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The Flora and Vegetation of Kunduz Forests (Vezirköprü / Samsun)

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Abstract: The research area, Kunduz Forests, is located on Kunduz Mountain, which is about 35 km south-west of Vezirköprü (Samsun). This area is in the A5 square in the grid scheme of Davis and is in the Euxine sector of the Euro-Siberian floristic region phytogeographically. The distribution of 306 specific and infraspecific taxa forming the flora of the research area according to floristic regions is as follows: Euro-Siberian 28.43%, Mediterranean 11.44% and Irano-Turanian 4.90%. The percentage of taxa found in more than one floristic region is 55.23%. Twenty-five of the 306 taxa found in the study area are given as new floristic records for the A5 square in the Flora of Turkey.

Besides the dominant forest vegetation type, there is also degraded forest vegetation in the research area. These vegetation types are represented by *Carpino-Quercetum cerridis* Kutbay & Kılınç 1995, *Daphno-Pinetum sylvestris* Kutbay & Kılınç 1995, *Junipero-Pinetum nigrae* Özen & Kılınç ass. nov. and *Galio-Fagetum orientalis* Özen & Kılınç ass. nov. associations. The last two out of the four associations mentioned here are determined to be new associations.

Key Words: Kunduz Mountain, Vezirköprü, Samsun, Flora, Vegetation.

Kunduz Ormanlarının (Vezirköprü / Samsun) Flora ve Vejetasyonu

Özet: Araştırma alanı olarak seçilen Kunduz Ormanları, Vezirköprü'nün (Samsun) 35 kilometre kadar güneybatısındaki Kunduz Dağı'nda bulunmaktadır. Davis'in kareleme sistemine göre A5 karesinde bulunan araştırma alanı, bitki coğrafyası bakımından Avrupa-Sibirya floristik bölgesinin Öksin Sektöründe yer almaktadır. Florayı oluşturan 306 tür ve türaltı seviyesindeki taksonun floristik bölgelere göre dağılımı şöyledir: Avrupa-Sibirya % 28,43, Akdeniz % 11,44, İran-Turan % 4,90 ve birden fazla bölgeliler % 55,23. Bu çalışmada yer alan taksonlardan 25 adedi A5 karesi için yeni kayıt olarak verilmektedir.

Araştırma alanında hakim vejetasyon tipi olan orman vejetasyonunun yanısıra, bozuk orman vejetasyon tipi de bulunmaktadır. Bu vejetasyon tipleri *Carpino-Quercetum cerridis* Kutbay & Kılınç 1995, *Daphno-Pinetum sylvestris* Kutbay & Kılınç 1995, *Junipero-Pinetum nigrae* Özen & Kılınç ass. nov. ve *Galio-Fagetum orientalis* Özen & Kılınç Özen & Kılınç ass. nov. bitki birlikleri ile temsil edilmektedir. Bu dört bitki birliğinden son ikisi bilim dünyası için yenidir.

Anahtar Sözcükler: Kunduz Dağı, Vezirköprü, Samsun, Flora, Vejetasyon.

Introduction

In this study, the floristical and phytosociological aspects of Kunduz Forests, situated on Kunduz Mountain, and the surrounding area were studied. Although this area is one of the well-protected regions in Turkey, there has, except for those carried out in nearby regions (Özen & Kılınç, 1995 a, b and c; Kılınç, 1985; Kutbay & Kılınç, 1995 a and b; Karaer & Kılınç, 1993; Kılınç & Özen, 1988), been no study on the vegetation and flora of the area. This area is of interest because there are some

Mediterranean floristic elements in the region. The aims of this study were to provide insight into the floristic and phytosociological structure of this area and to compare the data gained in the present study with those already known for some neighbouring localities.

Description of the Research Area

Kunduz Forests are located in the Central Black Sea area of the Black Sea region and are about 35 km south-

west of Vezirköprü (Samsun) (Figure 1). The altitude of the area varies between 400 and 1783 m. It is situated in the Euro-Siberian floristic region (Akman, 1993) and in the A5 square in Davis' grid scheme (Davis, 1965-1985; Davis et al., 1988). The geological structure of the region consists of Mesozoic, Upper Cretaceous and Metamorphic series (undifferentiated) (Erentöz, 1962). There are three large soil groups in the study area, namely grey brown podzolic soils, brown forest soils and chestnut soils (Anonymous, 1984). "Semiarid Mediterranean" bioclimate and the "Cold Winter Mediterranean" subsection of this bioclimate are seen in Vezirköprü according to the method of Emberger (Emberger, 1952). The precipitation regime in the study area is East Mediterranean Type 2 (Sp.W.A.S) (Akman, 1993).

Materials and Methods

The research area was visited during 1993-1996. Plants were identified using the Flora of Turkey (Davis, 1965-1985 and Davis et al., 1988). Plant specimens were kept at the herbarium of Balıkesir University (BAUH). The following strategy was used in order to list the flora: station, habitat characteristics, direction, altitude, collecting date, collector, specimen number,

floristic region of species and whether it is endemic or not. To avoid repetition "A5 Samsun: Vezirköprü" is not used each time. The plant list is given according to the rank of the Flora of Turkey. To indicate culture taxa and newly recorded taxa for the A5 square in Turkey, one asterisk and two asterisks are used, respectively. To identify new records for the A5 square in Turkey previous studies were used (Özen & Kılınc, 1995; Kutbay & Kılınc, 1995 a; Karaer & Kılınc, 1993; Kılınc & Özen, 1988; Kılınc & Özen, 1993; Özen, 2000; Donner, 1985, 1987 and 2000; Yıldırımli, 1997 and Yıldırımli, 1999).

The vegetation studies were carried out according to the Braun-Blanquet (1932) method. The plant associations were named and classified according to Syntaxonomic Nomenclatural Rules (Weber et al., 2000). During the classification of the vegetation, previous studies were used (Özen & Kılınc, 1995; Kılınc, 1985; Kutbay & Kılınc, 1995; Quezel et al., 1980; Akman et al., 1978, 1979, 1983 a and b and 1987; Akman, 1972 and 1973; Akman & Ketenoğlu, 1978; Akman & Aydoğdu, 1986; Ocakverdi, 1987; Gemici, 1988; Tatlı, 1987; Ekim & Akman, 1990; Düzenli, 1989; Akman & İlarıslan, 1983; Yurdakulol, 1981). Using Sorensen's similarity formula (Sorensen, 1948), the associations in the present study were compared with those given in the Black Sea region.

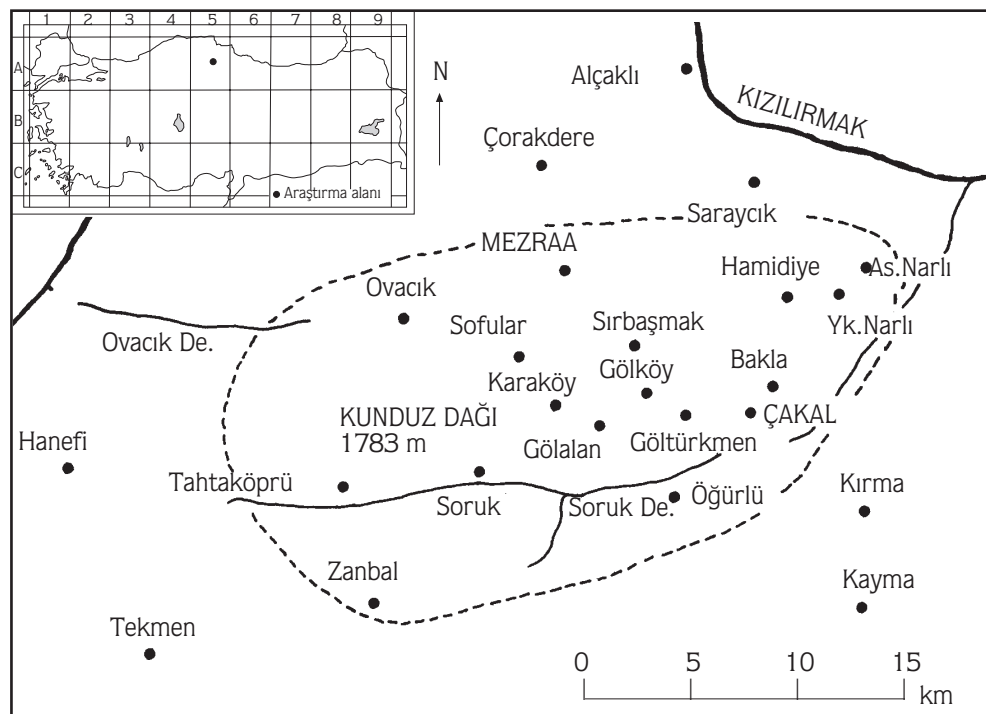


Figure 1. Map of study area

Results

Flora

This study was carried out on about 500 specimens. Two hundred and one species, 68 subspecies and 37

varieties, belonging to 190 genera and 70 families, were found in the research area. Among all the taxa examined, four were culture plants.

- PTERIDOPHYTA**
- SPHENOPSISIDA**
- EQUISETACEAE**
- Equisetum palustre* L.
- Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, streamside, 1200 m, 7.6.1995, F. Özen 1606.
- E. arvense* L.
- Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, streamside, 1200 m, 22.7.1994, F. Özen 1306.
- HYPOLEPIDACEAE**
- Pteridium aquilinum* (L.) Kuhn
- Around Karaköy Village, *Pinus sylvestris* forest clearings, 1000 m, 8.6.1995, F. Özen 1634.
- ATHYRIACEAE**
- Cystopteris fragilis* (L.) Bernh.
- Around fire observation tower, *Fagus orientalis-Galium odoratum* association, northern slopes, 1720 m, 1.8.1994, F. Özen 1374.
- ASPIDACEAE**
- Polystichum setiferum* (Forsk.) Woy.
- Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, *Pinus sylvestris* forest, south-western slopes, 1150 m, 7.6.1995, Özen, 1484.
- SPERMATOPHYTA**
- GYMNOSPERMAE**
- PINACEAE**
- Abies nordmanniana* (Steven) Spach subsp. *bornmuelleriana* (Mattf.) Coode & Cullen
- Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, northern slopes, 1250 m, 29.9.1993, F. Özen 1195, Endemic, Euxine element.
- Pinus sylvestris* L.
- Between Ovacık and deer production area, *Pinus sylvestris* forest, south-eastern slopes, 1150 m, 7.6.1995, F. Özen 1490, Euro-Siberian element.
- P. nigra* Arn. subsp. *pallasiana* (Lamb.) Holmboe
- Around Soruk Village, north-eastern slopes, 1000 m, 8.6.1995, F. Özen 1499.
- CUPRESSACEAE**
- Juniperus oxycedrus* L. subsp. *oxycedrus*
- Around Yukarı Narlı Village, *Pinus nigra-Juniperus oxycedrus* association, northern slopes, 400 m, 18.6.1993, F. Özen 1190.
- ANGIOSPERMAE**
- DICOTYLEDONAE**
- RANUNCULACEAE**
- Ranunculus repens* L.
- Between Ovacık and Soruk Villages, *Pinus sylvestris* forest clearings, 1100 m, 7.6.1995, F. Özen 1611.
- R. illyricus* L. subsp. *illyricus*
- Around deer production area, *Pinus sylvestris* forest clearings, 1300 m, 7.6.1995, F. Özen 1570.
- R. arvensis* L.
- Around deer production area, meadows, 1300 m, 7.6.1995, F. Özen 1547.
- (**) *R. sphaerospermus* Boiss. & Blanche
- Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, ponds, 1250 m, 10.6.1995, F. Özen 1605.
- PAPAVERACEAE**
- Papaver rhoeas* L.
- Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, field margins, 1150 m, 8.6.1995, F. Özen 1683.
- BRASSICACEAE (Cruciferae)**
- Sinapis arvensis* L.
- Around deer production area, meadows, 1350 m, 7.6.1995, F. Özen 1596.
- (**) *Crambe orientalis* L. var. *orientalis*
- Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, field margins, 1250 m, 8.6.1995, F. Özen 1656, Irano-Turanian element.
- Cardaria draba* (L.) Desv. subsp. *draba*
- Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, field margins, 1250 m, 8.6.1995, F. Özen 1657.
- Thlaspi orbiculatum* Steven
- Around Soruk Village, *Pinus sylvestris* forest, 1400 m, 9.6.1995, F. Özen 1601.
- T. perfoliatum* L.
- Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, field margins, 1250 m, 8.6.1995, F. Özen 1670.
- T. annuum* K.Koch
- Around deer production area, *Pinus sylvestris* forest, 1350 m, 7.6.1995, F. Özen 1580.
- Capsella bursa-pastoris* (L.) Medik.
- Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, field margins, 1250 m, 23.7.1994, F. Özen 1282.
- Erophila verna* (L.) Chevall. subsp. *verna*
- Between Ovacık and deer production area, *Pinus sylvestris* forest clearings, 1300 m, 1.6.1995, F. Özen 1609.
- Turritis laxa* (Sibth. & Sm.) Hayek
- Between Ovacık and deer production area, *Pinus sylvestris* forest clearings, 1300 m, 1.6.1995, F. Özen 1642.
- Cardamine bulbifera* (L.) Crantz
- Between Ovacık and Karaköy Villages, *Fagus orientalis-Galium odoratum* association, north-eastern slopes, 1150 m, 9.6.1995, F. Özen 1494, Euro-Siberian element.

C. quingifolia (M.Bieb.) Schmalh.

Around fire observation tower, *Fagus orientalis-Galium odoratum* association, north-western slopes, 1700 m, 1.8.1996, F. Özen 1701, Euro-Siberian element.

Sisymbrium loeselii L.

Between Ovacık and deer production area, *Pinus sylvestris* forest clearings, 1300 m, 1.6.1995, F. Özen 1610.

RESEDACEAE

Reseda lutea L. var. *nutans* Boiss.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, *Pinus sylvestris* forest clearings, 1200 m, 9.6.1995, F. Özen 1661.

R. luteola L.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, field margins, 1200 m, 20.7.1994, F. Özen 1314.

CISTACEAE

Cistus creticus L.

Around Sofular Village, *Pinus nigra* forest, southern slopes, 1160 m, 31.7.1994, F. Özen 1418, Omni-Mediterranean element.

C. laurifolius L.

Around Sofular Village, *Pinus nigra* forest, southern slopes, 1130 m, 31.7.1994, F. Özen 1417, Mediterranean element.

Helianthemum nummularium (L.) Mill. subsp. *nummularium*

Around Göltürkmen Village, *Quercus cerris-Carpinus orientalis* association, 1040 m, 31.7.1994, F. Özen 1421.

Fumana thymifolia (L.) Verl. var. *viridis* (Ten.) Boiss.

Around Gölalan Village, *Pinus nigra-Juniperus oxycedrus* association, 900 m, 8.6.1995, F. Özen 1506, Mediterranean element.

VIOLACEAE

Viola odorata L.

Around deer production area, *Pinus sylvestris-Daphne pontica* association, south-eastern slopes, 1350 m, 25.9.1993, F. Özen 1194.

POLYGALACEAE

Polygala pruinosa Boiss. subsp. *pruinosa*

Around Hamidiye Village, field margins, south-eastern slopes, 600 m, 7.6.1995, F. Özen 1564.

P. anatolica Boiss. & Heldr.

Between Mezraa and Sofular Village, *Pinus nigra-Juniperus oxycedrus* association, southern slopes, 800 m, 1.6.1995, F. Özen 1525.

CARYOPHYLLACEAE

(**) **Arenaria leptocladus** (Rchb.) Guss.

Around fire observation tower, rocks, 1700 m, 1.8.1995, F. Özen 1457.

A. serpyllifolia L.

Between Soruk Village-fire observation tower, *Fagus orientalis* forest, north-eastern slopes, 1500 m, 31.7.1994, F. Özen 1401.

Stellaria holostea L.

Around Göltürkmen Village, *Quercus petraea* forest, 950 m, 8.6.1995, F. Özen 1496, Euro-Siberian element.

Moenchia mantica (L.) Bartl. subsp. *mantica*

Around deer production area, *Pinus sylvestris* forest clearings, 1350 m, 7.6.1995, F. Özen 1602.

Dianthus armeria L. subsp. *armeria*

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, field margins, 1200 m, 22.7.1994, F. Özen 1277, Euro-Siberian element.

D. carmelitarum Reut. ex Boiss.

Around Gölalan Village, *Fagus orientalis* forest, 1110 m, 21.7.1994, F. Özen 1233, Endemic, Euxine element.

Silene vulgaris (Moench) Garcke var. *vulgaris*

Summit of Kunduz Mountain, *Fagus orientalis-Galium odoratum* association, 1720 m, 31.7.1994, F. Özen 1387.

Agrostemma githago L.

Around Göltürkmen Village, *Fagus orientalis* forest, 1100 m, 20.7.1994, F. Özen 1212.

ILLECEBRACEAE

Herniaria glabra L.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, field margins, 1200 m, 20.7.1994, F. Özen 1283.

POLYGONACEAE

(**) **Polygonum arenastrum** Bor.

Around fire observation tower, rocks, 1700 m, 1.8.1995, F. Özen 1455.

P. bellardii All.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, field margins, 1250 m, 20.7.1995, F. Özen 1297.

Rumex acetosella L.

Around fire observation tower, *Fagus orientalis* forest, north-eastern slopes, 1700 m, 1.8.1994, F. Özen 1393.

(**) **R. alpinus** L.

Around Tahtaköprü Village, streamside, 1000 m, 10.6.1995, F. Özen 1628.

R. patientia L.

Around Sofular Village, *Fagus orientalis* forest clearings, 1150 m, 20.7.1994, F. Özen 1202.

CHENOPODIACEAE

Chenopodium botrys L.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, field margins, 1180 m, 20.7.1994, F. Özen 1275.

C. murale L.

Around Soruk Village, *Pinus sylvestris* forest clearings, south-eastern slopes, 1400 m, 31.7.1994, F. Özen 1444.

Beta corolliflora Zosimovic ex Buttler

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, *Pinus sylvestris* forest clearings, 1100 m, 8.6.1995, F. Özen 1658, Irano-Turanian element.

TAMARICACEAE

Myricaria germanica (L.) Desv.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, streamside, 1200 m, 22.7.1994, F. Özen 1316.

HYPERICACEAE (Guttiferae)

Hypericum androsaemum L.

Around Karaköy Village, *Fagus orientalis* and *Pinus sylvestris* forest clearings, 1150 m, 10.7.1995, F. Özen 1250.

H. linarioides Bosse

Summit of Kunduz Mountain, *Fagus orientalis-Galium odoratum* association, 1740 m, 1.8.1995, F. Özen 1385.

()H. atomarium** Boiss.

Around Yukarı Narlı Village, field margins, 450 m, 9.6.1995, F. Özen 1562, East Mediterranean element.

()H. bithynicum** Boiss.

Around Sırbaşmak Village, roadsides, 400 m, 1.6.1995, F. Özen 1626, Euxine element.

()H. olympicum** L. subsp. **olympicum**

Around Gököy-Asarcık forest store, *Pinus nigra* forest clearings, 1080 m, 13.7.1994, F. Özen 1469, East Mediterranean element.

H. perforatum L.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, field margins, 1300 m, 13.7.1994, F. Özen 1312.

TILIACEAE

Tilia rubra DC. subsp. **caucasica** (Rupr.) V.Engl.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, 1200 m, 8.6.1995, Özen, 1660, Euxine element.

LINACEAE

Linum flavum L. subsp. **scabrinerve** (P.H.Davis) P.H.Davis

Around Hamidiye Village, *Pinus nigra* forest, south-eastern slopes, 750 m, 8.6.1995, F. Özen 1517, Endemic, Irano-Turanian element.

L. corymbulosum Rchb.

Around Hamidiye Village, *Pinus nigra* forest, south-eastern slopes, 750 m, 8.6.1995, F. Özen 1518, Mediterranean element.

L. aroanium Boiss. & Orph.

Around Yukarı Narlı Village, field margins, 500 m, 8.6.1995, F. Özen 1559.

GERANIACEAE**Geranium pusillum** Burm.f.

Around fire observation tower, rocks, 1700 m, 1.8.1994, F. Özen 1454.

G. asphedoleoides Burm.f. subsp. **asphedoleoides**

Around deer production area, *Pinus sylvestris-Daphne pontica* association, eastern slopes, 1400 m, 2.8.1996, F. Özen 1705, Euro-Siberian element.

G. pyrenaicum Burm.f.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, meadows, 1250 m, 8.6.1995, F. Özen 1685.

Erodium cicutarium (L.) L'Hér. subsp. **cicutarium**

Around Gölalan Village, *Fagus orientalis* forest clearings, 1150 m, 10.7.1994, F. Özen 1223.

SIMAROUBACEAE**(*)Ailanthus altissima** (Mill.) Swingle

Around Yukarı Narlı Village, roadsides, 500 m, 8.6.1995, F. Özen 1612.

ACERACEAE**Acer campestre** L. subsp. **leiocarpum** (Opiz) Pax

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, *Fagus orientalis* forest, 1030 m, 27.7.1994, F. Özen 1364, Euro-Siberian element.

RHAMNACEAE**Paliurus spina-christi** Mill.

Around Sırbaşmak Village, 400 m, 8.6.1995, F. Özen 1618.

ANACARDIACEAE**Rhus coriaria** L.

Around Bakla Village, *Pinus nigra-Juniperus oxycedrus* association, 800 m, 1.8.1995, F. Özen 1438.

(*)Pistacia vera L.

Around Sırbaşmak Village, field margins, 400 m, 8.6.1995, F. Özen 1616, Irano-Turanian element.

P. terebinthus L. subsp. **terebinthus**

Around Sırbaşmak Village, field margins, 450 m, 8.6.1995, F. Özen 1615, Mediterranean element.

FABACEAE (Leguminosae)**Genista lydia** Boiss. var. **lydia**

Around Göltürkmen Village, *Quercus cerris-Carpinus orientalis* association, north-eastern slopes, 1000 m, 8.6.1995, F. Özen 1495.

Argyrolobium biebersteinii Ball

Around Mezraa, *Pinus nigra-Juniperus oxycedrus* association, south-western slopes, 800 m, 9.6.1995, F. Özen 1511.

Astragalus angustifolius Lam. subsp. **angustifolius** var. **angustifolius**

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, *Pinus sylvestris* forest clearings, 1150 m, 8.6.1995, F.Özen 1655.

Psoralea bituminosa L.

Around Mezraa, *Pinus nigra-Juniperus oxycedrus* association, south-western slopes, 750 m, 7.6.1995, F. Özen 1514, Mediterranean element.

Vicia crocea (Desf.) B.Fedtsch.

Around Zanbal Village, *Fagus orientalis-Galium odoratum* association, north-eastern slopes, 1300 m, 20.7.1994, F. Özen 1328, Hyrcano-Euxine element.

()V. villosa** Roth subsp. **eriocarpa** (Hausskn.) P.W.Ball

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, 1250 m, 8.6.1995, F.Özen 1681.

()V. villosa** Roth subsp. **dasycarpa** (Ten.) Cav.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, field margins, 1200 m, 22.7.1994, F. Özen 1278.

V. peregrina L.

Around Sofular Village, field margins, 1100 m, 21.7.1994, F. Özen 1213.

V. lutea L. var. **hirta** (Balb.) Lois.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, 1250 m, 15.6.1995, F.Özen 1672.

V. sativa L. subsp. **nigra** (L.) Ehrh. var. **nigra**

Around Yukarı Narlı Village, field margins, 500 m, 8.6.1995, F. Özen 1556.

V. sativa L. subsp. **nigra** (L.) Ehrh. var. **segetalis** (Thuill.) Ser. ex DC.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, field margins, 1200 m, 22.7.1994, F. Özen 1296.

Lathyrus tukhtensis Czeczott

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, *Pinus sylvestris* forest clearings, north-western slopes, 1250 m, 8.6.1995, F. Özen 1680, Endemic.

L. pratensis L.

Around Karaköy Village, *Fagus orientalis* forest, south-western slopes, 1150 m, 8.6.1995, F. Özen 1629.

L. laxiflorus (Desf.) Kuntze subsp. **laxiflorus**

Around Göllalan Village, *Fagus orientalis-Galium odoratum* association, 1720 m, 31.7.1994, F. Özen 1380.

(**) **L. laxiflorus** (Desf.) Kuntze subsp. **angustifolius**

Around deer production area, *Pinus sylvestris-Daphne pontica* association, eastern slopes, 1350 m, 2.7.1994, F. Özen 1355, Endemic, East Mediterranean element.

L. aphaca L. var. **pseudoaphaca** (Boiss.) P.H.Davis

Around Mezraa, *Pinus nigra-Juniperus oxycedrus* association, south-eastern slopes, 750 m, 8.6.1995, F. Özen 1527, East Mediterranean element.

Ononis pusilla L.

Around Yukarı Narlı Village, field margins, 500 m, 8.6.1995, F. Özen 1558, Mediterranean element.

Trifolium campestre Schreb.

Around Soruk Village, *Pinus sylvestris* forest clearings, north-eastern slopes, 1400 m, F. Özen 1445.

T. medium L. var. **medium**

Around Sofular Village, *Pinus nigra* forest, southern slopes, 1130 m, 1.8.1994, F. Özen 1415.

T. caudatum Boiss.

Around fire observation tower, *Fagus orientalis* forest, north-eastern slopes, 1700 m, 31.7.1994, F. Özen 1394, Endemic.

T. hirtum All.

Around Sofular Village, *Fagus orientalis* forest clearings, eastern slopes, 1000 m, 13.7.1994, F. Özen 1218, Mediterranean element.

(**) **T. purpureum** Loisel var. **purpureum**

Around deer production area, *Pinus sylvestris* forest, north-eastern slopes, 1400 m, 7.6.1995, F. Özen 1599.

Meililotus officinalis (L.) Desr.

Around Göllalan Village, field margins, 1110 m, 22.7.1994, F. Özen 1206.

Medicago lupulina L.

Around Soruk Village, *Pinus sylvestris* forest clearings, 1400 m, 31.7.1994, F. Özen 1446.

Dorycnium graecum (L.) Ser.

Around Karaköy Village, *Fagus orientalis* forest, western slopes, 1150 m, 10.7.1995, F. Özen 1254, Euxine element.

D. pentaphyllum Scop. subsp. **anatolicum** (Boiss.) Gams

Around Mezraa, *Pinus nigra-Juniperus oxycedrus* association, south-eastern slopes, 750 m, 8.6.1995, F. Özen 1521.

D. pentaphyllum Scop. subsp. **herbaceum** (Vill.) Rouy

Around Yukarı Narlı Village, field margins, 500 m, 9.6.1995, F. Özen 1567.

Lotus angustissimus L.

Around deer production area, *Pinus sylvestris-Daphne pontica* association, north-eastern slopes, 1375 m, 20.7.1994, F. Özen 1334.

L. corniculatus L. var. **corniculatus**

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, 1250 m, 8.6.1995, F. Özen 1667.

L. corniculatus L. var. **tenuifolius** L.

Around Göltürkmen Village, *Fagus orientalis* forest clearings, 1150 m, 22.7.1994, F. Özen 1214.

L. corniculatus L. var. **alpinus** Ser.

Around fire observation tower, rocks, 1700 m, 31.7.1994, F. Özen 1453.

Coronilla scorpioides (L.) K.Koch

Around Mezraa, *Pinus nigra-Juniperus oxycedrus* association, south-eastern slopes, 750 m, 7.6.1995, F. Özen 1513.

C. varia L. subsp. **varia**

Around Göllalan Village, field margins, 1110 m, 22.7.1994, F. Özen 1205.

ROSACEAE

Filipendula vulgaris Moench

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, 1250 m, 21.6.1995, F. Özen 1676, Euro-Siberian element.

Rubus discolor Weihe & Nees

Around Göllalan Village, *Fagus orientalis* forest, 1100 m, 22.7.1994, F. Özen 1231.

R. canescens DC. var. **canescens**

Around Zanbal Village, 1150 m, 22.7.1994, F. Özen 1284, Euro-Siberian element.

R. hirtus Waldst. & Kit.

Between Ovacık and deer production area, *Fagus orientalis* forest, north-eastern slopes, 1270 m, 9.6.1995, F. Özen 1488, Euro-Siberian element.

Potentilla argentea L.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, *Pinus sylvestris* forest, 1300 m, 20.6.1995, F. Özen 1666.

P. inclinata Vill.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, *Pinus sylvestris* forest, 1300 m, 20.6.1995, F. Özen 1665.

P. recta L. Grup B

Around deer production area, *Pinus sylvestris* forest, 1250 m, 7.6.1995, F. Özen 1573.

P. reptans L.

Ovacık Village, around Burhan Zorlu Education Centre belonging Ministry of Forestry, field margins, 1300 m, 23.7.1994, F. Özen 1311.

Fragaria vesca L.

Around Karaköy Village, *Fagus orientalis* forest, northern slopes, 1100 m, 13.7.1995, F. Özen 1265.

Geum urbanum L.

Around Karaköy Village, *Fagus orientalis-Galium odoratum* association, 1700 m, 31.7.1994, F. Özen 1382, Euro-Siberian element.

Sanguisorba minor Scop. subsp. *muricata* (Spach) Briq.

Around Yukarı Narlı Village, field margins, 550 m, 8.6.1995, F. Özen 1557.

(**) *Alchemilla surculosa* E.Fröhner

Around fire observation tower, *Fagus orientalis* forest, north-eastern slopes, 1675 m, 31.7.1994, F. Özen 1390, Hyrcano-Euxine (mountain) element.

(**) *A. lithophila* Juz.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, 1150 m, 20.6.1995, F. Özen 1653.

A. heterophylla Rothm.

Around deer production area, 1350 m, 18.6.1995, F. Özen 1603.

Rosa canina L.

Around deer production area, *Pinus sylvestris-Daphne pontica* association, eastern slopes, 1350 m, 19.7.1994, F. Özen 1349.

Pyracantha coccinea Roem.

Around deer production area, *Pinus sylvestris* forest clearings, 1350 m, 7.6.1995, F. Özen 1542.

Crataegus tanacetifolia (Lam.) Pers.

Around deer production area, *Pinus sylvestris-Daphne pontica* association, western slopes, 1330 m, 7.6.1995, F. Özen 1541, Endemic.

C. monogyna Jacq. subsp. *monogyna*

Around deer production area, *Pinus sylvestris* forest, 1250 m, 7.6.1995, F. Özen 1535.

C. microphylla K.Koch

Around Gölalan Village, *Fagus orientalis* forest, 1030 m, 20.7.1994, F. Özen 1365, Hyrcano-Euxine element.

Sorbus torminalis (L.) Crantz var. *pinnatifida* Boiss.

Around Göltürkmen Village, *Quercus cerris-Carpinus orientalis* association, north-eastern slopes, 1000 m, 8.6.1995, F. Özen 1503.

(*) *Pyrus communis* L. subsp. *sativa* (DC.) Hegi

Around Sirbaşmak Village, field margin, 400 m, 15.6.1995, F. Özen 1617.

LYTHRACEAE

Lythrum salicaria L.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, streamsides, 1150 m, 20.7.1994, F. Özen 1280, Euro-Siberian element.

ONAGRACEAE

Circaea lutetiana L.

Around Göltürkmen Village, *Fagus orientalis* forest clearings, north-western slopes, 1100 m, 10.7.1994, F. Özen 1253.

Epilobium angustifolium L.

Between Ovacık and deer production area, *Pinus sylvestris* forest clearings, north-western slopes, 1400 m, 31.7.1994, F. Özen 1464.

E. parviflorum Schreb.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, field margins, 1180 m, 22.7.1994, F. Özen 1270.

E. hirsutum L.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, field margins, 1180 m, 22.7.1994, F. Özen 1272.

E. montanum L.

Around Göltürkmen Village, *Pinus sylvestris* forest clearings, 1150 m, 10.7.1995, F. Özen 1244, Euro-Siberian element.

E. lanceolatum Seb. & Mauri

Between Ovacık and deer production area, north-eastern slopes, 1250 m, 7.6.1995, F. Özen 1481.

E. palustre L.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, field margins, 1100 m, 22.7.1994, F. Özen 1271.

(**) *E. ponticum* Hausskn.

Around Karaköy Village, *Fagus orientalis* forest, north-western slopes, 1100 m, 11.7.1994, F. Özen 1256.

CRASSULACEAE

Sedum pallidum M.Bieb. var. *pallidum*

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, *Pinus sylvestris* forest clearings, 1180 m, 22.7.1994, F. Özen 1285, Euxine element.

S. pallidum M.Bieb. var. *bithynicum* (Boiss.) Chamb.

Around fire observation tower, *Fagus orientalis-Galium odoratum* association, 1740 m, 31.7.1994, F. Özen 1369.

SAXIFRAGACEAE

Saxifraga cymbalaria L. var. *cymbalaria*

Around Karaköy Village, *Fagus orientalis* forest clearings, 1100 m, 13.7.1995, F. Özen 1262.

APIACEAE (Umbelliferae)

Sanicula europaea L.

Around deer production area, *Pinus sylvestris-Daphne pontica* association, northern slopes, 1350 m, 20.7.1994, F. Özen 1335, Euro-Siberian element.

Chaerophyllum temulum L.

Around Gököy Village, *Fagus orientalis* forest clearings, 1150 m, 2.7.1994, F. Özen 1200, Euro-Siberian element.

Bifora radians M.Bieb.

Around Gölalan Village, field margins, 450 m, 8.6.1995, F. Özen 1625.

Seseli peucedanoides (M.Bieb.) Koso-Pol.

Around Hamidiye Village, *Pinus nigra-Juniperus oxycedrus* association, south-western slopes, 750 m, 10.6.1995, F. Özen 1531, Euro-Siberian element.

Trinia scabra Boiss. & Noe

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, *Pinus sylvestris* forest clearings, 1250 m, 9.6.1995, F. Özen 1692, Endemic?, Irano-Turanian element.

(**) *Peucedanum chryseum* (Boiss. & Heldr.) Chamb.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, field margins, 1200 m, 22.7.1994, F. Özen 1322, Endemic.

Orlaya daucooides (L.) Greuter

Around deer production area, *Pinus sylvestris* forest, 1350 m, 7.6.1995, F. Özen 1550, Mediterranean element ?

Artemisia squamata L.

Around Gököy-Asarcık forest store, roadsides, 1080 m, 31.7.1994, F. Özen 1470.

ARALIACEAE

Hedera helix L.

Around deer production area, *Pinus sylvestris* forest, 1250 m, 8.6.1995, F. Özen 1647.

CORNACEAE

Cornus sanguinea L. subsp. australis (C.A.Mey.) Jav.

Around Öğürlü Village, *Quercus cerris-Carpinus orientalis* association, south-western slopes, 1000 m, 29.7.1994, F. Özen 1426, Euro-Siberian element.

C. mas L.

Around Sırbaşmak Village, 350 m, 8.6.1995, F. Özen, 1620, Euro-Siberian element ?

CAPRIFOLIACEAE

Sambucus ebulus L.

Around Gölalan Village, *Fagus orientalis* forest clearings, 1110 m, 3.7.1994, F. Özen 1227, Euro-Siberian element.

S. nigra L.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, *Pinus sylvestris* forest clearings, north-eastern slopes, 1130 m, 29.7.1994, F. Özen 1695, Euro-Siberian element.

Viburnum lantana L.

Around Sofular Village, *Fagus orientalis* forest, 1030 m, 13.7.1994, F. Özen, 1367, Euro-Siberian element.

Lonicera etrusca Santi var. etrusca

Around Sırbaşmak Village, field margins, 400 m, 8.6.1995, F. Özen 1619, Mediterranean element.

VALERIANACEAE

Valerianella locusta (L.) Laterr.

Around deer production area, *Pinus sylvestris* forest, north-eastern slopes, 1400 m, 9.6.1994, F. Özen 1577, Euro-Siberian element?

MORINACEAE

Morina persica L.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, 1100 m, 8.6.1996, F. Özen 1652, Irano-Turanian element.

DIPSACACEAE

Dipsacus laciniatus L.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, field margins, 1300 m, 23.7.1994, F. Özen 1318.

Scabiosa columbaria L. subsp. ochroleuca (L.) Celak. var. ochroleuca (L.) Coult.

Around Gölköy, Village, roadsides, 1100 m, 6.7.1994, F. Özen 1229.

S. argentea L.

Around Karaköy Village, *Pinus nigra-Juniperus oxycedrus* association, 800 m, 31.7.1994, F. Özen 1439.

S. micrantha Desf.

Around Gölköy Village, field margins, 500 m, 8.6.1995, F. Özen 1624.

ASTERACEAE (Compositae)

Filago eriocephala Guss.

Around Mezraa, *Pinus nigra-Juniperus oxycedrus* association, south-western slopes, 800 m, 9.6.1995, F. Özen 1528, East Mediterranean element.

F. pyramidata L.

Around fire observation tower, rocks, 1700 m, 1.8.1995, F. Özen 1458.

Bellis perennis L.

Around deer production area, *Pinus sylvestris* forest, 1350 m, 7.6.1995, F. Özen 1588, Euro-Siberian element.

Doronicum orientale Hoffm.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, *Fagus orientalis* forest, northern slopes, 1200 m, 2.8.1996, F. Özen 1704.

Senecio vernalis Waldst. & Kit.

Around fire observation tower, *Pinus sylvestris* forest clearings, south-western slopes, 1400 m, 31.7.1994, F. Özen 1449.

Tussilago farfara L.

Around Karaköy Village, *Fagus orientalis* forest clearings, 1000 m, 8.6.1995, F. Özen 1633, Euro-Siberian element.

Anthemis tinctoria L. var. pallida DC.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, *Pinus sylvestris* forest clearings, 1250 m, 8.6.1995, F. Özen 1675.

Achillea millefolium L. subsp. millefolium

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, *Pinus sylvestris* forest clearings, 1250 m, 8.6.1995, F. Özen 1679, Euro-Siberian element.

A. coarctata Poir.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, field margins, 1180 m, 22.7.1994, F. Özen 1300.

Tanacetum parthenium (L.) Sch.Bip.

Around Gölalan Village, *Fagus orientalis* forest clearings, 1100 m, 20.7.1994, F. Özen 1225.

Arctium minus (Hill) Bernh. subsp. pubens (Bab.) Arénes

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, *Pinus sylvestris* forest clearings, 1200 m, 23.7.1994, F. Özen 1317, Euro-Siberian element.

Cirsium pseudopersonata Boiss. & Bal. subsp. pseudopersonata

Around Karaköy Village, *Pinus sylvestris* forest, 1150 m, 13.7.1994, F. Özen 1264, Endemic, Euxine element.

Centaurea hypoleuca DC.

Around Mezraa, *Pinus nigra-Juniperus oxycedrus* association, south-western slopes, 750 m, 7.6.1995, F. Özen 1515, Euxine element.

Cichorium intybus L.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, field margins, 1200 m, 22.7.1994, F. Özen 1291.

Tragopogon longirostris Bisch. ex Schultz var. longirostris

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, 1250 m, 15.6.1995, F. Özen 1659.

T. aureus Boiss.

Around Mezraa, *Pinus nigra-Juniperus oxycedrus* association, south-eastern slopes, 700 m, 7.6.1995, F. Özen 1509, Endemic.

Pilosella hoppeana (H.Schult.) C.H. & F.W.Schultz subsp. *pilisquama* (NP.) Sell & West

Around fire observation tower, rocks, 1700 m, 1.8.1995, F. Özen 1452.

P. hoppeana (Schultes) C.H. & F.W.Schultz subsp. *testimonialis* (Naegli ex Peter) Sell & West

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, *Pinus sylvestris* forest clearings, 1200 m, 22.7.1994, F. Özen 1290, Euro-Siberian element.

P. x auricoides (Lang) Sell & West

Around deer production area, *Pinus sylvestris* forest, 1300 m, 7.6.1995, F. Özen 1475.

Mycelis muralis (L.) Dum.

Around deer production area, *Pinus sylvestris-Daphne pontica* association, north-eastern slopes, 1350 m, 20.7.1994, F. Özen 1345, Euro-Siberian element.

CAMPANULACEAE

Campanula rapunculoides L. subsp. *rapunculoides*

Around Tahtaköprü Village, *Pinus nigra* forest clearings, southern slopes, 1125 m, 31.7.1994, F. Özen 1409, Euro-Siberian element.

C. glomerata L. subsp. *hispanica* (Witasek) Hayek

Around Soruk Village, *Fagus orientalis-Galium odoratum* association, 1720 m, 31.7.1994, F. Özen 1386, Euro-Siberian element.

C. saxorum Gand.

Around fire observation tower, 1675 m, 31.7.1994, F. Özen 1451, Endemic, Irano-Turanian element?

Asyneuma rigidum (Willd.) Grossh. subsp. *rigidum*

Around Mezraa, *Pinus nigra-Juniperus oxycedrus* association, south-eastern slopes, 1000 m, 8.6.1995, F. Özen 1520, Irano-Turanian element.

Legousia speculum-veneris (L.) Chaix

Around Soruk Village, *Fagus orientalis-Galium odoratum* association, 1750 m, 31.7.1994, F. Özen 1381, Mediterranean element.

ERICACEAE

Monoses uniflora (L.) A.Gray

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, *Fagus orientalis* forest, north-western slopes, 1300 m, 1.6.1995, F. Özen 1487.

Monotropa hypopithys L.

Around fire observation tower, *Fagus orientalis-Galium odoratum* association, north-western slopes, 1740 m, 29.7.1994, F. Özen 1368.

PRIMULACEAE

Primula vulgaris Huds. subsp. *vulgaris*

Around Soruk Village, *Fagus orientalis* forest, northern slopes, 1300 m, 3.8.1996, F. Özen 1707, Euro-Siberian element.

Cyclamen coum Mill. var. *coum*

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, *Fagus orientalis* forest, north, 4.8.1996, F. Özen 1709.

Lysimachia verticillaris Spreng.

Around Karaköy Village, streamside, north-western slopes, 1100 m, 11.7.1995, F. Özen 1257, Hyrcano-Euxine element.

OLEACEAE

Jasminum fruticans L.

Around Yukarı Narlı Village, *Pinus nigra-Juniperus oxycedrus* association, 400 m, 4.8.1996, F. Özen 1710, Mediterranean element.

Fontanesia philliraeoides Labill. subsp. *philliraeoides*

Around Sırbaşmak Village, 450 m, 8.6.1995, F. Özen 1627, East Mediterranean element.

Fraxinus excelsior L. subsp. *excelsior*

Around fire observation tower, *Fagus orientalis-Galium odoratum* association, northern slopes, 1720 m, 30.7.1996, F. Özen 1700, Euro-Siberian element.

Ligustrum vulgare L.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, 1200 m, 8.6.1995, F. Özen 1691, Euro-Siberian element.

Phillyrea latifolia L.

Around Yukarı Narlı Village, 870 m, 31.7.1994, F. Özen 1434, Mediterranean element.

GENTIANACEAE

Centaurium erythraea Rafn subsp. *erythraea*

Around Karaköy Village, north-western slopes, 1150 m, 20.7.1994, F. Özen 1259, Euro-Siberian element.

Gentiana cruciata L.

Around Karaköy Village, north-western slopes, 1150 m, 20.7.1994, F. Özen 1267, Euro-Siberian element.

CONVOLVULACEAE

Convolvulus cantabrica L.

Around Mezraa, *Pinus nigra* forest, south-eastern slopes, 750 m, 2.6.1995, F. Özen 1519.

Calystegia silvatica (Kit.) Griseb.

Around Karaköy Village, *Fagus orientalis* forest clearings, northern slopes, 1150 m, 20.7.1994, F. Özen 1255.

BORAGINACEAE

Myosotis arvensis (L.) Hill subsp. *arvensis*

Around deer production area, *Pinus sylvestris* forest, south-eastern slopes, 1250 m, 7.6.1995, F. Özen 1476, Euro-Siberian element.

M. sicula Guss.

Around deer production area, *Pinus sylvestris* forest clearings, 1300 m, 15.6.1995, F. Özen 1538.

Cynoglossum creticum Mill.

Around deer production area, *Pinus sylvestris* forest clearings, 1200 m, 15.6.1995, F. Özen 1553.

(**) *C. germanicum* Jacq.

Between Ovacık and deer production area, *Fagus orientalis* forest clearings, north-eastern slopes, 1350 m, 7.6.1995, F. Özen 1486, Euro-Siberian element.

Lithospermum officinale L.

Between Ovacık and deer production area, *Fagus orientalis* forest clearings, 1250 m, 15.6.1995, F. Özen 1608, Euro-Siberian element.

Echium italicum L.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, field margins, 1180 m, 20.7.1994, F. Özen 1315, Mediterranean element?

E. vulgare L.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, 1200 m, 13.6.1995, F. Özen 1668, Euro-Siberian element.

Onosma aucheranum DC.

Around Yukarı Narlı Village, field margins, 500 m, 8.6.1995, F. Özen 1555, East Mediterranean element.

Anchusa leptophylla Roemer & Schult. subsp. **leptophylla**

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, 1200 m, 13.6.1995, F. Özen 1671.

SCROPHULARIACEAE

Verbascum spectabile M.Bieb. var. **spectabile**

Around Karaköy Village, streamside, 1130 m, 1.8.1995, F. Özen 1461, Euxine element.

Scrophularia scopolii [Hoppe ex] Pers. var. **scopolii**

Around fire observation tower, 1675 m, 1.8.1995, F. Özen 1450.

S. canina L. subsp. **bicolor** (Sm.) Greuter

Around Zanbal Village, 1250 m, 12.6.1995, F. Özen 1669, East Mediterranean element.

Digitalis ferruginea L. subsp. **ferruginea**

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, *Pinus sylvestris* forest clearings, north-western slopes, 1180 m, 15.7.1994, F. Özen 1321, Euro-Siberian element.

D. ferruginea L. subsp. **schischkinii** (Ivan.) Werner

Around Gököy-Asarcık forest store, 1080 m, 13.7.1995, F. Özen 1468, Euxine element.

Veronica anagallis-aquatica L.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, streamsides, 1250 m, 23.7.1994, F. Özen 1310.

V. chamaedrys L.

Around deer production area, *Pinus sylvestris-Daphne pontica* association, 1350 m, 15.6.1995, F. Özen 1477, Euro-Siberian element.

V. orientalis Mill. subsp. **orientalis**

Around Tahtaköprü Village, *Pinus sylvestris* forest clearings, south-western slopes, 1150 m, 10.7.1995, F. Özen 1246, Irano-Turanian element.

V. multifida L.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, 1250 m, 15.6.1995, F. Özen 1673, Endemic, Irano-Turanian element.

Melampyrum arvense L. var. **arvense**

Around Göltürkmen Village, *Fagus orientalis* forest clearings, 1110 m, 20.7.1994, F. Özen 1219, Euro-Siberian element.

Parentucellia viscosa (L.) Caruel

Around deer production area, *Pinus sylvestris* forest, 1300 m, 23.6.1995, F. Özen 1604, Mediterranean element.

OROBANCHACEAE

Orobanche nana Noe ex Beck

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, north-west, 1300 m, 8.6.1995, F. Özen 1493.

GLOBULARIACEAE

Globularia trichosantha Fisch. & C.A.Mey.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, 1200 m, 8.6.1995, F. Özen 1694.

VERBENACEAE

Verbena officinalis L.

Around Karaköy Village, *Pinus sylvestris* forest clearings, 1150 m, 20.7.1994, F. Özen 1242.

LAMIACEAE (Labiatae)

Ajuga orientalis L.

Around deer production area, *Pinus sylvestris* forest, 1300 m, 7.6.1995, F. Özen 1537.

Teucrium chamaedrys L. subsp. **chamaedrys**

Around Mezraa, *Pinus nigra-Juniperus oxycedrus* association, south-eastern slopes, 750 m, 8.6.1995, F. Özen 1524, Euro-Siberian element.

T. chamaedrys L. subsp. **sympirensis** (K.Koch) Rech.f.

Around Gölalan Village, *Fagus orientalis* forest clearings, southern slopes, 1110 m, 13.7.1994, F. Özen 1211, Irano-Turanian element.

T. polium L.

Around Yukarı Narlı Village, field margins, 500 m, 8.6.1995, F. Özen 1563.

Marrubium astracanicum Jacq. subsp. **astracanicum**

Around deer production area, *Pinus sylvestris-Daphne pontica* association, eastern slopes, 1300 m, 20.7.1994, F. Özen 1351.

Sideritis montana L. subsp. **montana**

Around Gölalan Village, *Fagus orientalis* forest clearings, eastern slopes, 1150 m, 13.7.1995, F. Özen 1215, Mediterranean element.

Stachys iberica M.Bieb. subsp. **iberica** var. **iberica**

Around Yukarı Narlı Village, field margins, 500 m, 8.6.1995, F. Özen 1551, Irano-Turanian element.

S. annua (L.) L. subsp. **annua** var. **annua**

Around deer production area, *Pinus sylvestris* forest, 1350 m, 7.6.1995, F. Özen 1589.

S. officinalis (L.) Trevis. subsp. **officinalis**

Around Gölalan Village, *Pinus nigra* forest, southern slopes, 1130 m, 31.7.1994, F. Özen 1417, Euro-Siberian element.

Prunella vulgaris L.

Around Karaköy Village, *Pinus sylvestris* forest clearings, northern slopes, 1100 m, 13.7.1995, F. Özen 1263, Euro-Siberian element.

Origanum vulgare L. subsp. **viride** (Boiss.) Hayek

Around Gölalan Village, *Pinus nigra* forest, southern slopes, 1160 m, 31.7.1994, F. Özen 1416.

Calamintha grandiflora (L.) Moench

Summit of Kunduz Mountain, *Fagus orientalis-Galium odoratum* association, northern slopes, 1720 m, 1.8.1994, F. Özen 1375, Euro-Siberian element.

C. nepeta (L.) Savi subsp. *glandulosa* (Req.) P.W.Ball

Around Sofular Village, *Quercus cerris-Carpinus orientalis* association, 1040 m, 2.8.1996, F. Özen 1702.

Clinopodium vulgare L. subsp. *vulgare*

Summit of Kunduz Mountain, *Fagus orientalis-Galium odoratum* association, 1720 m, 1.8.1994, F. Özen 1379.

(**) **Thymus longicaulis** C.Presl subsp. *longicaulis* var. *subisophyllus* (Borbas) Jalas

Around deer production area, *Pinus sylvestris* forest, 1300 m, 7.6.1995, F. Özen 1546.

Mentha longifolia (L.) Hudson subsp. *typhoides* (Briq.) Harley var. *typhoides*

Around Gölalan Village, *Fagus orientalis* forest clearings, southern slopes, 1110 m, 13.7.1994, F. Özen 1216.

Salvia viridis L.

Around Gököy Village, field margins, 450 m, 1.6.1995, F. Özen 1622, Mediterranean element.

S. verticillata L. subsp. *amasiaca* (Frey & Bornm.) Bornm.

Around Gököy Village, field margins, 500 m, 8.6.1995, F. Özen 1621, Irano-Turanian element?

PLANTAGINACEAE**Plantago major** L. subsp. *major*

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, *Pinus sylvestris* forest clearings, 1200 m, 9.6.1995, F. Özen 1687.

P. major L. subsp. *intermedia* (Gilib.) Lange

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, field margins, 1150 m, 23.7.1995, F. Özen 1295.

P. holosteam Scop.

Around fire observation tower, *Fagus orientalis* forest clearings, eastern slopes, 1675 m, 1.8.1995, F. Özen 1456, Mediterranean element.

P. lanceolata L.

Around deer production area, *Pinus sylvestris* forest clearings, 1250 m, 9.6.1995, F. Özen 1590.

THYMELAEACEAE**Daphne pontica** L.

Around deer production area, *Pinus sylvestris-Daphne pontica* association, 1300 m, 7.6.1995, F. Özen 1473, Euxine element.

SANTALACEAE

Thesium divaricatum Jan ex Mert. & K.Koch

Around Sofular Village, *Quercus cerris-Carpinus orientalis* association, 1020 m, 1.8.1994, F. Özen 1423, Euro-Siberian element.

ARISTOLOCHIACEAE**Aristolochia pontica** Lam.

Around fire observation tower, *Fagus orientalis* forest, north-eastern slopes, 1675 m, 31.7.1994, F. Özen 1391, Euxine element.

EUPHORBACEAE**Euphorbia orientalis** L.

Around Gölalan Village, *Pinus nigra-Juniperus oxycedrus* association, eastern slopes, 930 m, 31.7.1994, F. Özen 1430, Irano-Turanian element.

()E. platyphyllos** L.

Around deer production area, *Pinus sylvestris-Daphne pontica* association, north-eastern slopes, 1350 m, 20.7.1994, F. Özen 1344.

E. stricta L.

Around deer production area, *Pinus sylvestris-Daphne pontica* association, eastern slopes, 1350 m, 20.7.1994, F. Özen 1360, Euro-Siberian element.

E. helioscopia L.

Around Tahtaköprü Village, *Pinus sylvestris* forest clearings, western slopes, 1375 m, 15.6.1995, F. Özen 1598.

E. falcata L. subsp. *falcata* var. *falcata*

Around Sofular Village, *Pinus nigra-Juniperus oxycedrus* association, 920 m, 3.8.1995, F. Özen 1432.

E. amygdaloides L. var. *amygdaloides*

Around Karaköy Village, *Fagus orientalis* forest, north-western slopes, 1150 m, 11.7.1995, F. Özen 1258, Euro-Siberian element.

URTICACEAE**Urtica dioica** L.

Around Karaköy Village, *Pinus sylvestris* forest clearings, 1150 m, 20.7.1994, F. Özen 1241, Euro-Siberian element.

MORACEAE**Ficus carica** L. subsp. *carica*

Around Sırbaşmak Village, 400 m, 8.6.1995, F. Özen 1613.

JUGLANDACEAE**(*)Juglans regia** L.

Around Sırbaşmak Village, 400 m, 8.6.1995, F. Özen 1614.

FAGACEAE**Fagus orientalis** Lipsky

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, *Fagus orientalis-Galium odoratum* association, northern slopes, 1110 m, 13.7.1994, F. Özen 1239, Euro-Siberian element.

Quercus petraea (Matt.) Liebl. subsp. *iberica* (Steven ex M.Bieb.) Krassiln.

Between Ovacık and Karaköy Villages, 1030 m, 13.7.1994, F. Özen 1366.

Q. infectoria Olivier subsp. *infectoria*

Around Yukarı Narlı Village, *Pinus nigra-Juniperus oxycedrus* association, northern slopes, 200 m, 18.6.1993, F. Özen 1698, Euro-Siberian element.

Q. cerris L. var. *cerris*

Around Mezraa, *Quercus cerris-Carpinus orientalis* association, southern slopes, 550 m, 13.7.1994, F. Özen 1324, Mediterranean element.

CORYLACEAE

Carpinus orientalis Mill. subsp. *orientalis*

Around Göltürkmen Village, *Quercus cerris-Carpinus orientalis* association, 1040 m, 31.7.1994, F. Özen 1697.

C. betulus L.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, *Fagus orientalis* forest, 1050 m, 9.6.1995, F. Özen 1643, Euro-Siberian element.

Corylus avellana L. var. avellana

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, streamside, north-eastern slopes, 1130 m, 29.7.1994, F. Özen 1442, Euro-Siberian element.

SALICACEAE

Salix alba L.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, streamside, 1200 m, 23.7.1994, F. Özen 1320, Euro-Siberian element.

RUBIACEAE

Asperula involucreta Wahlenb.

Around Gölalan Village, *Quercus petraea* forest, 950 m, 8.6.1995, F. Özen 1498, Euxine element.

A. arvensis L.

Around deer production area, *Pinus sylvestris* forest clearings, south-eastern slopes, 1300 m, 15.6.1995, F. Özen 1545, Mediterranean element.

Galium rotundifolium L.

Between Ovacık and deer production area, *Fagus orientalis* forest, north-eastern slopes, 1500 m, 8.8.1995, F. Özen 1403, Euro-Siberian element.

G. odoratum (L.) Scop.

Around Öğürlü Village, *Quercus cerris-Carpinus orientalis* association, south-eastern slopes, 1000 m, 1.6.1995, F. Özen 1501, Euro-Siberian element.

()G. elongatum C.Presl**

Around Gököy Village, field margins, 550 m, 1.6.1995, F. Özen 1623, Euro-Siberian element.

G. verum L. subsp. verum

Around Sofular Village, *Fagus orientalis* forest clearings, 1100 m, 10.7.1995, F. Özen 1245, Euro-Siberian element.

G. verum L. subsp. glabrescens Ehrend.

Around Gölalan Village, *Fagus orientalis* forest clearings, 1110 m, 20.7.1994, F. Özen 1199, Irano-Turanian element?

G. paschale Forssk.

Around Öğürlü Village, *Quercus cerris-Carpinus orientalis* association, north-eastern slopes, 1000 m, 1.6.1995, F. Özen 1500, East Mediterranean (mountain) element.

G. divaricatum Pourr. ex Lam.

Around Gölalan Village, *Pinus nigra* forest, 1130 m, 23.6.1994, F. Özen 1413, Mediterranean element.

()G. peplidifolium Boiss.**

Around deer production area, *Pinus sylvestris* forest, south-eastern slopes, 1400 m, 9.6.1994, F. Özen 1575, East Mediterranean element.

MONOCOTYLEDONAE

ARACEAE

()Arum italicum Mill.**

Between Ovacık and Karaköy Villages, *Fagus orientalis* forest clearings, 1110 m, 20.7.1994, F. Özen 1204.

LILIACEAE

Polygonatum multiflorum (L.) All.

Around deer production area, *Fagus orientalis* forest, 1300 m, 8.6.1995, F. Özen 1645.

Scilla autumnalis L.

Around Sofular Village, *Quercus cerris-Carpinus orientalis* association, northern slopes, 1040 m, 29.7.1994, F. Özen 1420, Mediterranean element.

Muscari armeniacum Leichtlin ex Baker

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, *Pinus sylvestris* forest clearings, 1200 m, 8.6.1995, F. Özen 1663.

M. neglectum Guss.

Around Yukarı Narlı Village, *Pinus nigra* forest, south-western slopes, 350 m, 2.5.1993, F. Özen 1192.

ORCHIDACEAE

Neottia nidus-avis (L.) J.M.C.Rich.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, *Fagus orientalis-Galium odoratum* association, northern slopes, 1250 m, 3.8.1996, F. Özen 1708, Euro-Siberian element.

Cephalanthera rubra (L.) J.M.C.Rich.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, 900 m, 8.6.1995, F. Özen 1505.

C. damasonium (Mill.) Druce

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, Northeast, 1000 m, 8.6.1995, F. Özen 1497, Euro-Siberian element.

Epipactis pontica Taub.

Around fire observation tower, 1670 m, 31.7.1994, F. Özen 1397, Endemic, Euxine element.

Epipogium aphyllum Sw.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, east, 1200 m, 20.7.1994, F. Özen 1333, Euro-Siberian element.

Platanthera chlorantha (Custer) Rchb.

Around deer production area, *Pinus sylvestris-Daphne pontica* association, eastern slopes, 1400 m, 3.8.1996, F. Özen 1706.

JUNCACEAE

Luzula pseudosudetica (V.I.Krecz.) V.I.Krecz. apud V.I.Krecz. & Gontsch.

Around Soruk Village, *Pinus sylvestris-Daphne pontica* association, south-eastern slopes, 1300 m, 20.6.1995, F. Özen 1480, Euxine (mountain) element.

L. multiflora (Ehrh. ex Retz.) Lej.

Around Karaköy Village, *Pinus sylvestris* forest, 1375 m, 7.6.1995, F. Özen 1583.

CYPERACEAE

()Carex pendula Huds.**

Around Soruk Village, streamside, 1000 m, 1.6.1995, F. Özen 1639, Euro-Siberian element.

C. sylvatica Huds. subsp. sylvatica

Around Soruk Village, *Pinus sylvestris* forest, 1000 m, 1.6.1995, F. Özen 1638.

C. flacca Schreber subsp. serrulata (Biv.) Greuter

Around deer production area, *Pinus sylvestris* forest, 1350 m, 7.6.1995, F. Özen 1600, Mediterranean element.

()C. acuta L.**

Around Gölalan Village, *Pinus nigra* forest, 1130 m, 31.7.1994, F. Özen 1408, Euro-Siberian element.

POACEAE (Gramineae)

Aegilops geniculata Roth

Around Yukarı Narlı Village, *Pinus nigra-Juniperus oxycedrus* association, 300 m, 18.6.1993, F. Özen 1699, Mediterranean element.

Triticum aestivum L.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, 1150 m, 20.7.1994, F. Özen 1304.

Hordeum murinum L. subsp. *glaucum* (Steud.) Tzvelev

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, 1250 m, 8.6.1995, F. Özen 1684.

H. bulbosum L.

Around deer production area, 1350 m, 7.6.1995, F. Özen 1586.

Bromus tectorum L.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, 1200 m, 8.6.1995, F. Özen 1677.

(**)*Avena fatua* L. var. *glabrata* Peterm.

Around Gölalan Village, *Fagus orientalis* forest clearings, 1100 m, 20.7.1994, F. Özen 1232, Euro-Siberian element.

Koeleria cristata (L.) Pers.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, field margins, 1180 m, 20.7.1994, F. Özen 1301.

Festuca heterophylla Lam.

Around deer production area, *Pinus sylvestris* forest clearings, south-western slopes, 1300 m, 8.6.1995, F. Özen 1649, Euro-Siberian element.

Lolium rigidum Gaudin var. *rigidum*

Around Gölalan Village, *Fagus orientalis* forest clearings, north-eastern slopes, 1110 m, 20.7.1994, F. Özen 1235.

Poa alpina L. subsp. *fallax* F.Herm.

Around deer production area, *Pinus sylvestris*-*Daphne pontica* association, south-eastern slopes, 1300 m, 7.6.1995, F. Özen 1479.

Dactylis glomerata L. subsp. *glomerata*

Around Soruk Village, *Fagus orientalis-Galium odoratum* association, 1720 m, 31.7.1994, F. Özen 1383, Euro-Siberian element.

D. glomerata L. subsp. *hispanica* (Roth) Nyman

Around Mezraa, *Pinus nigra-Juniperus oxycedrus* association, south-eastern slopes, 750 m, 8.6.1995, F. Özen 1529.

Cynosurus cristatus L.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, field margins, 1100 m, 20.7.1994, F. Özen 1308, Euro-Siberian element.

C. echinatus L.

Ovacık Village, around Burhan Zorlu Education Centre belonging to the Ministry of Forestry, ponds, 1200 m, 7.6.1995, F. Özen 1532, Mediterranean element.

Briza media L.

Around Yukarı Narlı Village, *Pinus nigra* ssp. *pallasiana-Juniperus oxycedrus* association, 850 m, 31.7.1994, F. Özen 1433.

Vegetation

There are two vegetation types in the study area: forest and degraded forests. Vegetation is stratified longitudinally. It is known that altitude, direction, topography, temperature and precipitation play an important role in the stratification (Özen & Kılınç, 1995). In this study it was found that *Quercus cerris* var. *cerris* and *Carpinus orientalis* were generally dominant and *Pinus nigra* subsp. *pallasiana* was sometimes dominant at low altitudes in the region. The dominance of *Pinus nigra* subsp. *pallasiana* increases with altitude up to 900 m. After 900 m *Quercus cerris* var. *cerris*, *Carpinus orientalis* and *Pinus nigra* subsp. *pallasiana* are almost equally dominant. *Pinus sylvestris* is dominant especially on southern slopes, whereas *Fagus orientalis* is dominant especially on northern slopes. Both are spread together at the higher vegetation stratum. *Fagus orientalis* is only dominant at the highest vegetation stratum in the study area.

A summary of vegetation stratification in the study area is given below:

400-600 m *Quercus cerris-Carpinus orientalis-Pinus nigra*

600-1150 m *Pinus nigra-Quercus cerris*

900-1050 m *Quercus cerris-Carpinus orientalis*

1000-1500 m *Pinus sylvestris-Fagus orientalis*

1450-1740 m *Fagus orientalis*

The associations found in the study area are as follows:

Degraded forest vegetation

1- *Carpino-Quercetum cerridis* Kutbay & Kılınç 1995 (Table 1)

Characteristic and differential species of this association are *Quercus cerris* var. *cerris*, *Carpinus orientalis* subsp. *orientalis* and *Quercus petraea* subsp. *iberica*. *Carpino-Quercetum cerridis* occurs between 400 and 1040 m. It is spread on brown forest soils and exhibits three vegetation layers, namely tree, shrub and herb. The total coverage of the tree layer varies between 5 and 90% and 5 and 10 m in height. The most common species in the tree layer are *Pinus nigra* subsp. *pallasiana* and *Fagus orientalis*. The total coverage and height of the shrub layer are 30 and 90% and 1 and 3 m, respectively. The most common species in the shrub layer are *Quercus*

Table 1. Carpino-Quercetum cerridis Kutbay & Kiliç 1995

Quadrat No	23	24	46	47	80	81	96	72	73	
Altitude (m)	600	400	1040	1020	1000	1020	1000	1000	1000	
Inclination (%)	-	-	-	10	-	-	10	25	-	
Exposure	-	-	-	SW	-	-	E	NE	-	
Height of the tree layer (m)	5	10	7	10	10	8	8	5	5	
Coverage of the tree layer (%)	-	-	90	90	10	5	-	80	90	
Height of the shrub layer (m)	-	3	1.5	1	5	2	2	2	1	
Coverage of the shrub layer (%)	80	80	30	30	90	90	80	50	70	Presence
Height of the herb layer (cm)	10	10	15	15	15	10	10	15	15	
Coverage of the herb layer (%)	15	15	20	15	10	10	10	20	30	
Characteristic and differential species of the association										
<i>Quercus cerris</i> var. <i>cerris</i>	44	33	45	44	44	45	33	12	44	V
<i>Carpinus orientalis</i> subsp. <i>orientalis</i>	23	22	33	33	22	33	33	22	22	V
<i>Quercus petraea</i> subsp. <i>iberica</i>	11	12	22	22	22	22	33	44	11	V
Characteristic species of Quercus-Carpinetales orientalis and Carpino-Acerion (*)										
<i>Crataegus monogyna</i> subsp. <i>monogyna</i>	12	.	11	11	11	22	+2	.	.	IV
<i>Lathyrus laxiflorus</i> ssp. <i>laxiflorus</i>	+1	+1	.	11	11	.	.	+2	11	IV
<i>Dorycnium pentaphyllum</i> subsp. <i>anatolicum</i>	.	.	.	+2	+1	.	.	+2	.	II
(*) <i>Cyclamen coum</i> var. <i>coum</i>	.	12	.	.	.	+1	.	.	+1	II
(*) <i>Asperula involucreta</i>	.	11	.	.	.	.	.	.	+2	II
Characteristic species of Quercetum pubescentis										
<i>Pinus nigra</i> subsp. <i>pallasiana</i>	.	11	+1	+1	+1	11	.	+1	+1	IV
<i>Sorbus torminalis</i> var. <i>pinnatifida</i>	.	.	.	+1	+1	.	+1	+1	11	III
<i>Juniperus oxycedrus</i> subsp. <i>oxycedrus</i>	.	.	+2	+2	.	11	.	.	.	II
<i>Acer campestre</i> subsp. <i>leiocarpum</i>	.	.	.	+1	.	.	.	.	.	I
Characteristic species of Rhododendro-Fagetalia orientalis										
<i>Fagus orientalis</i>	.	.	+1	.	+1	+1	+1	.	.	II
<i>Daphne pontica</i>	.	+1	+1	.	+1	.	.	.	.	II
<i>Rubus hirtus</i>	.	.	.	.	.	12	.	.	.	I
Characteristic species of Quercus-Fagea and Quercus-Fagetum (*)										
(*) <i>Euphorbia amygdaloides</i> var. <i>amygdaloides</i>	.	.	+1	+1	.	11	.	+1	+1	III
<i>Primula vulgaris</i> subsp. <i>vulgaris</i>	+1	.	+1	.	.	.	.	11	11	III
<i>Fragaria vesca</i>	.	.	11	+1	.	.	.	.	+2	II
<i>Clinopodium vulgare</i> subsp. <i>vulgare</i>	.	+1	.	.	.	.	.	.	.	I
<i>Teucrium chamaedrys</i> subsp. <i>chamaedrys</i>	.	.	.	.	.	.	+2	.	.	I
<i>Geum urbanum</i>	.	.	.	.	.	.	.	.	+1	I
<i>Veronica chamaedrys</i>	.	.	.	.	.	.	.	.	+1	I
Other Species										
<i>Rosa canina</i>	11	+1	11	11	+1	.	+1	+2	+2	V
<i>Cornus sanguinea</i> subsp. <i>orientalis</i>	+1	.	+1	.	+1	.	.	.	.	II
<i>Genista lydia</i> var. <i>lydia</i>	.	+2	.	.	.	.	.	+1	.	II
<i>Crataegus angustifolia</i>	.	.	.	.	.	.	.	22	22	II
<i>Bellis perennis</i>	+1	.	.	.	.	+1	.	.	.	I
<i>Silene vulgaris</i> var. <i>vulgaris</i>	.	+1	.	.	.	.	.	.	.	I
<i>Calamintha nepeta</i>	.	.	+1	.	.	.	.	.	.	I
<i>Scilla autumnalis</i>	.	.	+1	.	.	.	.	.	.	I
<i>Pilosella hoppeana</i> subsp. <i>testimonialis</i>	.	.	+1	.	.	.	.	.	.	I
<i>Thesium divaricatum</i>	.	.	.	+2	.	.	.	.	.	I
<i>Plantago lanceolata</i>	.	.	.	+1	.	.	.	.	.	I
<i>Helianthemum nummularium</i> subsp. <i>nummularium</i>	.	.	.	.	.	.	+1	.	.	I
<i>Luzula multiflora</i>	.	.	.	.	.	.	.	+1	.	I
<i>Vicia crocea</i>	.	.	.	.	.	.	.	+1	.	I
<i>Cephalanthera damasonium</i>	.	.	.	.	.	.	.	11	.	I
<i>Galium odoratum</i>	.	.	.	.	.	.	.	+1	.	I
<i>Galium paschale</i>	.	.	.	.	.	.	.	+1	.	I

cerris var. *cerris*, *Carpinus orientalis*, *Quercus petraea* subsp. *iberica*, *Crataegus monogyna* subsp. *monogyna* and *Rosa canina*. The total coverage of the herb layer varies between 10 and 30% and 10 and 15 cm in height. *Lathyrus laxiflorus* subsp. *laxiflorus*, *Euphorbia amygdaloides* var. *amygdaloides* and *Primula vulgaris* subsp. *vulgaris* are common species in this layer.

Carpino-Quercetum cerridis is more degraded than the other associations in the study area. This association includes various species belonging to various syntaxa units. In particular, species belonging to the class QUERCETEA PUBESCENTIS (Oberd. 1948) Doing Kraft 1955, the order QUERCO-CARPINETALIA ORIENTALIS Quezel, Barbero et Akman 1980 and the alliance CARPINO-ACERION Quezel, Barbero et Akman 1978 are richer than the other syntaxonomic units. The class QUERCETEA PUBESCENTIS is characterised by *Quercus cerris* var. *cerris*, *Pinus nigra* subsp. *pallasiana*, *Sorbus torminalis* var. *pinnatifida*, *Juniperus oxycedrus* subsp. *oxycedrus* and *Acer campestre* subsp. *leiocarpum*. The order QUERCO-CARPINETALIA ORIENTALIS and the alliance CARPINO-ACERION are represented by *Carpinus orientalis* subsp. *orientalis*, *Quercus petraea* subsp. *iberica*, *Crataegus monogyna* subsp. *monogyna*, *Lathyrus laxiflorus* subsp. *laxiflorus*, *Cyclamen coum* var. *coum* and *Asperula involucreta*. On the basis of the information given above, it is apparent that this association should be included in the order QUERCO-CARPINETALIA ORIENTALIS.

Forest vegetation

2- Junipero-Pinetum nigrae Özen & Kiliñç as. nov. (Table 2)

This association (holotype table 2, quadrat number 25) is widespread on the southern and eastern slopes between 400 and 1130 m and on brown forest soils in the study area. The characteristic and differential species of the association are *Pinus nigra* subsp. *pallasiana*, *Juniperus oxycedrus* subsp. *oxycedrus* and *Dorycnium pentaphyllum* subsp. *anatolicum*. This association comprises tree, shrub and herb layers. The tree layer is represented by *Pinus nigra* subsp. *pallasiana* and *Fagus orientalis*. The total coverage and height vary between 75 and 100% and 10 and 15 m in the tree layer, respectively.

The shrub layer is between 0.5 and 2 m in height and total coverage varies between 10 and 70%. The most

common species in this layer are *Juniperus oxycedrus* subsp. *oxycedrus*, *Quercus cerris* var. *cerris* and *Carpinus orientalis* subsp. *orientalis*. The total coverage and height of the herb layer are between 10 and 40% and 5 and 20 cm, respectively. The dominant species in the herb layer are *Dorycnium pentaphyllum* subsp. *anatolicum*, *Dorycnium graecum*, *Dactylis glomerata* subsp. *hispanica* and *Polygala pruinosa*.

Characteristic species of different syntaxonomic units are found together in the association *Junipero-Pinetum nigrae*. The order RHODODENDRO-FAGETALIA ORIENTALIS Quezel, Barbero et Akman 1980 is characterised by *Daphne pontica* and *Fagus orientalis*. The class QUERCETEA ILICIS Braun-Blanquet 1931 is only represented by *Phillyrea latifolia*. The frequency and cover percentage of species in this order and class are very low. The components of CISTO-MICROMERIETEA Raus 1979 are *Pteridium aquilinum*, *Teucrium polium*, *Origanum vulgare* subsp. *viride*, *Psoralea bituminosa* and *Cistus creticus*. The spread of taxa belonging to this class shows, to some extent, some human activity on the association. Species belonging to the class QUERCETEA PUBESCENTIS and the order QUERCO-CARPINETALIA ORIENTALIS are dominant in the association *Junipero-Pinetum nigrae*. Therefore, it is more appropriate to include this association in those syntaxa units.

3- Daphno-Pinetum sylvestris Kutbay & Kiliñç 1995 (Table 3)

The characteristic and differential species of this association are *Pinus sylvestris*, *Daphne pontica* and *Galium rotundifolium*. *Daphno-Pinetum sylvestris* is widespread, especially on the southern and eastern slopes between 1000 and 1400 m and on grey-brown podsolc soils in the study area.

The association comprises tree, shrub and herb layers. The tree layer is represented by *Pinus sylvestris* and *Fagus orientalis* having total coverage between 80 and 100% and 5 and 30 m height, respectively. The total coverage and height of the shrub layer vary between 15 and 35% and 0.5 and 1 m, respectively. The dominant species of this layer are *Daphne pontica*, *Pyracantha coccinea* and *Rubus hirtus*. The total coverage and height of the herb layer vary between 10 and 30% and 10 and 30 cm, respectively. The most common species are *Galium rotundifolium*, *Euphorbia amygdaloides* var. *amygdaloides*, *Sanicula europaea*, *Primula vulgaris* subsp. *vulgaris* and *Fragaria vesca* in this layer.

Table 3. Daphno-Pinetum sylvestris Kutbay & Kiliç 1995

Quadrat No	20	21	82	1	2	6	7	66	67	99	77	78	12	13	63	64	Presence
Altitude (m)	1350	1400	1300	1200	1250	1350	1350	1300	1000	1350	1330	1350	1300	1350	1200	1200	
Inclination (%)	25	10	15	30	20	20	30	40	50	15	10	25	35	25	-	20	
Exposure	SE	E	SE	E	E	NE	N	SE	SW	NE	W	E	E	NE	-	SE	
Height of the tree layer (m)	15	15	25	30	25	25	20	20	20	30	20	20	20	25	25	25	
Coverage of the tree layer (%)	85	90	100	95	90	90	80	95	95	100	90	90	90	100	90	90	
Height of the shrub layer (m)	0.5	0.5	0.5	0.5	0.5	1	0.5	1	1	0.75	0.75	0.5	0.5	0.75	0.5	0.5	
Coverage of the shrub layer (%)	15	30	20	20	25	30	35	25	25	15	30	15	25	25	30	20	
Height of the herb layer (cm)	10	20	10	25	30	25	25	15	25	20	20	25	20	25	10	10	
Coverage of the herb layer (%)	10	30	10	25	30	25	30	15	25	30	25	20	20	25	20	25	
Characteristic and differential species of the association																	
<i>Pinus sylvestris</i>	45	45	55	55	55	55	44	45	45	55	55	55	55	55	45	44	V
<i>Daphne pontica</i>	22	22	22	12	22	22	22	22	12	12	33	12	23	22	22	22	V
<i>Galium rotundifolium</i>	.	.	+1	11	22	12	22	+1	+1	11	.	+1	22	22	.	+1	IV
Characteristic species of Quercus-Fageteta																	
<i>Euphorbia amygdaloides</i> var. <i>amygdaloides</i>	12	12	12	11	11	11	22	12	12	22	22	11	22	22	22	12	V
<i>Viola odorata</i>	.	.	.	+1	.	+1	.	.	.	.	+1	.	11	11	+1	11	II
<i>Stellaria holostea</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Characteristic species of Rhododendro-Fagetalia orientalis																	
<i>Fagus orientalis</i>	.	.	+1	.	+1	11	.	+1	.	+1	.	+1	11	.	+1	.	III
<i>Rubus hirtus</i>	.	.	.	.	.	+2	11	.	.	12	.	12	22	12	.	.	II
Characteristic species of Quercus-Carpinetalia orientalis and Carpino-Acerion (*)																	
(*) <i>Pyraeantha coccinea</i>	+2	11	.	.	11	+1	11	12	+2	.	.	.	.	+1	.	+1	III
(*) <i>Cyclamen coum</i> var. <i>coum</i>	+1	+1	.	.	.	.	.	11	+1	.	.	.	.	.	11	11	II
<i>Lathyrus laxiflorus</i> subsp. <i>laxiflorus</i>	11	+1	.	.	.	.	.	11	+1	.	.	.	.	.	+2	.	II
<i>Doronicum orientale</i>	.	+1	33	.	.	.	.	23	11	.	.	.	.	.	12	22	II
<i>Digitalis ferruginea</i> subsp. <i>ferruginea</i>	.	.	.	+1	11	+1	11	.	11	11	.	.	.	.	.	.	II
<i>Geranium asphedoleoides</i> subsp. <i>asphedoleoides</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
<i>Crataegus monogyna</i> subsp. <i>monogyna</i>	.	.	.	+1	.	.	.	.	.	.	.	.	.	.	.	.	I
<i>Dorycnium graecum</i>	.	.	.	.	.	.	.	.	+1	.	.	.	.	.	.	.	I
Characteristic species of Fagetalia sylvaticae																	
<i>Sanicula europaea</i>	+1	+1	+1	+1	+1	+1	11	22	.	11	11	.	12	11	+1	11	V
<i>Calamintha grandiflora</i>	.	.	.	.	.	+1	.	.	.	11	.	11	11	+1	.	.	II
<i>Myrcelis muralis</i>	.	.	.	.	.	.	.	.	.	+1	.	.	.	.	.	.	I
<i>Galium odoratum</i>	.	.	.	.	.	.	.	.	.	.	.	.	+2	.	.	.	I
Characteristic species of Querceteta pubescentis																	
<i>Juniperus oxycedrus</i> subsp. <i>oxycedrus</i>	+2	.	.	.	.	.	.	.	11	.	.	.	.	.	.	.	I
<i>Cornus mas</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Characteristic species of Quercus-Fagea																	
<i>Primula vulgaris</i> subsp. <i>vulgaris</i>	11	22	11	+1	+1	+1	11	11	+1	11	+1	11	11	22	11	22	V
<i>Fragaria vesca</i>	+1	.	+1	+1	11	.	11	+1	+1	+1	+1	+2	22	12	.	+1	IV
<i>Veronica chamaedrys</i>	+1	+1	.	.	.	+1	11	+1	+1	.	.	.	.	.	+1	+1	III
<i>Hedera helix</i>	.	.	.	11	.	.	11	.	.	.	.	.	.	.	.	.	I
Other Species																	
<i>Pteridium aquilinum</i>	12	33	+1	33	33	33	33	22	11	22	23	.	22	.	12	11	V
<i>Myosotis arvensis</i> var. <i>arvensis</i>	+1	+2	.	.	.	.	.	+1	+1	+1	.	.	11	11	11	.	III
<i>Sambucus ebulus</i>	.	.	.	+2	.	+2	.	+2	+2	.	11	.	.	.	.	.	II
<i>Lathyrus laxiflorus</i> subsp. <i>angustifolius</i>	.	.	.	.	.	.	.	.	.	.	.	11	11	12	.	11	II
<i>Digitalis ferruginea</i> subsp. <i>schischkii</i>	.	.	.	.	.	.	.	.	.	.	11	11	11	11	.	.	II
<i>Pilosella hoppeana</i> subsp. <i>testimonialis</i>	.	.	.	.	.	.	.	+1	.	.	11	.	11	11	.	.	II
<i>Euphorbia stricta</i>	.	.	.	+1	+1	.	.	.	.	.	.	+1	11	.	.	.	II
<i>Prunella vulgaris</i>	.	.	.	.	.	+1	+1	.	.	11	.	.	.	+1	.	.	II
<i>Bellis perennis</i>	11	+1	.	.	.	.	.	.	.	.	.	.	.	.	+1	.	I
<i>Phloxella x auriculoides</i>	.	.	11	.	.	.	.	.	.	.	.	.	.	.	11	.	I
<i>Poa alpina</i> subsp. <i>fallax</i>	.	.	+1	.	.	.	.	11	.	.	.	.	.	.	.	.	I
<i>Rubus canescens</i> var. <i>canescens</i>	.	.	+2	.	.	.	.	11	.	.	.	.	.	.	.	.	I
<i>Luzula pseudosudetica</i>	.	.	11	.	.	.	.	.	.	.	.	.	.	.	11	11	I
<i>Carex acuta</i>	+1	.	.	.	.	.	.	.	.	+1	.	.	.	.	.	.	I
<i>Cirsium pseudopersonata</i> subsp. <i>pseudopersonata</i>	.	.	.	.	.	.	.	.	.	.	+1	.	.	.	.	.	I
<i>Galium peploidium</i>	+1	11	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I

The species of single frequency: *Platanthera chlorantha* (21), *Euphorbia platyphylos* (21), *Epipogium aphyllum* (1), *Sambucus nigra* (78), *Lotus angustissimus* (6), *Polystichum setiferum* (67), *Epipactis pontica* (99), *Sedum pallidum* var. *pallidum* (77), *Sanguisorba minor* subsp. *muricata* (77), *Crataegus lanceolata* (78), *Marrubium astracanicum* (78), *Rosa canina* (63).

Daphno-Pinetum sylvestris includes various species belonging to various syntaxa units. The class QUERCO-FAGETEA (Br.-Bl. et Vliegler 1937) Fuk. et Fab. 1968 is represented by *Pinus sylvestris*, *Galium rotundifolium*, *Euphorbia amygdaloides* var. *amygdaloides*, *Viola odorata* and *Stelleria holostea*. The order RHODODENDRO-FAGETALIA ORIENTALIS is characterised by *Fagus orientalis*, *Daphne pontica* and *Rubus hirtus*. The important components of the order QUERCO-CARPINETALIA ORIENTALIS and alliance CARPINO-ACERION are *Pyracantha coccinea*, *Cyclamen coum* var. *coum*, *Lathyrus laxiflorus* subsp. *laxiflorus* and *Doronicum orientale*. The order FAGETALIA SYLVATICAE is represented by *Sanicula europaea* and *Calamintha grandiflora*. The class QUERCETEA PUBESCENTIS is characterised by *Juniperus oxycedrus* subsp. *oxycedrus* and *Cornus mas*. The association *Daphno-Pinetum sylvestris* was included in the class QUERCO-FAGETEA and the order RHODODENDRO-FAGETALIA ORIENTALIS when the floristic composition was examined.

4- Galio-Fagetum orientalis Özen & Kılınc as. nov. (Table 4)

This association (holotype table 4, quadrat number 27) is scattered, especially on northern slopes between 1150 and 1740 m and on grey-brown podsolic soils in the study area. The characteristic and differential species of the association are *Fagus orientalis*, *Galium odoratum* and *Rubus hirtus*. The association exhibits tree, shrub and herb layers. The total coverage and height of the tree layer vary between 90 and 100% and 15 and 25 m, respectively. This layer is characterised by *Fagus orientalis* and *Pinus sylvestris*. The total coverage and height of the shrub layer vary between 10 and 20% and 0.5 and 1 m, respectively. The dominant species of the bush layer are *Rubus hirtus* and *Daphne pontica*. The total coverage and height of the herb layer vary between 5 and 40% and 5 and 20 cm, respectively. The most common species in the herb layer are *Galium odoratum*, *Lathyrus laxiflorus* subsp. *laxiflorus*, *Fragaria vesca* and *Urtica dioica*.

The floristic composition of the association includes the characteristic species of the orders FAGETALIA SYLVATICAE, RHODODENDRO-FAGETALIA ORIENTALIS and QUERCO-CARPINETALIA ORIENTALIS and the classes QUERCETEA PUBESCENTIS and QUERCO-FAGETEA. The characteristic species of the order FAGETALIA SYLVATICAE are *Monotropa hypopitys*,

Calamintha grandiflora, *Sanicula europaea*, and *Neottia nidus-avis*. The important components of the order QUERCO-CARPINETALIA ORIENTALIS and the alliance CARPINO-ACERION are *Lathyrus laxiflorus* subsp. *laxiflorus*, *Cyclamen coum* var. *coum* and *Doronicum orientale*. The class QUERCETEA PUBESCENTIS is only represented by *Cephalanthera rubra*.

From this point of view, the syntaxonomic explanation of the *Galio-Fagetum orientalis* is not easy. However, all characteristic and differential species of this association are typical for the order RHODODENDRO-FAGETALIA ORIENTALIS. Moreover, the class QUERCO-FAGETEA is also well represented in this association. Therefore, it should be considered in the syntaxa cited above.

Conclusions and Comments

From the 306 taxa found in the study area, *Ailanthus altissima*, *Pistacia vera*, *Pyrus communis* subsp. *sativa* and *Juglans regia* are culture plants and 25 taxa are new floristic records for the A5 square in the Flora of Turkey.

The distribution of taxa according to life forms and living periods is shown in Tables 5 and 6, respectively.

As seen in Table 5, the percentage of hemicryptophytes is higher than those of the other life forms. The proportions of therophytes and chamaephytes appear to be remarkably higher than those of the other life form categories (i.e. macrophanerophytes, nanophanerophytes and cryptophytes).

The distribution of taxa in different floristic regions is given in Table 7.

As seen in Table 7, Euro-Siberian elements are more common than the other floristic elements in the research area. This is due to the fact that the research area is situated in the Black Sea region. The lower altitudes of the research area have a Mediterranean microclimate because of its being near Kızılırmak Valley. Therefore, the percentage of Mediterranean elements is high at lower altitudes. In addition, some Irano-Turanian elements are also present, because the study area is located between the Black Sea and Central Anatolian regions.

Table 8 shows how similar the study and nearby areas are in terms of floristic composition.

Özen & Kılınc's study (1995) describes floristic properties the most similar to those in the study area (Table 8). The proportion of endemism in the area is very

Table 4. Callio-Fagetum orientalis Özen & Kiliç as. nov. ** Type: Quadrat 27

	4	5	27	29	30	31	98	79	28	34	83	36	18	68	71	70	38	Presence	
Quadrat No	1300	1300	1740	1720	1700	1720	1740	1740	1700	1740	1740	1740	1200	1150	1150	1300	1675		
Altitude (m)	30	25	35	20	-	-	35	35	35	25	45	40	30	50	15	10	15	V	
Inclination (%)	N	NE	NW	N	-	-	W	W	NW	W	W	W	N	NE	NE	NW	NE	V	
Exposure	25	20	15	20	15	15	15	15	20	20	15	20	15	15	20	20	15	II	
Height of the tree layer (m)	100	100	100	95	90	90	95	95	100	90	90	95	90	95	90	100	95	II	
Coverage of the tree layer (%)	0.5	0.5	1	1	0.5	1	1	1	0.5	1	1.5	1	0.5	0.75	0.75	0.5	0.5	II	
Height of the shrub layer (m)	20	15	20	25	25	30	20	20	15	.	.	5	20	15	40	5	25	III	
Coverage of the shrub layer (%)	15	15	10	15	10	20	15	15	15	.	15	5	15	15	20	5	20	III	
Height of the herb layer (cm)	20	15	15	15	20	20	10	5	15	.	.	5	25	15	40	10	20	III	
Coverage of the herb layer (%)																		IV	
Characteristic and differential species of the association																			
<i>Fagus orientalis</i>	55	55	55	55	45	45	55	55	55	45	45	45	55	45	45	55	55	V	
<i>Rubus hirsutus</i>	+	11	+1	+2	11	22	+1	11	+2	11	11	11	.	22	22	+1	12	V	
<i>Galium odoratum</i>	.	.	22	22	33	33	12	11	23	12	+	+	11	.	.	+	22	V	
Characteristic species of Fagetalia sylvatica																			
<i>Monotropa hypophysis</i>	+1	+1	+1	.	.	.	.	.	11	.	.	.	.	.	.	.	.	II
<i>Calamintha grandiflora</i>	.	.	.	.	.	22	+2	.	.	.	.	.	.	.	.	.	+2	II
<i>Sanicula europaea</i>	.	.	.	+1	+2	.	.	.	.	.	.	.	11	.	.	.	.	I
<i>Neottia nidus-avis</i>	.	.	.	.	.	.	.	.	.	.	.	.	+1	.	.	.	.	I
Characteristic species of Rhododendro-Fagetalia orientalis																			
<i>Daphne pontica</i>	+1	11	22	+2	12	.	22	22	+1	+1	11	12	.	.	+2	+1	12	V	
Characteristic species of Quercus-Carpinetalia orientalis and Carpino-Acerion (*)																			
<i>Ladyrhus laxiflorus</i> subsp. laxiflorus	11	+1	.	.	+1	11	+1	.	+1	+1	+1	.	11	22	22	+1	11	IV	
(*) <i>Cyclamen coum</i> var. coum	.	.	+1	11	11	.	.	.	+1	+1	.	.	+1	.	.	+1	+1	III	
<i>Doronicum orientale</i>	.	.	.	.	.	.	.	.	.	.	.	.	+1	11	.	.	.	I
<i>Digitalis ferruginea</i> subsp. ferruginea	.	.	.	.	.	.	.	.	.	.	.	.	+1	.	.	.	.	I
<i>Geranium asphedeloideum</i> subsp. asphedeloideum	.	.	.	.	.	.	.	.	.	.	.	.	.	+1	.	.	.	I
(*) <i>Pracantha coccinea</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Characteristic species of Quercetalia pubescentis																			
<i>Cephalanthera rubra</i>	I
Characteristic species of Quercus-Fagetalia (*) and Quercus-Fagea																			
<i>Fragaria vesca</i>	11	.	+1	+1	11	.	+1	+1	11	+1	+1	+1	11	22	22	.	11	IV	
<i>Polygonatum multiflorum</i>	.	.	.	.	.	.	.	.	11	+1	11	.	.	.	.	.	+1	III
<i>Primula vulgaris</i> subsp. vulgaris	+1	.	.	.	.	.	.	.	+1	.	.	.	11	.	.	.	11	II
(*) <i>Pinus sylvestris</i>	11	+1	.	.	.	.	.	.	.	.	.	.	+1	11	.	+1	.	II
(*) <i>Cardamine bulbifera</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
(*) <i>Callium rotundifolium</i>	+1	22	.	11	11	.	.	.	+1	.	.	.	.	.	.	.	11	II
(*) <i>Viola odorata</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
(*) <i>Euphorbia amygdaloides</i> var. amygdaloides	.	.	.	.	22	22	.	.	11	.	.	.	12	.	.	.	22	II
<i>Veronica chamaedrys</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
(*) <i>Anisostichia pontica</i>	.	+2	.	.	.	.	.	.	.	.	.	.	22	.	.	.	+2	I
<i>Clinopodium vulgare</i> subsp. vulgare	.	.	.	.	.	12	.	.	.	.	.	.	.	.	.	.	+1	I
<i>Geum urbanum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Other Species																			
<i>Pteridium aquilinum</i>	+1	11	+1	.	+1	.	.	+1	.	22	+1	+1	.	+1	.	.	+1	III	
<i>Urtica dioica</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
<i>Vicia cracca</i>	+1	11	.	.	+1	.	.	.	.	.	.	.	.	+2	.	.	.	II
<i>Sambucus ebulus</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
<i>Polystichum setiferum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
<i>Achenilla sarculosa</i>	.	.	.	+2	.	.	.	.	.	.	.	.	.	.	.	.	11	I
<i>Viburnum lanata</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
<i>Monoses uniflora</i>	.	+1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
<i>Arenaria serpyllifolia</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
<i>Dactylis glomerata</i> subsp. glomerata	.	.	.	.	.	11	.	.	+1	.	.	.	.	.	.	.	.	I
<i>Rosa canina</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
<i>Epipactis pontica</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
<i>Orobancha nana</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I

The species of single frequency: *Epipogon apophyllum* (4), *Cirsium pseudopersonata* (5), *Sedum palitium* var. *palitium* (27), *Senecio vernalis* (27), *Cystopteris fragilis* (29), *Silene vulgaris* var. *vulgaris* (31), *Leptosia speculum-venetis* (31), *Hypericum linarioides* (31), *Campanula glomerata* subsp. *hispanica* (31), *Cynoglossum germanicum* (68), *Epilobium lanceolatum* (68), *Pilosella x auriculoides* (68), *Sanguisorba minor* subsp. *inuricata* (71), *Tussilago fairraia* (71), *Crataegus angustifolia* (70), *Rumex acetosella* (68), *Trifolium caudatum* (38).

Table 5. The distribution of taxa according to life forms.

Life form	Number of Species	Percentage
Macrophanerophyte	17	5.55
Nanophanerophyte	29	9.48
Chamaephyte	65	21.24
Hemicryptophyte	122	39.87
Therophyte	67	21.90
Cryptophyte	6	1.96
Total	306	100.00

Table 6. The distribution of taxa according to living periods

Living period	Number of Species	Percentage
Annual	67	21.90
Biennial	38	12.42
Perennial	201	65.68
Total	306	100.00

Table 7. The distribution of species in different floristic regions.

Floristic Region		Number of Species	Percentage
Euro-Siberian	Euro-Siberian	68	28.43
	Euxine	14	
	Euxine (mt.)	1	
	Hyrcano-Euxine	3	
	Hyrcano-Euxine (mt.)	1	
Mediterranean	Mediterranean	26	11.44
	Mediterranean (mt.)	1	
	E. Mediterranean	8	
Irano-Turanian		15	4.90
More than one region		169	55.23
Total		306	100.00

Table 8. Comparison (%) of floristic results of the present study with those given for nearby regions in earlier studies.

	Number of species	Euro-Siberian	Mediterranean	Irano-Turanian	More than one region	Endemic
Kunduz	306	28.43	11.44	4.90	55.23	4.29
Özen & Kılınç (1995)	696	20.75	13.79	4.32	61.14	5.18
Kılınç (1985)	850	23.80	9.50	16.50	50.20	2.00
Kutbay & Kılınç (1995)	611	25.19	9.65	2.29	62.87	3.43
Karaer & Kılınç (1993)	654	18.60	19.60	1.70	60.10	2.75
Kılınç & Özen (1998)	330	17.10	15.00	1.20	66.70	-

low due to poor ecological diversity in this area (i.e. at a given area the level of endemism is mainly correlated with ecological diversity).

A comparison of the richest families found in the present study with those in other floristic studies previously carried out near this region is given in Table 9. As seen in this table, the families *Fabaceae*, *Rosaceae*, *Asteraceae*, *Lamiaceae* and *Poaceae* are the richest in terms of taxa in the study area. In addition, these families are also placed among the top five in Turkey in previous studies carried out in the Black Sea region, Turkey.

From the geographical and phytogeographical points of view, the study area is situated in the Central Black Sea part of the Black Sea region and the Euxine sector of the Euro-Siberian floristic region. The Euxine sector has been divided into three parts from the Black Sea region to Central Anatolian as Eu-Euxine, Sub-Euxine and Xero-Euxine by Zohary (1973). According to Zohary (1973) the research area is included in the Sub-Euxine part of the Euxine sector.

Table 9. Comparison (%) of the richest families of the present study with those given for nearby regions in earlier studies.

	Kunduz	Özen & Kılınç (1995)	Kılınç (1985)	Kutbay & Kılınç (1995)	Karaer & Kılınç (1993)	Kılınç & Özen (1998)
Fabaceae	10.78	9.94	11.30	10.14	9.63	12.30
Rosaceae	6.86	4.47	4.62	4.09	3.82	3.00
Asteraceae	6.53	10.38	11.30	11.62	10.39	12.30
Lamiaceae	5.88	5.76	6.25	6.87	5.19	7.20
Poaceae	4.90	7.06	7.97	6.87	8.25	6.00
Brassicaceae	3.92	3.89	5.80	3.60	3.36	3.60
Scrophulariaceae	3.59	3.46	4.37	4.41	3.66	2.40
Rubiaceae	3.26	2.60	2.50	-	1.37	1.80
Boraginaceae	2.94	2.74	2.75	3.10	3.36	2.40
Caryophyllaceae	2.61	3.31	4.37	2.61	3.82	5.10
Others	48.73	37.75	32.53	46.69	40.74	36.70

The study area includes a Mediterranean pre-steppic intrapontic layer, a supra-Mediterranean preontic layer, a mountainous preontic layer, a mountainous euxine layer and a Mediterranean intrapontic layer according to the treatment by Quezel et al. (1980) using altitude and biogeography criteria.

In this study four associations are determined. One of these belongs to degraded forest vegetation and the remaining belong to forest vegetation. The phytosociological evaluation of this associations is as follows.

Carpino-Quercetum cerridis was described previously by Kutbay & Kılınç (1995), Özen & Kılınç (1995) and Quezel et al. (1980). This association is included in QUERCETEA PUBESCENTIS by Quezel et al. (1980), QUERCO-CARPINETALIA ORIENTALIS by Kutbay & Kılınç (1995) and CARPINO-ACERION by Özen & Kılınç (1995). As seen in Table 10, the associations were compared with those in similar studies by using Sorensen's similarity formula (Sorensen, 1948), as a percentage, around the Black Sea region. As in Table 10, the association *Carpino-Quercetum cerridis* resembles Özen and Kılınç's association (1995) in 48.7%.

The association *Junipero-Pinetum nigrae* is described from the Black Sea region for the first time in this paper. There are several *Pinus nigra* associations described by Akman (1972, 1973), Akman & Ketenoğlu (1978), Akman et al. (1979, 1987, 1983 a and 1983 b), Yurdakulol (1981), Akman & Aydoğdu (1986), Akman & İlarıslan (1983), Özen & Kılınç (1995), Gemici (1988),

Ocakverdi (1987), Ekim & Akman (1990) and Kılınç (1985) in Turkey. This association is included in QUERCETEA PUBESCENTIS by Akman et al. (1983, 1987), Yurdakulol (1981), Akman & Aydoğdu (1986), and Akman & İlarıslan (1983), in CARPINO-ACERION by Özen & Kılınç (1995), Akman et al. (1983), and Gemici (1988), in QUERCO-CEDRETALIA LIBANI by Akman et al. (1979), Ocakverdi (1987), and Ekim & Akman (1990), and in PINO-CISTION LAURIFOLII by Kılınç (1985). The highest similarity (58.6%) to ours was obtained by Özen & Kılınç (1995) (Table 10).

The *Daphno-Pinetum sylvestris* association was named differently by some researchers (Özen & Kılınç, 1995; Kılınç, 1985; Akman et al., 1983 and 1987; Akman & Aydoğdu, 1986; Tatlı, 1987; Ekim & Akman, 1990; Düzenli, 1989). This association is included in RHODODENDRO-FAGETALIA ORIENTALIS by Özen & Kılınç (1995), in QUERCO-FAGETEA by Akman et al. (1983 and 1987), in QUERCETEA PUBESCENTIS by Akman & Aydoğdu (1986) and Düzenli (1989), in QUERCO-CEDRETALIA LIBANI by Ekim & Akman (1990), and in CARPINO-ACERION by Kılınç (1985) and Tatlı (1987). This association is most similar to that described by Özen & Kılınç (1995) (Table 10).

The association *Galio-Fagetum orientalis* is described from the Black Sea region for the first time in this paper. There are several *Fagus orientalis* associations with different codominant species described by Özen & Kılınç (1995), Kutbay & Kılınç (1995), Quezel et al. (1980), and Akman et al. (1983) in Turkey. This association is included in FAGETALIA SYLVATICAE by Akman et al.

(1983), in CARPINO-ACERION by Quezel et al. (1980), and in RHODODENDRO-FAGETALIA ORIENTALIS by Özen & Kılınç (1995) and Kutbay & Kılınç (1995). The highest similarity (49.3%) to ours was obtained by Özen & Kılınç (1995) (Table 10).

Table 10. Similarity percentages between associations in the study area and in other studies in the Black Sea region, according to Sorensen's similarity formula (Sorensen, 1948).

	Carpino- Quercetum cerridis	Junipero- Pinetum nigrae	Daphno- Pinetum sylvestris	Galio- Fagetum orientalis
Özen & Kılınç (1995)	48.70	58.60	57.10	49.30
Kılınç (1985)	-	16.10	27.30	-
Kutbay & Kılınç (1995)	30.90	49.30	38.20	37.50
Quezel et al. (1980)	22.80	23.40	-	23.60

The syntaxonomical interpretation of these associations is given below:

UPPER CLASS: *Quercu-Fagea* Fukarek & Fabjjanic 1968

CLASS: *Quercetea pubescentis* (Oberd. 1948) doing Kraft 1955

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ORDER: *Quercu-Carpinetalia orientalis* Quezel, Barbero et Akman 1980

ASSOCIATION: *Carpino-Quercetum cerridis* Kutbay & Kılınç 1995

ASSOCIATION: *Junipero-Pinetum nigrae* Özen & Kılınç as. nov.

CLASS: *Quercu-Fagetea* (Br.-Bl. et Vliegler 1937) Fuk. et Fab. 1968

ORDER: *Rhododendro-Fagetalia orientalis* Quezel, Barbero et Akman 1980

ASSOCIATION: *Daphno-Pinetum sylvestris* Kutbay & Kılınç 1995

ASSOCIATION: *Galio-Fagetum orientalis* Özen & Kılınç as. nov.

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