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FERGAN KARAER

MAHMUT KILINÇ

H. GÜRAY KUTBAY

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## The Woody Vegetation of the Kelkit Valley

Fergan KARAER

Ondokuz Mayıs University Faculty of Education Department of Sciences  
05100, Amasya-TURKEY

Mahmut KILINÇ, H. Güray KUTBAY

Ondokuz Mayıs University Faculty of Arts and Sciences Department of Biology  
55139 Kurupelit, Samsun-TURKEY

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**Abstract:** In this work, the forest, macchie and hygrophilous vegetation of Kelkit Valley was studied. Interestingly the study area is a transitional zone along the boundaries of Central Anatolia and the Central and East Black Sea regions. From the phytogeographical point of view this area is situated between the Euro-Siberian and Irano-Turanian floristic regions. This study was carried out according to the Braun-Blanquet method. Twelve plant associations and 2 subassociations were identified belonging to four different vegetation types. Ten of the associations and two subassociations here are determined as new associations. Vegetation tables are given.

**Key Words:** Vegetation, Kelkit Valley, Tokat, Sivas, Turkey

### Kelkit Vadisinin Odunsu Vejetasyonu

**Özet:** Bu çalışmada, Kelkit Vadisinin orman, maki ve higrofil vejetasyonu araştırıldı. Araştırma alanı coğrafik olarak İç Anadolu ile Orta ve Doğu Karadeniz, bitki coğrafyası bakımından ise Avrupa-Sibirya ve İran-Turan floristik bölgeleri arasında bir geçit alanında bulunmaktadır. Alanın vejetasyonu Braun-Blanquet metoduna göre araştırılarak sınıflandırılmış ve dört farklı vejetasyon tipine ait 12 bitki birliği ile iki alt birlik tespit edilmiştir. Bunlardan on birlik ile iki alt birlik bilim dünyası için yenidir. Vejetasyon tabloları verilmiştir.

**Anahtar Sözcükler:** Vejetasyon, Kelkit Vadisi, Tokat, Sivas, Türkiye.

### Introduction

Kelkit Valley is a transitional zone between Central Anatolia and the Middle and East Black Sea regions geographically. Moreover it is a transitional zone between the Euro-Siberian and Irano-Turanian phytogeographic regions. Such transition zones have interesting properties, due to the mixing of oceanic and continental climates. This situation is clearly reflected in the vegetation of the study area. Local Mediterranean climates are seen in the region. Mediterranean enclaves are widespread in the study area where they are dominant. There has been no study so far on the vegetation of Kelkit Valley. For the reasons given above, Kelkit Valley was chosen as the study area.

Kelkit Valley is the most northern point and the longest valley of the Yeşilirmak Basin (246 km) which is situated on the boundary of the Tokat and Sivas provinces (Figure 1). Kelkit Valley starts from the Giresun Mountains and lies in an east-west direction along the Yeşilirmak Mountain and Canik mountains which constitute the northern and southern slopes of the valley.

The mean altitudes of these mountains are between 1400 and 1500m. At the bottom of the valley there is a clear decrease in height in an east-west direction. The altitude is about 650 m in Koyulhisar, 450 m in Reşadiye, 350 m in Niksar and 280 m in Erbaa.

Kelkit Valley has a complex geological structure because it contains the Northern Anatolian Fault and it has a border between the Northern and Middle Anatolia tectonic units. The geological structure of the research area mostly contains limestone and volcanic rocks belonging to the Cretaceous and Tertiary flysches. However there are limestone and volcanic rocks in the southern slopes of the valley and flysch formation which causes erosion on the northern slopes of the valley. In addition travertine and alluvial occur on the bottom of the valley (1), there are six large soil groups in the study area namely brown forest soils, noncalcareous brown forest soils, chestnut soils, alluvial soils and grey brown podzolic soils. The most widespread of these is brown forest soils (2).

The climatic characteristics of the area were estimated

Table 1. Bioclimatic and Climatic data of the study area

Meteorological station	Alt. (m)	P (mm)	M	m	Q	PE	S	Pre. reg.	Bioclimatic
Erbaa	230	585.5	31.0	0.5	66.4	91.1	2.9	S'WAS	Semihumid cool
Niksar	350	508.9	30.0	0.8	60.4	67.7	2.2	S'WAS	Semiarid cool
Reşadiye	450	458.6	29.4	-0.5	52.2	65.0	2.2	S'WAS	Semiarid cold
Koyulhisar	800	406.0	28.7	-2.0	46.1	52.2	1.5	S'WAS	Semiarid cold

P(mm): Mean annual precipitation

M(°C): Mean maximum for the hottest month

m(°C): Mean minimum for the coldest month

S': Spring, W: Winter, A: Autumn, S: Summer.

Q: Pluviometric quotient  $Q = 2000 \times P / M^2 - m^2$

PE: Summer rainfall

S: Emberger's index of xericity  $S = PE / M$

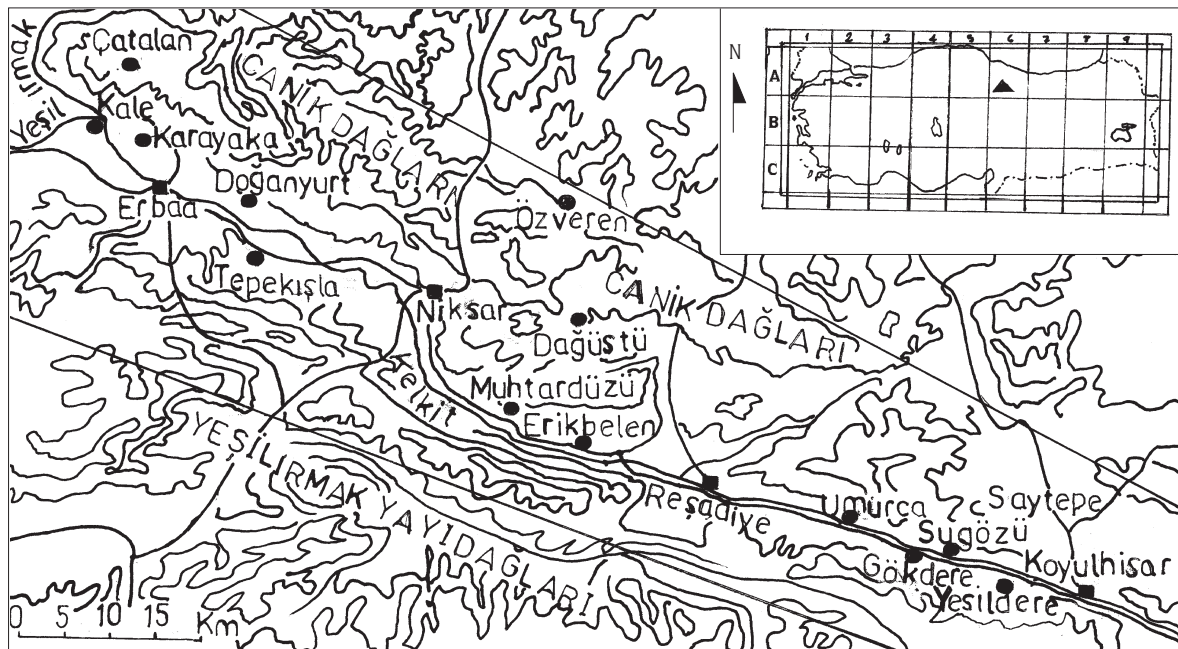


Figure 1. Map of study area

according to data from the Erbaa, Niksar, Reşadiye and Koyulhisar meteorological stations (3). Mediterranean climate is seen in the study area along the valley between 300 and 900 m. But at the upper part of the valley, the effect of Mediterranean climate starts decreasing and oceanic climate becomes dominant. "Semihumid cool Mediterranean", "Semiarid cool Mediterranean", "Semiarid cold Mediterranean", climates are seen in Erbaa, Niksar, Reşadiye and Koyulhisar respectively according to the method of Emberger (4). In addition, the effect of the climate decreases from west to east and becomes continental climate (Table 1). The total annual rainfall decreases around Reşadiye and Koyulhisar. The

precipitation regime in the study area is East Mediterranean Type 2 (SWAS). As seen in the climatic diagrams, which were drawn by Walter's method (5), an arid period was observed between the sixth and ninth months (Figure 2). A frost period was observed in the first month in Reşadiye and in the first, second, third and twelfth months in Koyulhisar. However there is no frost period in Erbaa and Niksar.

### Materials and Methods

The material consisted of plant specimens which were collected during 1990-1993 and identified with the help

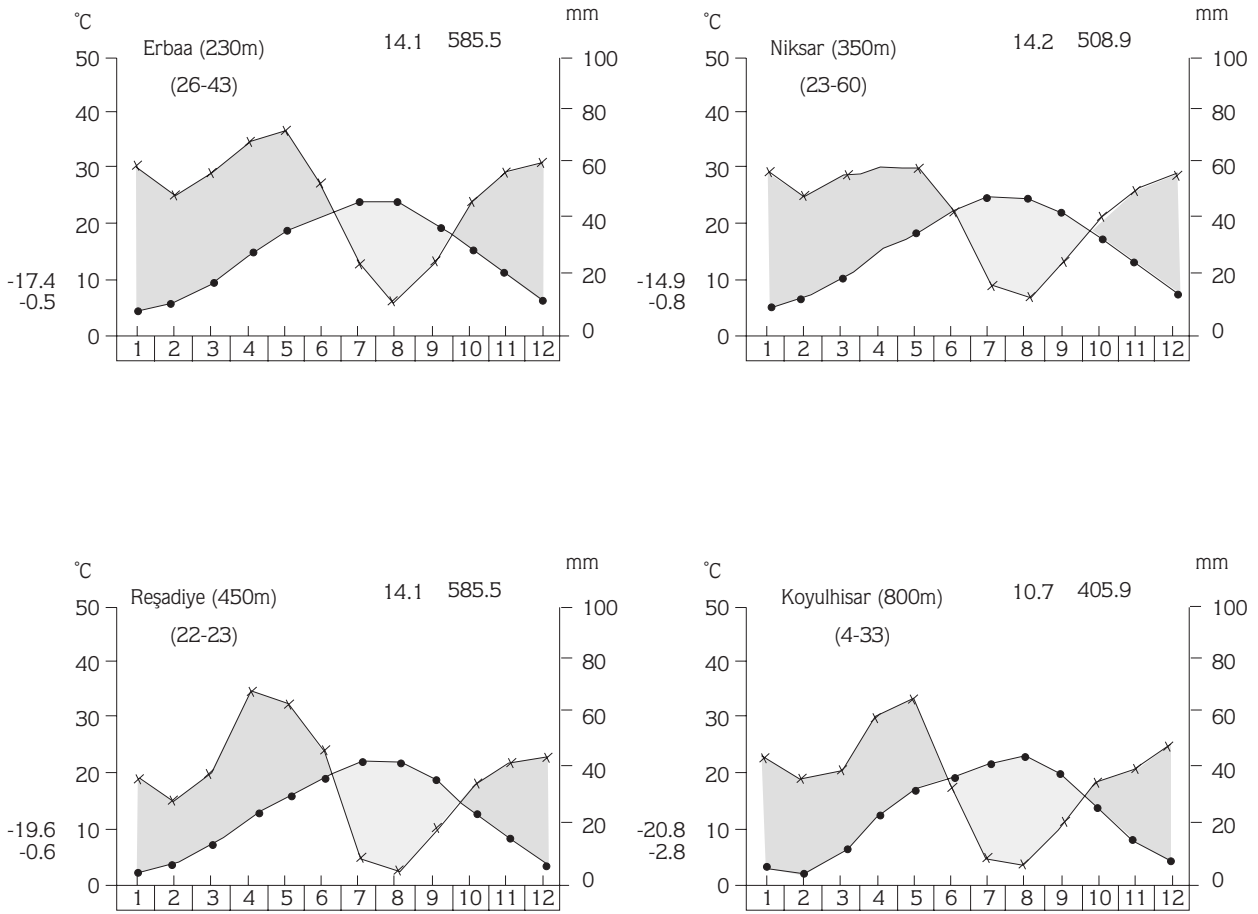


Figure 2. Climatic diagrams of Erbaa, Niksar, Reşadiye and Koyulhisar.

of the Flora of Turkey (6). Taxonomic nomenclature followed that of Flora of Turkey. Plant specimens were kept at the herbarium of Ondokuz Mayıs University (OMUB). The vegetation studies were carried out according to the Braun-Blanquet method (7). One hundred and ninety-five quadrats were chosen and the vegetation of the study area was classified according to the differential and characteristic species. During the classification of the vegetation the studies of Kılınç, Karaer and Özen (8), Kutbay and Kılınç (9), Özen and Kılınç (10), Akman et al. (11-13), Kılınç (14), Quezel et al. (15), Uslu (16), Akman and Ekim (17), Ekim and Akman (18), Gemici (19), Ocakverdi (20), Bekat (21) and Quezel et al. (22) were used widely. The associations were compared with similar studies with Sorensen's similarity (23) formula. The plant associations were named and classified according to the Syntaxonomic Nomenclature Rules (24).

## Vegetation

There are four vegetation types in the study area namely forest, macchie, degraded forest and hygrophilous. Vegetation is stratified from the bottom of the valley to the slopes. Altitude, direction, topography, temperature and precipitation play an important role in stratification. Macchie vegetation is found in the area as Mediterranean enclaves because of the destruction of *Pinus brutia* Ten. forest. Macchie vegetation usually occurs on south-facing slopes of the area around Erbaa and Reşadiye and the bottom of the valley. The characteristic species of macchie vegetation are *Quercus coccifera* L., *Olea europea* L. var. *sylvestris*, *Arbutus andrachne* L., *Phillyrea latifolia* L., *Fontanesia philiraeoides* Labil. subsp. *philliraeoides*, *Cistus creticus* L., *Thymra spicata* L. var. *spicata*, *Clematis flammula* L. and *Styrax officinalis* L.. *Pinus brutia* is part of macchie vegetation in some parts of the area. Forest vegetation is the most widespread vegetation type in the area and

occurs between 350 and 1450 m. Forest vegetation includes *Pinus brutia*, *Pinus nigra* Arn. subsp. *pallasiana* (Lamb.) Holmboe, *Pinus sylvestris* and *Fagus orientalis* Lipsky forests. Degraded forest vegetation is especially widespread in the northern-exposed slopes of the area and includes *Quercus pubescens* Willd., *Quercus cerris* L. var. *cerris* and *Juniperus excelsa* Bieb. forests formed as a result of the destruction of *Pinus brutia*, *Pinus nigra* subsp. *pallasiana* and *Pinus sylvestris* forests. Hygrophilous vegetation is widespread along the edge of Kelkit River around Erbaa and Koyulhisar. The characteristic species of hygrophilous vegetation are *Vitex agnus-castus* L., *Tamarix symrnensis* Bunge, *Elaeagnus angustifolia* L., *Periploca graeca* L. var. *graeca*.

### Macchie vegetation

#### 1. Siderito dichotomae-Quercetum cocciferae Karaer, Kılınç & Kutbay ass. nov. (Table 2)

This association (Holotype table 2, quadrat number 1) is widespread located on the south-facing slopes (350-800m) between Erbaa and Niksar (Kelkit Valley) and calcareous parent rock. Characteristic and differential species of this association are *Quercus coccifera*, *Sideritis dichotoma* Huter, *Fumana thymifolia* (L.) Verlot. and *Phillyrea latifolia*. This association exhibits two vegetation layers namely shrub and herb layers. Total coverage of the shrub layer varies between 80 and 90% and 0.5 and 3 m in height. The most common species in the shrub layer are *Quercus coccifera*, *Juniperus oxycedrus* L. subsp. *oxycedrus*, *Pistacia terebinthus* L. subsp. *palaestina* (Boiss) Engler, *Cotinus coggyria* Scop, *Cistus creticus*, *Jasminum fruticans* L. and *Phillyrea latifolia*. Total coverage and height of the herb layer is 25 and 40% and 40 and 50 cm respectively. The most common species in the herb layer are *Silene dichotoma* Ehr., *Ruscus aculeatus* L., *Micromeria myrtifolia* Boiss. & Hohen, *Fumana thymifolia*, *Euphorbia rigida* Bieb., *Salvia tomentosa* Miller. In damaged parts of the association steppic species are seen such as *Chrysopogon gryllus* (L.) Trin. subsp. *gryllus*, *Globularia trichosantha* Fishc. & Mey., *Ziziphora capitata* L., *Teucrium polium* L.. This association includes different species belonging to different syntaxonomical units (Table 2). QUERCETEA (ETALIA) ILICIS, class is represented by *Arbutus unedo*, *Rubia tenuifolia* d.Urv., *Pistacia terenbinthus* subsp. *palaestina*, *Arbutus andrachne*, *Thymbra spicata* var. *spicata*, *Ruscus aculeatus*, *Juniperus oxycedrus* subsp. *oxycedrus*, *Putoria calabrica* (L.fil.) DC, *Quercus infectoria* Olivier subsp. *boissieri* (Reuter) O. Schwarz and *Euphorbia rigida*. In degraded parts some species

belonging to CISTO-MICROMERIETEA class are seen such as *Cistus creticus*, *Fumana arabica* (L.) Spach., *Salvia tomentosa*, *Psoralea bituminosa* L., *Micromeria myrtifolia*. This association is considered in QUERCETEA (ETALIA) ILICIS, class because most of the species of the association belong to that syntaxa. This association is spread on calcareous parent rock and brown forest soils and it is the most important association belonging to macchie vegetation. *Quercus coccifera* can be included with other species because of its high reproductivity. As a result of destruction it can readily spread. This association plays an important role of the protection of soil (16).

#### Cotino coggyriae-Arbutetum andrachnes Karaer, Kılınç & Kutbay ass. nov. (Table 3)

This association (Holotype table 3, quadrat number 135) usually occurs on the south-facing slopes around Erbaa (Çatalan village) and Niksar (Erikbelen and Muhtar-düzü villages). This association is spread on calcareous parent rock and brown forest soils and it is formed by the destruction of *Pinus brutia* forests. Thus as a result of a large fire in 1972 around the western part of Erikbelen village (Niksar) *Pinus brutia* forests were destroyed and *Arbutus andrachne* was scattered. Characteristic and differential species of this association are *Arbutus andrachne*, *Cotinus coggyria* Scop. This association consists of two vegetation layers physiologically, namely shrub and herb layers. Total coverage of the shrub layer varies between 80 and 90% and 0.5 and 3 m in height. The shrub layer includes *Arbutus andrachne*, *Cotinus coggyria*, *Pistacia terebinthus* subsp. *palaestina*, *Phillyrea latifolia*, *Jasminum fruticans*, *Thymbra spicata* var. *spicata* and the herb layer includes *Origanum vulgare* L. subsp. *viride* (L.) Hayek, *Dorycnium graecum* (L.) Ser., *Psoralea bituminosae*, *Micromeria myrtifolia*, *Hedysarum varium* Willd., *Fumana arabica*, *Linum hirsutum* L., *Salvia tomentosa*. QUERCETEA (ETALIA) ILICIS and CISTO-MICROMERIETEA classes are represented by *Phillyrea latifolia*, *Pinus brutia*, *Jasminum fruticans*, *Anarrhinum orientale* Bentham, *Thymbra spicata* var. *spicata*, *Rubia tenuifolia*, *Salvia tomentosa*, *Origanum vulgare* subsp. *viride*, *Micromeria myrtifolia*, *Cistus creticus*, *Psoralea bituminosa* and *Fumana arabica* respectively. The species belonging to ASTRAGALO-BROMETEA and QUERCETEA PUBESCENTIS classes are shown in table 3. The components of QUERCETEA (ETALIA) ILICIS are represented quite well physiologically therefore this association should be considered in the syntaxa cited above.

Table 2. Siderito dichotomae-Quercetum cocciferae Karaer et al., ass. nov.

Quadrat No	1	2	3	4	5	6	7	71	73	75	76	77		
Size of quadrat (m2)	400	400	400	400	400	400	400	400	400	400	400	400		
Altitude (m)	450	470	400	400	450	430	500	350	400	450	450	350		
Exposure	S	S	S	S	S	SW	SW	SW	S	S	S	S		
Inclination (%)	20	25	30	30	20	40	40	40	30	40	30	40		
Height of the shrub layer (m)	2	2	2	3	3	2	3	2	3	2	2	2		
Coverage of the shrub layer (%)	90	80	90	80	80	80	80	90	85	90	80	80		
Height of the herb layer (m)	40	30	30	40	40	40	40	30	40	40	40	40		
Coverage of the herb layer (%)	40	40	30	40	40	30	30	25	40	40	30	40	*	**
Characteristic and differential species of the association														
<i>Quercus coccifera</i>	54	43	54	43	44	44	44	54	43	44	44	43	100	v
<i>Phillyrea latifolia</i>	11	22	11	22	11	11	11	+1	11	-	11	22	92	v
<i>Sideritis dichotoma</i>	12	+2	+1	+2	+2	-	12	-	-	+2	-	12	67	iv
<i>Fumana tymifolia</i>	+1	-	+1	11	-	-	+1	+1	11	-	+1	11	67	iv
Characteristic species of QUERCETEA (ETALIA) ILICIS														
<i>Pistacia terebinthus</i>	+1	11	11	+1	+1	+1	+1	+1	+1	+1	+1	+1	100	v
<i>Thymra spicata</i> var. <i>spicata</i>	+2	+2	+2	-	-	-	+2	-	-	+2	+2	+2	58	iii
<i>Quercus infectoria</i> subsp. <i>boissieri</i>	-	+2	-	-	-	+2	+2	-	-	+2	-	-	39	ii
<i>Euphorbia rigida</i>	+1	+1	+1	-	+1	-	-	-	+1	-	-	-	33	ii
<i>Jasminum fruticans</i>	-	-	-	+1	-	-	-	+1	-	+1	-	+1	33	ii
<i>Ruscus aculeatus</i>	+2	-	-	-	-	-	+2	-	-	-	+2	-	25	ii
<i>Arbutus andrachne</i>	+1	-	+1	-	-	-	-	-	-	-	-	+1	25	ii
<i>Putoria calabrica</i>	-	-	-	-	-	12	-	-	+2	-	-	-	16	ii
<i>Arbutus unedo</i>	-	-	-	-	-	-	-	+1	+1	-	-	-	16	ii
<i>Rubia tenuifolia</i>	-	-	-	-	-	-	+1	-	-	-	+1	-	16	ii
Characteristic species of CISTO-MICROMERIETAE														
<i>Cistus creticus</i>	+2	12	+2	+2	-	+2	-	+2	-	-	+2	+2	67	iv
<i>Salvia tomentosa</i>	+1	-	+1	-	-	-	+1	+1	+1	+1	+1	+1	67	iv
<i>Psoralea bituminosa</i>	+1	+1	+1	-	+1	+1	-	-	+1	+1	+1	-	67	iv
<i>Micromeria myrtifolia</i>	+1	+1	+1	-	-	-	+1	-	-	-	+1	+1	50	iii
<i>Fumana arabica</i>	+1	-	-	-	-	+1	-	-	+1	-	-	-	25	ii
Characteristic species of QUERCO-CEDRETALIA LIBANI and QUERCETEA PUBESCENTIS														
<i>Juniperus oxycedrus</i>	+2	-	+2	-	+2	+2	+2	-	-	+2	-	+2	58	iii
(*) <i>Dorycnium pentaphyllum</i>	-	+2	-	-	-	-	+2	-	+2	+2	+2	-	42	iii
(*) <i>Cotoneaster nummularia</i>	-	+1	+1	-	-	-	-	+1	-	-	-	-	25	ii
(*) <i>Alyssum strigosum</i>	+1	-	-	+1	-	+1	-	-	-	-	+1	-	25	ii
<i>Polygala supina</i>	-	+1	-	-	-	-	+1	-	+1	-	-	-	25	ii
<i>Cotinus coggyrea</i>	-	-	-	-	-	-	-	+1	-	-	+1	-	21	ii
<i>Quercus cerris</i> var. <i>cerris</i>	+1	-	-	-	+1	-	-	-	-	-	-	-	16	i
<i>Colutea cilicica</i>	+1	-	-	-	+1	-	-	-	-	-	-	-	16	ii
<i>Coronilla scripoides</i>	-	-	-	-	-	-	+1	-	-	-	-	-	16	i
Characteristic species of ASTRAGALO-BROMETEA														
<i>Ziziphora capitata</i>	+1	+1	+1	+1	-	+1	-	-	+1	+1	-	+1	67	iv
<i>Teucrium polium</i>	-	+1	+2	+2	-	-	+2	+2	+2	+2	-	+2	67	iv
<i>Globularia trichosantha</i>	+1	+1	-	-	+1	+1	+1	-	+1	+1	+1	-	67	iv
<i>Cryosopogon gryllus</i> ssp. <i>gryllus</i>	+1	-	+1	+1	-	+1	-	+1	-	+1	+1	+1	67	iv
<i>Veronica multifida</i>	-	+2	-	-	+1	+1	-	-	+2	+2	+2	+2	58	iii
<i>Helianthemum salicifolium</i>	+1	+1	+1	-	+1	+1	-	+1	-	-	-	-	50	iii
<i>Koeleria cristata</i>	-	-	+1	-	+1	-	-	+1	-	+1	+1	-	42	iii
<i>Teucrium chamaedrys</i>	-	+1	-	+1	-	-	+1	-	-	-	+1	-	33	ii
<i>Linum hirsutum</i> subsp. <i>anatolicum</i>	+1	-	-	+1	+1	-	-	-	+1	-	-	-	33	ii
<i>Hypericum origanifolium</i>	-	+1	-	-	-	-	+1	-	-	-	+1	+1	33	ii
<i>Onosma armena</i>	-	-	-	+1	+1	-	-	+1	-	-	+1	-	33	ii
<i>Sangiosorbo minor</i>	-	-	+1	-	-	-	-	+1	-	+1	-	-	25	ii
<i>Centaurea triumfetti</i>	-	-	-	-	-	-	-	-	+1	+1	+1	-	25	ii
<i>Helianthemum nummularium</i>	-	-	-	-	-	+1	-	-	-	+1	-	-	16	i
<i>Convolvulus cantabica</i>	+1	+1	-	+1	-	+1	+1	+1	+1	-	+1	-	67	i
<i>Crucianella bithynica</i>	+1	-	+1	+1	-	-	+1	-	+1	+1	+1	+1	67	i
<i>Dactylis glomerata</i>	-	-	+1	+1	-	-	+1	+1	+1	-	+1	-	50	ii
<i>Muscari aucheri</i>	+1	+1	-	-	-	-	+1	+1	+1	+1	-	-	50	ii
<i>Vincetoxicum fuscum</i> subsp. <i>boissieri</i>	-	-	-	-	+1	12	-	+2	+2	+2	-	+2	50	ii
<i>Thesium billardieri</i>	+1	+1	+1	+1	-	+1	-	-	-	-	-	-	42	ii

Table 2. continued

Scabiosa columbaria	-	-	-	-	-	-	-	+1	+1	+1	+1	-	33	II
Johrenia tortuosa	-	+1	-	+1	-	+1	-	+1	-	-	-	-	33	II
Silene otites	-	-	-	-	+1	-	-	-	+1	-	+1	+1	33	II
Dianthus orientalis	-	+2	-	+2	+2	-	-	-	-	-	-	-	25	II
Scutellaria salviifolia	+1	-	+1	-	-	-	-	-	+1	-	-	-	25	II
Medicago xvaria	-	+1	-	-	-	-	-	+1	+1	-	-	-	25	II
Pteroccephalus plumosus	+1	-	-	-	-	+1	-	-	-	-	+1	-	25	II
Crepis alpina	+1	-	+1	-	-	+1	-	-	-	-	-	-	25	II
Trifolium campestre	-	+1	-	-	-	-	-	+1	-	+1	-	-	25	II
Galium margaceum	-	-	-	+1	-	-	+1	+1	-	-	-	-	25	II
Crepis foetida	+1	-	-	-	-	-	-	-	-	-	+1	-	25	II
Digitaria sanguinea	+1	-	-	-	-	-	-	-	-	-	+1	-	25	I
Legosia falcata	-	-	+1	-	-	-	+1	-	-	-	-	-	25	I
Andrachne telephioides	+1	-	-	-	-	-	-	-	-	-	-	+1	25	I
Steptorhamphus tuberosus	-	-	-	-	+1	-	-	-	-	+1	-	-	25	I
Rostaria cristata	-	-	-	-	-	-	-	+1	-	-	-	+1	25	I
Medicago minima	-	-	-	+1	-	+1	-	-	-	-	-	-	25	I

\*: Frequency \*\*: Presence

**Paliuro spinae-christi-Fontanesietum philliraeoidis** Karaer, Kiliç & Kutbay ass. nov. (Table 4).

This association (Holotype table 4, quadrat number 28) is locally widespread around Ağcageçe and İverönü villages (Erbaa) between 300 and 350 m. The characteristic species are *Fontanesia phillireoides* subsp. *phillireoides*, *Paliurus spina-christi* Miller, *Ruscus aculeatus*, *Nigella nigellastrum* (L.) Willk & Lange. It usually occurs on chestnut soils. This association comprises shrub and herb layers having a total coverage of 60 and 85% and 10 and 40% respectively. The height of the shrub and herb layers are 2 and 3 m and 20 and 40 cm respectively. The shrub layer is represented by *Fontanesia phillireoides* subsp. *phillireoides*, *Quercus infectoria* subsp. *infectoria*, *Crataegus monogyna* Jacq. *Paliurus spina-christi*, *Jasminum fruticans*, *Carpinus orientalis* Miller. The most common species in the herb layer are *Geranium molle* subsp. *molle*, *Coronilla scropioides* (L.) Koch, *moehringia trinervia* (L.) Clavier, *Crepis alpina* L., *Teucrium polium*, *Medicago minima* (L.) Bart. It consists of the characteristic species of QUERCETEA (ETALIA) ILICIS, QUERCETEA PUBESCENTIS, QUERCO-FAGETEA and ASTRAGALO-BROMETEA syntaxa. The most common species of QUERCETEA (ETALIA) ILICIS are *Thymbra spicata* var. *spicata*, *Salvia tomentosa*, *Jasminum fruticans*, *Origanum vulgare* subsp. *viride*, *Pistacia terebinthus* subsp. *palaestina*, *Anarrhinum orientale*. QUERCETEA PUBESCENTIS is represented by *Crataegus monogyna*, *Juniperus oxycedrus* subsp. *oxycedrus*, *Acinos rotundifolia* Pers., *Cephalanthera rubra*, *Alyssum strigosum* Banks & Sol, *Coronilla scropioides*, QUERCO-FAGETEA includes *Lapsana communis* L. subsp.

*intermedia*, (Bieb) Hayek, *Agrimonia eupatoria* L., *Moehringia trinervia*. The floristic composition of the association usually changes owing to the destruction of *Paliurus spina-christi* and *Fontanesia philliraeoides* subsp. *phillireoides*. Thus the high representation of ASTRAGALO-BROMETEA supports that fact. This association includes various species belonging to various syntaxa units. But it should be considered in the QUERCETEA (ETALIA) ILICIS class because of the high representation of the species belonging to that syntaxa physiologically (Table 4).

#### Forest vegetation

**Querco infectoriae-Pinetum brutiae** Quezel, et al. 1980, (Table 5)

*Pinus brutia*, is one of the most widespread pine species in Turkey. Its main distribution area is around the Mediterranean, Aegean and Marmara regions. In the Black Sea Regions it is found in the Mediterranean enclave and is widespread 10-400 m around the coastline (Samsun). However it is usually widespread at 350-800 m along the stream valleys in the inner parts of the West and Central Black Sea Regions. In Kelkit Valley *Pinus brutia* has a large distribution compared with the other parts of the Black Sea Region. It is widespread around Erbaa (Kale village) and between Niksar (Muhtardüzü, Erikbelen villages) and Reşadiye at the bottom of the valley and the south-exposed slopes. Characteristic and differential species are *Pinus brutia* and *Quercus infectoria* subsp. *infectoria*. This association exhibits tree, shrub and herb layers. The tree layer is only characterised by *Pinus brutia* which has a 60 and 90% total coverage and 5 and 12 m in height. Total coverages of the shrub

Table 3. *Catino coggyriae*-*Arbutetum andrachnes* Karaer et al., ass. nov.

Quadrat No	128	129	130	131	132	133	134	135	136	137	138		
Size of quadrat (m <sup>2</sup> )	400	400	400	400	400	400	400	400	400	500	500		
Altitude (m)	400	400	450	450	500	500	400	400	400	500	500		
Exposure	S	S	S	S	SE	SE	S	S	S	SE	SE		
Inclination (%)	40	30	30	30	40	40	40	40	30	40	40		
Height of the shrub layer(m)	3	3	3	3	4	4	3	3	3	2	3		
Coverage of the shrub layer(%)	90	80	80	80	90	80	90	90	80	90	90		
Height of the herb layer(m)	40	30	30	30	45	45	30	40	40	30	30		
Coverage of the herb layer(%)	30	10	20	20	40	30	20	20	20	10	10	*	**
Characteristic and differential species of the association													
<i>Arbutus andrachne</i>	43	44	44	44	44	43	44	43	43	44	44	100	v
<i>Cotinus coggyria</i>	12	12	22	12	12	+2	12	22	+2	12	12	100	v
Characteristic species of QUERCETEA (ETALIA) ILICIS													
<i>Pistacia terebinthus</i>	+1	+1	+1	+1	+1	+1	+1	-	+1	+1	+1	91	v
<i>Phillyrea latifolia</i>	-	-	+1	-	+1	+1	+1	+1	-	+1	+1	64	iv
<i>Anarrhinum orientale</i>	+1	+1	+1	-	-	-	+1	-	-	-	+1	45	iii
<i>Rubia tenuifolia</i>	+1	-	-	-	+1	-	+1	+1	-	-	-	36	ii
<i>Thymra spicata</i> var. <i>spicata</i>	-	-	-	+2	-	-	-	-	+2	-	-	27	ii
<i>Jasminum fruticans</i>	-	-	+2	-	-	+2	-	-	-	-	+2	27	ii
<i>Pinus brutia</i>	-	+1	-	-	-	-	+1	-	-	-	-	18	i
Characteristic species of CISTO-MICROMERIETAE													
<i>Psoralea bituminosa</i>	+1	+1	+1	+1	+1	+1	-	+1	+1	+1	+1	91	v
<i>Cistus creticus</i>	+2	+2	-	+2	+2	+2	+2	12	+2	-	+2	82	v
<i>Origanum vulgare</i> subsp. <i>viride</i>	+1	-	+1	+1	-	+1	+1	+1	-	+1	+1	73	iv
<i>Fumana arabica</i>	+1	+1	-	-	-	-	+1	-	+1	+1	+1	55	iii
<i>Salvia tomentosa</i>	-	+1	-	-	-	-	-	+1	+1	+1	+1	45	iii
<i>Micromeria myrtifolia</i>	-	-	+1	-	+1	-	+1	-	-	-	-	27	ii
Characteristic species of QUERCETEA PUBESCENTIS													
<i>Quercus infectoria</i> subsp. <i>infectoria</i>	+1	+2	-	+2	-	+1	-	+2	+2	+2	+2	73	iv
<i>Dorycnium graecum</i>	+2	+2	+2	-	+2	-	-	+2	+2	+2	+2	73	iv
<i>Polygala supina</i>	-	+1	-	-	+1	-	-	+1	+1	+1	+1	55	iii
<i>Coronilla scripoides</i>	-	+1	-	+1	-	+1	+1	-	+1	-	+1	45	iii
<i>Acinos rotundifolia</i>	+1	-	-	+1	-	+1	-	-	-	-	-	27	ii
<i>Colutea cilicica</i>	-	-	-	-	-	-	+1	-	+1	+1	-	27	ii
<i>Alyssum strigosum</i>	-	-	+1	-	+1	-	-	-	+1	-	-	27	ii
Characteristic species of ASTRAGALO-BROMETEA													
<i>Teucrium polium</i>	+2	-	+1	+2	+1	+1	+2	+2	-	+1	+1	82	v
<i>Linum hirsutum</i> subsp. <i>anatolicum</i>	11	11	-	-	11	+1	+1	+1	+1	+1	+1	82	v
<i>Cryspogon gryllus</i> subsp. <i>gryllus</i>	+1	+1	+1	+1	+1	+1	+1	-	+1	-	+1	82	v
<i>Teucrium chamaedrys</i>	-	-	-	+1	+1	+1	+1	-	+1	+1	+1	64	v
<i>Hedysarum varium</i>	-	+2	-	+2	+2	-	+2	-	+2	+2	-	55	iii
<i>Anthemis tinctoria</i>	+1	+1	+1	-	-	-	-	+1	-	+1	-	45	iii
<i>Helianthemum nummularium</i>	+1	-	+1	+1	-	+1	-	-	-	-	-	36	ii
<i>Veronica multifida</i>	-	-	-	-	+2	-	+2	-	-	+2	-	27	ii
<i>Koeleria cristata</i>	-	-	-	+1	-	-	-	+1	-	-	+1	27	ii
<i>Filago eriocephala</i>	-	+1	-	-	-	-	+1	-	+1	-	-	27	ii
<i>Globularia trichosantha</i>	-	-	+1	+1	-	-	-	+1	-	-	-	27	ii
<i>Centaurea consanguinea</i>	-	-	+1	-	-	-	-	-	-	+1	+1	27	ii
Companions													
<i>Linum tenuifolium</i>	+1	+1	+1	-	+1	+1	-	+1	-	+1	+1	73	iv
<i>Genista albida</i>	+1	+1	+1	-	+1	-	+1	-	+1	-	+1	64	ii
<i>Pteroccephalus plumosus</i>	+1	-	+1	+1	-	+1	-	-	+1	-	+1	55	iii
<i>Astragalus supruneri</i>	+1	-	+1	-	-	+1	+1	+1	-	-	+1	55	iii
<i>Linum corymbulosum</i>	-	+1	+1	-	+1	+1	-	-	+1	+1	-	55	iii
<i>Ononis viscosa</i> subsp. <i>brevifolia</i>	-	+1	-	-	-	-	-	+1	+1	+1	+1	45	iii
<i>Verbascum oocarpum</i>	+1	+1	-	-	+1	-	-	-	+1	+1	-	45	iii
<i>Astragalus sigmoideus</i>	+1	-	+1	-	+1	+1	-	-	-	-	-	36	ii
<i>Myosotis ramosissima</i>	-	-	-	+1	-	+1	+1	+1	-	-	-	36	ii
<i>Andrachne telephoides</i>	-	-	-	-	+1	-	-	-	+1	-	+1	27	ii
<i>Scutellaria salviifolia</i>	-	-	-	-	-	+1	+1	-	+1	-	-	27	ii
<i>Muscari aucheri</i>	+1	-	+1	-	+1	-	-	-	-	-	-	27	ii
<i>Johrenia tortuosa</i>	-	-	-	+1	-	-	+1	+1	-	-	-	27	ii
<i>Silene otites</i>	-	-	-	+1	-	-	+1	-	-	+1	-	27	ii
<i>Trigonella lunata</i>	-	-	+1	-	+1	-	-	-	+1	-	-	27	ii
<i>Trifolium campestre</i>	-	+1	-	-	-	+1	-	-	-	-	+1	27	ii
<i>Lens ervoides</i>	+1	-	-	-	-	-	-	+1	-	-	+1	27	ii
<i>Tragopogon aureus</i>	-	+1	-	-	-	+1	-	-	-	-	+1	27	ii
<i>Galium margaceum</i>	+1	+1	-	-	-	-	-	-	-	-	-	18	i
<i>Medicago minima</i>	-	-	-	+1	-	-	-	-	-	+1	-	18	i
<i>Legousia falcata</i>	-	-	+1	-	-	-	+1	-	-	-	-	18	i



Table 4. Paliuro spinae-christi-Fontanesietum philliraeoidis Karaer et al. ass. nov.

Quadrat No	26	27	28	29	30	31	32	33	199	200		
Size of quadrat (m2)	400	400	400	400	400	400	300	300	400	400		
Altitude (m)	300	360	370	350	350	300	250	250	420	420		
Exposure	-	S	S	-	-	-	-	-	SW	SW		
Inclination (%)	-	5	5	-	-	-	-	-	10	10		
Height of the shrub layer(m)	2	2.5	2.5	2	2	2	2	2	3	3		
Coverage of the shrub layer(%)	70	60	80	60	70	70	70	60	80	60		
Height of the herb layer(m)	30	30	25	30	20	30	20	20	30	40		
Coverage of the herb layer(%)	40	30	30	40	40	40	30	30	10	20	*	**
Characteristic and differential species of the association												
Fontanesia philliraeoides subsp.philliraeoides	43	23	43	33	43	33	33	32	43	23	100	v
Paliurus spiana-christi	12	32	22	32	12	23	32	22	12	33	100	v
Ruscus aculeatus	12	22	12	12	12	-	12	12	-	22	90	v
Nigella nigellastrum	-	-	-	+1	+1	+1	-	+1	-	-	40	ii
Chracteristic species of QUERCETEA (ETALIA) ILICIS												
Pistacia terebinthus subsp.palaestina	+1	11	+1	11	-	11	11	11	+1	11	90	v
Jasminum fruticans	+2	12	+2	+1	+1	-	-	-	+1	12	70	iv
Thymbra spicata var.spicata	-	+2	-	-	-	-	+2	-	-	+2	30	ii
Anarrhinum orientale	-	-	-	-	-	+1	+1	-	-	-	20	ii
Phillyrea latifolia	-	-	-	-	-	-	-	-	+1	+1	20	ii
Origanum vulgaresubsp.viride	+1	+1	-	-	-	-	-	-	-	-	20	ii
Salvia tomentosa	-	-	+1	-	+1	-	-	-	-	-	20	ii
Characteristic species of QUERCETEA PUBESCENS												
Juniperus oxycedrus subsp.oxycedrus	+1	12	-	11	-	11	11	11	+1	12	80	iv
Coronilla cripoides	+1	+1	+1	+1	-	-	-	-	+1	+1	60	iii
Carpinus orientalis subsp.orientalis	-	+1	+1	-	+1	-	-	-	+1	+1	40	ii
Cephalanthera rubra	-	-	-	-	-	+1	+1	+1	+1	-	40	ii
Crataegus monogyna	-	-	-	-	-	+1	-	-	+1	+1	30	ii
Alyssum strigosum	-	+1	+1	+1	-	-	-	-	-	-	30	ii
Acinos rotundifolia	-	-	-	-	+1	+1	+1	-	-	-	30	ii
Characteristic species of QUERCO-FAGETEA												
Moehringia trinervia	+1	+1	-	+1	+1	+1	+1	+1	-	-	70	iv
Lapsana communis subsp.intermedia	+1	+1	+1	-	+1	+1	+1	+1	-	-	70	iv
Clinopodium vulgare subsp.vulgare	-	-	+1	+1	-	-	+1	+1	+1	+1	60	iii
Agrimonia eupatoria	-	+1	+1	-	-	-	-	-	+1	+1	40	ii
Characteristic species of ASTRAGALO-BROMETEA												
Sangiosorba minor	+1	-	+1	+1	-	-	+1	+1	-	+1	60	iii
Centaurea triumfettii	-	+1	+1	+1	-	-	-	+1	-	+1	50	iii
Teucrium polium	-	12	12	-	12	+2	-	-	+2	-	50	iii
Ziziphora capitata	-	-	+1	+1	+1	-	-	-	+1	-	40	ii
Crysopogon gryllus subsp.gryllus	+1	-	+1	-	-	-	+1	-	-	+1	40	ii
Koeleria cristata	+1	-	-	+1	+1	-	+1	-	-	-	40	ii
Paronychia kurdica subsp.kurdica	-	-	+2	+2	-	-	+2	-	-	-	30	ii
Centaurea urvillei subsp.armata	-	-	-	-	-	+1	-	+1	+1	-	30	ii
Teucrium chamaedrys	-	+1	-	-	-	-	-	+1	-	+1	30	ii
Trifolium stellatum	-	-	-	-	+1	-	+1	+1	-	-	30	ii
Veronica multifida	+1	-	-	-	-	+1	-	-	-	+1	30	ii
Ajuga chamaedrys subsp.chia	-	-	+1	+1	-	-	-	+1	-	-	30	ii
Filago eriocephala	-	-	+1	-	-	-	+1	-	+1	-	30	ii
Anthemis tinctoria	-	+1	-	-	+1	-	-	-	-	+1	30	ii
Companions												
Geranium molle	+1	+1	-	+1	+1	+1	+1	+1	-	+1	80	iv
Medicago minima	+1	+1	+1	+1	-	+1	-	-	+1	+1	70	iv
Trifolium campestre	+1	+1	+1	+1	-	+1	-	-	+1	+1	70	iv
Potentilla recta	+1	-	-	+1	+1	-	+1	+1	-	+1	60	iii
Cynosurus cristatus	-	+1	+1	+1	+1	-	+1	+1	-	-	60	iii
Silene alba	-	-	+1	+1	+1	-	-	+1	-	+1	60	iii
Trifolium physodes	-	+1	-	-	-	+1	+1	+1	+1	+1	60	iii
Bromus diandrus	+1	+1	-	+1	-	+1	-	-	+1	+1	60	iii
Lathyrus aphaca var.aphaca	-	-	+1	+1	+1	-	+1	-	+1	-	50	iii
Cerastium glomeratum	+1	+1	-	+1	-	-	-	+1	-	+1	50	iii
Allium scorodoprassum subsp.jajlei	-	-	+1	+1	+1	+1	-	-	-	+1	50	iii

Table 4. continued

<i>Crepis foetida</i> subsp.foetida	-	+1	-	-	+1	+1	+1	+1	-	-	50	III
<i>Senecio vernalis</i>	-	-	-	-	+1	+1	+1	+1	+1	-	50	III
<i>Dactylis glomerata</i>	-	-	+1	-	-	-	+1	+1	+1	+1	50	III
<i>Pteroccephalus plumosus</i>	+1	+1	-	-	-	+1	-	-	+1	+1	50	III
<i>Crepis alpina</i>	+1	+1	-	-	+1	+1	-	-	-	+1	50	III
<i>Rubus canescens</i>	-	+2	-	-	-	-	+2	+2	-	+2	40	II
<i>Plantago lanceolata</i>	-	-	-	-	+1	-	+1	+1	+1	-	40	II
<i>Torilis arvensis</i>	-	+1	-	+1	-	+1	-	-	-	+1	40	II
<i>Centaurea eryhraea</i> subsp.turcica	+1	-	+1	+1	-	-	-	-	-	+1	40	II
<i>Lepidium campestre</i>	-	+1	+1	+1	-	-	-	-	+1	-	40	II
<i>Melilotus officinalis</i>	+1	+1	-	-	-	-	+1	-	+1	-	40	II
<i>Bellis perennis</i>	+1	+1	-	-	+1	+1	-	-	-	-	40	II
<i>Scabiosa columbaria</i> subsp.columbaria	-	-	+1	+1	+1	-	-	+1	-	-	40	II
<i>Rosa canina</i>	-	-	-	+1	-	+1	-	-	-	+1	40	II
<i>Poa trivialis</i>	-	+2	-	-	-	-	+2	-	+2	-	30	II
<i>Reseda lutea</i>	+1	-	+1	-	-	-	-	-	+1	-	30	II
<i>Verbascum orientale</i>	-	-	-	+1	+1	-	-	-	-	+1	30	II
<i>Briza media</i>	-	+1	-	+1	-	+1	-	-	-	-	30	II
<i>Setaria viridis</i>	+1	-	+1	-	-	-	-	+1	-	-	30	II
<i>Orchis tridentata</i>	-	-	-	-	+1	+1	-	-	-	-	30	II
<i>Parietaria lusitanica</i>	-	-	-	+1	-	-	-	-	+1	+1	30	II
<i>Erodium cicutarium</i>	-	-	-	-	-	+1	-	+1	-	+1	30	II
<i>Lolium perenne</i>	+2	+2	+2	-	-	-	-	-	-	-	30	II
<i>Cynoglossum creticum</i>	-	-	-	+1	+1	-	+1	-	-	-	30	II
<i>Prunella orientalis</i>	-	+1	-	+1	-	-	-	-	+1	-	30	II

and herb layers are 20 and 50% and 20 and 40% respectively. The shrub layer is 2 and 3 m in height, the herb layer 10 and 60 cm in height. The most common species in the shrub layer are *Quercus infectoria* subsp. *infectoria*, *Styrax officinalis*, *Arbutus andrachne*, *Juniperus oxycedrus* subsp. *oxycedrus*, *Thymra spicata* var. *spicata* and *Cistus creticus*. The herb layer includes *Psoralea bituminosa*, *Teucrium chamaedrys* L., *Teucrium polium*, *Salvia tomentosa*, *Dactylis glomerata* L., *Thesium billardieri* Boiss. and *Medicago minima*. QUERCETEA (ETALIA) ILICIS is characterised by *Arbutus andrachne*, *Quercus coccifera*, *Rubia tenuifolia*, *Phillyrea latifolia*, *Ruscus aculeatus*, CISTO-MICROMERIETEA class includes *Origanum vulgare* subsp. *viride*, *Fumana arabica*, *Psoralea bituminosae*, *Salvia tomentosa*. QUERCO-CEDRETALIA LIBANI order is also represented in this association by *Cotoneaster nummularia* Fisch. & Mey., *Coronilla scirpioides* (L.) Koch, *Bunium microcarpum* (Boiss.) Freyn. and *Alyssum strigosum*. The species belonging to QUERCO-CARPINETALIA ORIENTALIS, QUERCETEA PUBESCENTIS and QUERCO-FAGETEA and ASTRAGALO-BROMETEA are shown in table 5. This association is spread on calcareous parent rock and brown forest soils and two subassociations differentiated and characterised by *Cistus creticus*, *Astragalus vicifolius* DC., *Astragalus sanguinolentus* Bieb, *Styrax officinalis*, *Chamaecytisus supinus* (L.) Link respectively are formed. Both of the subassociations are described for the first time in this paper. *cistetosum cretici* (Holotype table 5: quadrat number 16) occur on south-facing slopes and at the

bottom of the valley between 350 and 500 m in Erbaa (Kale village) and Niksar (Erikbelen village). This subassociation is widespread on south and north exposed slopes and at the bottom of the valley around Reşadiye. It usually replaces *Pinus brutia* forest as a result of destruction. *styracetosum officinalis* (Holotype table 5: quadrat number: 81) is spread around Niksar (Muhtar-düzü, Hacilar villages) between 400 and 550 m on south and northwest exposed slopes in protected areas. The differential and characteristic species are *Chamaecytisus supinus* and *Styrax officinalis*. The height of *Pinus brutia* trees distributed around this subassociation are higher than in the other parts of the study area. The characteristic species belonging to high rank syntaxa units of these subassociations are shown in Table 5. *Pinus brutia* association is spread in different places in respect to climatic and edaphic factors. These associations have been included in different syntaxa units up to now. For example Kutbay and Kılınç (9), Özen and Kılınç (10), Akman and Ekim (17) have suggested these associations be included in QUERCETEA ILICIS. However Gemici (19) included *Pinus brutia* associations in QUERCO-CEDRETALIA LIBANI and QUERCO-CARPINETALIA ORIENTALIS. Ekim and Akman (18) considered *Pinus brutia* associations in QUERCETEA PUBESCENTIS. Serin and Eyce (25) suggested that these associations be included in QUERCO-CEDRETALIA LIBANI and QUERCETEA PUBESCENTIS. The syntaxonomic explanation of *Pinus brutia* associations are quite difficult because they include various syntaxa units. But

Table 5. Quercus infectoriae-Pinetum brutiae Quezel et al. 1980

Quadrat No	13	16	17	85	87	110	111	112	127	79	80	81	82	83	84	117		
Size of quadrat (m <sup>2</sup> )	400	400	400	600	600	400	400	400	400	400	400	800	800	800	800	400		
Altitude (m)	350	400	400	400	400	450	450	450	500	400	400	450	450	450	450	550		
Exposure	S	S	S	SW	SW	S	S	S	S	S	S	S	S	S	S	SE		
Inclination (%)	40	45	30	25	30	20	40	40	10	20	25	30	20	20	30	30		
Height of the tree layer(m)	5	8	7	6	10	10	10	12	12	8	10	10	10	8	8	10		
Coverage of the tree layer(%)	60	70	80	85	90	80	90	80	90	90	70	80	80	80	85	70		
Height of the shrub layer(m)	2	2	3	2	2	3	3	2	3	2	3	3	2	2	3	2		
Coverage of the shrub layer(%)	30	20	10	20	10	20	20	20	10	20	30	30	20	30	50	30		
Height of the herb layer(m)	30	30	20	30	25	30	30	20	25	30	25	30	40	30	20	30		
Coverage of the herb layer(%)	20	30	25	20	20	20	30	20	30	20	30	30	25	30	25	20	*	**
Characteristic and differential species of the association																		
Pinus brutia	33	33	43	44	44	44	43	44	44	44	33	43	43	43	44	33	100	v
Quercus infectoria subs p.infectoria	+2	22	12	+2	12	12	22	-	12	12	+2	12	12	12	+2	22	94	v
Characteristic species of subass.																		
	cistetosum cretici subass.nov.									styracetosum officinalis subass.nov.								
Cistus creticus	22	12	12	12	-	12	12	-	+2	-	-	-	+2	-	-	-	50	iii
Astragalus sanguinolentus	11	+2	-	11	+2	11	-	+1	+1	-	-	-	-	-	-	-	44	iii
Astragalus viciifolius	11	+1	+1	-	-	-	11	11	+1	-	-	-	-	+1	-	-	44	iii
Sytrax officinalis	-	-	-	-	-	-	-	-	-	12	22	22	22	22	22	22	44	iii
Chamaecytisus supinus	-	-	-	-	+2	-	-	-	-	-	12	12	12	-	12	-	+2	31
Characteristic species of QUERCETEA (ETALIA) ILICIS																		
Pistacia terebinthus subsp. palaestina	+1	11	11	+1	11	+1	11	11	+1	11	-	11	11	11	-	11	88	iv
Rubia tenuifolia	+1	-	+1	-	+1	+1	-	-	+1	-	-	-	+2	-	+2	-	44	iii
Phillyrea latifolia	-	+1	-	-	-	-	-	+1	-	-	11	11	-	-	-	11	31	ii
Ruscus aculeatus	-	-	-	-	+2	-	-	-	12	12	-	-	-	-	12	12	31	ii
Thymra spicata var.spicata	+2	+2	+2	-	-	-	-	-	-	-	+2	-	-	-	-	-	25	ii
Arbutus andrachne	-	-	-	-	-	+1	-	+1	-	-	-	-	-	-	-	+1	19	i
Putoria calabrica	-	-	-	+2	-	-	+2	-	-	-	-	-	-	-	-	-	13	i
Quercus coccifera	-	-	-	-	-	-	-	-	-	-	-	+2	-	+2	-	-	13	i
Characteristic species of CISTO-MICROMERIETEA																		
Salvia tomentosa	11	11	-	-	+1	-	11	+1	+1	-	11	+1	+1	+1	+1	-	69	iv
Psoralea bituminosa	+1	-	-	+1	+1	+1	+1	+1	-	+1	-	-	+1	+1	+1	+1	69	iv
Fumana arabica	-	-	+1	+1	-	-	+1	-	+1	-	+1	+1	-	-	-	-	38	ii
Micromeria myrtifolia	+1	+1	+1	-	+1	-	-	-	-	-	-	-	+1	-	-	+1	38	ii
Characteristic species of QUERCO-CEDRETALIA LIBANI																		
Coronilla scorpioides	-	-	+1	+1	-	-	+1	+1	-	+1	-	-	+1	-	+1	-	44	iii
Dorycnium pentaphyllum	-	-	-	-	+2	-	12	-	+1	-	12	-	-	-	-	12	31	ii
Cotoneaster nummularia	+2	-	-	-	-	+2	-	-	-	-	+2	-	-	+2	-	-	25	ii
Alyssum strigosum	-	-	+1	-	-	-	+1	+1	-	-	-	-	-	-	+1	-	25	ii
Bunium microcarpum subsp. bourgaei	-	-	-	-	-	-	-	+1	-	-	-	+1	-	-	-	-	13	i
Characteristic species of QUERCO-CARPINETALIA ORIENTALIS(*) and QUERCETEA PUBESCENTIS																		
Juniperus oxycedrus subsp.oxycedrus	12	+2	-	-	+2	12	12	-	12	12	12	-	+2	-	-	12	63	iv
Tanacetum poteriifolium	+1	-	+1	-	-	-	-	-	+1	+1	+1	-	-	+1	+1	-	44	iii
(*)Quercus cerris var.cerris	12	-	-	+1	-	-	+1	-	+1	-	-	-	-	+1	-	-	31	ii
Polygala supina	-	+1	-	-	+1	+1	-	-	-	-	+1	-	+1	-	-	-	31	ii
Acinos rotundifolia	-	-	-	+1	-	-	+1	+1	-	-	-	+1	-	-	+1	-	31	ii
Cotinus coggyrea	-	-	-	-	-	-	+1	+1	-	-	-	+1	-	-	-	+1	25	ii
Colutea cilicica	-	-	+1	+1	-	-	-	-	-	+1	-	-	-	+1	-	-	25	ii
(*)Carpinus orientalis	+1	-	-	-	-	-	-	-	+1	-	-	-	-	-	-	+1	19	i
Paliurus spina-christi	-	-	-	-	-	-	+1	+1	-	-	-	-	-	-	-	+1	19	i
Characteristic species of ASTRAGALO-BROMETEA																		
Teucrium polium	11	11	12	-	+2	+2	+2	12	+2	-	+1	+1	+1	-	-	+1	75	iv
Cryspogon gryllus subsp.gryllus	+1	+1	+1	+1	-	-	-	-	+1	-	+1	+1	-	+1	-	-	50	iii

Table 5. continued

<i>Helianthemum nummularium</i>	+1	+1	+1	-	+1	-	-	-	-	+1	+1	-	+1	-	-	+1	50	III
<i>Teucrium chamaedrys</i>	-	-	-	-	+1	+1	+1	-	+1	-	+1	+1	+1	-	-	+1	50	III
<i>Ziziphora capitata</i>	+1	-	+1	+1	-	+1	+1	+1	-	-	-	-	+1	-	+1	-	50	III
<i>Koeleria cristata</i>	+1	-	-	-	-	-	-	+1	-	+1	-	-	-	+1	-	+1	31	II
<i>Sanguisorba minor</i>	+1	+1	-	-	-	-	-	-	-	-	-	-	-	+1	+1	+1	31	II
<i>Dianthus zonatus</i>	-	-	-	+1	+1	-	-	-	+1	-	-	+1	-	-	+1	-	31	II
<i>Fibigia ericalycina</i>	+1	-	-	-	-	-	-	-	-	-	-	-	-	-	+1	+1	19	I
<i>Paronychia kurdica</i>	+2	-	+2	-	-	-	-	+2	-	-	-	-	-	-	-	-	19	I
<i>Hypericum origanifolium</i>	-	-	-	-	-	+1	-	-	-	-	-	-	-	+1	-	+1	19	I
<i>Ajuga chamaepithys</i> subsp.chia	-	-	-	+1	+1	-	-	-	-	-	-	-	-	-	-	+1	19	I
<i>Veronica multifida</i>	-	-	-	-	-	-	+1	-	-	+1	+1	-	-	-	-	-	19	I
<i>Globularia trichosantha</i>	+1	+1	-	-	-	+1	-	-	-	-	-	-	-	-	-	-	19	I
Companions																		
<i>Dactylis glomerta</i>	+1	-	+1	+1	+1	+1	+1	+1	-	+1	-	-	+1	+1	+1	-	69	IV
<i>Thesium billardieri</i>	+1	+1	+1	+1	+1	+1	-	+1	+1	-	-	-	-	+1	+1	+1	69	IV
<i>Medicago minima</i>	+1	+1	+1	-	-	+1	+1	+1	+1	-	-	+1	-	-	-	+1	56	III
<i>Crucianella bithynica</i>	+1	-	-	+1	+1	-	-	+1	-	+1	+1	+1	+1	-	+1	-	56	III
<i>Ononis pusilla</i> subsp.leiocarpa	+1	+1	-	-	-	+1	+1	-	-	+1	+1	-	+1	+1	-	+1	56	III
<i>Trifolium campestre</i>	-	+1	-	+1	+1	+1	+1	+1	+1	+1	-	-	-	-	+1	-	56	III
<i>Sideritis montana</i>	+1	-	-	+1	-	+1	+1	-	-	-	+1	+1	-	+1	-	+1	50	III
<i>Convolvulus cantabica</i>	-	+1	-	+1	-	-	+1	-	+1	+1	-	+1	-	-	+1	-	44	III
<i>Coronilla orientalis</i>	-	-	+2	-	-	+2	-	+2	-	-	-	-	+2	-	+2	+2	38	II
<i>Trigonella monspeliaca</i>	+1	-	-	-	+1	+1	-	+1	-	-	+1	-	-	+1	-	-	31	II
<i>Muscari aucheri</i>	-	-	+1	+1	-	-	+1	-	-	+1	-	-	+1	-	-	-	31	II
<i>Pteroccephalus plumosus</i>	+1	-	-	-	+1	-	-	+1	-	-	+1	-	-	-	+1	-	31	II
<i>Carthamus lanatus</i>	-	+1	-	-	-	-	+1	-	+1	-	-	+1	-	-	+1	-	31	II
<i>Trigonella lunata</i>	+1	-	-	-	+1	-	-	-	-	-	+1	-	-	+1	-	+1	31	II
<i>Callipeltis cucullaria</i>	+1	+1	+1	+1	-	-	-	-	+1	-	-	-	-	-	-	-	31	II
<i>Crepis foetida</i>	-	-	-	-	+1	+1	-	-	-	-	-	+1	-	+1	-	-	25	II
<i>Astradaucus orientalis</i>	-	+1	-	+1	-	-	-	-	-	+1	-	-	+1	-	-	-	25	II
<i>Scabiosa columbaria</i>	+1	-	+1	-	-	+1	-	-	-	-	+1	-	-	-	-	-	25	II
<i>Astragalus panduratus</i>	-	-	-	+1	-	-	+1	-	+1	-	-	-	-	-	+1	-	25	II
<i>Sideritis taurica</i>	+1	+1	-	-	-	-	-	-	-	-	-	+1	-	-	-	+1	25	II
<i>Allium erubescens</i>	+1	+1	-	-	-	+1	-	+1	-	-	-	-	-	-	-	-	25	II

QUERCETEA (ETALIA) ILICIS class is well represented under *Pinus brutia* forest in our study area. Therefore it should be considered in the syntaxa cited above.

#### **Astragalo aucheri-Pinetum pallasianae** Karaer, Kılınç & Kutbay ass. nov. (Table 6)

This association (Holotype table 6, quadrat number 169) is scattered around Erbaa (Çatalan village) and Reşadiye (Umurca village) and Koyulhisar at an altitude of 800-1300 m on north and northeast facing slopes. Characteristic and differential species are *Pinus nigra* subsp. *pallasiana*, *Astragalus aucheri* Boiss., *Astragalus dictyophytus* Boiss., *Genista albida* Willd. It occurs on brown forest soils. The association exhibits tree, shrub and herb layers. Total coverage of the tree layer is 70 and 90% reaching 10 and 15 m in height and characterised by *Pinus nigra* subsp. *pallasiana*. Total coverages of the shrub and herb layers are 10 and 25% and 20 and 50% respectively and they are 1 and 3 m and 15 and 40 cm in

height respectively. The shrub layer is characterised by *Quercus pubescens*, *Juniperus oxycedrus* subsp. *oxycedrus*, *Quercus infectoria* subsp. *infectoria*, *Juniperus excelsa*, *Cotoneaster nummularia*. The most common species in the herb layer are *Astragalus aucheri*, *Genista albida*, *Astragalus dictyophytus*, *Tanacetum poteriifolium* (Ledeb) Grierson, *Anthemis cretica* (L.) Nym., *Melampyrum arvense* L. and *Linaria corifolia* Desf. The association occurs in the most eastern point of the distribution area of *Pinus nigra* subsp. *pallasiana* forest. CARPINO-ACERION alliance is characterised by *Pyracantha coccinea* Roemer, *Dorycnium pentaphyllum* Scop subsp. *herbaceum* (Vill.) Rouy, *Laser trilobum* (L.) Borkh. The components of QUERCO-CARPINETALIA ORIENTALIS are represented by *Asperula involucreta* Wahlenb., *Tanacetum poteriifolium*, *Lathyrus laxiflorus* (Desf.) O. Kuntze species. The characteristic species of QUERCO-CEDRETALIA LIBANI and QUERCETEA PUBESCENTIS are shown in table 6. The components of CARPINO-ACERION alliance and QUERCO-CARPINETALIA

Table 6. Astragalus aucheri-Pinetum pallasianae Karaer et al., ass. nov.

Quadrat No	169	170	171	172	176	177	179	182	183	184	185		
Size of quadrat (m2)	800	800	800	800	1000	800	800	800	800	800	800		
Altitude (m)	1000	1000	1000	1050	1100	1000	1100	1100	1000	1000	1000		
Exposure	NE	NE	NE	NE	N	E	NE	NE	N	N	N		
Inclination (%)	30	30	30	30	20	30	30	20	30	30	30		
Height of the shrub layer(m)	10	12	10	10	15	10	12	12	15	10	10		
Coverage of the shrub layer(%)	80	70	80	80	80	80	90	80	80	80	90		
Height of the herb layer(m)	2	1	3	1	2	1	2	13	1	2	1		
Coverage of the herb layer(%)	10	20	10	25	10	20	10	10	20	25	10		
Height of the herb layer(m)	30	20	20	30	30	30	30	15	20	30	30		
Coverage of the herb layer(%)	40	50	40	30	50	40	20	30	20	40	30	*	*
Characteristic and differential species of the association													
<i>Pinus nigra</i> subsp.pallasiana	44	43	43	43	33	43	44	43	43	44	44	100	v
<i>Astragalus aucheri</i>	11	+1	+1	11	11	+1	11	11	11	-	11	91	v
<i>Genista albida</i>	+1	+2	-	+2	+2	+2	+2	-	+2	+2	-	73	iv
<i>Astragalus dictyophyus</i>	+2	-	+2	-	+2	+2	-	+2	-	+2	-	55	iii
Characteristic species of CARPINO-ACERION(*) and QUERCO-CARPINETALIA ORIENTALIS													
(*) <i>Tanacetum poteriifolium</i>	-	+1	+1	+1	+1	-	+1	+1	-	-	-	55	iii
<i>Dorycnium pentaphyllum</i>	-	+1	-	+1	+1	-	-	+1	-	-	+1	45	iii
<i>Asyneuma rigidum</i>	+1	-	-	-	+1	+1	-	+1	+1	-	-	45	iii
<i>Laser trilobum</i>	-	+1	-	-	-	+1	+1	+1	-	-	-	36	ii
(*) <i>Asperula involucrata</i>	+1	-	-	+1	+1	-	-	+1	-	-	-	36	ii
(*) <i>Lathyrus laxiflorus</i>	-	-	-	+1	+1	+1	-	-	-	-	-	27	ii
<i>Pyracantha coccinea</i>	+2	.	.	-	-	-	+2	-	-	+2	-	27	ii
Characteristic species of QUERCO-CEDRETTALIA LIBANI(*) and QUERCETEA PUBESCENTIS													
<i>Juniperus oxycedrus</i>	+1	+1	+1	+2	+2	+2	+1	+2	+1	+1	+1	100	v
(*) <i>Bunium microcarpum</i>	+1	+1	+1	-	+1	+1	+1	-	+1	+1	+	82	iv
<i>Melampyrum arvense</i>	-	-	-	+1	+1	+1	+1	-	+1	-	+1	55	iii
<i>Quercus infectoria</i> subsp.infectoria	+2	-	-	+2	-	+2	-	+2	-	-	-	36	ii
<i>Quercus pubescens</i>	-	+1	-	-	-	-	-	+1	+1	-	+1	36	ii
<i>Juniperus excelsa</i>	-	-	-	+1	+2	-	-	-	+1	-	-	27	ii
(*) <i>Cotoneaster nummularia</i>	+1	-	-	-	+1	-	+1	-	-	-	-	27	ii
<i>Acinos rotundifolia</i>	-	-	-	-	-	+1	-	-	-	+1	-	18	i
<i>Coronilla varia</i>	-	-	+1	-	-	-	-	-	+1	-	-	18	i
Characteristic species of ONOBRYCHIDO-THYMETALIA LEUCOSTOMI (*) and ASTRAGALO-BROMETEA													
<i>Anthemis cretica</i>	+1	+1	-	+1	-	+1	+1	-	-	+1	+1	64	iv
<i>Lineria corifolia</i>	+1	-	+1	-	+1	-	-	+1	+1	+1	+1	64	iv
<i>Helianthemum nummularium</i>	+1	+1	-	+1	+1	+1	+1	-	+1	-	-	64	iv
(*) <i>Salvia cryptantha</i>	-	+2	-	+2	+2	-	-	-	-	+2	+2	45	iii
<i>Fibigia ericalcyna</i>	-	-	+1	-	+1	+1	+1	-	+1	-	+1	55	iii
<i>Hypericum lydium</i>	+1	-	-	+2	-	+1	-	+1	+1	-	+2	55	iii
<i>Helianthemum canum</i>	-	-	+1	+1	+1	-	-	+1	-	+1	+1	55	iii
<i>Allium flavum</i> subsp.tauricum	-	-	+1	-	+1	+1	-	+1	-	+1	-	45	iii
<i>Polygala pruinosa</i>	+1	-	-	+1	+1	+1	-	-	-	+1	-	45	iii
(*) <i>Paranonychia kurdica</i>	-	-	-	-	+2	+2	-	+2	-	+2	+2	45	iii
<i>Teucrium polium</i>	+2	+2	+2	-	+2	-	+2	-	-	-	-	45	ii
(*) <i>Jurinea consanguinea</i>	-	-	-	+1	-	+1	+1	-	+1	-	-	36	ii
(*) <i>Silene supina</i> subsp.pruinosa	-	-	-	-	+2	-	-	+2	+2	-	-	36	ii
<i>Minuartia anatolica</i> var.anatolica	-	-	-	-	+1	-	+1	+1	-	-	+1	36	ii
<i>Piiosella hoppeana</i>	+1	-	-	+1	-	-	+1	-	-	-	-	27	ii
Companions													
<i>Ononis pusilla</i> subsp.leiocarpa	+1	+1	-	+1	+1	+1	+1	+1	-	+1	-	73	i
<i>Aegilops geniculata</i>	-	+1	+1	+1	-	+1	+1	+1	-	-	+1	64	i
<i>Vincetoxicum fuscum</i>	+2	+2	-	+2	-	-	+2	+2	+2	-	+2	64	i
<i>Dianthus fluribundus</i>	-	-	+1	-	+1	+1	+1	-	+1	+1	+1	64	i
<i>Muscari armeniacum</i>	+1	+1	-	-	+1	+1	+1	+1	-	+1	-	64	i

Table 6. continued

<i>Silene montbretiana</i>	-	-	-	-	+1	+1	+1	+1	-	+1	+1	55	III
<i>Ampylopyron muticum</i>	-	-	+1	+1	-	+1	+1	-	+1	+1	-	55	III
<i>Allyssum erusulum</i>	-	+1	-	+1	+1	-	-	+1	+1	+1	-	55	III
<i>Dactylis glomerata</i>	+1	-	-	-	-	-	+1	+1	+1	+1	+1	55	III
<i>Salvia tomentosa</i>	+1	+1	-	-	-	+1	-	+1	-	+1	+1	55	III
<i>Geranium cinereum</i>	-	-	+1	-	-	+1	+1	-	+1	+2	-	55	III
<i>Carex flacca</i>	+1	-	-	+1	+1	-	+1	-	+1	-	+1	55	III
<i>Eryssimum crassipes</i>	-	-	+1	+1	-	-	+1	+1	+1	-	+1	55	III
<i>Tragopogon porrifolius</i>	-	+1	+1	+1	-	+1	+1	-	-	-	+1	55	III
<i>Anarrhinum orientale</i>	+1	+1	-	+1	+1	-	-	+1	+1	-	-	55	III
<i>Stachys iberica</i>	+1	-	-	+1	+1	+1	-	-	-	+1	+1	55	III
<i>Thesium billardieri</i>	+1	-	-	+1	-	+1	+1	-	+1	-	+1	55	III
<i>Bromus squarrosus</i>	+1	-	-	+1	-	+1	-	+1	-	+1	-	45	III
<i>Lens ervoides</i>	-	-	-	+1	+1	-	+1	-	+1	-	+1	45	III
<i>Trigonella courelescens</i>	-	-	+1	-	-	+1	+1	-	+1	-	-	36	II
<i>Thymus parnasicus</i>	-	+2	-	+2	-	+1	-	-	+1	-	-	36	II
<i>Cicer bijugum</i>	-	-	-	+1	+1	-	-	-	-	+1	+1	36	II
<i>Campanula saxonorum</i>	-	-	+1	-	-	-	-	+1	-	+1	-	27	II
<i>Saponaria prostrata</i>	-	-	-	-	+1	-	-	+1	-	+1	-	27	II
<i>Hedysarum nitidum</i>	-	-	+1	-	-	-	-	+1	-	-	+1	27	II
<i>Medicago minima</i>	-	-	-	+1	+1	-	-	-	-	-	+1	27	II
<i>Cerastium chlorifolium</i>	-	-	-	-	+1	-	-	+1	-	-	+1	27	II
<i>Verbascum cherianthifolium</i>	+1	-	-	-	-	+1	-	-	+1	-	-	27	II
<i>Scutellaria salviifolia</i>	-	-	-	+1	-	-	-	-	-	+1	+1	27	II

ORIENTALIS order are well represented in this association. So that this association must be considered in those syntaxa units.

**Ranunculo buhsei-Pinetum sylvestris** Karaer, Kılınc & Kutbay ass. nov. (Table 7)

*Pinus sylvestris* is one of the most widespread pine species in the world. It is spread all over the Black Sea Regions and Kars in Turkey. It is also widespread in the surroundings of Murat Dağ and Sundiken Mountains (18), Akdağ (19) and Akdağmadeni (26). *Ranunculo buhsei-Pinetum sylvestris* (Holotype table 7, quadrat number 96) occurs on forest brown soils on north and south-facing slopes at altitudes of 1000-1450 m. The characteristic and differential species are *Pinus sylvestris*, *Ranunculus buhsei* Boiss, *Juniperus communis* subsp. *alpina*, *Daphne pontica* L., *Crepis macropus* Boiss & Heldr. and *Pyrola media* Swartz. The association exhibits tree, shrub and herb layers. The tree layer is only characterised by *Pinus sylvestris* having a total coverage 80 and 90% and 20 and 25 m in height. Total coverages of the shrub and herb layers vary between 20 and 50%, and 20 and 40% respectively. The shrub layer reaches, 0.5 and 3 m in height and herb layer 40 and 60 cm in height. The shrub layer comprises *Quercus cerris* var. *cerris*, *Rubus hirtus*, *Juniperus communis* subsp. *alpina*, *Acer platanoides* L., *Euonymus verrucosus* Scop. The herb

layer is characterised by *Pyrola media*, *Crepis macropus*, *Ranunculus buhsei*, *Doronicum orientale* Hoffman, *Asperula involucrata*, *Euphorbia amygdaloides* L., *Orchis mascula* (L.) L., *Sanicula europaea* L., *Luzula forsteri* (Sm) DC, *Pilosella hoppeana* (Schultes) C.H. & F.W. Schultz, *Dactylis glomerata* and *Carex sylvatica* Hudson. The component of CARPINO-ACERION *Asperula involucrata*, *Tanacetum poterifolium*, *Lathyrus aureus* (Stev.) Brandza, *Helleborus orientalis* Lam., *Lathyrus laxiflorus*. QUERCO-CARPINETALI ORIENTALIS is characterised by *Doronicum orientale*, *Lathyrus tukhtensis* Czeck, *Polygala supina* Schreb, *Acer platanoides* L. *Quercus cerris* var. *cerris*. In addition to these syntaxonomic units RHODODENDRO-FAGETALIA ORIENTALIS order and QUERCETEA PUBESCENTIS and QUERCO-FAGETEA classes are also represented (Table 7). This associations is included in QUERCO-CARPINETALIA ORIENTALIS by Kutbay and Kılınc (9), RHODODENDRO-FAGETALIA ORIENTALIS by Özen and Kılınc (10), QUERCO-CARPINETALI ORIENTALIS and QUERCETEA PUBESCENTIS by Akman et al. (12), CARPINO-ACERION and QUERCO-CARPINETALI ORIENTALIS by Kılınc (14), GERANIO-PINION Quezel et al. (15), QUERCO-CEDRETALI LIBANI by Ekim & Akman (18). The floristic composition of the association includes the characteristic species of QUERCO-CARPINETALI ORIENTALIS order and CARPINO-ACERION alliance. Owing to these reasons to the association should be included in these syntaxa units.

Table 7. Ranunculo buhsei-Pinetum sylvestris Karaer et al., ass. nov.

Quadrat No	86	89	93	94	96	97	98	99	100	101		
Size of quadrat (m2)	1000	1000	1000	800	1000	800	1000	1000	800	800		
Altitude (m)	1450	1480	1400	1450	1400	1450	1400	1350	1450	1450		
Exposure	NE	NE	SW	N	SW	NE	N	NE	NE	NW		
Inclination (%)	5	10	10	10	20	15	15	10	20	20		
Height of the shrub layer(m)	25	20	20	25	20	20	20	25	20	20		
Coverage of the tree layer(%)	80	90	90	80	90	90	80	80	90	80		
Height of the shrub layer(m)	1	2	2	2	2	2	3	2	2	1		
Coverage of the shrub layer(%)	50	40	30	40	40	40	30	40	30	50		
Height of the herb layer(m)	30	20	20	20	20	30	20	30	40	30		
Coverage of the herb layer(%)	40	40	50	30	30	50	40	40	30	50	*	**
Characteristic and differential species of the association												
<i>Pinus sylvestris</i>	43	44	44	43	54	54	43	43	54	43	100	v
<i>Ranunculus buhsei</i>	-	21	+1	21	21	+1	+1	21	+1	-	90	v
<i>Juniperus communis</i> subsp.alpina	13	23	23	23	-	13	13	23	-	23	80	v
<i>Crepis macropus</i>	+1	+1	-	+1	+1	-	+1	+1	+1	+1	80	v
<i>Daphne pontica</i>	12	+2	-	-	+2	12	-	12	-	12	60	III
<i>Pyrola media</i>	+1	-	+1	+1	-	+1	-	-	-	-	40	II
Characteristic species of CARPINO-ACERION(*) QUERCO-CARPINETALIA ORIENTALIS												
<i>Doronicum orientale</i>	+1	+1	+1	+1	+1	+1	+1	-	+1	+1	90	v
(*) <i>Asperula involucrata</i>	+1	-	-	+1	+1	-	+1	+1	+1	-	60	III
<i>Lathyrus tukhtensis</i>	+1	-	-	+1	+1	-	-	-	+1	+1	50	III
<i>Quercus cerris</i> var.cerris	-	+1	+1	-	-	+1	+1	-	-	-	40	II
(*) <i>Lathyrus laxiflorus</i>	-	-	+1	-	-	+1	-	-	-	+1	30	II
(*) <i>Tanacetum poteriifolium</i>	-	+1	+1	-	-	+1	-	-	-	-	30	II
<i>Acer platanoides</i>	+1	-	-	-	+1	-	-	-	-	-	30	II
(*) <i>Lathyrus aureus</i>	-	-	-	+1	-	+1	-	-	-	-	20	II
<i>Polygala supina</i>	-	-	-	-	+1	-	+1	-	-	-	20	II
(*) <i>Helleborus orientalis</i>	-	-	-	-	-	-	+1	+1	-	-	20	II
Characteristic species of QUERCETEA PUBESCENTIS												
<i>Hypericum perforatum</i>	+1	-	-	-	+1	+1	+1	+1	+1	-	60	III
<i>Sorbus torminalis</i>	+1	-	+1	+1	+1	-	-	-	+1	-	50	III
<i>Campanula rapunculoides</i>	-	+1	-	+1	-	-	+1	-	-	+1	40	II
<i>Brachypodium pinnatum</i>	-	+1	-	-	-	+1	-	+1	+1	-	30	II
<i>Trifolium medium</i> subsp.medium	+1	-	+1	-	-	-	+1	-	-	-	30	II
<i>Euonymus verrucosus</i>	+1	-	-	-	+1	-	-	-	-	+1	30	II
Characteristic species of RHODODENDRO-FAGETALIA ORIENTALIS												
<i>Rubus hirtus</i>	+1	-	-	+1	+1	+1	-	-	-	+1	50	III
<i>Epimedium pubigerum</i>	+1	+1	+1	-	-	+1	-	-	+1	-	50	III
<i>Salvia forskahlei</i>	+1	+1	+1	-	-	-	-	+1	-	-	40	II
<i>Fagus orientalis</i>	+2	-	-	+2	-	-	-	+2	-	-	30	II
Characteristic species of QUERCO-FAGETEA												
<i>Euphorbia amygdaloides</i>	+1	+1	-	-	+1	+1	+1	+1	+1	+1	80	IV
<i>Luzula forsteri</i>	+1	+1	+1	+1	+1	+1	+1	+1	-	-	80	IV
<i>Carex sylvatica</i>	-	+1	-	+1	-	+1	+1	+1	+1	+1	70	IV
<i>Sanicula europaea</i>	+1	+1	+1	+1	+1	-	+1	-	-	-	60	III
<i>Populus tremula</i>	+1	-	-	-	+1	+1	-	-	+1	+1	50	III
<i>Stellaria holostea</i>	-	+1	+1	+1	+1	-	-	-	-	-	40	II
<i>Brachypodium sylvaticum</i>	-	-	+1	-	+1	-	-	+1	-	+1	40	II
Companions												
<i>Alchemilla heterophylla</i>	+1	-	+1	+1	+1	-	+1	-	+1	+1	70	IV
<i>Dactylis glomerata</i>	-	-	-	+1	+1	+1	+1	+1	+1	+1	70	IV
<i>Pilosella hoppeana</i>	+1	+1	-	-	+1	+1	+1	+1	-	+1	70	IV
<i>Orchis mascula</i>	+1	+1	+1	-	+1	-	+1	+1	-	+1	70	IV
<i>Carex flacca</i>	-	+1	+1	-	-	+1	+1	+1	+1	-	60	III
<i>Silene alba</i>	-	+1	+1	+1	-	+1	-	+1	-	-	50	III
<i>Sideritis montana</i>	-	-	-	+1	+1	+1	-	+1	+1	-	50	III
<i>Poa trivialis</i>	+2	+2	+2	-	-	-	+2	-	-	+2	50	III
<i>Hypericum orientale</i>	-	-	-i	+1	+1	+1	-	+1	+1	-	50	III
<i>Astragalus fragrans</i>	+1	-	-	-	-	-	+1	-	-	+1	30	II
<i>Ajuga orientalis</i>	+1	-	-	-	+1	-	-	-	-	+1	30	II
<i>Bellis perennis</i>	-	+1	-	-	-	-	+1	+1	-	-	30	II
<i>Galium odoratum</i>	+1	-	-	-	-	-	-	-	+1	+1	30	II
<i>Potentilla micrantha</i>	-	-	-	+1	-	+1	-	-	+1	-	30	II
<i>Viola odorata</i>	-	-	+1	-	-	-	-	-	+1	-	20	I

**Veronico melissaefoliace-Fagetum orientalis**  
Quezel et al. 1980, (Table 8)

This association is usually dominant on the north and northeast facing slopes and brown froest soils at altitudes of 1000-1350 m around Erbaa (Çatalan village, Kızılotlu and Sancar plateaus). The characteristic and differential species of this association are *Fagus orientalis*, *Salvia glutinosa* L. *Veronica magna* M.A. Fischer (Syn. *Veronica melissifolia* Poir.) and *Arum euxinum* R. Miller. The association mostly exhibits tree and herb layers physiologically. But in densely degraded parts the association also includes a shrub layer. The tree layer is only characterised by *Fagus orientalis* having a total coverage of 90 and 100% and 30 and 40 m in height. Total coverages of the shrub and herb layers vary between 5 and 15% and the shrub and herb layers reaching 0.5 and 1 m and 20 and 40 cm in height respectively. The most common species in the shrub layer are *Daphne pontica* L., and *Rhododendron luteum* Sweet. The herb layer includes *Veronica magna*, *Arum euxinum*, *Doronicum orientale*, *Euphorbia amygdaloides*, *Cyclamen coum* Miller var. *caucasica* (C. Koch) Meikle, and *Cardamine quinquefolia* (Bieb.) Schmalh.

The components of VERONICO-FAGION alliance are *Fagus orientalis*, *Veronica peduncularis*, *Veronica magna*, *Arum orientale*. PINO-PICETALIA ORIENTALIS order is characterised by *Cyclamen coum* var. *caucasica*, *Paris incompleta* Bieb. FAGETALIA SYVATICA order and RHODODENDRO-FAGETALIA ORIENTALIS order are also represented by *Salvia forskahlei* L., *Rhododendron luteum*, *Trachystemon orientale* (L.) G. Don, *Neottia nidus-avis* (L.) L.C.M. Richard, *Cardamine bulbifera* (L.) Crantz. and *Daphne pontica*. The characteristic species of QUERCO-FAGETEA and QUERCETEA PUBESCENTIS are shown in table 8. This association is included in RHODODENDRO-FAGETALIA ORIENTALIS order by Kutbay and Kılınç (9), and Özen and Kılınç (10). However Quezel et al. (15) suggested that this association be included in VERONICO-FAGION alliance and PINO-PICEETALIA ORIENTALIS order. When the floristic composition of this associations is taken into account, the association must be included in the same syntaxa units mentioned by Quezel et al. (15).

**Degraded vegetation**

**8. Cephalanthero rubrae-Quercetum cerridis**  
Karaer, Kılınç & Kutbay ass. nov. (Table 9)

This association (Holotype table 9, quadrat number 35) is scattered around Erbaa (Üçtepel) and spread at

the height of 400-900 m on north exposed slopes. The characteristic and differential species are *Quercus cerris* var. *cerris*, *Cephalanthera rubra* (L.) L.C.M. Richard, *Carpinus orientalis* subsp. *orientalis* and *Dianthus orientalis* Adams. This association has been exploited due to human activity. However *Quercus cerris* var. *cerris* reaches 12-15 m in height in the surroundings of Hacilar village (Niksar) and Kozlu village (Erbaa) in a protected area. The most common species under *Quercus cerris* var. *cerris* forests are *Juniperus oxycedrus* subsp. *oxycedrus*, *Crataegus microphylla* C. Koch, *Ruscus aculeatus*. This association is spread on forest brown soils and the floristic composition of associations changes due to the exposure the degree of human activity etc. The association, the total coverage of which varies between 60 and 80%, exhibitis two vegetational layers, a shrub layer reaching 4-5 m in height and a herbaceous layer. The height of them vary between 30 and 50 cm. The shrub layer is characterised by *Quercus cerris* var. *cerris*, *Carpinus orientalis* subsp. *orientalis*, *Quercus infectoria* subsp. *infectoria*, *Juniperus oxycedrus*. subsp *oxycedrus*, *Coluteu cilicica* Boiss. & Bal., *Cotoneaster nummularia*, *Crataegus microphylla*. The herb layer is dominated by *Silene compacta* Fischer, *Dorycnium pentaphyllum*, *Potentilla recta* L., *Clinopodium vulgare* L., *Tanacetum poteriifolium*, *Cephalanthera rubra* and *Pilosella hoppeana*. CARPINO-ACERION alliance is represented by *Asperula involucreta*, *Lathyrus laxiflorus*, *Cornus sanguinea* L., *Cyclamen coum* var. *caucasica*, *Viola sieheana* Becker. The species belonging to QUERCO-CARPINETALIA ORIENTALIS order are *Lathyrus tukhtensis*, *Argyrolobium biebersteini* Ball., *Digitalis ferruginea* L., *Lasier trilobum*. The components of QUERCETEA PUBESCENTIS, QUERCO-FAGETEA, QUERCETEA (ETALIA) ILICIS, CISTO-MICROMERIEA and ASTRAGALO-BROMETEA are shown in table 9. The association was included in CARPINO-ACERION alliance and QUERCO-CARPINETALIA ORIENTALIS order when the floristic composition was examined.

**9. Onobrychido tournefortii-Quercetum pubescentis** Karaer, Kılınç & Kutbay ass. nov. (Table 10)

This association (Holotype table 10, quadrat number 181) is spread on brown forest soils in the surroundings Koyulhisar at altitudes of 800-1100 m. Characteristic and differential species of this association are *Quercus pubescens*, *Onobrychis tournefortii* (Willd.) Desv., *Aristolochia maurorum* L. and *Phlomis pungens* Willd. The association exhibits two vegetation layers namely shrub and herb layers. Total coverage of the shrub layer



Table 8. Veronico melissaefoliae-Fagetum orientalis Quezel et al., 1980

Quadrat No	44	45	46	47	48	49	50	51	52	53		
Size of quadrat (m2)	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000		
Altitude (m)	1340	1300	1350	1350	1300	1300	1300	1280	1280	1270		
Exposure	NE	NE	NE	N	NE	NE	N	NE	NE	NE		
Inclination (%)	20	10	30	20	40	20	30	30	15	30		
Height of the shrub layer(m)	30	30	30	30	40	40	30	30	30	30		
Coverage of the tree layer(%)	100	100	100	90	100	100	100	90	100	90		
Height of the shrub layer(m)	1	1	1	1	1	1	1	1	1	1		
Coverage of the shrub layer(%)	5	5	5	5	15	5	5	10	5	15		
Height of the herb layer(m)	20	20	30	40	20	20	20	20	30	20		
Coverage of the herb layer(%)	10	15	15	10	10	10	15	15	10	15	*	*
Characteristic and differential species of the association												
Fagus orientalis	55	55	55	54	55	55	55	54	55	54	100	v
Veronica magna	12	-	+2	12	+2	12	+2	22	+2	22	90	v
(Syn:Veronica melissifolia)												
Arum euinum	+1	+1	+1	+1	+1	-	-	-	+1	-	60	III
Salvia glutinosa	11	11	+1	+1	-	-	11	-	-	-	50	III
Characteristic species VERONICA FAGION(*) and PINO-PICEETALIA ORIENTALIS												
Cyclamen coum var. caucasica	+1	+1	+1	+1	+1	+1	-	-	+1	-	70	IV
(*)Veronica peduncularis	-	+1	-	+1	+1	+1	+1	-	-	+1	60	III
(*)Arum orientale	+1	-	+1	-	-	+1	-	-	-	-	30	II
Paris incompleta	-	-	-	-	-	-	-	-	+1	+1	20	I
Characteristic species of RHODODENDRO-FAGETALIA ORIENTALIS and FAGETALIA SYLVATICA(*)												
(*)Cardamine bulbifera	+1	+1	+1	-	-	-	+1	+1	+1	+1	70	IV
(*)Neottia nidus-avis	+1	-	-	+1	-	+1	+1	-	-	-	40	II
Rhododendron luteum	-	-	-	+2	+2	-	-	+2	-	+2	40	II
Daphne pontica	-	-	-	-	+2	-	-	+2	-	-	20	I
Trachystemon orientale	-	-	-	-	-	-	-	+1	-	+1	20	I
Salvia forskahlei	+1	+1	-	-	-	-	-	-	-	-	20	I
Characteristic species of QUERCO-FAGETEA												
Euphorbia amygdaloides	+1	+1	+1	+1	,	+1	+1	-	+1	-	70	IV
Geranium robertianum	+1	-	+1	+1	+1	-	-	-	-	+1	50	II
Myosotis alperstris	+1	+1	+1	+1	-	-	+1	-	-	-	50	II
Luzula forsteri	+1	-	+1	-	-	-	+1	+1	-	-	40	I
Brachypodium sylvaticum	-	-	-	-	-	+1	+1	+1	-	+1	40	I
Fragaria vesca	+2	+2	-	-	-	-	-	-	-	-	20	I
Characteristic species of QUERCETEA PUBESCENTIS												
Doronicum orientale	+1	+1	+1	+1	+1	-	+1	+1	+1	-	80	IV
Helleborus orientalis	+1	+1	-	+1	-	-	-	-	-	-	30	II
Viola sieheana	-	+1	-	-	-	-	+1	-	-	+1	30	II
Tanacetum parthenium	-	-	-	-	-	-	-	+1	+1	-	20	I
Cephalanthera rubra	-	+1	-	-	-	+1	-	-	-	-	20	I
Companions												
Cardamine quinquefolia	+1	+1	+1	+1	+1	+1	-	+1	+1	+1	90	v
Potentilla micrantha	+2	+2	-	+2	+2	+2	-	-	+2	-	60	III
Prunella laciniata	+1	+1	+1	+1	+1	-	-	-	-	+1	60	III
Geranium cinereum	-	+1	-	+1	-	+1	-	+1	-	+1	50	III
Ajuga reptans	-	-	+1	+1	-	-	-	+1	+1	-	50	III
Cirsium pseudopersonata subsp. pseudopersonata	+1	-	+1	+1	-	-	-	-	-	+1	40	II
Solananthes stamineus	-	-	+1	+1	+1	+1	-	-	-	-	40	II
Bellis perennis	+1	+1	-	-	-	+1	-	-	-	-	30	II
Pteridium aquilinum	-	-	+1	-	+1	-	-	+1	-	-	30	II
Verbascum spectabile	-	-	-	+1	+1	+1	-	-	-	-	30	II
Epipactis pontica	-	-	+1	-	-	-	-	-	-	+1	20	I
Colchium speciosum	-	-	-	-	-	-	-	-	+1	+1	20	I

is 40 and 70% and height of shrub layer is about 3 and 5 m. The shrub layer is characterised by *Quercus pubescens*, *Juniperus oxycedrus* subsp. *oxycedrus* and *Colutea cilicica*. Total coverage of the herb layer is 30 and 70% and of height 20 and 40 cm. The herb layer is dominated by steppic plants. QUERCION ANATOLICA alliance is represented by *Vicia cracca* L., *Coronilla varia* L., *Anthemis tinctoria*, *Trifolium pannonicum* Jacq. subsp. *elongatum* (Wild) Zoh., *Colutea cilicica*. The components of QUERCETEA PUBESCENTIS are *Asyneuma rigidum*, *Juniperus oxycedrus* subsp. *oxycedrus*, *Silene compacta*, *Acinos rotundifolia*, *Geum urbanum* L., *Dorycnium pentaphyllum* Scop subsp. *herbaceum* (Vill.) Rouy, *Asperula involucrata*, *Brachypodium pinnatum* (L.) P. Beauv., *Melampyrum arvense* and *Crataegus orientalis* Pallas ex Bieb. The species belonging to QUERCOFAGETEA are *Epipactis hellebornine* (L.) Crantz, *Campanula glomerata* L., *Lapsana communis* subsp. *intermedia*, *Clinopodium vulgare* and *Moehringia trinervia*. The association has been exploited due to human activity. Such places were characterised by ASTRAGALO-BROMETEA class and ONOBRYCHIDO-THYMETALIA LEUCOSTOMI order. Furthermore the association consists of several cosmopolitan species because of the existence of meadows near the study area. Composition of associations changes due to the exposure, the degree of human activity etc. *Quercus pubescens* forest represents subclimax vegetation in Central anatolia. They are usually neighbouring *Pinus nigra* subsp. *pallasiana* forests and are usually formed as a result of the destruction of *Pinus nigra* subsp. *pallasiana* forests (14). Although ASTRAGALO-BROMETEA class is quite well represented in same places due to human activity, it is more suitable to include this association in QUERCETEA PUBESCENTIS class.

#### 10. Achilleo gypsicolae-Juniperetum excelsae Karaer, Kiliñç & Kutbay ass. nov. (Table 11)

The association is widespread (Holotype table 11, quadrat number 217) around Kayaören, Yukarıkale and Yalnıztepe villages (Koyulhisar) at altitudes of 600-800 m on south-facing slopes and alluvial and brown forest soils. Characteristic and differential species of this association are *Achillea gypsicola* Hub.-Mor., *Juniperus excelsa*, *Rhamnus elaterrus* L. The association, the total coverage of which varies between 30 and 70% exhibits two vegetation layers i.e. a shrub layer reaching 2-4 m and a herb layer. The height of them varies between 30 and 40 cm QUERCETEA (ETALIA) ILICIS is represented by *Pistacia terebinthus* subsp. *palaestina*, *Jasminum*

*fruticans*. QUERCETEA PUBESCENTIS is *Juniperus oxycedrus* subsp. *oxycedrus*, *Cotoneaster nummularia*, *Berberis crataegina* DC. and ONOBRYCHIDO-THYMETALIA LEUCOSTOMI order and ASTRAGALO-BROMETEA class are quite well represented. It is too difficult to explain the association syntaxonically. The association is the last degradation stage of *Pinus nigra* subsp. *pallasiana* forests. Several researchers have included *Juniperus excelsa* associations in QUERCETEA PUBESCENTIS class. The classification of this association is quite difficult due to the high number of steppic species (27). The syntaxonomic interpretation is becoming more difficult because the association is situated in a transition area. Steppic species are very widespread. However typical forest species are not found. So it should be considered in ONOBRYCHIDO-THYMETALIA LEUCOSTOMI and ASTRAGALO-BROMETEA.

#### Hygrophilous vegetation:

#### 11. Vitici agni-casti-Tamaricetum smynensis Karaer, Kiliñç & Kutbay ass. nov. (Table 12)

The association (Holotype table 12, quadrat number 207) is scattered along the Kelkit River around Kale and Tepekışla villages (Erbaa) at altitudes of 230-250 m. It is spread on alluvial soils and exhibits shrub and herb layers. Total coverage of the shrub layer is 70 and 90% and 2 and 3 m in height. It is characterised by *Tamarix smyrnensis* Bunge, *Vitex agnus-castus* L. and *Rubus canescens* DC. Total coverage of the herb layer is 30 and 50% and 30 and 90 cm in height. The herb layer is characterised by *Eupatorium cannabinum* L., *Mentha pulegium* L., *Teucrium scordium* L., *Pulicaria dysenterica* (L.) Bernh and *Sophora alopecuroides*. The components of MOLINETEO-ARRHENATHERETEA and PHRAGMITETEA (ETALIÁ) classes are well represented. The classification of these associations scattered along streams is quite difficult and the present data are not sufficient. However, Çetik (28) indicated that there were the same associations belonging to MOLINETEA-ARRHENATHERETEA class on natural and irrigated pastures, wet meadows of the plateau and mountain steppes of Central Anatolia and these associations were not studied sufficiently. In our opinion the vegetation of such places should be considered MOLINETEA-ARRHENATHERETEA class. In previous studies the vegetation of such places were not classified syntaxonically by Çetik (29) or they were included in POPULETALIA order and QUERCETEA ILICIS class (9, 10). Because of the high percentages of hygrophilous species this association must be included in PHRAGMITETEA (ETALIA).

Table 9. Cephalanthero rubrae-Quercetum cerridis Karaer et al. ass. nov.

Quadrat No	35	36	37	39	40	41	42	43	140	141		
Size of quadrat (m2)	500	500	400	600	400	500	500	600	400	400		
Altitude (m)	400	400	400	450	450	470	470	470	450	450		
Exposure	N	NE	NE	NW	NW	N	N	N	NW	NW		
Inclination (%)	5	10	10	15	15	20	20	20	10	10		
Height of the shrub layer(m)	4	4	4	5	4	5	5	4	5	5		
Coverage of the shrub layer(%)	80	80	70	80	70	80	60	70	70	60		
Height of the herb layer(m)	50	50	50	30	40	30	40	30	40	30		
Coverage of the herb layer(%)	30	30	40	30	40	30	50	30	30	40	*	**
Characteristic and differential species of the association												
<i>Quercus cerris</i> var.cerris	44	43	33	33	43	33	43	43	12	11	100	v
<i>Cephalanthera rubra</i>	21	-	+1	+1	11	-	11	+1	+1	21	80	iv
<i>Carpinus orientalis</i> subsp.orientalis	-	21	+2	-	+2	12	-	12	21	21	70	iv
<i>Dianthus orientalis</i>	+2	-	-	+2	+2	+2	+2	-	-	12	60	iii
Characteristic species of CARPINO-ACERION and QUERCO-CARPINETALIA ORIENTALIS(*)												
<i>Asperula involucreta</i>	+1	+1	+1	-	-	+1	+1	+1	-	+1	70	iv
<i>Cyclamen coum</i> var.coum	-	+1	+1	+1	-	-	-	-	+1	-	40	ii
<i>Lathyrus laxiflorus</i>	-	+1	+1	-	+1	-	-	+1	-	-	40	ii
(*) <i>Argyrobolium biebersteini</i>	-	-	-	+1	-	+1	+1	-	-	+1	40	ii
(*) <i>Laser trilobum</i>	+1	-	+1	-	-	-	-	-	-	+1	30	ii
<i>Cornus sanguinea</i>	-	-	-	-	+1	-	-	-	+1	-	20	i
(*) <i>Digitalis ferruginea</i>	-	-	-	+1	-	-	-	+1	-	-	20	i
(*) <i>Lathyrus tukhtensis</i>	+1	-	-	-	+1	-	-	-	-	-	20	i
<i>Viola sieheana</i>	-	+1	-	-	-	-	-	-	-	-	10	i
Characteristic species of QUERCETEA PUBESCENTIS												
<i>Juniperus oxycedrus</i>	+2	+2	+2	+2	+2	-	+2	+2	+2	-	80	iv
<i>Dorycnium pentaphyllum</i>	+2	+2	+2	+2	+2	+2	-	+2	-	-	70	iv
<i>Tanacetum potterifolium</i>	-	+1	-	+1	+1	+1	+1	+1	-	-	60	iii
<i>Silene compacta</i>	+1	+1	+1	+1	-	-	+1	-	-	+1	60	iii
<i>Quercus infectoria</i> subsp.infectoria	-	-	-	-	-	+2	-	+2	+2	+2	40	ii
<i>Vicia cracca</i> subsp.tenuifolia	+2	+1	+2	-	+1	-	-	-	-	-	40	ii
<i>Cotoneaster nummularia</i>	-	-	-	-	-	-	+1	-	+1	+1	30	i
<i>Campanula rapunculoides</i>	-	+1	+1	-	-	-	-	-	-	-	20	i
<i>Trifolium medium</i> subsp.medium	-	-	-	-	+1	-	+1	-	-	-	20	i
<i>Colutea cilicica</i>	+1	-	-	-	-	-	-	-	+1	-	20	i
<i>Acinos rotundifolia</i>	+1	-	-	+1	-	-	-	-	-	-	20	i
(*) <i>Coronilla varia</i>	-	+1	-	-	-	+1	-	-	-	-	20	i
Characteristic species of QUERCO-FAGETEA												
<i>Brachypodium sylvaticum</i>	-	+1	+1	-	+1	-	-	+1	-	+1	50	iii
<i>Clinopodium vulgare</i>	-	-	-	+1	+1	-	-	-	+1	+1	40	ii
<i>Veronica chamaedrys</i>	-	-	-	-	-	+2	+2	-	-	-	20	i
<i>Epipactis helleborine</i>	-	-	-	+1	-	-	-	+1	-	-	20	i
<i>Primula vulgaris</i> subsp. vulgaris	+2	-	-	-	+2	-	-	-	-	-	20	i
Characteristic species of QUERCETEA ILICIS and CISTO-MICROMERIETEA(*)												
<i>Pistacia terebinthus</i>	-	+1	+1	-	+1	-	-	+1	+1	-	50	iii
(*) <i>Psoralea bituminosa</i>	-	-	+1	+1	-	+1	+1	-	-	+1	50	iii
<i>Ruscus aculeatus</i>	+2	-	-	+2	-	-	-	-	+2	-	30	ii
<i>Jasminum fruticans</i>	-	+2	-	-	+2	-	+2	-	-	-	30	ii
Characteristic species of ASTRAGALO-BROMETEA												
<i>Helianthemum nummularium</i>	+1	-	+1	-	+1	+1	+1	+1	+1	+1	80	iv
<i>Potentilla recta</i>	+1	+1	-	+1	-	+1	+1	+1	+1	+1	80	iv
<i>Globularia trichosantha</i>	-	+1	+1	+1	+1	-	-	-	+1	+1	60	iii
<i>Hedysarum varium</i>	-	-	+2	+2	+2	+2	-	-	-	+2	50	iii
<i>Pilosella hoppeana</i>	+1	+1	-	-	-	+1	+1	-	-	-	54	iii
<i>Anthemis tinctoria</i>	+2	-	+2	-	-	-	+1	+1	-	-	40	ii
<i>Leontodon asperimus</i>	+1	+1	-	-	+1	+1	-	-	-	-	40	ii
<i>Crypsogon gryllus</i> subsp.gryllus	-	-	+1	+1	-	-	-	-	+1	+1	40	ii
<i>Allium flavum</i> subsp. tauricum	-	-	-	-	-	-	-	-	+1	+1	20	i
<i>Teucrium polium</i>	-	-	-	-	-	-	+2	+2	-	-	20	i
<i>Onobrychis armena</i>	-	-	-	-	-	+1	+1	-	-	-	20	i

Table 9. continued

Companions												
Dactylis glomerata	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	100	v
Carex flacca	+2	+2	+1	-	+1	+1	+1	+1	+1	+1	90	v
Scabiosa columbaria	+1	+1	+1	-	+1	+1	+1	+1	-	-	70	iv
Trifolium campestre	+1	-	+1	-	-	+1	+1	+1	+1	+1	70	iv
Prunella vulgaris	+1	+1	+1	+1	-	+1	+1	+1	-	-	70	iv
Ononis pusilla subsp. leiocarpa	+1	-	+1	+1	+1	+1	+1	-	-	-	60	iv
Trigonella coerulescens	-	+1	-	+1	-	+1	-	+1	+1	-	50	iii
Myosotis ramosissima	+1	-	-	+1	+1	-	-	-	+1	+1	50	iii
Veronica orientalis	-	+2	+2	+2	-	+2	-	-	-	-	40	ii
Lathyrus aphaca	-	-	-	-	+1	-	+1	+1	-	+1	40	ii
Convolvulus cantabica	-	-	-	+1	-	+1	+1	-	+1	-	40	ii
Coronilla orientalis	+2	+2	-	-	-	-	-	+2	-	+2	40	ii
Crupina vulgaris	+1	-	+1	-	-	+1	-	-	+1	-	40	ii
Steptorhamphus tuberosus	-	-	-	+1	+1	+1	+1	-	-	-	40	ii
Rosa canina	+1	-	-	-	-	-	-	+1	-	+1	30	ii
Muscari armeniacum	-	+1	-	-	+1	-	-	-	+1	-	30	ii
Trigonella monspeliaca	-	-	+1	-	-	-	-	-	+1	+1	30	ii
Viola odorata	-	-	-	+1	-	-	-	+1	+1	-	30	ii

## 12. Periploco graecae-Elaeagnum angustifoliae Karaer, Kiliñç & Kutbay ass. nov. (Table 13)

The association (Holotype table 13, quadrat number 159) is scattered along the Kelkit River around Sugözü village (Koyulhisar) at an altitude of 600 m. It is spread on alluvial and colluvial soils. Characteristic and differential species of association are *Elaeagnus angustifolia* L., *Periploca graeca* L. var. *graeca*, *Bryonia alba* L., *Asparagus acutifolius* L. and *Clematis viticella*. The association exhibits shrub and herb layers which have a 30 and 80% total coverage of shrub layer 3 and 5 m in height and characterised by *Elaeagnus angustifolia*, *Rubus canescens*, *Rosa canina* L., *Crataegus monogyna*. The herb layer is 40 and 70 cm in height and includes hygrophilous species such as *Pulicaria dysenterica* (L.) Bernh., *Prunella vulgaris* L., *Asparagus acutifolius*, *Torilis arvensis* (Huds) Link., *Lolium perenne* L. Due to the fact mentioned above this association must be included in MOLINIETEO-ARRHENATHERETEA and PHRAGMI-TETEA (ETALIA).

### Conclusions and Comments

In the study area, 12 plant associations and 2 subassociations belonging to forest, degraded forest, macchie and hygrophilous vegetation types were determined, 10 as 1 new associations and 2 subassociations. Syntaxonomical interpretation of these associations are shown below:

QUERCETEA ILICIS Braun-Blanquet 1947.

QUERCETALIA ILICIS Braun-Blanquet 1947.

1. Siderito dichotomae-Quercetum cocciferae ass. nov.

2. Cotino coggyriae-Arbutetum andrachnes ass. nov.

3. Paliuro spinae-christi-Fontanesietum phillira-eoidis ass. nov.

4. Quercu infectoriae-Pinetum brutiae Quezel et al. 1986.

a- cistetosum cretici subass. nov.

b- styracetosum officinalis subass. nov.

QUERCETEA PUBESCENTIS Doing Kraft 1955.

QUERCO CERRIDIS-CARPINETALIA ORIENTALIS Akman, Barbero et Quezel 1980.

CARPINO BETULI-ACERION HYRCANI Quezel, Barbero et Akman 1980.

5. Ranunculo buhsei-Pinetum sylvestris ass. nov.

6. Astragalo aucheri-Pinetum pallasianea ass. nov.

7. Cephalanthero rubrae-Quercetum cerridis ass. nov.

QUERCION-ANATOLICAE Akman, Barbero et Quezel, 1979.

8. Onobrychido tournefortii-Quercetum pubescentis ass. nov.

QUERCO-FAGETEA Fuk et Fab. 1968.

PINO SYLVESTRIS-PICEETALIA ORIENTALIS Quezel, Barbero et Akman 1980.

VERONICO PEDUNCULARIS-FAGION ORIENTALIS Quezel, Barbero et Akman 1980.

9. Veronico melissaefoliae-Fagetum orientalis Quezel, Barbero et Akman 1980.

ASTRAGALO MICROCEPHALI-BROMETEA TOMENTELLI Quezel 1973.

ONOBRYCHIDO ARMENA-THYMETALIA LEUCOS-

Table 10. Onobrychido tournefortii-Quercetum pubescentis Karaer et al. Ass. Nov.

Quadrat No	174	175	180	181	194	195	196	197	213	214		
Size of quadrat (m2)	400	400	600	600	400	400	400	400	500	500		
Altitude (m)	1150	1150	800	850	1100	1100	1000	1000	1200	1200		
Exposure	SW	SW	SW	SW	SW	SW	SE	SE	SE	SE		
Inclination (%)	10	15	10	10	15	15	10	15	20	20		
Height of the shrub layer(m)	4	5	3	4	3	4	4	3	4	4		
Coverage of the shrub layer(%)	70	50	60	50	60	40	60	50	70	70		
Height of the herb layer(m)	30	30	20	20	30	30	20	30	25	25		
Coverage of the herb layer(%)	40	60	30	40	50	30	50	70	50	40	*	**
Characteristic and differential species of the association												
<i>Quercus pubescens</i>	33	32	33	33	33	32	33	32	43	43	100	v
<i>Onobrychis tournefortii</i>	12	12	12	+2	12	12	-	12	-	-	70	iv
<i>Aristolochia maurorum</i>	+1	-	+1	+1	-	+1	+1	-	+1	-	60	iii
<i>Phlomis pungens</i>	-	+1	-	+1	+1	-	+1	+1	+1	+1	80	iv
(*) <i>Anthemis tinctoria</i>	+1	+1	-	-	+1	+1	+1	-	+1	+1	70	iv
<i>Silene compacta</i>	-	+1	+1	+1	+1	+1	+1	+1	+1	-	70	iv
<i>Juniperus oxycedrus</i>	+2	+2	+2	-	-	+1	-	+2	-	+2	60	iii
<i>Tanacetum poterifolium</i>	-	+1	+1	+1	-	+1	-	+1	-	+1	60	iii
<i>Brachypodium pinnatum</i>	-	-	-	+1	+1	+1	+1	-	+1	-	50	iii
<i>Asyneuma rigidum</i>	+1	-	-	+1	-	+1	+1	-	-	+1	50	iii
<i>Dorycnium pentaphyllum</i>	-	+1	+1	-	+1	-	+1	+1	-	-	50	iii
(*) <i>Trifolium pannonicum</i>	-	+1	+1	-	+1	-	+1	-	-	-	40	ii
<i>Asperula involucreta</i>	+1	+1	+1	-	-	-	+1	-	-	-	40	ii
<i>Bunium microcarpum</i>	-	+1	-	+1	-	-	-	+1	-	+1	40	ii
<i>Cephalanthera rubra</i>	-	-	-	-	+1	+1	+1	+1	-	-	40	ii
(*) <i>Coronilla varia</i>	-	-	-	-	+1	-	-	+1	+1	+1	40	ii
(*) <i>Colutea cilicica</i>	-	+1	-	-	-	+1	+1	-	-	-	30	ii
(*) <i>Vicia cracca</i> subsp. <i>tenuifolia</i>	-	-	+1	-	-	-	-	+1	-	+1	30	ii
<i>Crataegus orientalis</i>	-	-	-	-	+1	-	-	+1	-	-	20	i
<i>Melampyrum arvense</i>	-	-	-	+1	-	-	-	-	+1	-	20	i
Characteristic species of QUERCO-FAGETEA												
<i>Lapsana communis</i>	-	-	-	-	+1	-	+1	+1	+1	+1	50	iii
<i>Geum urbanum</i>	-	-	-	-	+1	-	+1	-	+1	+1	40	ii
<i>Epipactis helleborine</i>	-	+1	+1	-	+1	-	+1	-	-	-	40	ii
<i>Campanula glomerata</i>	+1	-	-	+1	-	-	-	-	-	-	20	i
<i>Clinopodium vulgare</i>	-	-	-	-	-	+1	-	+1	-	-	20	i
<i>Moehringia trinervia</i>	-	-	-	+1	-	-	-	-	-	+1	20	i
Characteristic species of ONOBRYCHIDO-THYMETALIA LEUCOSTOSMI(*) and ASTROGALO-BROMETEA												
(*) <i>Jurinea consanguinea</i>	+1	+1	+1	+1	-	+1	+1	+1	+1	+1	90	v
<i>Helianthemum canum</i>	+1	+1	+1	+1	-	-	+1	+1	+1	+1	80	iv
<i>Potentilla recta</i>	+1	+1	-	+1	+1	+1	-	+1	+1	-	70	iv
<i>Pilosella hSoppeana</i>	-	-	+1	+1	+1	-	+1	+1	+1	+1	70	iv
<i>Linaria corifolia</i>	+1	+1	+1	+1	+1	-	-	+1	-	+1	70	iv
<i>Fibigia eriocalycina</i>	+1	-	+1	+1	+1	-	+1	+1	-	-	60	iii
<i>Paranonychia chionea</i>	+1	+1	+2	+2	-	+2	-	-	+2	-	60	iii
<i>Teucrium polium</i>	+2	-	-	+2	-	+2	-	+2	-	+2	50	iii
<i>Cruciata taurica</i>	-	+2	+2	-	+2	-	-	-	+2	+2	50	iii
<i>Teucrium chamaedrys</i>	-	-	+1	-	+1	-	-	+1	+1	+1	50	iii
(*) <i>Alium flavum</i> subsp. <i>tauricum</i>	-	-	+1	+1	-	+1	-	-	+1	+1	50	iii
<i>Erysimum crassipes</i>	+1	+1	-	+1	-	-	+1	+1	-	-	50	iii
<i>Hypericum lydiium</i>	-	-	+2	-	-	-	-	+2	+2	+2	40	ii
(*) <i>Polygala pruinosa</i>	-	+1	-	+1	-	-	+1	-	+1	-	40	ii
(*) <i>Silene supina</i> subsp. <i>pruinosa</i>	+2	-	+2	-	+2	-	-	-	-	+2	40	ii
<i>Astragalus microcephalus</i>	-	-	-	-	-	+3	-	-	+3	+3	30	ii
<i>Acantholimon acerosum</i>	-	-	+3	-	+3	-	+3	-	-	-	30	ii
<i>Sangiosorba minor</i>	-	+1	-	-	-	-	-	-	+1	+1	30	ii
<i>Miuartia anatolica</i> var. <i>anatolica</i>	-	+1	+1	-	-	-	-	+1	-	-	30	ii
<i>Iberis taurica</i>	+1	-	-	+1	-	-	+1	-	-	-	30	ii
(*) <i>Bunaea trifida</i>	-	+1	-	-	+1	-	-	-	-	+1	30	ii
(*) <i>Onobrychis armena</i>	-	-	-	-	+1	+1	-	+1	-	-	30	ii
(*) <i>Helianthemum nummularium</i>	-	-	+1	-	+1	-	+1	-	-	-	30	ii
Companions												
<i>Ampylopyron muticum</i>	+1	+1	+1	+1	+1	+1	+1	+1	-	+1	90	v
<i>Alyssum erusulum</i>	+1	+1	+1	+1	+1	-	-	+1	+1	-	70	iv

Table 10. continued

<i>Ononis pusilla</i> subsp. <i>leiocarpa</i>	+1	+1	+1	+1	-	+1	+1	-	+1	-	70	iv
<i>Aegilops geniculata</i>	+1	+1	+1	+1	-	-	+1	+1	-	+1	70	iii
<i>Scabiosa columbaria</i> ssp. <i>columbaria</i>	-	+1	-	+1	+1	+1	-	+1	+1	+1	70	iii
<i>Trifolium physodes</i>	+1	-	-	+1	-	+1	+1	+1	+1	+1	70	iii
<i>Poa bulbosa</i>	+2	+2	-	+1	+1	-	+2	-	-	+2	60	iii
<i>Veronica orientalis</i>	-	+2	+2	-	+2	+2	-	+2	+2	-	60	iii
<i>Stachys iberica</i>	+1	-	-	+1	+1	-	+1	-	+1	+1	60	iii
<i>Helichyrsium armenum</i> ssp. <i>armenum</i>	+2	+2	+2	-	-	+2	-	+2	-	-	50	iii
<i>Silene montbretiana</i>	+2	-	-	+2	+2	-	+2	-	+2	-	50	iii
<i>Dianthus fluribundus</i>	-	+1	+1	+1	-	-	-	+1	-	+1	50	iii
<i>Scleranthus uncinatis</i>	+1	-	+1	-	-	+1	-	+1	+1	-	50	iii
<i>Hedysarum nitidum</i>	-	+1	-	-	+1	-	+1	-	+1	+1	50	iii
<i>Crupina vulgaris</i>	-	-	+1	+1	+1	-	-	+1	+1	-	50	iii
<i>Rumex tuberosus</i>	-	-	-	-	+1	+1	+1	+1	-	+1	50	iii
<i>Teucrium orientale</i> var. <i>puberula</i>	-	-	-	-	+1	+1	-	+1	+1	+1	50	iii
<i>Thymus parnasicus</i>	+1	+1	+1	+1	-	+1	-	-	-	-	50	iii
<i>Muscari armeniacum</i>	+1	+1	-	-	-	-	+1	-	-	+1	40	ii
<i>Scutellaria salviifolia</i>	-	+1	+1	-	+1	-	-	-	+1	-	40	ii
<i>Verbascum cherianthifolium</i>	-	+1	-	+1	-	-	+1	-	-	-	40	ii
<i>Calamagrostis pseudophragmites</i>	-	-	-	-	-	+2	-	+2	+2	-	30	ii
<i>Medicago falcata</i>	-	-	+1	-	+1	-	-	-	+1	-	30	ii
<i>Johrenia tortuosa</i>	-	-	-	-	-	+1	-	-	+1	+1	30	ii

TOMI Akman, Ketenöglü, Quezel & Demirörs 1974.

10. *Achilleo gypsicolae-Juniperetum excelsae* ass. nov.

PHRAGMITETEA R. Tx. et Preising 1942.

PHRAGMITETALIA Koch 1926.

11. *Vitici agni-casti-Tamaricetum smyrnensis* ass. nov.

MOLINO-ARRHENATHERETEA R. Tx. 1937.

ARRHENATHERETALIA Pawl 1928.

12. *Periploco graecae-Elaeagnetum angustifoliae* ass. nov.

Macchie vegetation is found in the study area in Mediterranean enclaves. *Siderito dichotomae-Quercetum cocciferae* associations was first described from the Black Sea Region by us. There are 15 different *Quercus coccifera* associations or communities which have different codominant species in Turkey (30). The floristic resemblance of the associations varies between 14 and 27%. The floristic resemblance of *Cotino coggyriae-Arbutetum andrachnes* varies between 13.2 and 21.2%. *Paliuro spinae-christi-Fontanesietum philliraeoidis* has a quite local character in the study area and is firstly described by us. Fourteen different *Pinus brutia* associations have been determined to date because *Pinus brutia* can be scattered on several sites which have different climatic and edaphic properties (16). *Querco infectoria-Pinetum brutiae* association varies between 10.8 and 39.3% (Table 14). This association floristically closely resembles the association described by Quezel et

al. (15). The association is firstly described by us and it includes two subassociations namely *cistetosum cretici* and *styracetosum officinalis*, also described by us. *Styracetosum officinalis* is scattered around undegraded *Pinus brutia* forest. However *cistetosum cretici* is widespread around degraded *Pinus brutia* forest. *Astragalo aucheri-Pinetum pallasianae* is firstly described by us. There are several *Pinus nigra* associations which have different codominant species described by Akman and Ketenöglü (11), Quezel et al. (15), Ekim and Akman (18), Gemici (19), Ocakverdi (20), Bekat (21), Uslu (30), Akman (31), Yurdakulol (32), Kutbay and Kılınç (9), Özen and Kılınç (10) Akman et al. (12) and Kılınç (14). *Astragalo aucheri-Pinetum pallasianae* varies between 6 and 17.4%. This association is similar to the association described by Bekat (21). *Ranunculo buhsei-Pineteum sylvestris* association was described previously under different titles by several authors. Kutbay and Kılınç (9), Özen and Kılınç (10), Akman and Ketenöglü (11), Akman et al. (12), Kılınç (14), Quezel et al. (15), Düzenli (26) and Akman (31) described this association around the Black Sea Regions. Ekim and Akman (18) described the association from Sündiken Mountain which constitutes the southernmost border of *Pinus sylvestris*. The floristic resemblance of the associations varies between 14 and 30.5% and the highest resemblance to ours was obtained by Özen and Kılınç (10). *Veronico melissaefoliae-Fagetum orientalis* association was described by several authors. Floristic resemblance varies between 15.2 and 42% and the highest resemblance was obtained by Quezel et al. (15). *Cephalanthero rubrae-Quercetum cerridis* was described previously by Kutbay and Kılınç (9), Özen and

Quadrat No	215	216	217	218	219		
Size of quadrat (m2)	500	500	500	500	500		
Altitude (m)	650	600	700	600	650		
Exposure	-	-	S	S	-		
Inclination (%)	20	15	10	10	10		
Height of the shrub layer(m)	4	4	3	3	2		
Coverage of the shrub layer(%)	70	50	60	70	60		
Height of the herb layer(m)	30	30	40	40	30		
Coverage of the herb layer(%)	40	30	30	40	30	*	**
Characteristic and differential species of the association							
<i>Juniperus excelsa</i>	33	33	32	33	32	100	v
<i>Achillea gypsicola</i>	12	11	12	-	11	80	iv
<i>Rhamnus elaternus</i>	+1	+2	-	-	-	40	ii
Characteristic species of ONOBRYCHIDO-THYMETALIA LEUCOSTOSMI							
<i>Allium flavum</i> subsp. <i>tauricum</i>	+1	+1	+1	+1	+1	100	v
<i>Paranoychia kurdica</i>	-	+2	+2	+2	+2	80	iv
<i>Ziziphora capitata</i>	+1	+1	+1	+1	-	80	iv
<i>Alyssum murale</i>	+1	+1	+1	-	+1	80	iv
<i>Onobrychis armena</i>	-	+1	+1	+1	+1	80	iv
<i>Salvia cryptantha</i>	-	+2	+2	+2	-	60	iii
<i>Verbascum cherianthifolium</i>	-	+1	+1	+1	-	60	iii
<i>Noaea mucronata</i>	-	+1	+1	+1	-	60	iii
Characteristic species of ASTROGALO-BROMETEA							
<i>Teucrium polium</i>	12	+2	12	+2	12	100	v
<i>Artemisia taurica</i>	+1	+2	-	+2	+1	80	iv
<i>Eryngium campestre</i>	+1	-	+1	+1	+1	80	iv
<i>Marrubium parviflorum</i>	-	-	+1	+1	+1	60	iii
<i>Alkanna orientalis</i>	+1	-	-	+1	+1	60	iii
<i>Helianthemum canum</i>	-	+1	+1	+1	-	60	iii
<i>Asragalus microcephalus</i>	-	-	13	-	13	40	ii
<i>Erysimum crassipes</i>	+1	-	-	+1	-	40	ii
<i>Koelaria cristata</i>	-	+1	+1	-	-	40	ii
<i>Melica ciliata</i> subsp. <i>ciliata</i>	-	+2	+2	-	-	40	i
<i>Centaurea triumfeti</i>	-	-	+1	-	+1	40	i
<i>Pennisetum orientale</i>	-	-	-	+3	-	20	i
Characteristic species of QUERCETEA ILICIS							
<i>Pistacia terebinthus</i> subsp. <i>terebinthus</i>	+1	-	+1	+1	-	60	iv
<i>Jasminum fruticans</i>	-	+1	-	-	-	20	i
Characteristic species of QUERCETEA PUBESCENTIS							
<i>Berberis crataegina</i>	+2	-	+2	-	+2	60	iii
<i>Cotoneaster nummularia</i>	-	-	+1	-	+1	40	ii
<i>Juniperus oxycedrus</i> subsp. <i>oxycedrus</i>	-	-	-	+2	-	20	i
Companions							
<i>Alyssum strigosum</i> subsp. <i>strigosum</i>	+1	+1	+1	+1	+1	100	v
<i>Scleranthus annuus</i>	+1	+1+	1+1	+1	+1	100	v
<i>Xeranthemum annuum</i>	+1	+1	+1	+1	+1	100	v
<i>Trachynia distachia</i>	+1	-	+1	+1	+1	80	iv
<i>Crucienella bithynica</i>	-	+1	+1	+1	+1	80	iv
<i>Thesium billardiari</i>	+1	+1	+1	+1	-	80	iv
<i>Scabiosa columbaria</i>	-	+1	+1	+1	+1	80	iv
<i>Bromus tectorum</i>	-	+1	+1	+1	-	60	iii
<i>Iris caucasica</i> subsp. <i>caucasica</i>	-	+1	+1	+1	-	60	iii
<i>Cnicus benedictus</i>	+1	-	+1	+1	-	60	iii
<i>Artemisia tournefortii</i>	+1	-	-	+1	+1	60	iii
<i>Stachys annua</i> subsp. <i>annua</i>	-	+1	-	+1	+1	60	iii
<i>Taeniatherum caput-medusae</i>	-	+2	+2	-	+2	60	iii
<i>Hippocrepis unisiliquosa</i>	-	-	+1	+1	+1	60	iii
<i>Poa bulbosa</i>	+1	-	+2	+2	-	60	iii
<i>Dactylis glomerata</i>	+1	-	+1	+1	-	60	iii
<i>Callipeltis cucullaria</i>	-	-	+1	+1	+1	60	iii
<i>Achillea biebersteinii</i>	+1	+1	+1	-	-	60	iii
<i>Cicer pinnatifidum</i>	+1	+1	-	-	-	40	ii
<i>Andrachne telephoides</i>	-	+1	-	-	+1	40	ii
<i>Salvia viridis</i>	-	-	+1	+1	-	40	ii
<i>Onopordum tauricum</i>	-	-	+1	-	+1	40	ii
<i>Petrorhagia saxifraga</i>	-	+1	-	-	+1	40	ii

Table 11. *Achillea gypsicolae*-*Juniperetum excelsae* Karaer et al., ass. nov.

Table 12. Viteci agni-casti-Tamaricetum symmensis Karaer et al., ass. nov.

Quadrat No	203	204	205	206	207	208	209	210	211	212		
Size of quadrat (m <sup>2</sup> )	200	250	250	250	200	250	200	200	250	250		
Altitude (m)	250	250	250	250	200	250	200	200	280	250		
Height of the shrub layer(m)	3	3	3	2	3	3	3	3	3	3		
Coverage of the shrub layer(%)	80	40	60	70	90	80	70	30	70	50		
Height of the herb layer(m)	60	50	50	40	40	40	50	50	40	60		
Coverage of the herb layer(%)	40	30	30	40	30	30	50	40	30	40	*	**
Characteristic and differential species of the association												
Tamarix smyrnensis	43	43	43	33	44	43	33	43	33	43	100	v
Vitex agnus-castus	+2	-	-	12	-	+2	12	+2	12	-	60	iii
Sophora alopecuroides	+2	+1	-	-	+2	-	+2	-	+2	+2	60	iii
Ononis spinosa	-	+2	+2	+2	-	-	-	+2	+2	+2	60	iii
Glycyrrhiza echinata	-	-	-	-	+2	-	12	-	-	+2	30	ii
Characteristic species of PHRAGMITETEA (ETALIA)												
Teucrium scordium subsp. scordium	+2	-	+2	+2	+2	-	-	+2	+2	+2	70	iv
Lycopus europaeus	+1	+1	-	-	-	+1	+1	+1	+1	+1	70	iv
Rumex pulcher	-	-	+1	-	-	+1	+1	-	+1	-	40	ii
Nasturtium officinale	-	+2	-	-	+2	-	-	+2	-	-	30	ii
Cyperus longus	-	-	-	+2	-	-	+2	-	-	-	20	i
Veronica anagallis-aquatica	-	-	-	-	-	-	-	-	+1	+1	20	i
Characteristic species of MOLINETO-ARREHNATHERETEA												
Pulicaria dysenterica	+1	+1	+1	+1	+1	-	+1	+1	-	+1	80	iv
Eupatorium cannabinum	-	+1	-	+1	+1	+1	-	+1	-	+1	70	iv
Potentilla reptans	+2	+2	+2	-	-	+2	+2	-	+2	-	60	iii
Plantago lanceolata	+1	+1	-	+1	+1	-	-	+1	-	+1	60	iii
Mentha aquatica	-	+1	+1	+1	-	-	-	-	+1	+1	50	iii
Lotus corniculatus	-	-	-	+1	+1	+1	-	-	-	-	30	iii
Senecio aquatica	-	-	+1	-	+1	-	-	-	-	-	20	i
Companions												
Verbena officinalis	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	100	v
Rubus canescens	+2	+2	+2	+2	+2	-	12	+2	+2	+2	90	v
Digitaria sanguinea	+1	+1	+1	+1	+1	+1	+1	+1	+1	-	90	v
Mentha pulegium	+1	+1	+1	-	+1	-	+1	+1	+1	+1	80	iv
Setaria viridis	+1	+1	-	+1	-	+1	-	+1	+1	+1	70	iv
Centaurium pulchellum	+1	+1	+1	-	-	-	+1	+1	+1	-	60	iii
Polygonum aviculare	+1	-	+1	-	-	+1	-	+1	+1	+1	50	iii
Cirsium arvense	-	-	-	+1	+1	+1	-	+1	+1	-	50	iii
Bromus tomentellus	+1	+1	+1	-	-	+1	-	-	-	-	50	iii
Cichorium intybus	+1	+1	-	+1	-	-	+1	-	-	-	40	ii
Eriyngium creticum	-	+1	+1	-	-	-	-	+1	+1	-	40	ii
Xanthium spinosum	-	-	+1	+1	+1	+1	-	-	-	-	40	ii
Clematis vitalba	-	+2	-	-	-	-	+2	-	-	+2	30	ii
Filago pyramidata	-	-	-	-	+1	+1	-	-	+1	-	30	ii
Crepis foetida	-	-	-	+1	-	-	+1	-	-	+1	30	ii
Apium graveolens	-	-	+1	-	-	+1	-	-	+1	-	20	i
Hypericum lydiium	-	-	-	-	-	-	-	+2	-	+2	20	i
Lappula barbata	-	-	-	-	+1	+1	-	-	-	-	20	i
Cynoglossum montanum	+1	-	-	-	-	-	-	+1	-	-	20	i
Trifolium campestre	-	-	-	-	+1	+1	-	-	-	-	20	i



Table 13. *Periploca graecae*-*Eleagnatum angustifoliae* Karaer et al. ass. nov.

Quadrat No	159	160	161	162	163	164	165	166	167	168		
Size of quadrat (m2)	300	400	400	300	300	300	250	400	300	400		
Altitude (m)	600	600	600	600	600	600	600	600	600	600		
Height of the shrub layer(m)	4	4	3	4	3	5	5	4	4	4		
Coverage of the shrub layer(%)	70	75	70	75	80	70	80	80	70	80		
Height of the herb layer(m)	60	40	70	70	50	50	60	50	40	60		
Coverage of the herb layer(%)	60	60	50	50	40	60	30	40	50	40	*	**
Characteristic and differential species of the association												
<i>Eleagnus angustifolia</i>	33	33	33	33	43	43	44	44	33	33	100	v
<i>Periploca graeca</i> var. <i>graeca</i>	12	+2	12	-	-	12	+2	-	+2	-	60	III
<i>Asparagus acutifolius</i>	+1	-	+1	-	11	-	-	-	+1	11	50	III
<i>Bryonia alba</i>	+2	-	-	-	+2	-	-	-	-	+2	30	III
<i>Clematis viticella</i>	-	-	-	-	-	+2	-	-	-	+2	20	II
Characteristic species of ARRHENATHERETALIA(*) and MOLINETO-ARREHNATHERETE A												
<i>Prunella vulgaris</i>	+1	+1	+1	+1	+1	-	-	+1	-	+1	70	IV
<i>Lolium perenne</i>	+2	+2	+1	+2	-	+1	+2	-	+1	-	70	IV
<i>Plicaria dysenterica</i>	-	+1	+1	-	+1	-	+1	-	-	+1	50	III
<i>Eupatorium cannabinum</i>	+1	-	-	+1	-	+1	-	+1	-	+1	50	III
(*) <i>Trifolium pratense</i>	+1	+1	-	+1	+1	-	+1	-	-	-	50	III
<i>Potentilla reptans</i>	-	-	+2	+1	+1	-	+2	-	-	-	40	II
(*) <i>Daucus carota</i>	-	+1	-	-	-	+1	-	-	+1	+1	40	II
(*) <i>Bellis perennis</i>	+1	+1	-	-	-	-	+1	-	-	+1	40	II
<i>Mentha aquatica</i>	+1	+1	-	-	-	-	-	-	+1	-	30	II
(*) <i>Phleum pratense</i>	-	-	+1	+1	-	+1	-	-	-	-	30	II
<i>Lysimachia dubia</i>	-	+1	-	-	+1	-	-	+1	-	-	30	II
(*) <i>Plantago lanceolata</i>	-	-	-	-	-	-	+1	-	+1	-	20	I
(*) <i>Medica lupulina</i>	-	-	+1	+1	-	-	-	-	-	-	20	I
<i>Epilobium parviflorum</i>	-	-	-	-	-	-	-	-	+1	+1	20	I
Characteristic species of PHRAGMITETEA (ETALIA)												
<i>Nasturtium officinale</i>	+1	-	-	+1	-	+1	-	+1	11	-	50	II
<i>Teucrium scordium</i> subsp. <i>scordium</i>	-	-	+2	-	-	+2	-	-	-	+2	30	II
<i>Lycopus europaeus</i>	-	+1	-	-	-	-	+1	-	-	-	20	I
<i>Veronica anagallis-aquatica</i>	-	-	-	+2	-	-	+2	-	-	-	20	I
Companions												
<i>Rubus canescens</i>	+2	+2	+2	-	+2	+2	-	+2	+2	+2	80	IV
<i>Torilis arvensis</i>	+1	-	+1	+1	+1	+1	+1	-	+1	+1	80	IV
<i>Vitis sylvestris</i>	+2	+2	+2	+2	-	-	+2	+2	+2	-	70	IV
<i>Trifolium campestre</i>	+1	-	-	-	+1	+1	+1	+1	+1	+1	70	IV
<i>Echium vulgare</i>	-	+1	+1	+1	-	-	+1	+1	+1	-	60	III
<i>Artemisia squamata</i>	-	-	+1	+1	+1	+1	+1	-	+1	-	60	III
<i>Verbena officinalis</i>	+1	+1	-	-	+1	-	+1	+1	-	+1	60	III
<i>Euphorbia helioscopia</i>	-	+1	+1	+1	-	+1	-	-	+1	-	50	III
<i>Calystegia silvatica</i>	+1	+1	+1	+1	-	-	+1	-	-	-	50	III
<i>Crataegus monogyna</i>	+1	-	+1	-	+1	-	-	-	+1	-	40	II
<i>Crepis pulcra</i>	+1	-	-	+1	-	-	+1	-	+1	-	40	II
<i>Coronilla scorpioides</i>	-	-	+1	-	+1	+1	-	-	-	+1	40	II
<i>Reseda lutea</i>	-	-	+1	+1	-	+1	-	-	+1	-	40	II
<i>Rosa canina</i>	-	-	-	+1	-	+1	+1	-	+1	-	40	II
<i>Thesium billardieri</i>	-	+1	-	-	-	-	+1	-	+1	+1	40	II
<i>Filago pyramidata</i>	+1	+1	+1	-	-	-	-	-	-	-	30	II
<i>Polygonum convolvulus</i>	-	-	+1	+1	-	-	-	+1	-	-	30	II
<i>Setaria viridis</i>	-	+1	+1	-	-	-	-	-	+1	-	30	II
<i>Cynodon dactylon</i>	-	-	+1	+1	-	+1	-	-	-	-	30	II

Kılınç (10), Quezel et al. (15) and Ekim and Akman (18). The floristic resemblance of the associations varies between 20.1 and 27.7% (Table 14). *Onobrychido tournefortii-Quercetum pubescentis* was firstly described by us. Gemici (19), Akman (31) described it with different codominant species. This association is very similar to the association described by Gemici (19) and floristic resemblance varies between 11.3 and 18.4%. *Achilleo gypsicolae-Juniperetum excelsae* association is firstly described by us and it was described previously under different titles by Gemici (19), Ocakverdi (20), Bekat (21) and Serin and Eyce (25) in the vicinities of the Mediterranean Region and by Kılınç (14) around the Black Sea Region. The floristic resemblance varies

between 8.2 and 27.8% and the highest resemblance was obtained by Kılınç (14). Of the associations belonging to stream vegetation *Vitici agni-casti-Tamaricetum smyrnensis* is described by Çetik (30) as a community with floristic resemblance of 26.2%. *Periploco grecae-Elaeagnetum angustifoliae* association is firstly described by us and the floristic composition of this as sociations varies due to seasonal flooding.

We believe that our results will be a significant contribution to syntaxonomical studies because our research was carried out in transitional zone between Central Anatolia and the Central and East Black Sea Regions.

	<i>Siderito dichotomae-Quercetum cocciferae</i>	<i>Cotino coggyriae-Arbutetum andrachnes</i>	<i>Quercu infectoriae-Pinetum brutiae</i>	<i>Astrgalo aucheri-Pinetum pallasianae</i>	<i>Veronico melissaefoliae-Fagetum orientalis</i>	<i>Ranunculo buhsei-Pinetum sylvestris</i>	<i>Cephalanthero rubrae-Quercetum cerridis</i>	<i>Onobrychido tournefortii-Quercetum pubescentis</i>	<i>Achilleo gypsicolae-Arbutetum andrachnes</i>
Kılınç et al. (8)	-	17.6	-	-	-	-	-	-	-
Kutbay & Kılınç (9)	-	-	30.2	10	31.3	26.3	21.9	-	-
Özen & Kılınç (10)	-	13.2	25.1	10.4	15.2	30.5	27.7	-	-
Akman et al. (11)	-	-	-	6.1	-	18.7	-	-	-
Akman et al. (12)	-	-	-	12	-	21	-	-	-
Kılınç (14)	-	-	24.6	8.7	21.4	-	15.9	27.8	-
Quezel et al. (15)	-	-	39.3	12.9	42	14	20.2	-	-
Uslu (16)	27	21.1	26.8	-	-	-	-	-	-
Akman & Ekim (17)	14	-	10.8	-	-	-	-	-	-
Ekim & Akman (18)	-	-	23.3	15.9	-	18.8	20.1	-	-
Gemici (19)	19.4	-	17.1	15	-	-	-	18.4	10.3
Ocakverdi (20)	-	-	-	8.5	-	-	-	-	8.5
Bekat (21)	18	-	-	17.4	-	-	-	-	17.4
Serih & Eyce (25)	19.7	-	20.9	-	-	-	-	-	-
Uslu (30)	21.2	17.6	23	9.4	-	-	-	-	-
Akman (31)	-	-	-	6	-	21.3	-	11.3	-
Yurdakulol (32)	-	-	30.5	16.7	-	-	-	-	-

Table 14. The associations were compared with those in similar studies by using Sorensen's (23) similarity formula.

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