Vitex agnus-castus* L.	Hayıt	Sarımsak Peninsula, Tuzla lake, 15.06.2016, (SV 1835)	Mediterranean
Lythraceae	*Lythrum tribracteatum* Salzm. ex Ten.	Üçaklarotu	Hakkıbey Peninsula, 17.03.2016 (SV 1658)	-
Papaveraceae	*Glaucium flavum* Crantz	Gündürmelalesi	Sarımsak Peninsula, Tuzla, 15.06.2016, (SV 1842)	-
Papaveraceae	*Hypecoum procumbens* subsp. *atropunctatum* Å.E.Dahl	Düğmecik	Southern of Sarımsak Peninsula, 21.06.2016 (SV 1854)	Mediterranean
Papaveraceae	*Papaver rhoeas* L. *var. rhoeas*	Gelincik	Alibey Island, Hakkıbey Peninsula, 15.07.2016 (SV 1866)	-
Plantaginaceae	*Plantago bellardii* All.	Babadeşen	Alibey Island, Patrice, 17.03.2016 (SV 1649)	Mediterranean
Plantaginaceae	*Plantago coronopus* L. subsp. *commutata* (Guss.) Pilger	Çığnak	Alibey Island, Küçük Maden Island, 25.04.2017 (SV 1958)	Mediterranean
Plantaginaceae	*Plantago lagopus* L.	Kırkdamarotu	Alibey Island,Sarımsak Peninsula, 25.04.2017 (SV 1965)	Mediterranean

Plantaginaceae	*Plantago lanceolata* L.	Damarlıca	Sarımsak Peninsula, Pınar Island, 15.06.2016, (SV 1836)	-
Plumbaginaceae	*Limonium sinuatum* (L.) Mill.	Denizlavantası	Alibey Island, Maden Island, 15.07.2016 (SV 1868)	Mediterranean
Plumbaginaceae	*L. angustifolium* (Tausch) Turrill	Sahilkaranfili	Alibey Island, Patrice, 25.04.2017 (SV 1966)	-
Plumbaginaceae	*L. bellidifolium* (Gouan) Dumort	Hoşkuduzotu	Sarımsak Peninsula, Tuzla, 15.06.2016, (SV 1838)	Euro-Sibirian
Plumbaginaceae	*L. graecum* (Poir.) Rech.f. var. *graecum*	Kumkaranfili	Alibey Island, Çatal Hill, 25.04.2017 (SV 1969)	Mediterranean
Plumbaginaceae	*L. virgatum* (Willd.) Fourr.	Cılızot	Sarımsak Peninsula, 21.06.2016 (SV 1851)	Mediterranean
Poaceae	*Brachypodium distachyon* (L.) P.Beauv.	Tekkılcan	Alibey Island, Duba, Pınar Island, 09.05.2017 (SV 1972)	Mediterranean
Poaceae	*Echinochloa crus-galli* (L.) P. Beauv.	Darıcan	Southern of Sarımsak Peninsula, 21.06.2016 (SV 1853)	-
Poaceae	*Elymus farctus* (Viv.) Runemark ex Melderis	Cicora	East of Hakkıbey Peninsula, 17.03.2016 (SV 1650)	-
Poaceae	*E. flaccidifolius* (Boiss. & Heldr.) Melderis	Bataklıkcicorası	East of Hakkıbey Peninsula, 01.05.2016 (SV 1799)	Mediterranean
Poaceae	*Holcus annuus* Salzm. ex C.A.Meyer	Kadife otu	Kamış Island, 29.06.2017 (SV 2011)	Mediterranean
Poaceae	*Phragmites australis* (Cav.) Trin. ex Steudel	Kamış	Alibey Island Duba, Sarımsak Peninsula, 06.07.2017 (SV 2018)	Euro-Sibirian
Poaceae	*Poa bulbosa* L.	Yumrulusalkım	Alibey Island, Alibey Hill, 09.05.2017 (SV 1974)	-
Poaceae	*Stipa capensis* Thunb.	Kumkılaçı	Maden Island, 28.03.2017, (SV 1927)	Mediterranean
Polygonaceae	*Polygonum maritimum* L.	Sicimlik	Southern of Sarımsak Peninsula, Alibey Island, 11.05.2016 (SV 1828)	-
Polygonaceae	*Rumex pulcher* L. subsp. *pulcher*	Ekşilik	Southern of Sarımsak Peninsula, Alibey Island, 11.05.2016 (SV 1829)	-
Primulaceae	*Anagallis arvensis* L. var. *arvensis*	Farekulağı	Southern of Sarımsak Peninsula Alibey Island, 11.05.2016 (SV 1832)	-
Primulaceae	*A. arvensis* L. var. *parviflora* (Hoffmanns. & Link) Ces.	Farekulağı	Alibey Island, Patrice, 29.06.2017 (SV 2004)	Mediterranean
Rosaceae	*Sarcopoterium spinosum* (L.) Spach	Abdestbozan	Alibey Island, Maden Island, Pınar Island, 09.05.2017 (SV 1976)	-
Rubiaceae	*Crucianella imbricata* Boiss.	Kurakhaçotu	Southwest of Sarımsak Peninsula, 12.06.2017 (SV 1997)	Mediterranean
Rubiaceae	*Galium aparine* L.	Çobansüzgeci	Kamış Island, 29.06.2017 (SV 2002)	-
Rubiaceae	*G. brevifolium* Sm. subsp. *insulare* Ehrend. & Schrönb.-Tem.	Sünnetotu	Yumurta Island, 29.06.2017 (SV 2007)	Mediterranean
Rubiaceae	*Sherardia arvensis* L.	Gökörenotu	Alibey Island, Patrice,Sarımsak Peninsula, 09.05.2017 (SV 1979)	Mediterranean
Rubiaceae	*Valantia hispida* L.	Kıllıörenotu	Southern of Sarımsak Peninsula, Alibey Island, 29.06.2017 (SV 1999)	Mediterranean
Rubiaceae	*Valantia muralis* L.	Örenotu	Çıplak Island, 29.06.2017 (SV 2001)	Mediterranean
Santalaceae	*Thesium humile* Vahl.	Bodurgüvelek	Alibey Island, Patrice, 09.05.2017 (SV 1982)	Mediterranean
Tamaricaceae	*Tamarix tetrandra* Pall. ex Bieb.	Gezik	Alibey Island, Çatal Hill, 09.05.2017 (SV 1988)	-
Typhaceae	*Typha angustifolia* L.	Saz	Southwest of Sarımsak Peninsula, 12.06.2017 (SV 1992)	-
Typhaceae	*Typha domingensis* Pers.	Şeytanmumu	Southern of Sarımsak Peninsula, 12.06.2017 (SV 1994)	-

Distribution of taxa to phytogeographic regions is as follows; The Mediterranean element is 39%, the Euro-Siberian Element is 3%, and the unknown is 58%. In the study region, Iran-Turanian elements weren't found. According to IUCN, two taxa were identified as threatened categories. Local endemic *Trigonella coerulescens* subsp. *ayvalikensis* was evaluated as VU (Vulnerable) while *Pancratium maritimum* was evaluated in LC (Least Concern) category.

The characteristic flora of the sand dunes in the region is dominated by Brassicaceae, Plantaginaceae and Amaranthaceae families. *Cakile maritima, Matthiola tricuspidata* and *Malcolmia flexuosa* from Brassicaceae family; *Plantago coronopus* subsp. *commutata* from Plantaginaceae family and *Halimione portulacoides, Salsola kali and S. soda* from Amaranthaceae family have been observed intensively along the coasts of Ayvalık.

The coastal dunes in the area pass from the sea shore line, after a width of 5-10 m towards the front dune, to the rear dune zone. In the pre-dunes, one-year-old ephemeral plants are mainly observed and perennial and woody species are frequently found towards the rear dunes. In the front sand dunes in the area, *Matthiola tricuspidata, Malcolmia flexuosa, Salicornia emericii, Cakile maritima, Anthemis rigida, A. tomentosa, Halimione portulacoides, Plantago coronopus, Lotus cytisoides, Trifolium subterraneum, Eryngium maritimum, Jasione montana, Allium sphaerocephalon, Euphorbia paralias, Trigonella coerulescens* subsp. *ayvalikensis* and *Limonium bellidifolium* taxa were found intensively. However, in the sand dunes of Cunda, *Matthiola tricuspidata, Malcolmia flexuosa, Anthemis rigida, A. tomentosa, Plantago coronopus, Lotus cytisoides, Trifolium subterraneum, Eryngium maritimum, Cakile maritima* and *Euphorbia paralias* have been extensively distributed. In the sand dunes of Badavut, *Halimione portulacoides, Jasione montana, Allium sphaerocephalon, Euphorbia paralias* taxa are dense. In the sandy dunes of Sarımsaklı, *Lotus cytisoides, Anthemis rigida, A. tomentosa* taxa along with one-year endemic *T. coerulescens* subsp. *ayvalikensis* species are extensively distributed. *Halimione portulacoides, Salicornia europaea* and *Limonium bellidifolium* have densely formed sand meadows in the Altınova dunes. As we move towards the interior, there is a change in the type in that species such as *Sarcopoterium spinosum, Lavandula stoechas* subsp. *stoechas, Pistacia lentiscus, Limonium angustifolium, L. bellidifolium, L. graecum* var. *graecum, L. sinuatum, L. virgatum, Eryngium maritimum, Cardopatium corymbosum, Elymus farctus, Halimione portulacoides, Asphodelus aestivus* and *Inula viscosa* have been distributed in the region. In the Altınova dunes, however, *L. bellidifolium* is in dense populations. In the inner part of the settled dune meadows, the *S. spinosum* and the *A. aestivus* are observed. In the environments similar to wetland and reed field on the shore, species demanding high level of watering such as *Juncus acutus, J. capitatus, J. gerardi* subsp. *gerardi,* and *Phragmites australis* are abundant. The only endemic taxa distributed in the sand dunes of Ayvalık is *T. coerulescens* subsp. *ayvalikensis* (Erdoğan et al. 2017). Furthermore, although *Carthamus caeruleus* are available in western countires, the only place in Turkey, where it is grown, is on the coasts of 3 localities of Cunda Island (Alpınar, 1997).

In the study, as a result of floristic and ecological observations, anthropogenic factors that threaten dune plant diversity and distribution areas were determined: In this study, Avcı (2017a) pointed out that various human effects such as agricultural activities, urbanization and tourism have changed the coastal ecosystems and the most important factors causing damaging change in coastal ecosystems are anthropogenic factors. Similar anthropogenic effects were also heavily observed in the coastal dunes of Ayvalık. In particular, due to tourism and secondary housing construction in the region, changes in land use are important factors leading to habitat losses.

Distribution area of one-year endemic *T. coerulescens* subsp. *ayvalikensis* species (Ayvalık çemeni) is a beach area in the sand dunes of Sarımsaklı, Ayvalık. However, the fact that the flowering period of the species is long before the holiday season has prevented the species from being endangered. Moreover, it

would be beneficial to protect the spreading area of the species against the beach arrangement and the grazing. In particular, it is damaging the flora of dune areas due to activities such as beach arrangement. Therefore, the habitats of *P. maritimum* and *N. tazetta* have been damaged and their populations on the island have been reduced. In addition, that the bulbs of sea daffodil is collected by the public has brought this species to the stage of extinction. Sand dunes with the habitats of species such as "sea daffodil" and "Narcissus" should be put under protection. From the habitats determined in the region, especially the areas located in the coastal part such as the coastal dunes, degraded coastal forests, beaches, wetlands and reed-straw areas, which are under pressure of heavy land use, should be primarily protected. Uncontrollability and ignorance are the basis of ecological problems in the region. Therefore, besides the biological, cultural and geomorphological resource values that are in the foreground in the ecological planning process, it is also important to raise awareness of the people in the region. In order to protect the landscaping, ecological, cultural and archaeological values of the Natural Park, restriction in human use of some areas in the region is required. For this purpose, regions with different levels of protection and use as well as sensitive ecosystems and values should be established in the Natural Park.

CONCLUSION

The species and evaluations identified in this study are thought to constitute the basis for the coastal management studies to be conducted in the future. The nature walks that will be done in Natural Park and introduce the plants and natural life of the environment will increase the interest in the matter. To that end, ecotourism routes should be determined in the area. On these trips which may be done on appropriate dates, the photos of the plants may be taken but their collection should never be allowed. According to the (f) paragraph of article 9. of Environmental Law numbered 2872, "In order to ensure the sustainability of biodiversity, the protection of endangered and endangered species and rare plant and animal species is essential and prohibited to be traded in contradiction with the legislation". Those who destroy biodiversity in contravention of the provisions the (k) paragraph of of article 20 of the same law are fined.

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