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Distrubition and Floristic Composition of Coastal Vegetation in Northeastern Turkey

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ABSTRACT: *Coastal areas form interesting landscape characters in the world, as well as Turkey. Assessment of the environment in coastal areas that are consequences of natural events or interventions based on the perspective of landscape architecture is significant in sustainable landscape planning and design studies that would be conducted in coastal areas.Therefore, in the present study, particularly, the rapid population growth in recent years and the accompanying environmental problems and the distribution of native or alien plant species habitat in coastal habitats of the coastal areas of Eastern Black Sea Region which are affected negatively by these factors were examined. The study area was conducted at the coastal areas of the Eastern Black Sea Region (Artvin, Rize, Trabzon, Giresun). A total of 2422 taxa were collected from 141 sample areas within the study area and Ficus carica L. (56.74), Robinia pseudoacacia L. (%51.77),Torilis arvensis(HUDS.) LINK subsp. arvensis (HUDS.) LINK (%50.35) were determined to be the first three with 218 plant taxa with the highest percentage of prevelance. According to the statistical analysis, it was found that there was a significant relationship between the variables with significance level of P<0.05 for the distribution of plant species according to provinces and with the values of F greater than 1. As a result, the vegetation structure and habitat characteristics of the coastal areas and their characteristics in terms of utilization of plants and sustainability of the landscapes were evaluated.*

KEYWORDS: *Coastal Vegetation, Northeastern Turkey, Landscape assessment*

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I. INTRODUCTION

Coastal areas, which are transitional zones between the land and the marine ecosystems, are ecologically significant and sensitive habitats and are easily affected by the diversely and widely by the human induced utilizations due to their more sensitive structure compared to the inner parts of the land (Doygun and Berberoğlu, 2001; Kay and Alder, 1999; Calvao et al., 2013; Luca et al., 2011). Due the fact that the coastal areas are considered complementary to urban life of the individuals, it is possible to assert that the incomplete aspects of the urban life, in which secondary relations remain in the foreground, all paths of life are formed through strict rules, the hierarchy, diversity and the alienation of individuals could clearly be perceived, could be compensated through the natural structure, calmness and openness of the coastal areas. (Duru, 2003; Gülez et al., 2007).The coastal areas are ecosystems that enable life, breeding, protection and growth of flora-fauna communities of different species and characteristics and provide the relationship between the cultural fabric and the natural structures and biological richness.(Cengiz, 2009; Kap, 2010).Hence, such functions are deemed significant for the sustainability of the ecosystems.

Thepresent era necessitates the ecological research, conservation and development regarding the natural resources, in order to secure the future of human communities.(Tunay, 2008; Sarı, 2013).In order to determine the natural resources, it is essential to conduct research on coastal areas, where macro and micro scale ecological environments exist. These areas, that hosted diverse life environments since the early ages, also have an important potential in terms of biodiversity. Yet, to meet the increasing needs and demands, the natural coastal areas are being filled in and are getting more and more destructed day by day. The landscapes that are developed in a balance between the ecological wealth of the coastal areas and human activities are being

deteriorated over time due to factors such as rapid population growth, industrialization and technological developments. Similar to all other natural areas, economic gains in coastal areas are considered above the ecological values, thus the interventions on the coastal areas cause irreparable consequences(Kap, 2010).

Due to the variation in climate, topography and other natural features, Turkey accommodates rich characteristics in terms of the natural, historical and cultural values (Kavak, 2006; Çakar, 2007). Coastal areas, which are significant in terms of these characteristics, were attractive for the individuals in the past and the present, and the tendency towards such areas increased(Acar and Sakıcı, 2008). However, as a result of the settlements, agriculture, industry, highways close to the coast, and the development of the unplanned recreational and tourism facilities in the 8333 km long coastline of Turkey, the coastal areas are losing their natural values(Çakar, 2007; Mavituna, 2007; Sağlık et al., 2012). Trying to gain terrestrial space from the marine environment by creating fills in the coastal areas leads to the loss of natural coastal values. (Akkaya and Müftüoğlu, 2001; Acar et al., 2014; Ongan, 1997; Sesli et al., 2002).Coastal urbanization cause devastating effects on flora and fauna including endemic plant species along with beach erosion and sand dune stabilization(Çakar, 2007). There is a need for a standardized data inventory to protect the natural values. An ecosystem-based description of the diversity of the habitat of the coastal area and information on the terrestrial spread of the identified classes should be used as a basis for monitoring the ecological-biological diversity and transformation of these areas(Kaya, 2010).

The Eastern Black Sea Region has a unique flora formed by the effects of the land structure and climate characteristics. In time, the forest flora was destroyed due to dense settlements, and the pseudo-vegetation flora became dominant instead (Altan, 2000). 2239 of the plants taxa (approximately a quarter) that constitute Turkey's flora are available naturally in this region, and almost 23% of these plants are assumed to be endemic. In terms of plant geography, the Eastern Black Sea Region is located in the European-Siberian floristic area of the Holarctic flora area Starting from Iceland, this region includes the coast of the Black Sea Region of Turkey, extends to Kamchatya in the east and is divided into two, as the Balkans in the inner parts of Thrace and the Black Sea (Euxine) Provence in the Black Sea Region. The Black Sea Provence is mainly covered with broadleaf tree forests at lower altitudes and coniferous forests at higher altitudes. This region is closely related to the Hyrcanian Provence in northern Iran. At the same time, this region exhibits similarities with the Balkans and central Europe, and even with the Atlantic Europe (Davis, 1971; Zohary, 1973). As a result, the Euro-Siberian Flora Field in the temperate zones of the world, where plant migrations continue, forms a migration route between Europe and the Caucasus, and consequently there exists a large number of flowering plant taxa naturally found in the Eastern Black Sea Region (Anşin, 1980; Var, 1992; Terzioğlu and Anşin, 2001; Avcı, 2005; Palabaş Uzun, 2009).

On account of the increased flora and vegetation studies in recent years, the flora and vegetation structure of this region was acknowledged better However, such studies on coastal areas are not sufficient yet. These areas, which accommodate significant diversities for plant species, also have remarkable ecological and visual characteristics in terms of landscape architecture.The identification of this potential is of great importance for planning and design of the coastal areas. In order to determine the existing plant potential in the coastal areas of the Eastern Black Sea, a literature review on the studies that investigated the plant species within the different regions of the Eastern Black Sea was conducted (Kahveci,2009; Anşin, 1980;Acar, 1993; Acar, 1997; Acar, 2001; Terzioğlu 1998; Var, 1992; Uzun, 2002; Palabaş, 2002; Palabaş Uzun, 2009; Köse, 2013; Acar et al., 2014). However, it was not possible to holistically evaluate these studies in terms of the coastal areas of the Eastern Black Sea region, since they focused on different regions or elevations.

Given the context above, the objectives of the present paper are

- to determine the coastal vegetation structure in the Eastern Black Sea Region,
- to reveal the plant taxa distributions for the vegetation structure,
- to reveal the characteristics of the plant taxa,
- to holistically evaluate the coastal habitats and vegetation of the Eastern Black Sea Region.

II. MATERIALS AND METHODS

2.1. Description of the field of work

The coastal areas contain distinctive landscapes in the world, with respect to their unique characteristics. In Turkey, where a long coastline exists, the Black Sea Region comprises diverse characteristics within its coastal environments. Although, the region receives precipitation through all seasons and this results in a loss of interest for people in terms of beach tourism, the Black Sea Region is one of the first choices of nature lovers for visiting(Güçlü, 2010; Başar et al., 2002).

The present study focuses on the coastal habitats along the coastal strip to the northern part of the Black Sea Coastal Road, which runs parallel to the Black Sea coastline in the Eastern Black Sea Region (41˚29′N-40˚57′N; 41˚31′E-38˚07′E) (Figure1). The research area lies between the Georgian border of Artvin province in the east and Rize, Trabzon and Giresun provinces in the west, up to the border of the Ordu province.

The route, which the present research focuses on, includes the coastal habitats to the north of the 346 km highway that lies in the east-west direction. The highest altitude within the study area is 25 meters and the lowest is the sea level.

The research area is comprised of different inclinations of the land. While the slope is less than 25% in the sand areas, the slope exceeds 75% in rocky or cliff areas.

The research area located in the north-facing part of the Black Sea Region includes north, northeast and northwest experimental groups. According to Turkish macroclimatic types, the research area lies within the Eastern Black Sea climate zone. The characteristics of this climate type are defined through highest values of precipitation with respect to the sea effect, with warm and abundant rainfall in warm winters (Table 1).

Table 1. Annual mean rainfall (mm) and temperature (^{0}C) according to provinces

	Annual mean rainfall (mm)	Annual mean temperature (^{0}C)
Artvin	2300	14.6
Rize	2310	14.5
Trabzon	800	14.8
Giresun	1300	14.7

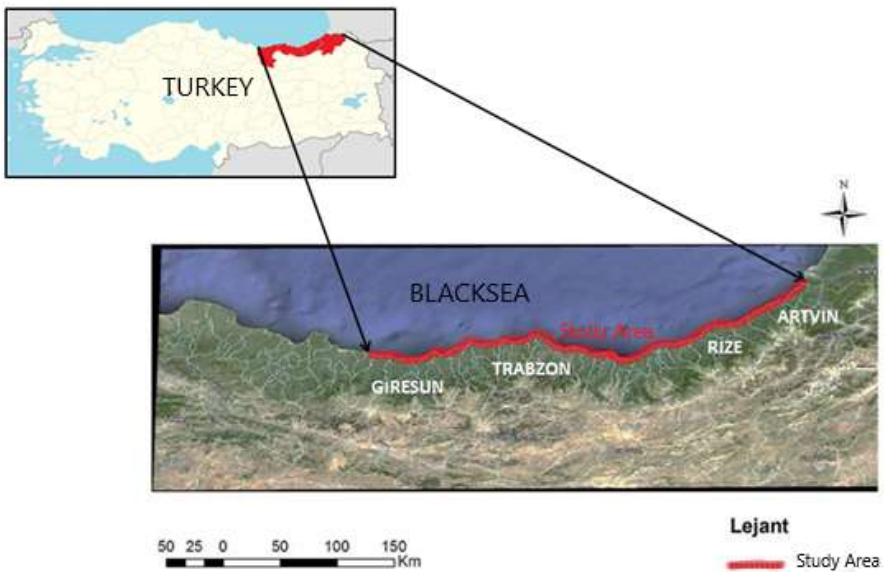

Figure1. The study area

The present research was conducted in the coastal areas, that have an approximate length of 346 kilometers, between the Georgian border and the border of the Ordu province of Turkey. In order to determine the plant species, 2422 plants were collected from 141 sample zones and were identified. The data regarding the habitat structure and determination of plant species were collected during the fall months of the year 2014. The variables and numerical codes used in transferring the data, collected during the field study, to the computer were presented in Table 2.

So, the sampling procedure was undertaken in the following steps.

First, the sample areas were limited with the zone between the upper part of the Eastern Black Sea coastal road and Black Sea was considered as the lower limit reference. Horizontally, the land surveys were conducted with at least 25 meters width in order to reflect the characteristics of the habitat fully. A systematic sampling approach was adopted to identify plant species in the Eastern Black Sea Coastal Areas (Giresun, Trabzon, Rize, Artvin). For this purpose, in order to determine the sample areas, preliminary samples were collected at approximately every two kilometers while driving along the coastal road. The route was set in from the Georgian border at the easternmost province of Artvin towards the west, to border of the Giresun and Ordu provinces.

Table 2 Coastal habitat variables and numerical datas

Variables (abbreviations)	Description and numerical coding	Assessment method
Exposure	north-east=1, north=2, North-west=3	GPS
Slope	<25°=1, 25°-50°=2, 50°-75°=3, >75°=4	Measured on site
Altitude	<5 m=1, 5-10 m=2, >10 m=3	Measured on site
Soil type	Soil=1, soil+sand=2, soil+sand +gravel=3 soil+gravel=4, sand=5, sand+gravel=6	Measured on site
Distance from the city center	City center=1, <20 km=2, 20-40 km=3, >40km=4	GPS, Map
Distance from the road	<5 m=1, 5-10 m=2, >10 m=3	Measured on site
Distance from the sea	<5 m=1, 5-10 m=2, >10 m=3	Measured on site
Province	Artvin=1, Rize=2, Trabzon=3, Giresun=4	GPS,Map

Second; Braun-Blanquet method was selected as the floristic analysis method in identification of the plants (Braun-Blanquet, 1964; Acar 1997, Terzioğlu 1998, Uzun 2002; Terzioğlu et al., 2007; Palabaş Uzun 2009; Kahveci, 2009; Sarı 2013). The plants collected according to this method were identified in HKTU (Herbarium of Karadeniz Technical University). The nomenclature of taxa follows mainly Davis (1965–85) and Fitter et al. (1986). Life–form classification followed Raunkier's (1934) system improved by Ellenberg and MuellerDombois (1967).

2.2. Data analysis

The data are transferred to the Excel table in order to determine the diversity distribution of the plant species with respect to the sample areas and their relations with the parameters obtained in these areas. According to this table, various indexes were used to measure the diversity of the plant species. The α diversity indexes were used to evaluate the diversity of the species based on floristic data. Here, the diversity of the species was defined as the number of species found in each sample area. Shannon, Species Richness, Evenness and Berger-Parker diversity indexes were used to calculate the diversity values. The Shannon index was defined by $H' = -\Sigma pi\ Ln\ pi$, where pi is ni/N (ni: number of each species, i and N are the total number of individuals) (Carboni et al, 2009; Margalef 1968; Luca et al.. 2011). The Pielou's evenness index (J0 = H0/log S), where S is the number of species and the Berger–Parker index (d ¼ Nmax/NT), where Nmax is the total dominant species with respect to the habitat type and NT is the ratio of all species, were calculated(Shannon, 1948; Magurran, 1988).

The Community Analysis Package v1.41, was used to determine the relationship between all habitat factors and cluster analysis was performed to determine the relation between the diversity of the species diversity (CAP, 1999). The statistical studies were conducted using the SPSS 16.0 software for Windows.

III. RESULTS

3.1. The distribution of plant species recorded in coastal habitats

As a result, 218 plant taxa that belong to 83 families were identified in the existing habitats of the coastal areas of the Eastern Black Sea Region.Accordingly, the most prevalent plant type in the coastal habitats was found to be the *Ficus carica* L. (56.74%). The second one was *Robinia pseudoacacia* L. (51.77%) and the third most prevalent plant type was identified as the *Torilis arvensis* (HUDS.) LINK subsp. *arvensis* (HUDS.) LINK (50.35%). The prevalence order of the plant taxa was determined as follows: *Clematis vitalba* L. (47.52%), *Alnus glutinosa (*L.) GAERTNER subsp. *barbata (*C.A. MAYER) YALT. (44.68%), *Eupatorium cannabinum* L. (43.97%).

When the plant list was scrutinized, it was observed that one of the least prevalent plant taxa were *Verbascum thapsus* L. (0.71%), *Verbascum gnaphalodes* BIEB. (0.71%), *Urtica dioica* L. (0.71%), *Tanacetum parthenium* (L.) SCHULTZ BIP. (0.71%), and *Sonchus oleraceus* L. (0.71%).

3.1.1. Plant families represented by species

As a result of the present study, it was determined that the identified 218 plant taxa belonged to 79 different families (Appendix1). Figure 2 presents the distribution of plant taxa according to these families. The richest families in terms of plant taxon were identified as Asteraceae (13.3%; 29 taxa) and Fabaceae(%8.26; 18 taxa), Rosaceae (%6.42; 14 taxa), Poaceae (%5.05; 11 taxa), Lamiaceae (%3.21; 7 taxa), respectively. The families with minor plant taxa were found to be Acanthaceae(%0.46; 1 taxa), Simaroubaceae(%0.46; 1 taxa) and Umbelliferae (%0.46; 1 taxa).]

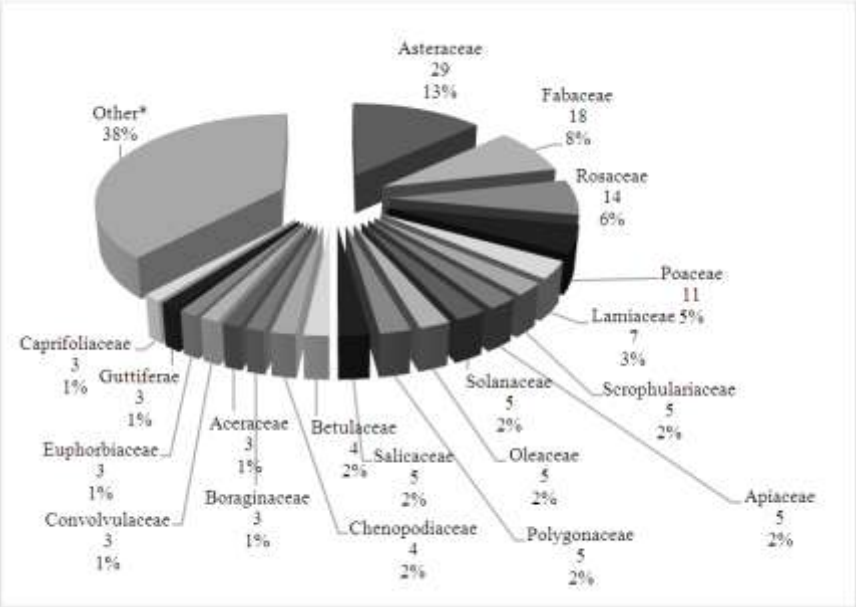

Figure 2. The distribution of plant species by families

3.1.2.The distribution of plant taxa by raunkiaer life form

According to the results of the conducted classification Hemicrytophytes was found to have the highest percentage of 39% (83 plant taxa) and Phanerophytes with the second-high percentage of 32%(70 plant taxa). This ranking was followed by the Therophytes with 17.89% (39 plant taxa), Chamaephytes with 5.96% (13 plant taxa) and Geophytes with 4.59%. The life form with the least percentage was found to be the Hydrophytes with 0.46% (1plant taxa) (Figure3).

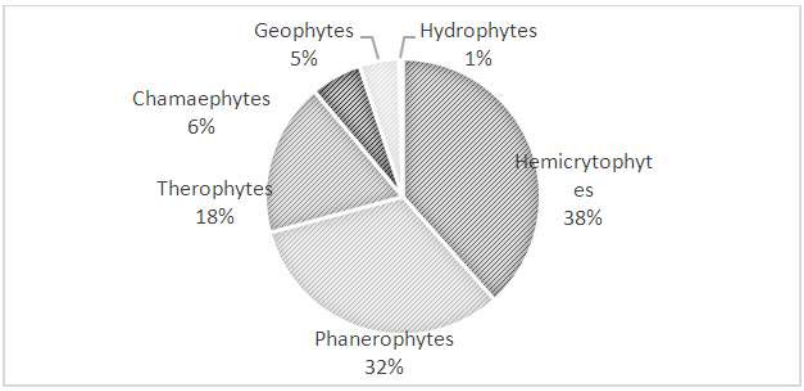

Figure 3. The distribution of plant species by Raunkier's life-form

3.1.3. The distribution of plant species by life-form

Once the life forms of the identified plant taxa are examined, it is possible to observe that the highest percentage, 56.88% (124 taxa), are herbaceous plants. The following is plant life form trees by 17.89% (39 taxa). In 218 of plant life forms, the least a percentage is for succulent plants, by 0.46% (1 taxa) (Figure 4).

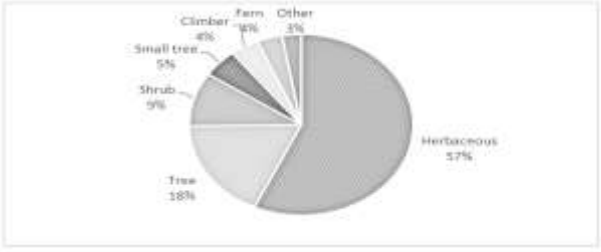

Figure 4. The distribution of plant species by life-form. Other life forms; Small tree/shrub (%0.92; 2 taxa), Succulent (%0.46; 1 taxa), Tree/shrub (%0.46; 1 taxa), Tree/Small tree (%0.46; 1 taxa).

3.1.4. The distribution of plant species by life-span

Within the scope of the study, 218 plant taxa were identified in the 141 sample areas determined in the coastal areas of the Eastern Black Sea Region. In this context, once the life duration of 218 obtained plant taxa were examined, it was determined that 160 plant taxa(%73.39) were perennial, 45 plant taxa(%20.64) were annual and 13 (%5.96) were biannual plants (Figure 5).

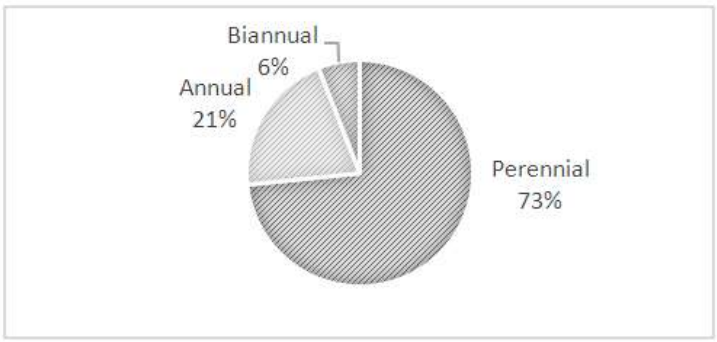

Figure 5. The distribution of plant species by life-duration

3.1.5. The distributions of plants according to their origin and status

According to the research conducted upon the acquired plant taxon list, the geographical origins of plant taxa were identified. Figure 6 shows the geographic origins of plant taxa found in coastal areas of the Eastern Black Sea. According to Figure 6a, most of the plant taxon were from the Euro-Siberian (ES) origin with 29% percent. This is followed by plants that were from the Mediterranean an Eurasiatic origin by 15%. The lowest percentages were from the North America origin with 2% and European- Mediterranean origin by 2%.

Also in Figure 6b shows the status of the plants. Result of the study native plants (190 plant taxa) were found to be majority (Appendix1).

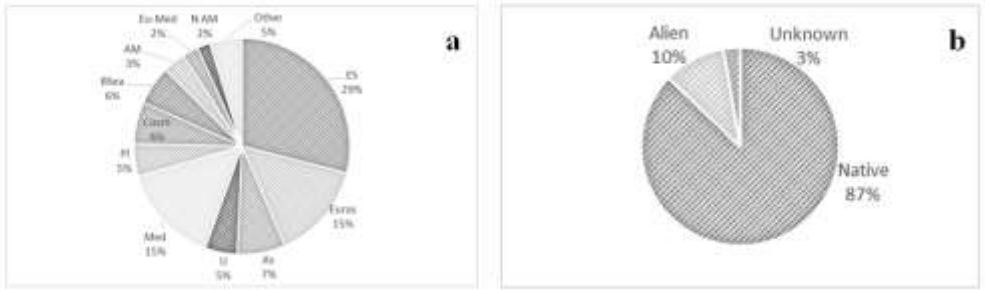

Figure6. The distributions of plants cccording to theirorijin (a) and status (b) ; N AM North America, S AM South America, AM America, IT Irano-Turanian, ES Euro-Siberian, Med Mediterranean, Cosm Cosmopolitan, Euras Eurastic, As Asiatic, Pl Polyregion, Eu Europe, Aust Australia, Bsea Blacksea, U Unknown.), Others:IT, Aust, Eu,Eu-N AM, AM-As, A AM-As, S AM.

3.2. Assessment of the Plant Taxon Diversity in the Sample Coastal Areas

3.2.1. Evaluation of plant diversity in coastal areas at provincial level

The research area consisted of 141 sample areas including 4 provinces. Distribution of sample areas according to the provinces are as follows: 12 in Artvin, 31 in Rize, 48 in Trabzon and 50 in Giresun. ANOVA analysis was used to test whether the distribution of plant taxon varies were significant at province level and sample areas. Once the values in the acquired ANOVA table were examined, it was determined that there was a significant difference between the variables with significance level of $P<0.05$ and the variables with their F values greater than 1. Accordingly, diversity analysis with respect to the Shannon, Species Richness, Evenness and Berger-Parker diversity indexes were presented in Table 3 in detail.

According to the ANOVA table, obtained via the conducted statistical analyses, $P<0.05$ (sig=0,015668) and $F>1$ were obtained for the Shannon diversity index. According to this result, the provincial distribution of the identified plant taxon was found to be significant with respect to the Shannon diversity index. $P<0.05$ (Sig=0,026207) and $F>1$ were obtained according to the Species Richness diversity index. Hence, the provincial distribution of the identified plants was found to be significant for the Species Richness diversity index. In addition, $P<0.05$ and $F>1$ were obtained for the Eveness and Berger-Parker diversity indexes. Artvin province, which has the maximum annual precipitation, was determined to have the maximum plant taxon diversity

(20,08±4,58) according to the Species Diversity index, when compared to the other provinces. The reason for larger plant diversity in Artvin province could climatically be considered as the maximum annual precipitation.

Table 3. ANOVA table of plant distribution according to provinces ($p \leq 0.05$)

	Provinces	**Number of plots**	**Mean±SD**	**F**	**P**
Shannon's diversity index (*H'*)	Artvin	12	2,97±0,23	3,57	0,01
	Rize	31	2,92±0,32		
	Trabzon	48	2,65±0,45		
	Giresun	50	2,66±0,60		
	Total	**141**	**2,74±0,48**		
Species richness index (*R'*)	Artvin	12	20,08±4,58	3,17	0,02
	Rize	31	19,51±5,20		
	Trabzon	48	15,47±5,95		
	Giresun	50	16,66±8,28		
	Total	**141**	**17,17±6,81**		
Pielou's evenness index (*J'*)	Artvin	12	0,55±0,04	3,57	0,01
	Rize	31	0,54±0,05		
	Trabzon	48	0,49±0,08		
	Giresun	50	0,49±0,11		
	Total	**141**	**0,50±0,09**		
Berger–Parker	Artvin	12	0,05±0,01	3,22	0,02
	Rize	31	0,05±0,02		
	Trabzon	48	0,07±0,04		
	Giresun	50	0,08±0,06		
	Total	**141**	**0,07±0,04**		

3.2.3. Characteristics of plant grouping along coastal samples

In this section, the classification of the 218 identified plant taxa in the sample areas according to their prevalence equal or greater than 10% was conducted via the CAP (Community Analysis Package v1.41) software through the utilization of the TWINSPAN statistical analysis method (CAP, 1999). According to the results of the conducted statistical analysis, the plants were classified under four groups (A, B, C, D) (Fig 7).

Among these groups, in group A, plant taxa with the highest percentage of prevalence in the sample areas formed a group among themselves. Once the properties of these plant taxa were scrutinized, it was found that these taxa were common cultivars for many regions and were easily adapting to their environment. Therefore, these plant taxa could easily be utilized in urban and coastal areas with barren lands, wind exposure or salt water sprays for the landscape restoration activities to be carried out.

Once group B is examined, it was possible to observe that plant taxa that spread mostly in wetlands were prevalent in this group. Such plant taxa were complacent and could grow in areas with barren lands.

Plant species that were classified within group C were the plant taxa that cultivated in mild climate areas. Fruit species such as *Prunus laurocerasus* and mulberry were also included in this group.

The latter main group, group D, was mainly consisted of perennial herds. The plants in this group, *Salix* sp. and *Populus* sp, presented a perennial character and undertook multiple functions in areas they were planted. Figure 7 presents the names of the plant taxa and the groups they were included in terms of the percentage of prevalence.

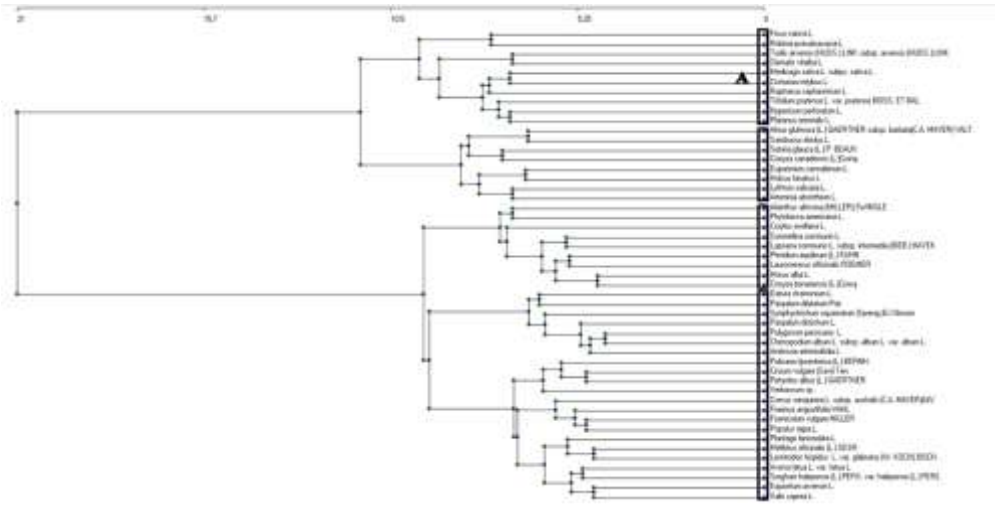

Figure7. Plants groups to percentage of prevalence by Cluster analysis (A, plant taxa with the highest percentage of prevalence)

IV. DISCUSSION AND CONCLUSIONS

In the present research, the objective was to adopt a holistic approach in evaluating the coastal area of the Eastern Black Sea Region, which has a rich flora and vegetation due to its natural structure and favorable climatic conditions. Since the vegetation studies focusing on the coastal areas of the Eastern Black Sea Region were scarce, this research became significant in terms of infrastructure formation and development for the identification of existing natural resources. In this respect, the outcomes of the study conducted on the coastal areas of Eastern Black Sea in 141 sample areas yielded 218 plant taxa, which were mainly herbaceous plants.

In Turkey and in the world, the studies to determine the existing vegetation structure was an ongoing effort of the last decades (Zohary, 1973; Davis, 1965-85; Kılınç and Özkanca, 1991; Var, 1992; Acar, 1997; Terzioğlu 1998; Akbulut, 2002;Deniz and Şirin, 2005; Yılmaz, 2006; Artega et al., 2008; Kahveci, 2009, Palabaş Uzun, 2009). There exist studies focusing on the structure of the vegetation in the Eastern Black Sea Region of Turkey, where new plant taxa are still being introduced in literature. Anşin (1980) conducted a vegetation research in his doctoral dissertation, on perpendicular sections to the sea in the Eastern Black Sea Region and covered the whole region. He mentioned the existence of pseudo-scrub vegetation in the parts close to the coast of the sections taken perpendicular to the sea and listed the plant species in these areas. When compared to the doctoral dissertation of Var (1992) it was observed that most of the plant taxa were similar and these plants were evaluated in terms of landscape architecture. Kahveci (2009), whose work provided the foundations of the present doctoral dissertation, studied the plant taxa on the coastal fortifications of the Trabzon province and determined 169 plant taxa, which were mostly herbaceous plants.

It is imperative to acknowledge that the plant varieties in Turkey are significant and it is essential to preserve and augment these varieties in terms of environmental contribution. Current vegetation design approaches should utilize natural plants and these natural taxa were widely studied for their cultivation. (Var, 1992; Acar, 1997; Karahan, 1998; Karahan and Yılmaz, 2001; Pulatkan, 2001; Karim and Malik, 2007; Bekçi, 2010; Bekçi et al., 2010; Bretzel et al., 2009; Bretzel et al. 2012; Hitchmough et al, 2004; Kahveci, 2009; Mamıkoğlu, 2010; Sarı, 2013; Tıktık, 2009). In the present study, the identified taxa in the coastal areas were established to be natural by 90%. In the study on the assessment of aesthetic and functional aspects of naturally-grown plants on the slopes of Erzurum-Uzundere road, Yılmaz (2006) identified the naturally-grown plants and specified the contribution of these plants to the restoration of the landscape. Karim and Malik (2008) studied the differentiation of plant species on the corridors of Nova National Park, Terra, Newfoundland, Canada and suggested that existing plants should be used for planting the roadsides. Deniz and Sirin (2005) conducted a study on the assessment of natural flora of Mount Samson and co ncluded that the plants identified in their study, Centauriumerythraea ve Teucrium chamaedrys L., which were also identified in this study, were valuable with respect to landscape architecture and that they had to be used.Bekçi et al., 2010, emphasized the importance of using natural plants in the designs and focused on the plant taxa *Laurocerasus officinalis Roem, Rosa canina* L., *Sorbus torminalis* L. Crantz, *Sorbus aucuparia* L., *Crateagus monogyna* Roem., *Arbutus unedo* L., *Vaccinium arcthostophyllos* L., *Corylus avellana* L., *Pyrus communis* L. which grew naturally in Trabzon and its vicinities, along with the cultivation techniques for these plants.

In the research area of the present study, there existed natural and artificial coastal habitats with different characteristics. Among these habitats, those with the sand characteristics (9 habitats) were mostly focused on dune areas. Kılınç and Özkanca (1991) conducted a research on the coastal dunes of the Mid Black Sea Region (Ünye-Alaçam) in terms of plant sociology and classified the plants into vegetation plant groups according to the Braun-Blanquet method. Avcı (2017) stated that the number of Eastern Black Sea Region coastal dunes were five. These were, Görele-Tirebolu-Espiye dunes, Denizli-Eynesil dunes, Araklı dunes, Eskipazar-Of dunes and Ardeşen-Pazar dunes. In these identified coastal dunes, existed rare dune plants. However, the present study determined that currently, these dunes were devastated by urbanization, divided coastal road and coastal groins and the natural texture was disrupted.

It was established that the diversity of the plant species in the coastal areas of the Eastern Black Sea were not endemically rich. In the thesis of Sarı (2013), which was conducted in the alpine zone, determined that only 12 of the identified plant species were endemic. In the study of Acar (1997) identified 18 endemic plant species and Eroğlu (2012) identified 12. However, in the present study, 1 plant taxon was identified as endemic.

In the present study, the plants were classified for being natural or alien and of the 218 plant taxa, 22 were identified to be alien (%10,09). There exists an abundant array of studies in literature, in which plant taxa belonging to certain regions were identified and evaluated according to their natural and alien status (Carboni et al., 2010; Anastasiu et al., 2011; Artega et al., 2008; Podda et al., 2012; Pollnac et al., 2012). In a study conducted at the harbors of the Black Sea coast, the influence of the people on the spread of foreign plant taxa was investigated and a positive relationship was discovered. The present study similarly identified the 10% of the total species as alien. In addition, the life forms, origins, families, use of plants, cases of invasion were also presented for the identified alien plants in the present study. Artega et al. (2008) examined the elevation, exposure, distance to the center of the city and road width factors which were assumed to be influential on the

expansion of alien and natural vegetation in the Canary Islands, Tenerife. It was concluded that elevation and exposure were highly influential on the presence of woody, annual, biennial and perennial plants in the roadside plant compositions. Podda et al. (2012) concluded that the alien status of the plants identified in Sardinia (Italy) were positively correlated with human activities (syntrophic and agricultural areas). In addition, Artega et al. (2008) studied the distribution of alien and natural plants along the roads in the ocean islands in Canary Islands, Tenerife. In this study 264 plant taxa were detected in a total of 50 sample areas.

Once the life forms of the identified plant taxa in the present study were examined, it could be observed that the herbaceous plants had the highest percentage of prevalence, with 56.88% (124 taxa). There exist studies on the use of herbaceous plants in landscape design in literature (Hitchmough and Woudstra, 1999; Acar and Var, 2001; Hitchmough et al., 2004; Messer, 2008; Bretzel et al. 2009).In coastal areas, the growing superiority of herbaceous plants and their soil healing property should not be ignored in the design works for coastal habitats where the soil is found to be partly infertile. Hitchmough (2000) carried out a study to cultivate natural herbaceous plants into landscaping. Hitchmough et al. (2004), in a study that emphasized the importance of herbaceous plants, investigated the development of 17 North American grassy weeds and grass species in Sheffield. Bretzel et al. (2009) reported that natural herbaceous plants had significant potential in covering and naturalizing the damaged soils from urban or excavation interventions. Messer (2008) revealed the landscape design features and utilization strategies for herbaceous plants. Messer mentioned that herbaceous plants were advantageous since they were durable, did not require replanting annually and increased the quality of life of the urban environment. In this respect, herbaceous species, such as *Humulus lupulus* L., *Eupatorium cannabinum* L., *Lapsana communis* L.subsp. *intermedia* (BIEB.) HAYEK, *Raphanus raphanistrum* L., *Medicago sativa* L. subps. *sativa*, *Cirsium vulgare* (Savi) Ten, *Commelina communis* L., *Cichorium intybus* L., *Dorycnium pentaphyllum* SCOP. subsp. *Herbaceum* (VILL.) ROUY,*Trifolium repens* and *Hypericum perforatum* L. could ecologically and functionally be taken into consideration in urban and rural rehabilitation studies.

Planting design projects to be realized within the context of the landscape architecture discipline needs to be ecologically and aesthetically appropriate to the design area. Therefore, ecologically and aesthetically attractive species should be identified for their use in the designs as the naturally growing plant species, not only in the Eastern Black Sea Region, but also in all other regions of Turkey.It is essential to commence with the scientific studies on these identified species in terms of their cultivation, design, application and care. *Ficus carica* L., with the highest prevalence of existence, could be beneficial for the people in the urban areas with respect to its regeneration characteristic. In addition, it would be an attractive element of the designs due to its aesthetical broad green leaves and the calligraphic characteristic during winter. Furthermore, *Acer negundo* L., *Acer pseudoplatanus* L., *Fraxinus angustifolia* VAHL, *Hedera helix* L., *Spartium junceum* L., *Tilia rubra* DC, *Phillyrea latifolia* L. could be preferred due to their ecological characteristics. Plant taxa belonging to the *Calamintha, Campanula,Centaurea, Cichorium, Cirsium, Echium, Hypericum, Lavatera, Lonicera, Lythrum, Melilotus, Nerium, Ruscus, Salvia, Tanacetum, Trifolium, Trachystemon, Verbascum, Prunella, Achillea, Agrimonia,İnula, Teucrium*genera could be taken into consideration in the designs due to their aesthetical color and texture characteristics.

Although the Eastern Black Sea Region has several plant species that are unique to its geography, the vegetation designs do not reflect this identity of the region. However, most of the naturally growing species could be utilized in landscape designs. Thus, it would be possible to present the different types of exotic plant species that have a significant place in the national vegetation practices, as well as providing the designers with different characteristics of the natural plant material. Yahyaoğlu et al. (2006) noted that natural species were also extremely important in terms of providing material that was harmonious with the environment, when natural conditions, such as climate and soil structure of the environment, were taken into consideration. Furthermore, continuous and economical provision of seeds and seedlings could become the basis of erosion control studies, hence, the natural species could provide an important source.

The rehabilitation of the coastal areas and utilization of the existing natural plants in the future planning endeavor could result with better outcomes in terms of sustainability. The utilization of these plants could provide aesthetical plant compositions for the pedestrians who utilize sidewalks and paths for leisure promenading and for drivers who pass by, without any encounters of ecological adaptation.

Today's world focuses on the sustainable approaches on studies of landscape architecture. The objectives of these approaches are to preserve the limited natural resources, to utilize these resources without disrupting them, and contribute to their regeneration. In this respect, the present study constitutes a basis for the naturally growing plant in coastal areas and their utilization in the landscape designs.

The plants identified in the coastal areas does not only provide facilities in vegetating the coastal line, but also could provide an array of utilization areas within the urban environment, where the aim is to experience the natural settings in the urban fabric. The plant taxa listed in the present study could be used in special landscape concept approaches, such as "gravel gardens", "pollination orchards", gardens with plants that tolerate draught, "succulent gardens", rock gardens, mixed gardens, rain gardens.

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Appendix 1. The coastal vegetation innortheastern Turkey

Plant Species	Familya	Raunkier Life Forms	Status	Duration	Orijin
Acacia saligna (Labill.) H.L.Wendl.	Fabaceae	Phanerophytes	a	P	Aust
Acanthus mollis L.	Acanthaceae	Hemicryptophytes	n	P	Med
Acer heldreichii subsp. *trautvetteri* (Medw.) A.E.Murray	Sapindaceae	Phanerophytes	n	P	N AM
Acer negundo L.	Aceraceae	Phanerophytes	n	P	N AM
Acer pseudoplatanus L.	Aceraceae	Phanerophytes	n	P	ES
Achillea maritima (L.) Ehrend.&Y.P.Guo subsp. *maritima*	Asteraceae	Hemicryptophytes	n	P	Med
Aesculus hippocastanum L.	Sapindaceae	Phanerophytes	n	P	Euras
Ailanthus altissima (MILLER) SWINGLE	Simaroubaceae	Phanerophytes	a	P	As
Agrimonia eupatoria L.	Rosaceae	Hemicryptophytes	U	P	U
Alcea biennis Winterl	Malvaceae	Hemicryptophytes	n	Bi	ES
*Alnus glutinosa (*L.) GAERTNER *subsp. barbata(*C.A. MAYER) YALT.	Betulaceae	Phanerophytes	n	P	IT
Amaranthus hybridus L.	Amaranthaceae	Therophytes	a	An	N AM
Ambrosia artemisiifolia L.	Asteraceae	Therophytes	a	An	AM
Anthemis cretica L.	Asteraceae	Hemicryptophytes	n	P	ES
Arbutus unedo L.	Ericaceae	Phanerophytes	n	P	Med
Argyrolobium biebersteinii BALL	Fabaceae	Hemicryptophytes	n	P	U
Artemisia absinthium L.	Asteraceae	Hemicryptophytes	n	P	Eu
Asplenium adianthum-nigrum L.	Aspleniaceae	Geophytes	n	P	Eu-Med
Asplenium scolopendrium L.	Aspleniaceae	Geophytes	n	P	Eu-N AM
*Athyrium filix-femina (*L.)Roth	Athyriaceae	Geophytes	n	P	Pl
Atriplex hastata L.	Chenopodiaceae	Therophytes	n	An	Euras
Avena fatua L. var. *fatua* L.	Poaceae	Therophytes	n	An	ES
Beta trigyna WALDST. ET KIT.	Chenopodiaceae	Therophytes	n	P	Cosm
Betula pendula Roth.	Betulaceae	Phanerophytes	n	P	ES
Buddleja davidii Franch.	Scrophulariaceae	Phanerophytes	a	P	Pl
Calamintha nepeta (L.) Kuntze *subsp. glandulosum*(Req.) Govaerts	Lamiaceae	Hemicryptophytes	n	P	ES
Calamintha menthifolium (Host)Stace subsp. *menthifolium*	Lamiaceae	Hemicryptophytes	n	P	ES
Calystegia sepium (L.) R. Br.	Convolvulaceae	Hemicryptophytes	n	P	Cosm
Calystegia silvatica (KIT.) GRISEB.	Convolvulaceae	Hemicryptophytes	n	P	Med
Campanula alliariifolia WILLD.	Campanulaceae	Hemicryptophytes	n	P	Euras
Campanula rapunculoides L.	Campanulaceae	Hemicryptophytes	n	P	ES
Carpinus betulus L.	Betulaceae	Phanerophytes	n	P	ES
Carpinus orientalis Mill.	Betulaceae	Phanerophytes	n	P	ES
Castanea sativa Mill.	Fagaceae	Phanerophytes	n	P	ES
Catalpa bignonioides Walter	Bignoniaceae	Phanerophytes	a	P	AM
Centaurea iberica Trevir. & Spreng.	Asteraceae	Therophytes	n	Bi	As
Centaurea jacea L.	Asteraceae	Hemicryptophytes	n	P	ES
Centaurium erythraea RAFN	Gentianaceae	Hemicryptophytes	n	Bi	ES
Cerasus avium (L.) Monench	Rosaceae	Phanerophytes	n	P	ES
Chenopodium album L. subsp. *album* L.var. *album* L.	Chenopodiaceae	Therophytes	n	An	Euras
Chenopodium ambrosioides L.	Chenopodiaceae	Therophytes	n	An	AM
Cichorium intybus L.	Asteraceae	Hemicryptophytes	n	P	Cosm
Cirsium vulgare (Savi) Ten.	Asteraceae	Hemicryptophytes	n	Bi	Euras
Cistus creticus L.	Cistaceae	Phanerophytes	n	P	Med
Cistus salviifolius L.	Cistaceae	Chamaephytes	n	P	Med
Citrus limon (L.) Burm.f.	Rutaceae	Phanerophytes	U	P	U
Clematis vitalba L.	Ranunculaceae	Phanerophytes	n	P	Med
Clerodendrum bungei Steud.	Verbenaceae	Phanerophytes	a	P	As
Commelina communis L.	Commolinaceae	Therophytes	a	P	N AM-

					As
Convolvulus arvensis L.	Convolvulaceae	Hemicryptophytes	n	P	Cosm
Conyza bonariensis (L.)Cronq.	Asteraceae	Therophytes	a	An	S AM
Conyza canadensis (L.)Cronq.	Asteraceae	Therophytes	a	An	AM
Cornus sanquinea L.subsp. *australis* (C.A. MAYER)JAV.	Cornaceae	Chamaephytes	n	P	ES
Corylus avellana L.	Corylaceae	Phanerophytes	n	P	ES
Cota tinctoria var. pallida (DC.) U.Özbek & Vural	Asteraceae	Hemicryptophytes	n	P	Euras
Crataegus microphylla C. KOCH.	Rosaceae	Phanerophytes	n	P	BSea
Crepis foetida L. subsp. *foetida*	Asteraceae	Therophytes	n	An	Euras
Crepis foetida L.subsp. *rhoeadifolia* (BIEB.) CELAK.	Asteraceae	Therophytes	n	An	Euras
Crepis setosa HALL. FIL.	Asteraceae	Therophytes	n	An	ES
Crithmum maritimum L.	Apiaceae	Chamaephytes	n	P	Med
Cucurbita sp.	Cucurbitaceae	Chamaephytes	a	An	AM
Cydonia oblonga MILLER	Rosaceae	Phanerophytes	n	P	As
Cynodon dactylon (L.) PERS.var. *villosus* REGEL	Poaceae	Hemicryptophytes	n	P	Cosm
Cynoglossum creticum MILLER	Boraginaceae	Hemicryptophytes	n	Bi	Euras
Cynosurus echinatus L.	Poaceae	Therophytes	n	An	Med
Cyperus longus L.	Cyperaceae	Therophytes	n	P	Euras
Dactylis glomerata L.	Poaceae	Hemicryptophytes	n	P	ES
Datisca cannabina L.	Datiscaceae	Chamaephytes	n	P	As
Datura stramonium L.	Solanaceae	Therophytes	n	P	Cosm
Daucus carota L.	Umbelliferae	Hemicryptophytes	n	Bi	Med
Digitaria ischaemum (SCHREBER EX SCHWEIGGER) MÃœHLENB.	Poaceae	Hemicryptophytes	n	An	Euras
Diospyros kaki Thunb.	Ebenaceae	Phanerophytes	n	P	As
Diospyros lotus L.	Ebenaceae	Phanerophytes	n	P	As
Dorycnium pentaphyllum SCOP. subsp. *herbaceum(VILL.) ROUY*	Leguminosae	Chamaephytes	n	P	Euras
Dryopteris filix-mas (L.) SCHOTT	Aspidiaceae	Geophytes	n	P	Euras
Echinochloa crus-galli (L.) P. BEAUV.	Poaceae	Hemicryptophytes	n	An	Med
Echium italicum L.	Boraginaceae	Hemicryptophytes	n	Bi	Med
Echium vulgare L.	Boraginaceae	Hemicryptophytes	n	Bi	ES
Elaeagnus angustifolia L.	Elaeagnaceae	Chamaephytes	n	P	Med
Equisetum arvense L.	Equisetaceae	Geophytes	n	P	Euras
Eriobotrya japonica (THUNB.) LINDL.	Rosaceae	Phanerophytes	U	P	As
Erica arborea L.	Ericaceae	Phanerophytes	n	P	Med
Eryngium maritimum L.	Apiaceae	Hemicryptophytes	n	P	Eu-Med
Eucalyptus camaldulensis DEHNH.	Myrtaceae	Phanerophytes	a	P	Aust
Euonymus europaeus L.	Celastraceae	Phanerophytes	n	P	ES
Euphorbia sp.	Euphorbiaceae	Hemicryptophytes	n	An	U
Eupatorium cannabinum L.	Asteraceae	Hemicryptophytes	n	P	ES
Fagus orientalis LIPSKY	Fagaceae	Phanerophytes	n	P	ES
Ficus carica L.	Moraceae	Phanerophytes	n	P	Med
Foeniculum vulgare MILLER	Apiaceae	Hemicryptophytes	n	P	Med
Frangula dodonei Ard.subsp. *dodonei*	Rhamnaceae	Phanerophytes	n	P	Cosm
Fraxinus angustifolia VAHL	Oleaceae	Phanerophytes	n	P	Cosm
Galega officinalis L.	Fabaceae	Hemicryptophytes	n	P	ES
Galium album MILLER subsp. *prusense* (C. KOCH) EHREND. ET KRENDL	Rubiaceae	Hemicryptophytes	n	P	ES
Galium sp.	Rubiaceae	Hemicryptophytes	n	P	ES
Geranium columbinum L.	Geraniaceae	Therophytes	n	An	Euras
Hedera colchica (C. KOCH) C. KOCH	Araliaceae	Phanerophytes	n	P	BSea
Hedera helix L.	Araliaceae	Phanerophytes	n	P	Euras
Helleborus orientalis LAM.	Ranunculaceae	Hemicryptophytes	n	An	BSea
Heracleum platytaenium BOISS.	Apiaceae	Hemicryptophytes	n(endemic)	An	BSea

Hieracium sp.	Asteraceae	Hemicryptophytes	n	An	Euras
Holcus lanatus L.	Poaceae	Hemicryptophytes	n	P	ES
Humulus lupulus L.	Cannabaceae	Phanerophytes	n	P	ES
Hypericum androsaemum L.	Guttiferae	Hemicryptophytes	n	P	ES
Hypericum bithynicum BOISS.	Guttiferae	Hemicryptophytes	n	P	BSea
Hypericum perforatum L.	Guttiferae	Hemicryptophytes	n	P	ES
Ínula conyzae (Griess.)Meikle	Asteraceae	Hemicryptophytes	n	P	ES
Juglans regia L.	Juglandaceae	Phanerophytes	n	P	ES
Koelreuteria paniculata Laxm.	Sapindaceae	Phanerophytes	n	P	As
Lapsana communis L.subsp. *intermedia* (BIEB.) HAYEK	Asteraceae	Hemicryptophytes	n	P	As
Laurocerasus officinalis M.Roem.	Rosaceae	Phanerophytes	n	P	BSea
Laurus nobilis L.	Lauraceae	Phanerophytes	n	P	Med
Lavatera thuringiaca L.	Malvaceae	Hemicryptophytes	n	P	Euras
Leontodon hispidus L. subsp. *hispidus*	Asteraceae	Geophytes	n	An	ES
Lepidium virginicum L.	Brassicaceae	Therophytes	a	An	AM
Ligustrum japonicum Thunb.	Oleaceae	Phanerophytes	a	P	As
Lonicera japonica Thunb	Caprifoliaceae	Phanerophytes	a	P	As
Lotus anqustissumus L.	Fabaceae	Therophytes	n	An	Euras
Lotus corniculatus L. var. *corniculatus* (BIEB.) ARC.	Fabaceae	Hemicryptophytes	n	P	Euras
Luzula sp.	Juncaceae	Geophytes	n	P	U
Lycopus europaeus L.	Lamiaceae	Hemicryptophytes	n	P	ES
Lythrum salicaria L.	Lythraceae	Hemicryptophytes	n	P	ES
Malus sylvestris MILLER	Rosaceae	Phanerophytes	n	P	Euras
Matricaria chamomilla L.	Asteraceae	Therophytes	n	An	Euras
Medicago lupulina L.	Fabaceae	Hemicryptophytes	n	P	ES
Medicago sativa L. subps. *sativa* L.	Fabaceae	Hemicryptophytes	n	P	BSea
*Melilotus albus*DESR.	Fabaceae	Therophytes	n	An	Euras
Melilotus officinalis (L.) DESR.	Fabaceae	Therophytes	n	An	Euras
Mentha spicata L.	Lamiaceae	Hemicryptophytes	n	P	ES
Mercurialis annua L.	Euphorbiaceae	Therophytes	n	An	Euras
Mercurialis perennis L.	Euphorbiaceae	Hemicryptophytes	n	P	ES
Morus alba L.	Moraceae	Phanerophytes	n	P	As
Nerium oleander L.	Apocynaceae	Phanerophytes	n	P	Med
Oenanthe pimpinelloides L.	Apiaceae	Hemicryptophytes	n	P	Med
Oenothera biennis L.	Onagraceae	Hemicryptophytes	a	Bi	N AM
Olea europaea L.subsp. *europaea*	Oleaceae	Phanerophytes	n	P	Med
Origanum vulgare L.	Lamiaceae	Hemicryptophytes	n	P	ES
Origanum vulgare subsp. *viridulum* (Martin-Donos) Nyman	Lamiaceae	Hemicryptophytes	n	P	ES
Paspalum dilatatum Poir.	Poaceae	Hemicryptophytes	a	P	S AM
Paspalum distichum L.	Poaceae	Hemicryptophytes	a	P	AM
Petasites albus (L.) GAERTNER	Asteraceae	Hemicryptophytes	n	P	ES
Petrorhagia saxifraga (L.) LINK	Caryophyllaceae	Hemicryptophytes	n	P	ES
Philadelphus coronarius L.	Hydrangeaceae	Phanerophytes	n	P	Med
Phillyrea latifolia L.	Oleaceae	Chamaephytes	n	P	Med
Phytolacca americana L.	Phytolaccaceae	Hemicryptophytes	a	P	AM
Picris hieracioides L.	Asteraceae	Hemicryptophytes	n	P	ES
Pinus pinea L.	Pinaceae	Phanerophytes	n	P	Med
Pinus sylvestris L.	Pinaceae	Phanerophytes	n	P	ES
Plantago lanceolata L.	Plantaginaceae	Hemicryptophytes	n	P	E As
Plantago major L. subsp. *major*	Plantaginaceae	Hemicryptophytes	n	P	E As
Platanus orientalis L.	Platanaceae	Phanerophytes	n	P	ES-Euras
Polygonum aviculare L.	Polygonaceae	Therophytes	n	An	Cosm
Polygonum hydropiper L.	Polygonaceae	Therophytes	a	An	AM
Polygonum perfoliatum L.	Polygonaceae	Therophytes	n	P	BSea
Polygonum persicaria L.	Polygonaceae	Therophytes	n	An	Euras
Polystichum braunii (SPENN.) FEE	Aspidiaceae	Geophytes	n	An	Euras
Populus nigra L.	Salicaceae	Phanerophytes	n	P	Cosm
Populus tremula L.	Salicaceae	Phanerophytes	n	P	ES
Prunella vulgaris L.	Lamiaceae	Hemicryptophytes	n	P	ES

Prunus divaricata LEDEB.var. *divaricata* LEDEB.	Rosaceae	Phanerophytes	n	An	ES
Pteridium aquilinum (L.) KUHN	Dennstaedtiaceae	Geophytes	n	An	Cosm
Pteris cretica L.	Pteridaceae	Geophytes	n	An	Euras
Pulicaria dysenterica (L.) BERNH.	Asteraceae	Hemicryptophytes	n	P	Eu-Med
Punica granatum L.	Punicaceae	Phanerophytes	n	P	Med
Pyracantha coccinea M.ROEMER	Rosaceae	Phanerophytes	n	P	ES
Pyrus communis L.	Rosaceae	Phanerophytes	n	P	ES
Raphanus raphanistrum L.	Brassicaceae	Therophytes	n	An	Med
Rhus chinensis MILL. var. *chinensis*	Anacardiaceae	Phanerophytes	n	P	U
Rhus coriaria L.	Anacardiaceae	Phanerophytes	n	P	Med
Robinia pseudoacacia L.	Fabaceae	Phanerophytes	a	P	Pl
Rosa canina L.	Rosaceae	Chamaephytes	n	P	Eu-Med
Rubus sanctus SCHREBER	Rosaceae	Phanerophytes	n	P	Eu-Med
Rumex crispus L.	Polygonaceae	Hemicryptophytes	n	An	Cosm
Ruscus aculeatus L.	Liliaceae	Chamaephytes	n	P	Eu
Salix alba L.	Salicaceae	Phanerophytes	n	P	ES
Salix babylonica L.	Salicaceae	Phanerophytes	n	P	As
Salix caprea L.	Salicaceae	Phanerophytes	n	P	ES
Salvia verticillata L.	Lamiaceae	Hemicryptophytes	n	P	ES
Sambucus ebulus L.	Caprifoliaceae	Chamaephytes	n	P	ES
Sambucus nigra L.	Caprifoliaceae	Chamaephytes	n	P	ES
Sanguisorba minor SCOP.	Rosaceae	Hemicryptophytes	n	P	Med
Scabiosa columbaria L. subsp. *columbaria* L.var. *intermedia* (POST) MATTHEWS	Dipsacaceae	Hemicryptophytes	U	P	U
Setaria glauca (L.) P. BEAUV.	Poaceae	Therophytes	n	An	Pl
Sigesbeckia orientalis L.	Asteraceae	Therophytes	n	An	As
Smilax excelsa L.	Liliaceae	Phanerophytes	n	P	BSea
Solanum americanum Mill.	Solanaceae	Therophytes	n	An	Med
Solanum dulcamara L.	Solanaceae	Hemicryptophytes	n	P	ES
Solanum woronowii Pojark	Solanaceae	Therophytes	n	An	BSea
Solanum luteum MILLER	Solanaceae	Therophytes	n	An	Cosm
Sonchus arvensis L.subsp. *uliginosus* (M.BIEB.) NYMAN	Asteraceae	Hemicryptophytes	n	P	As
Sonchus asper (L.) HILL subsp. *glaucescens* (JORDAN) BALL	Asteraceae	Hemicryptophytes	n	An	Med
Sonchus oleraceus L.	Asteraceae	Therophytes	n	An	Pl
Sorghum halepense (L.) PERS. var. *halepense* (L.) PERS.	Poaceae	Hemicryptophytes	n	P	Med
Spartium junceum L.	Fabaceae	Phanerophytes	n	P	Med
Spiraea vanhouttei (Briot) Carriere	Rosaceae	Phanerophytes	a	P	AM-As
Staphylea pinnata L.	Staphyleaceae	Phanerophytes	n	P	BSea
Symphyotrichum squamatum (Spreng.)G.I.Nesom	Asteraceae	Therophytes	n	An	Euras
Syringa vulgaris L.	Oleaceae	Phanerophytes	a	P	Euras
Tanacetum parthenium (L.) SCHULTZ BIP.	Asteraceae	Hemicryptophytes	n	P	Cosm
Teucrium chamaedrys L.	Lamiaceae	Hemicryptophytes	n	P	ES
Tilia rubra DC	Tiliaceae	Phanerophytes	U	P	U
Torilis arvensis (HUDS.) LINK subsp. *arvensis* (HUDS.) LINK	Apiaceae	Therophytes	n	An	Pl
Trachystemon orientalis (L.) G. DON	Boraginaceae	Hemicryptophytes	n	P	BSea
Trifolium arvense L.	Fabaceae	Therophytes	n	P	Euras
Trifolium pratense L. var. *pratense* BOISS. ET BAL.	Fabaceae	Hemicryptophytes	n	P	Med
Trifolium repens L.	Fabaceae	Hemicryptophytes	n	P	Pl
Trifolium resupinatum L. var. *resupinatum* L.	Fabaceae	Therophytes	n	An	Pl
Ulmus glabra HUDSON	Ulmaceae	Phanerophytes	n	P	ES
Typha shuttleworthii W. KOCHET SONDER	Typhaceae	Hemicryptophytes	n	P	Cosm
Ulmus minor MILLER	Ulmaceae	Phanerophytes	n	P	ES
Urtica dioica L.	Urticaceae	Hemicryptophytes	n	P	ES
Verbascum blattaria L.	Scrophulariaceae	Hemicryptophytes	n	Bi	Pl

Verbascum gnaphalodes BIEB.	Scrophulariaceae	Hemicryptophytes	n	Bi	BSea
Verbascum sp.	Scrophulariaceae	Hemicryptophytes	n	Bi	U
Verbascum thapsus L.	Scrophulariaceae	Hemicryptophytes	n	Bi	ES
Verbena officinalis L.	Verbenaceae	Hemicryptophytes	n	P	Pl
Vicia cracca L.subsp. *cracca* L.	Fabaceae	Hemicryptophytes	n	P	ES
Vitis sp.	Vitaceae	Chamaephytes	U	P	U

***** Status: a alien, n native, U Unknown; Duration: P perennial, Bi biannual, An annual; Orijin: N AM North America, S AM South America, AM America, IT Irano-Turanian, ES Euro-Siberian, Med Mediterranean, Cosm Cosmopolitan, Euras Eurastic, As Asiatic, Pl Polyregion, Eu Europe, Aust Australia, Bsea Blacksea, U Unknown.

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