JEB
Journal of Environmental Biology

Journal Home page : www.jeb.co.in
E-mail : editor@jeb.co.in

ISSN: 0254-8704 (Print)
ISSN: 2394-0379 (Online)
CODEN: JEBIDP

Vegetation ecology of the Princes' Islands, Istanbul-Turkey

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Publication Info

Paper received:
15 July 2013

Revised received:
10 November 2013

Re-revised received:
18 June 2014

Accepted:
22 September 2014

Abstract

The aim of this paper was to evaluate phytoecological and phytosociological characteristics of the vegetation distributed in Princes' Islands (Istanbul/Turkey). Field studies were carried out during 2002-2010 following the classical Braun-Blanquet method. The data obtained from the research area on characteristics of two associations belonging to maquis vegetation was analyzed. One of these associations was new and its detailed description, typification and syntaxonomy are mentioned. The associations identified were: *Arbuto unedonis - Phillyretum latifoliae* ass. nova and *Phillyreo latifoliae-Pinetum brutiae*. The physical and chemical characteristics of soil like saturation (%), pH, P_2O_5 (kg da^{-1}), K_2O (kg da^{-1}), $CaCO_3$ (%), total salt (%) and organic matter (%) are presented as well. Relationship between vegetation, ecological characteristics and their protection against biotic pressures were discussed together with phytosociological and phytoecological features of the associations and was compared with similar other studies.

Key words

Phytosociology, Biotic pressure, Princes Islands, Turkey

Introduction

Vegetation describes plant community that belongs to certain region, and any given vegetation may hold various plant associations (Box and Fujiwara, 2005; Kavgacı, 2008). Interpreting vegetation-environment relationship in a particular region, using correlations between vegetation and corresponding environmental variables, gives a reference point with respect to the definition of plant species composition and structure of that region (Munica, 1997). However, the abundance of each plant species cannot be determined by counting each of them, hence on assumption that samples taken from that region are good representatives for that region. The type of data desired, objective of the study, morphology of the vegetation, and available time are parameters for choosing sampling methods (Khan *et al.,* 2013). Abundance or importance of taxa (usually species) indexed by sampling units e.g., quadrats, releves, stands, traps etc. are commonly used in data sampling methods (Shah *et al*., 2010). Moreover, recent computer based methods of multivariate statistics have become very popular in community ecology in the last few decades. It helps ecologists to discover structure in the data sets (Shaheen *et al*., 2012; Khan *et al*., 2012).

Turkey located on the transition zones of 3 different biogeographically regions (the European-Siberian, Mediterranean and Irano-Turanian) has a rich flora and vegetation in comparison with Europe and Middle East due to diverse climate types, soil structure, geology, gene pools and topography in terms of biodiversity of Turkey (Aksoy and Gemici, 2010; Atalay and Efe, 2010). Although many studies and vegetation maps have been completed by most of the well-developed countries, the studies on local vegetation are not sufficient and efficient to construct a vegetation map of Turkey (Tel *et al.,* 2010; Sağlam, 2013).

Although there are numerous reports on the geology, flora, forestry, landscape architecture and geographical features of Princes' Islands (Eliçin, 1970; Dönmez, 1979; Kantarcı, 1984; Yaltırık *et al.,* 1993; Günal, 1998; Garipağaoğlu, 1999; Uzun *et al.,* 2012), vegetation study has not been carried out yet. The aim of the present study was thus to identify the phyto-sociological features of the vegetation present in the Princes' Islands and to

define the associations representing the vegetation and to reveal the biotic pressures over the vegetation.

Materials and Methods

Study area : The Princes Islands include four large (Büyükada-5.46 km^2, Heybeliada-2.4 km^2, Burgazada-1.5 km^2 and Kınalıada-1.3 km^2) and five small (Sedef Adası-0.157 km^2, Yassıada-0.05 km^2, Sivriada-0.05 km^2, Kaşık Adası-0.006 km^2 and Tavşan Adası-0.004 km^2) islands located in the southeast part of the Sea of Marmara of Istanbul (40° 52' 0" N, 29° 6' 0" E) (Fig. 1) (Uzun *et al.,* 2012; Governership site, 2013). Büyükada is officially known as the center of these islands within the premises of Istanbul district (Municipality, 2013). The population of the Princes Islands is 13.883 (Tuikapp, 2012). Approximately, 20.000 of the settled population live in Büyükada, Heybeliada, Kınalıada and Burgazada. The population increased dramatically up to 400.000, when people from other locations of Istanbul moved to these islands for touristic visits (Behramoğlu, 2010, Municipality, 2013).

This research was carried out in the densely populated four larger islands (Büyükada, Heybeliada, Burgazada and Kınalıada). The research area consists many hills, highest being Yücetepe (202 m), followed by Değirmentepesi (136 m), Hristostepesi (170 m) and Çınartepesi (155 m), which are mainly covered with *Pinus brutia* forests (Yaltırık *et al*., 1993). In terms of geological structure of the islands, the groundmass is composed of arkoses and quartzite. The forests and shrubs are present on the sides covered by a typical shallow soil and alluviums are found in residential areas and coastal gardens. Average depth of the soil varies from 60 to 80 cm. In some parts of the islands, the depth of the soil is about 30 cm or shallower because of erosion around the sites resulting in an uncovered parent material zone.

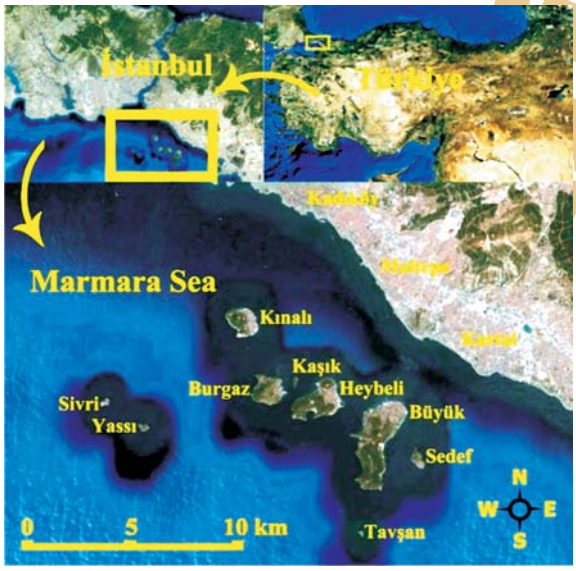

Fig. 1 : Map showing the location of Princes' Islands in Istanbul, Turkey

The average soil pH value is 5.5 (Kantarcı, 1984; Uzun *et al*., 2012).

The annual average temperature of these Islands is 14.5°C, generally above 30°C during May-September. The annual average precipitation is about 682.3 mm. The type of rain regime is winter-autumn-spring-summer (W.A.Sp.Su) being "Central Mediterranean Rain Type". The relative humidity is between 73-77%, but these values decrease to around 65-68% during summer (Akman, 1999; DMI, 2013).

Data analyses : Plants were collected from Princes' Islands during 2002-2010 vegetation periods, and were identified according to the "Flora of Turkey and the East Aegean Islands" (Davis, 1965-1985). Life forms [phanerophytes (Ph), chamaephytes (Ch), hemicryptophytes (H), therophytes (Th) and geophytes (G)] were determined according to Raunkiaer system (1934) and the findings are listed in Tables 1 and 2. Ecological data was recorded using random quadrate sampling method. For classification of vegetation, the Braun-Blanquet approach (Braun-Blanquet, 1964) was applied. The widths of the quadrats were estimated by employing "minimal area" method, which ranged to 1000 m^2 for *Pinus brutia* community and to 100 m^2 for *Phillyrea latifolia* community. The rules of "International Code of Phytosociological Nomenclature" were pursued for naming the new plant associations (Weber *et al*., 2000).The related literatures were used for the correction of syntaxonomic categories, in plant associations (Akman, 1995; Blasi *et al.,* 2000; Varol *et al.,* 2006; Aksoy and Gemici, 2010; Ketenoğlu *et al.,* 2010; Özen, 2010; Altay *et al.,* 2012). Similarity index (Sorensen, 1948) was calculated for the comparison of associations.

Soil samples were collected from a depth of 30 cm from each quadrate and sieved through a 2-mm mesh. The physical and chemical parameters like; soil texture, pH, organic matter, $CaCO_3$ content, plant-available soil phosphorus, total K and Na were determined following the methods outlined in detail by Tüzüner (1990) and Öztürk *et al.* (1997).

Results and Discussion

Two different plant associations from maquis vegetation were determined after evaluating 18 sampling areas selected from the Prince's Islands. Syntaxonomical interpretations of these associations are given below;

Class : Quercetea ilicis Braun-Blanquet 1947 ex A. and O. Bolòs Y Vayreda 1950; Order : Quercetalia ilicis Braun-Blanquet 1936 em. Rivas Martinez 1974; Alliance : Quercion ilicis Braun-Blanquet (1931) 1936 em. Rivas Martinez 1974; Association: *Phillyreo latifoliae-Pinetum brutiae* Schwarz, 1936; Association: *Arbuto unedonis-Phillyretum latifoliae* ass.nova

Pinus brutia Ten., the most dominant taxon of this association, was unique tree species in the forests of these

islands, except Kınalıada. Shrub vegetation was only recorded in Kınalıada and no forest vegetation was observed here. The association was distributed in the south, east, west and southeast slopes with 10º-35º inclination, found between 30-160 m altitudes. The general coverage ranged between 90-100%. *Pinus brutia*, *Phillyrea latifolia* and *Cistus creticus* were dominant in the plant physiognomy (Table 1). Analysis of soil showed that, this association was capable of growing in clay, slightly acidic, salt-free and poor lime soil (Table 3). The soil was rich in P_2O_5 and K_2O, and had rich organic matter content.

In this association, the largest group of life forms were therophytes (41.67%) and phanerophytes (28.33%). The percentage of other life forms was as follows: hemicryptophytes (18.33%), geophytes (10.00%) and chamaephytes (1.67%) (Table 1).

Dominant taxon of this newly found association was *Phillyrea latifolia*. It is distributed in Büyükada, Burgazada and Kınalıada, generally found on the south, west, northwest, south east and south west slopes with 30°-50° inclination, and at an

Table 1 : Characteristic of *Phillyreo latifoliae-Pinetum brutiae* association

Life Form	Quadrate number	3	4	5	16	6	7	12	13	17	18	Presence
	Size (m^2 x 1000)	1	1	1	1	1	1	1	1	1	1	
	Altitude (m x 10)	5	7	9	5	3	8	16	14	9	8	
	Direction	E	E	S	E	W	SE	E	E	W	W	
	Inclination (°)	30	30	30	35	10	30	30	30	30	30	
	Main Rock					QUARTZ						
	Total cover (%)	100	100	95	90	90	95	100	100	95	95	
	Characteristic species of the association											
Ph	*Pinus brutia*	33	44	33	44	33	33	44	33	44	33	V
Ph	*Phillyrea latifolia*	44	22	44	22	44	44	22	44	22	44	V
Ph	*Cistus creticus*	44	22	33	.	+1	+1	12	12	33	33	V
Ph	*Jasminum fruticans*	.	.	.	.	.	.	.	.	+1	.	I
	Characteristic species of the *Quercion ilicis* (*) Alliance, *Quercetalia (etea) ilicis* Order and Class											
G	**Asparagus acutifolius*	22	+2	12	12	33	33	+2	12	22	+2	V
Ph	*Erica arborea*	.	22	+2	12	12	22	12	12	+1	22	V
Ph	*Arbutus unedo*	.	12	+1	+1	+1	22	33	.	.	+1	IV
Ph	*Juniperus oxycedrus* subsp. *oxycedrus*	+1	12	12	+1	.	.	11	12	.	.	III
Th	*Geranium purpureum*	.	.	.	.	+2	+2	+1	+1	+1	+1	III
Ph	*Smilax excelsa*	.	.	.	.	12	22	+2	+1	.	+1	III
Ph	**Quercus coccifera*	.	.	.	.	.	+1	23	33	.	.	II
G	*Ruscus aculeatus*	.	.	.	.	12	.	.	.	.	+1	I
Ph	*Laurus nobilis*	+2	.	.	.	.	.	.	.	.	.	I
	Characteristic species of the *Oleo-Ceratonion* (*) Alliance and *Pistacio-Rhamnetalia alaterni* Order											
H	*Rubia peregrina*	+1	+2	+2	+1	+2	+2	+1	+2	.	+1	V
Ph	*Pistacia lentiscus*	+1	+1	.	12	+1	12	11	11	.	.	IV
Ph	**Clematis cirrhosa*	.	.	.	.	+2	+2	+1	+1	.	+2	III
Ph	**Olea europaea*	.	.	.	11	.	.	11	.	.	.	I
	Characteristic species of the *Quercetea pubescentis* Class											
H	*Brachypodium pinnatum*	.	+1	+1	.	.	+1	.	+1	+1	.	III
Ph	*Lonicera etrusca* var. *etrusca*	+2	.	.	.	.	.	.	.	.	.	I
H	*Hypericum perforatum*	.	.	.	.	.	.	.	+2	.	.	I
Th	*Lathyrus digitatus*	.	.	.	.	.	.	.	.	+2	.	I
	Characteristic species of the *Cisto-Micromerietea* Class											
Ch	*Lavandula stoechas*	+1	12	+2	+2					+2	.	III
Ph	*Cistus salvifolius*	+1	+2	.	33	.	.	.	.	.	.	II
H	*Dorycnium hirsutum*	.	.	.	.	.	+1	.	.	.	.	I
	Companions											
H	*Dactylis glomerata*	+2	+2	+2	+1	.	+2	.	.	.	+2	III
G	*Poa bulbosa*	+2	.	.	+1	.	.	.	+2	.	+2	II
Th	*Avena barbata*	+1	+2						+2	+1	.	II
Th	*Linum trigynum*	+2	+1	+2	.	.	.	.	.	.	.	II

Th	*Cynosurus echinatus*	+2	.	+1	.	.	.	.	+2	.	.	II
G	*Muscari neglectum*	.	.	.	.	.	+1	.	.	+2	.	I
Th	*Veronica cymbalaria*	.	.	+1					+2	.	.	I
Th	*Capsella bursa-pastoris*	.	.	.	.	+1	.	.	+1	.	.	I
Th	*Hordeum murinum*	.	.	.	.	12	.	.	+2	.	.	I
Th	*Cerastium semidecandrum*	.	.	.	.	+2	.	.	.	+2	.	I
H	*Rumex pulcher*	.	.	.	.	+1	.	.	+2	.	.	I
Th	*Sisymbrium officinale*	.	.	.	.	+1	.	.	+1	.	.	I
Th	*Orobanche pubescens*	.	.	.	.	.	.	.	+2	+1	.	I
H	*Briza maxima*	.	.	.	+2	.	.	.	+2	.	.	I
Th	*Aira elegantissima*	.	.	.	+1	.	.	.	.	.	+1	I
G	*Ranunculus ficaria*	.	.	.	.	.	.	.	.	+2	.	I
Th	*Myosotis ramosissima*	.	.	.	.	.	.	.	.	+1	.	I
Th	*Anagallis arvensis*	+1	.	.	.	.	.	.	.	.	.	I
Th	*Euphorbia falcata*	.	.	.	.	.	.	.		+1	.	I
Th	*Silene compacta*	.	.	.	.	.	.	.	+2	.	.	I
Ph	*Rosa canina*	.	.	+1	.	.	.	.	.	.	.	I
G	*Asphodelus fistulosus*	.	.	+1	.	.	.	.	.	.	.	I
Th	*Urtica pilulifera*	.	.	.	.	+2	.	.	.	.	.	I
H	*Potentilla recta*	.	.	.	.	+1	.	.	.	.	.	I
H	*Mentha pulegium*	.	.	.	.	+2	.	.	.	.	.	I
Ph	*Rubus discolor*	.	.	.	.	.	.	+1	.	.	.	I
Th	*Lagurus ovatus*	.	.	.	.	.	.	.	+2	.	.	I
Th	*Vicia hirsuta*	.	.	.	.	.	.	.	+2	.	.	I
Th	*Senecio vulgaris*	.	.	.	+1	.	.	.	.	.	.	I
Th	*Medicago polymorpha*	.	.	.	+1	.	.	.	.	.	.	I
H	*Galium verum*	.	.	.	+1	.		.	.	.	.	I
H	*Bellis perennis*	.	.	.	.	.	.	.	.	+1	.	I
Th	*Vicia hybrida*	.	.	.	.	.	.	.	.	+2	.	I
Th	*Euphorbia helioscopia*	.	.	.	.	.	.	.		+1	.	I
Th	*Sherardia arvensis*	.	.	.	.	.	.	.	.	+1	.	I
Th	*Vicia sativa*	.	.	.	.	.	.	.	.	+1	.	I

altitude of 20 to 85 m. The general coverage ranged between 60-95%. *Phillyrea latifolia*, *Arbutus unedo*, *Erica arborea* and *Cistus creticus* were dominant in the plant physiognomy (Table 2). The soil samples collected from the study area were slightly acidic, rich in P_2O_5, K_2O and organic matter content. The soil type in which the association grew was clay loamy, salt-free and poor in lime (Table 3). The largest groups of life forms were phanerophytes (37.21%) and therophytes (34.88%). The percentage of other life forms were as follows: geophytes (16.28%), chamaephytes (6.98%) and hemicryptophytes (4.65%) in this association (Table 2).

There were many types of *P. brutia* associations having different codominant species in Turkey (Akman *et al*., 1978, 1998; Akman and Ekim, 1988; Kutbay and Kılınç 1995; Vural *et al*., 1995; Ayaşlıgil, 1987; Ekim and Akman, 1990; Karaer *et al*., 1999, 2010; Varol and Tatlı, 2001; Yurdakulol *et al*., 2002; Varol *et al*., 2006; Şık and Gemici, 2009; Aksoy and Gemici, 2010; Öner and Akbin, 2010). Floristic resemblances of these associations varied between 8.25-23.91% and the highest resemblance was noticed in the reports of Aksoy and Gemici, (2010) (Table 4). Till date, 15 different *P. brutia* associations have been identified. The distribution zones of *P. brutia* were quite different due to different climatic and edaphic features (Ketenoğlu *et al*., 2010). The syntaxonomic explanations of *P. brutia* associations were quite difficult because they included various syntaxa units (Karaer *et al*., 1999; Varol *et al*., 2006). *Quercetea* (etalia) *ilicis* class and order were well represented under *P. brutia* forest in the study area. Therefore, it should be considered in the syntaxa cited above. In this work, community of *P. brutia* was included in *Phillyreo latifoliae - Pinetum brutiae* association due to the resemblance of dominant and character species with the association.

There are many types of *P. latifolia* associations having different codominant species in Turkey (Quézel *et al*., 1980; Ketenoğlu *et al*., 1983; Kutbay and Kılınç, 1995; Özen, 2010; Altay *et al*., 2012). Floristic resemblance of the associations varied between 17.65 and 26.79% and the highest resemblance was observed with that of Özen (2010) (Table 4). Additionally, five different associations of *P. latifolia* have been identified till now (Ketenoğlu *et al*., 2010; Özen, 2010; Altay *et al*., 2012). This association (*Arbuto unedonis - Phillyretum latifoliae* ass.nova) has been found as a new association in terms of both low resemblance ratio and differentiation of character species with other associations. Since, *Arbuto unedonis - Phillyretum latifoliae*

Table 2 : *Arbuto unedonis-Phillyretum latifoliae* ass. nova (*Holotypus Quadrat number: 9)

Life Form	Quadrate number	1	2	8	9*	10	11	14	15	Presence
	Size (m^2 x 100)	1	1	1	1	1	1	1	1	
	Altitude (m)	80	85	50	70	70	70	20	70	
	Direction	W	NW	SE	SE	SE	W	SW	S	
	Inclination (°)	40	30	35	35	35	50	30	40	
	Main Rock	Q	U	A	R	T	Z			
	Total cover (%)	90	95	60	60	60	80	90	70	
	Characteristic species of the association									
Ph	*Phillyrea latifolia*	43	44	44	44	44	33	43	22	V
Ph	*Arbutus unedo*	22	33	33	33	23	33	.	34	V
	Characteristic species of the *Quercion ilicis* (*) Alliance, *Quercetalia (etea) ilicis* Order and Class									
G	**Asparagus acutifolius*	12	22	12	22	+2	22	12	22	V
Ph	*Erica arborea*	11	22	22	22	22	33	.	22	V
Ph	*Smilax excelsa*	+1	+1	+1	+2	+2	+2	.	.	IV
Ph	*Juniperus oxycedrus* subsp. *oxycedrus*	12	12	.	11	.	11	.	.	III
Th	*Geranium purpureum*	+1	+2	.	+1	.	.	.	+1	III
Ph	**Quercus coccifera*	.	23	.	23	.	33	.	23	III
Ph	**Jasminum fruticans*	.	.	12	22	22	.	.	.	II
Ph	*Cupressus sempervirens*	.	.	12	12	.	.	.	.	II
G	*Ruscus aculeatus*	.	.	.	+1	.	+1	.	.	II
Ph	*Laurus nobilis*	.	.	.	.	.	+2	.	.	I
Ph	*Calicotome villosa*	.	.	.	.	.	.	23	.	I
	Characteristic species of the *Oleo-Ceratonion* (*) Alliance and *Pistacio-Rhamnetalia alaterni* Order									
H	*Rubia peregrina*	+1	+1	+2	+2	.	+2	+2	+2	V
Ph	**Olea europaea*	11	12	12	12	22	.	.	.	IV
Ph	*Pistacia lentiscus*	.	22	12	.	.	22	12	.	III
Ph	**Clematis cirrhosa*	.	.	.	+1	11	.	.	+1	II
	Characteristic species of the *Cisto-Micromerietea* Class									
Ph	*Cistus creticus*	22	33	12	12	33	33	22	.	V
Ch	*Lavandula stoechas*	.	+2	.	+2	.	+2	12	.	III
	Companions									
Th	*Myosotis ramosissima*	+1	+2	+1	+2	.	+2	.	+2	IV
G	*Muscari neglectum*	.	+2	+2	+1	+1	.	+1	+1	IV
Th	*Avena barbata*	.	.	+2	+2	+1	.	+1	.	III
G	*Poa bulbosa*	+2	+2	+2	.	.	.	.	.	II
Ch	*Sedum hispanicum*	+1	+1	.	.	.	.	+2	.	II
H	*Dactylis glomerata*	+2	+2	.	+2	.	.	.	.	II
Th	*Anagallis arvensis*	+1	.	+2	.	.	.	.	+2	II
Ph	*Lonicera etrusca* var. *etrusca*	.	.	.	.	.	+2	+1	+2	II
G	*Ranunculus ficaria*	+1	+1	.	.	.	.	.	.	II
Ch	*Umbilicus rupestris*	+1	.	+2	.	.	.	.	.	II
Th	*Filago pyramidata*	.	.	+2	.	.	.	+2	.	II
Th	*Trifolium campestre*	.	.	+2	.	.	.	+2	.	II
G	*Allium ampleoprasum*	.	.	+1	.	.	.	+1	.	II
Th	*Vicia hybrida*	+1	.	.	.	.	.	.	.	I
Th	*Euphorbia falcata*	.	+1	.	.	.	.	.	.	I
G	*Ornithogalum comosum*	.	+2	.	.	.	.	.	.	I
Th	*Veronica cymbalaria*	.	+1	.	.	.	.	.	.	I
Th	*Cynosurus echinatus*	.	.	+2	.	.	.	.	.	I
Th	*Trifolium nigrescens*	.	.	+1	.	.	.	.	.	I
Ph	*Ephedra campylopoda*	.	.	+2	.	.	.	.	.	I
Th	*Silene compacta*	.	.	+1	.	.	.	.	.	I
Th	*Capsella bursa-pastoris*	.	.	+1	.	.	.	.	.	I
Th	*Hordeum murinum*	.	.	+1	.	.	.	.	.	I
Th	*Cerastium semidecandrum*	.	.	.	.	.	.	+1	.	I

Table 3 : Soil characteristics of the sampled plots, where plant associations are distributed

	Phillyreo latifoliae-Pinetum brutiae	*Arbuto unedonis-Phillyretum latifolia*
Saturation (%)	85	60
pH	6.34	6.40
$CaCO_3$ (%)	1.20	1.00
Organic matter (%)	14.92	6.82
P_2O_5 (kg da^{-1})	26.65	20.60
K_2O (kg da^{-1})	163.15	187.20
Salt (%)	0.0625	0.086

Table 4 : The associations were compared with those in similar studies by using Sorensen's (1948) similarity (%) formula

	Phillyreo latifoliae-Pinetum brutiae	*Arbuto unedonis-Phillyretum latifolia*
Akman *et al.* (1978)	17.85	-
Quézel *et al.* (1980)	-	20
Ketenoğlu *et al.* (1983)	-	18.82
Ayaşlıgil (1987)	12.65	-
Akman and Ekim (1988)	17.72	-
Ekim and Akman (1990)	8.25	-
Kutbay and Kilinç (1995)	13.67	17.65
Vural *et al.* (1995)	22.38	-
Akman *et al.* (1998)	19.67	-
Karaer *et al.* (1999)	12.50	-
Varol and Tatli(2001)	17.89	-
Yurdakulol *et al.* (2002)	16.79	-
Varol *et al.* (2006)	9.00	-
Aksoy and Gemici (2010)	23.91	-
Karaer *et al.* (2010)	10.94	-
Öner and Akbin (2010)	21.35	-
Özen (2010)	-	26.79
Şık and Gemici (2009)	17.20	-
Altay *et al.* (2012)	-	25.37

ass. nova was the character species of *Quercetea ilicis* class, *Quercetalia ilicis* order and *Quercion ilicis* alliance, it was included in these syntaxa units.

The soil analysis showed that both associations preferred similar soil characteristics although little difference were noted. While *Phillyreo latifoliae - Pinetum brutiae* preferred mostly clay soil, *Arbuto unedonis - Phillyretum latifoliae* ass. nova preferred clay loamy soil.

In Heybeliada, there is a naval school inside the forest and therefore, *Phillyreo latifoliae-Pinetum brutiae* association is being largely protected. Nevertheless, severe destructions of vegetation were seen in other islands of the archipelago. One such incidence was fire in Burgazada in September 2003. Due to fire, a large part of *P. brutia* forest was lost. Post fire, rejuvenation of the area by seedlings of *Cistus creticus, Pistacia terebinthus, Phillyrea latifolia, Quercus coccifera* with invasive plant *Ailanthus altissima* was observed. At the same time, plantation of *Pinus* sp., *Cercis siliquastrum*, *Platanus orientalis* and *Robinia pseudoacacia* seedlings was performed by the foresters in the burnt forest parts. *P. brutia* forests were resistant to drought (Neyişçi, 1993; Başlar *et al.*, 2009; Doğan *et al.*, 2010; Öztürk *et al.*, 2010; Atalay and Efe, 2010). The burnt area could be recovered by planting *P. brutia* relatively in a short time, if the area was well treated after the fire (Atalay and Efe, 2010). Dramatically, the burnt areas were used for the construction of illegal summer houses in Burgazada.

Because of human activities such as full time residents, summer residents as well as people visiting for daily touristic purposes, the natural vegetation in the islands is under deforestation pressure. *Phillyreo latifoliae - Pinetum brutiae* and *Arbuto unedonis - Phillyretum latifoliae* ass. nova associations from maquis vegetation were being degraded here due to anthropogenic activities. Additionally, a large number of carts and coaches are a great attraction for tourists, especially in Büyükada. Thus, nearly 1000 horses graze on the grasslands and destroy the herbaceous vegetation.

A great number of *Pinus brutia* trees have been cut and besides forest flora, most of the habitats other than forests have vanished. The typical maquis representatives like *P. latifolia* and *Calicotome villosa* were once densely distributed in the archipelago but today, these species are rarely distributed due to destruction. These habitats have been occupied by *Lagurus ovatus*. The *P. brutia* trees along the roadside showed a degenerated appearance. The roadside flora was dominated by *Urtica dioica*, *Malva sylvestris, Hordeum murinum*, *Rubus sanctus*, *Ficus carica, Convolvulus arvensis, Ballota nigra* and *Xanthium spinosum*.

The islands and peninsulas all over the world have always attracted the scientists from various disciplines (Oflas and Öztürk, 1987). They have always been a source of fascination and inspiration for bio-geographers, as they show interesting patterns of colonization, adaptation, and speciation. There is a strong need for sanctions by the local municipal authorities in order to save the vegetation of these islands and to overcome the negative effects, and attempts should be taken to make people conscious about the problem.

Acknowledgment

Our special thanks go to Assist. Prof. Dr. Ilhan Doğan from Izmir Institute of Technology, Department of Molecular Biology and Genetics, for checking the language of the manuscript.

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