

Flora of the Gölcük Area (Bolu, Turkey)

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Abstract: Field studies were carried out to determine the vascular flora of the Gölcük area (Bolu) during 1997-1998. At the end of the evaluation of the identification of the collected specimens and the results of previous studies, 80 families, 277 genera, 461 species and 475 taxa in total were determined. The rates of species belonging to certain phytogeographical regions are as follows: the Euro-Siberians 30.8% (142 spp.), the Irano-Turanians 1.5% (7 spp.), the Mediterraneans 5.2% (24 spp.), and phytogeographically unknown 58.4% (269 spp.). The number of endemic taxa found in the research area is 16; thus the endemism rate is 3.5%. The largest 3 families are *Asteraceae* (43 spp.; 9.3%), *Poaceae* (43 spp.; 9.3%), and *Fabaceae* (40 spp.; 8.7%). The largest 3 genera are *Vicia* L. (10 spp.; 2.2%), *Trifolium* L. (8 spp.; 1.7%), and *Veronica* L. (7 spp.; 1.5%).

Key Words: Gölcük, Bolu, flora, Turkey

Gölcük Bölgesinin (Bolu-Türkiye) Florası

Özet: Bu çalışmada 1997-1998 yılları arasında Gölcük bölgesinin damarlı bitkiler florası araştırılmıştır. Gölcük ile ilgili daha önceki araştırmalar da gözönüne alınarak, bu örneklerin adlandırılması sonucu 80 familyaya ait 277 cins, 461 tür ve toplam 475 takson tespit edilmiştir. Toplam 461 türden 142 (% 30,8) tanesi Avrupa-Sibirya elementi, 24 (% 5,2) tanesi Akdeniz elementi, 7 (% 1,5) tanesi İran-Turan elementi, geriye kalan 269 (% 58,4) türün ise fitocoğrafik bölgesi ya belli değildir yada kozmopolittir. Alanda bulunan endemik taksonların sayısı 16 ve endemizm oranı % 3,5'dir. Araştırma alanında en büyük üç familya sırasıyla şunlardır: *Asteraceae* (43 tür; % 9,3), *Poaceae* (43 tür; % 9,3), *Fabaceae* (40 tür; % 8,7). Araştırma alanında en üç büyük cins: *Vicia* L. (10 tür; % 2,2) *Trifolium* L. (8 tür; % 1,7) ve *Veronica* L.'dir (7 tür; % 1,5).

Anahtar Sözcükler: Gölcük, Bolu, flora, Türkiye

Introduction

Lake Gölcük, located in the Western Black Sea region of Anatolia, is a touristic part of Bolu province. It is on the northern slopes of Aladağ and is in the Euro-Siberian phytogeographical region. The study area is within Kökez Nature Reserve. It is located in the A3 grid square (Figure 1), and is found 13 km along the Bolu-Seben road. The Gölcük area is positioned approximately at the latitudes of 40° 37' 03"- 40° 42' 25" N and the longitudes of 31° 29' 31"- 31° 38' 18" E. The study area is located on the upper side of the village of Karacasu, extending from 800 m to 1350 m altitude. The lake is at about 1240 m altitude.

According to Davis (1975), the research area is included in moderately known areas. To date, there has been no other work on the flora of Gölcük area. At the same time, the area is of touristic importance due to its natural beauty and its geographical location since it is located between İstanbul and Ankara. The area is visited and used by many people at weekends.

The soil type of the research area is mainly brown forest soil. This kind of soil has been formed on the main substance, which is extremely calcified. The structure of the soil is fine-pored or granulated and the pH of the soil is alkaline and rarely neutral. The study site, dating back to upper-Eocene (35-40 mya) of the Tertiary in the

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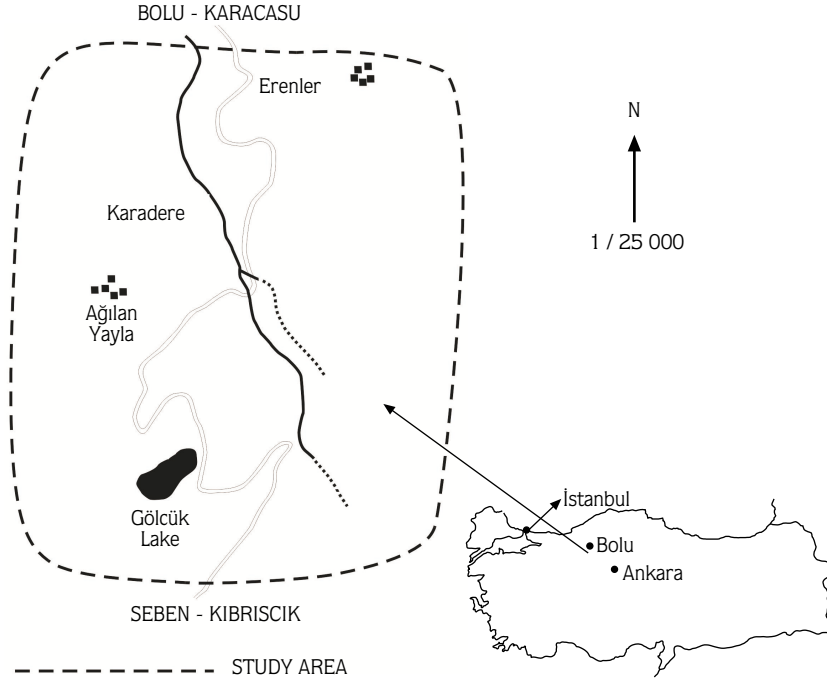


Figure 1. Map of the study area.

Cenozoic era, consists of different types of rock, including basalt, andesite, turf and aglomera of a variety of colours from pink to black to claret red. The surface morphology, formed by erosion and tectonic activities, is elaborated by metamorphite and volcanic rocky types (Aktimur & Algan, 1983).

According to the data obtained from Bolu Meteorology Station, the mean annual temperature of the area is expected to be between 7.1 and 9.6 °C. Mean annual precipitation of the research area is expected to be between 599.6 and 869.6 mm. Of this precipitation 32% is in winter, 29% is in spring, 21% is in autumn and 18% is in summer. The most rainy months of the year are December, January and February and the least rainy month is August.

The study area mainly consists of forest vegetation; at lower elevations deciduous mixed forests are dominant (*Fagus orientalis* Lipsky, *Quercus robur* L. subsp. *robur*, *Q. petraea* (Matt.) Liebl. subsp. *iberica* (Steven ex M.Bieb.) Krassiln., *Q. pubescens* Willd., *Acer campestre* L. subsp. *campestre*, *A. platanoides* L., *Crataegus microphylla* C.Koch, *C. monogyna* Jacq. subsp. *azarella* (Gris) Franco, *C. orientalis* Pall., *Carpinus betulus* L.,

Juniperus oxycedrus L. subsp. *oxycedrus*, *Sorbus torminalis* (L.) Crantz var. *torminalis*). After these trees there are nearly pure *Abies nordmanniana* (Steven) Spach subsp. *bornmuelleriana* (Mattf.) Coode & Cullen forests. Only a few *Pinus nigra* J.F.Arnold subsp. *nigra* var. *caramanica* (Loudon) Rehder and *Pinus sylvestris* L. trees are found around the road and the lake. The study area is also rich in marshy habitats. There are water plants in the lake (like *Nuphar lutea* (L.) Sm., *Potamogeton natans* L., *P. gramineus* L. and *Polygonum amphibium* L.) and marshy plants surround the edge of the lake (like *Carex flacca* Schreb. subsp. *flacca*, *C. remota* L., *C. otrubae* Podp. *Juncus effusus* L., and *Typha latifolia* L., *Phragmites australis* (Cav.) Trin. ex Steud.). There are meadows near the lake. Beyond the meadows, there are wild fruit trees (*Malus sylvestris* Mill. subsp. *orientalis* (Uglitzk.) Browicz var. *orientalis*, *Pyrus communis* L. subsp. *communis*, *P. elaeagnifolia* Pall. subsp. *elaeagnifolia*, *Prunus spinosa* L.). *Salix amplexicaulis* Bory & Chaub., *S. caprea* L., *S. caucasica* Anderson, *S. elaeagnos* Scop., *Populus tremula* L., and *Alnus glutinosa* (L.) Gaertn. subsp. *glutinosa* trees grow at the lake and also around small streams.

Materials and Methods

The floristic inventory was generated by repeated visits during 1997 and 1998, between March and October in each year. The remaining months were not suitable for material collection. The 887 specimens collected were dried according to known herbarium techniques and processes. During the identification of the plant specimens, "Flora of Turkey and the East Aegean Islands" (Davis, 1965-1985; Davis et al., 1988; Güner et al., 2000) was used as the main reference source. Doubtful identifications were checked in "Flora Europaea" (Tutin et al., 1964-1980), and "Flora of Iraq" (Townsend, 1966-1985). All the herbarium specimens are kept in the Herbarium of Abant İzzet Baysal University (AIBU). Authors of plant names are abbreviated according to Brummitt and Powell (1992). All taxa in the floristic list are given according to the order in the Flora of Turkey (Davis, 1965-1985; Davis et al., 1988). The citation of the floristic list is in the following order:

- i- Species name, author(s) name,
- ii- Habitat, locality, date of collection, name of collector and collector number are given, in that order. All collected specimens were identified by N. İkinci and A. Güner, except specimens belonging to the family Poaceae, which were identified or checked by M. Doğan. Grid squares of all localities are omitted because the study area is completely within the A3 grid square. City name (Bolu) and Gölcük are similarly not mentioned. If more than one specimen was collected from the same locality, only one's citation was written. Information on phytogeographic regions is followed by information about endemism, and IUCN (2001) threat categories are given for endemic taxa.

The new records for A3 grid square were checked against the related literature (Akman & Ketenoğlu, 1978, 1986; Akman & Yurdakulol, 1981a, 1981b; Ketenoğlu, 1983; Ekim & İlarıslan 1982; Akman et al., 1983a, 1983b; Akman & İlarıslan, 1983; Akman et al., 1985; Erik & Demirkuş, 1985; Türker, 2003; Yıldırım, 1987, 1997, 1999, 2001a, 2001b, 2003a, 2003b; Alpınar, 1988; Donner, 1990). New records for grid square A3 are shown with an asterisk. Some words used in the text are abbreviated as follows: Euro-Sib., Euro-Siberian; Hyrc.-Euxine, Hyrcano-Euxine; Medit., Mediterranean; E. Medit., East Mediterranean; Ir.-Tur., Irano-Turanian; Nİ, Nursel İkinci; LC., Least Concern; NT., Near Threatened; VU., Vulnerable; EN., Endangered; DD., Data Deficient; NE., Not Evaluated.

Results and Discussion

The vascular plant flora of the Gölcük area is represented by 461 species in 277 genera and 80 families (Appendix). The angiosperms comprised 453 species in 271 genera and 75 families, the gymnosperms consisted of 4 species in 2 families and 3 genera and the pteridophytes included 4 species in 3 genera and 3 families. Floristic properties of the research area are given in Table 1. Twenty-three species were found as new records for the square A3.

The distribution of species according to phytogeographic regions is given in Table 2. In this research, Euro-Siberian elements rank first with 30.8%. Because the research area is in the Euro-Siberian phytogeographic region, the finding of much more Euro-Siberian elements is expected. In addition, in all of the compared studies (Table 2) the number of Euro-Siberian elements is higher than the number of elements of other

Table 1. Floristic properties of the research area.

	Ferns	Gymno.	Dicots	Monocots	Total
Families	3	2	62	13	80
Genera	3	3	219	52	277
Species	4	4	376	77	461
Subspecies			10		10
Varieties			4		4
Endemic taxa		1	12	3	16
Medit.			16	8	24
Ir.-Tur.			5	2	7
Euro-Sib.		1	90	25	115
Hyrc.-Euxine			4		4
Euxine		1	17	5	23
Others	4	2	226	37	269

Table 2. Comparison of floristic studies (abbreviations are below the table).

	Compared Studies						
	Gölçük	Abant	Yedigöl.	BoluMt.	SemenMt.	Gölköy	Aktaş
Total Taxa	475	677	236	276	286	445	315
Endemic species (%)	3.5	8.1	6.7	5.0	4.1	4.3	5.0
Euro-Sib. (%)	30.8	29.3	32.4	31.8	27.6	29.2	15.6
Medit. (%)	5.2	5.6	-	5.3	7.6	5.8	7.6
Ir.-Tur. (%)	1.5	4.7	2.3	2.6	3.8	4.7	7.6
Multi-regional or phytogeographic region unknown (%)	58.4	60.6	55.5	55.1	36.7	60.6	66.0

Abbreviations: Gölçük: Our results; Abant: Türker (2003); Yedigöl.: Ekim & İlarıslan (1982); BoluMt.: Akman & Yurdakulol (1981a); SemenMt.: Akman & Yurdakulol (1981b); Gölköy: Flora of Gölköy Campus (pers. comm.); Aktaş: Akman & Ketenöglü (1979).

phytogeographic regions. In our survey, the Mediterranean elements (5.2%) rank second and the Irano-Turanian elements (1.5%) third. Although these results are in agreement with those of previous studies (Akman & Ketenöglü, 1979; Akman & Yurdakulol, 1981a, 1981b; Akman et al., 1983), there are no records for the Mediterranean elements in the "Flora of Yedigöller Milli Parkı" survey (Ekim & İlarıslan, 1982). According to Akman & Ketenöglü (1986), Turkey comes under the influence of a continental, oceanic and Mediterranean climate. The oceanic climate prevails on the northern slopes along the 1500 km Black Sea Turkish coast, but at some points of this coastal belt a Mediterranean climate influence is evident. This kind of climate with the vegetation occurring as patches in the Black Sea region is also seen in our research area as Mediterranean semi-arid and Mediterranean sub-humid types. Therefore, the Mediterranean elements in our research area rank second. It is expected to have a very low number of Irano-Turians because the study area occupies the northern slopes of Aladağlar, which are under the influence of oceanic climate and composed of mainly *Abies nordmanniana* subsp. *bornmuelleriana* forests. On the other hand, the southern part of the mountain range is under the influence of a semi-continental climate and has a different floristic structure (Akman et al., 1983b). Our study area is dominated by *Abies* forests; on the other hand, due to decreasing precipitation the southern slopes of the mountain range are mainly composed of *Pinus* forests.

The endemism rate of the research area is 3.5%, with 16 species. The endemism rate of the Gölçük area is lower than those in other studies. According to Davis et al. (1988), the endemism rate of the Euro-Siberian phytogeographical region is lower than that of the other 2 phytogeographical regions in Turkey. The fact that our research area is in the Euro-Siberian phytogeographical region may explain the low endemism rate.

The most diverse families were *Asteraceae* and *Poaceae* (43 species), *Fabaceae* (40), *Rosaceae* (25), *Lamiaceae* (22), *Brassicaceae* (18), *Caryophyllaceae*, *Apiaceae* (17), *Scrophulariaceae* (14) and *Boraginaceae* (13). When we compare the largest families with other surveys (Table 3), we see that *Fabaceae* and *Asteraceae* were present in all studies, but in different ranks. *Asteraceae* is the largest family in the Flora of Turkey. This family possesses an easy dispersal ability and some members of the family have spines to protect them from grazing; in addition, the family has a wide ecological tolerance. Species belonging to *Poaceae* were also found in the study area in large numbers. There are at least 2 possible reasons of the occurrence of this family at the study site: the family *Poaceae* is mostly known as common in prairie habitats and the species of this family are known as abundant in numbers around wetlands and marshy environments. In the present study, the species of the family were also collected from similar environments around the lake. *Lamiaceae*, the third largest family in the Flora of Turkey, is also present in third or fourth rank in most studies. However, in our study it ranks fifth. This

Table 3. Comparison of our research with other surveys according to the 10 largest families. Proportion of total number species is given in parentheses (%). (Abbreviations are below Table 2).

	Compared Studies						
	Gölcük	Abant	Yedigöl.	BoluMt.	SemenMt.	Gölköy	Aktaş
<i>Asteraceae</i>	43 (9.3)	68 (10.3)	25 (10.6)	25 (9.3)	21 (7.4)	53 (12.1)	26 (8.3)
<i>Poaceae</i>	43 (9.3)	55 (8.3)	11 (4.7)	16 (5.9)	17 (6.0)	22 (5.0)	17 (5.4)
<i>Fabaceae</i>	40 (8.7)	46 (6.9)	26 (11)	28 (10.4)	27 (9.5)	39 (8.9)	35 (11.2)
<i>Rosaceae</i>	25 (5.4)	35 (5.3)	13 (5.5)	18 (6.4)	21 (7.4)	25 (5.7)	16 (5.1)
<i>Lamiaceae</i>	22 (4.8)	45 (6.8)	13 (5.5)	22 (7.9)	19 (6.7)	30 (6.8)	16 (5.1)
<i>Brassicaceae</i>	18 (3.9)	31 (4.7)	6 (2.5)		16 (5.6)	21 (4.8)	14 (4.8)
<i>Caryophyllaceae</i>	17 (3.7)	23 (3.5)	10 (4.2)		14 (4.9)	15 (3.4)	15 (4.8)
<i>Apiaceae</i>	17 (3.7)		11 (4.7)	8 (2.8)		16 (3.7)	
<i>Scrophulariaceae</i>	14 (3.0)	32 (4.8)	6 (2.5)		16 (5.6)	23 (5.3)	26 (8.3)
<i>Boraginaceae</i>	13 (2.8)					17 (3.9)	14 (4.5)

may be because the family is not common in forested areas and its members are common plants of the Mediterranean area (Harley & Reynolds, 1992).

The most species-rich genera were *Vicia* (10 species), *Trifolium* (8), *Veronica* (7), *Bromus*, *Poa* and *Viola* (6), *Carex*, *Dianthus*, *Geranium* and *Galium* (5). When we compare the largest genera with other surveys, *Trifolium* is present in all studies. *Vicia* is the largest genus in our study, but it is not present in the first 3 studies listed in Table 4. *Veronica*, among the largest genera, was also

common in 3 other studies. One reason for the high number of *Veronica* is probably the presence of wet habitats.

According to the study by Bottema et al. (1993) on Lake Yeniçağa and Lake Abant, there were steppe vegetation plants and tree pollens were absent at around 14,000 BP. Between the periods of 12,330 and 10,180 the arboreal pollen percentages increased, including the pollens of *Quercus*, *Pinus*, *Juniperus* and on higher altitudes *Abies* and *Betula*. There was a strong increase in

Table 4. Comparison of our research with other surveys according to the 10 largest genera. (Abbreviations are below Table 2).

	Compared Studies						
	Gölcük	Abant	Yedigöl.	BoluMt.	SemenMt.	Gölköy	Aktaş
<i>Vicia</i>	10 (2.2)						
<i>Trifolium</i>	8 (1.7)	10 (1.5)	9 (3.8)	6 (2.2)		9 (2.1)	9 (2.9)
<i>Veronica</i>	7 (1.5)	15 (2.3)			7 (2.5)	8 (1.8)	12 (3.8)
<i>Bromus</i>	6 (1.3)						
<i>Poa</i>	6 (1.3)	7 (1.0)		3 (1.1)	6 (2.1)		
<i>Viola</i>	6 (1.3)						
<i>Carex</i>	5 (1.1)	11 (1.7)			5 (1.8)		
<i>Dianthus</i>	5 (1.1)						
<i>Geranium</i>	5 (1.1)						
<i>Galium</i>	5 (1.1)	8 (1.2)			6 (2.1)		

Abies, *Corylus* and *Pinus* around 9880 BP. The study by Beug (1967) on pollen diagrams from Lake Abant and Lake Yeniçağa showed that the character of the forests has changed little during the last 5000-6000 years. According to Butzer (1958), the climate in the Near East became drier and warmer around 2400 BC. The possible result for this climatic change in our area is the expansion of *Pinus* forests and depression of *Abies* forests.

Disturbed areas in the region are the forest margins, roadsides and meadows, which are subject to grazing. These disturbed areas show different species compositions. Housing and development near the study site could cause destruction of habitats. The environs of the lake are also exposed to the movement and picnicking activity of many people, especially at weekends and during holidays. Such activities bring about the destruction of flora due to the heavy usage of the area, causing environmental pollution. Another point that should be stressed is that there is no monitoring in the

area although it has been a nature reserve since 1987. A recent study on the ecology of the lake also showed that the lake has poor ecological conditions and the quality of the water is affected by human activities (Külköylüoğlu & Dügel, 2004). Studies on grazing and its effect on natural habitats have been commonly discussed among conservation biologists (Hobbs & Huenneke, 1992; Bolen, 1999). Even though we did not measure the effect of grazing within the study area, our personal observation seems to support the idea that grazing can negatively affect the plant habitats in the study site.

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APPENDIX

- FLORISTIC LIST**
- PTERIDOPHYTA**
- Equisetaceae**
- Equisetum palustre* L.
Damp places, stream sides, 880-950 m, 24 vi 1997, Nİ 1264.
- E. telmateia* Ehrh.
Damp places, road banks, 1200-1350 m, 20 vii 1997, Nİ 1456.
- Hypolepidaceae**
- Pteridium aquilinum* (L.) Kuhn
Damp places, 890 m, 17 vi 1997, Nİ 1231.
- Aspidiaceae**
- Dryopteris filix-mas* (L.) Schott
Abies forests, wet places, 1240 m, 17 vi 1997, Nİ 1237.
- SPERMATOPHYTA**
- GYMNOSPERMAE**
- Pinaceae**
- Abies nordmanniana* (Steven) Spach subsp. *bornmuelleriana* (Mattf.) Coode & Cullen
Around the lake, 1000-1250 m, 11 ix 1997, Nİ 1643. Euxine.
Endemic. Threat Category: LC.
- Pinus sylvestris* L.
Roadsides, 1100-1250 m, 11 x 1998, Nİ 1833. Euro-Sib.
- P. nigra* J.F.Arnold subsp. *nigra* var. *caramanica* (Loudon) Rehder
Roadsides, 870-1000 m, 29 ix 1998, Nİ 1756.
- Cupressaceae**
- Juniperus oxycedrus* L. subsp. *oxycedrus*
Under *Quercus* forests, roadsides, 870-1000 m, 29 ix 1998, Nİ 1738.
- ANGIOSPERMAE**
- DICOTYLEDONAE**
- Ranunculaceae**
- Helleborus orientalis* Lam.
Abies forests, mixed forests, 900-1235 m, 30 iv 1997, Nİ 1038. Euxine.
- Nigella arvensis* L. var. *glauca* Boiss.
Roadsides, 850-900 m, 16 vii 1997, Nİ 1443.
- Consolida orientalis* (Gay) Schröd.
Fields, roadsides, 850-950 m, 02 vi 1998, Nİ 1705.
- Clematis vitalba* L.
Roadsides, on *Rubus* sp. bushes, 870-1250 m, 29 ix 1998, Nİ 1717.
- Ranunculus repens* L.
Roadsides, under *Abies* forests, 1180-1190 m, 25 v 1997, Nİ 1135.
- R. arvensis* L.
Field borders, roadsides, open places, 810-1160 m, 11 ix 1997, Nİ 1687.
- R. ficaria* L. subsp. *ficariiformis* Rouy & Foucher
Wet, open places, near the lake, 1240 m, 06 v 1997, Nİ 1064.
- Nymphaeaceae**
- Nuphar lutea* (L.) Sm.
In shallow water, 1240 m, 12 vii 1997, Nİ 1403.
- Papaveraceae**
- Chelidonium majus* L.
Roadsides, 1120 m, 21 v 1997, Nİ 1088. Euro-Sib.
- Papaver rhoeas* L.
Roadsides, open places, fields, 880-950 m, 24 vi 1997, Nİ 1299.
- Corydalis caucasica* DC.
Under mixed and *Abies* forests, 900-1235 m, 30 iv 1997, Nİ 1036. Euxine.
- Brassicaceae/Cruciferae**
- Conringia orientalis* (L.) Andrz.
Abies forests, Türk-Alman Research Forest, 1120 m, 21 v 1997, Nİ 1100.
- Cardaria draba* (L.) Desv. subsp. *draba*
Road sides, 990-1300 m, 10 vi 1997, Nİ 1208.
- Thlaspi perfoliatum* L.
Open places, near lake, 1240-1250 m, 30 iv 1997, Nİ 1028.
- T. arvense* L.
Near Karacasu Village, 700 m, Alpay 314.
- Capsella bursa-pastoris* (L.) Medik.
Under mixed forests, 850-950 m, 11 ix 1997, Nİ 1627.
- Alyssum repens* Baumg. var. *stenophyllum* Hal.
Roadsides, 850-900 m, 16 vii 1997, Nİ 1445.
- A. minus* (L.) Rothm. subsp. *minus*
Open places, 1240 m, 06 v 1997, Nİ 1060.
- Erophila verna* (L.) Chevall. subsp. *verna*
Open places, *Abies* forests, 1120 m, 21 v 1997, Nİ 1098.
- Arabis sagittata* (Bertol.) DC.
By roads, 1150-1160 m, 25 v 1997, Nİ 1131.
- Rorippa sylvestre* (L.) Bessey
Swampy ground, near the lake, 1240 m, 01 vii 1997, Nİ 1318.
- Barbarea vulgaris* R.Br.
Open places, roadsides, 1150-1250 m, 11 x 1998, Nİ 1827.
- B. plantaginea* DC.
Roadsides, 990-1140 m, 10 vi 1997, Nİ 1204.
- Cardamine bulbifera* (L.) Crantz
Abies forests, Türk-Alman Research Forest, 1120 m, 21 v 1997, Nİ 1106. Euro-Sib.

- C. tenera* C.C.Gmel.
Roadsides, 1180-1190 m, 25 v 1997, Nİ 1140. Hırc.-Euxine.
- C. impatiens* L. var. *pectinata* (Pall.) Trautv.
Under *Abies* forests, Türk-Alman Research Forest, 1120 m, 21 v 1997, Nİ 1099. Euro-Sib.
- C. hirsuta* L.
Open places, near lake, 1240 m, 06 v 1997, Nİ 1058.
- Alliaria petiolata* (M.Bieb.) Cavara & Grande
Under *Abies* forests, shady places, 1200 m, 25 v 1997, Nİ 1117.
- Sisymbrium officinale* (L.) Scop.
Wet places, forest borders, open places, roadsides, 850-1250 m, 11 ix 1997, Nİ 1639.
- **S. orientale* L.
Roadsides and waste places, around lake, 1200-1250 m, 11 x 1998, Nİ 1778.
- Resedaceae**
- Reseda luteola* L.
Roadsides, open places, 850-1250 m, 22 vii 1997, Nİ 1467.
- Cistaceae**
- Helianthemum nummularium* (L.) Mill. subsp. *nummularium*
Open places, roadsides, 880-980 m, 10 vi 1997, Nİ 1184.
- Violaceae**
- Viola odorata* L.
Shady places, 1240 m, 06 v 1997, Nİ 1067.
- V. alba* Besser
Under *Abies* forests, 1235 m, 30 iv 1997, Nİ 1037.
- V. reichenbachiana* Jord.
Bolu Da. (Ala Da.), Kühne 1056.
- V. sieheana* W.Becker
Under *Abies* forests, 1200-1250 m, 02 vi 1998, Nİ 1690.
- V. canina* L.
Roadsides, 1150-1160 m, 25 v 1997, Nİ 1126.
- V. kitaibeliana* Roem. & Schult.
Aladağlar, under sparse *Pinus sylvestris* forests, 1300-1400 m, 02 iv 1998, Nİ 1998.
- V. arvensis* Murray
Wheat fields, 850-950 m, 11 ix 1997, Nİ 1659.
- Polygalaceae**
- Polygala supina* Schreb.
Meadows, open places, 810-950 m, 02 vi 1997, Nİ 1151.
- Caryophyllaceae**
- Stellaria media* (L.) Vill subsp. *pallida* (Dumort.) Asch. & Graebn.
Open, wet places near lake, 1240 m, 06 v 1997, Nİ 1069.
- Myosoton aquaticum* (L.) Moench
Damp places, around lake, 1100-1250 m, 11 x 1998, Nİ 1801. Euro-Sib.
- Moenchia mantica* (L.) Bartl. subsp. *mantica*
Meadows, 930-1050 m, 02 vi 1998, Nİ 1694.
- Dianthus leucophaeus* Sibth. & Sm. var. *leucophaeus*
Ala Dağ. D. 37390.
Endemic. Threat Category: NE.
- D. corymbosus* Sibth. & Sm.
Open places, roadsides, 850-950 m, 24 vi 1997, Nİ 1313.
- D. zonatus* Fenzl var. *hypochlorus* (Boiss. & Heldr.) Reeve
Wet places, 850-950 m, 11 ix 1997, Nİ 1636.
- D. carthusianorum* L.
Meadows, open places, 850-1250 m, 11 ix 1997, Nİ 1649.
- D. calocephalus* Boiss.
Open woodlands, 850-900 m, 16 vii 1997 Nİ 1408.
- D. lydus* Boiss.
Under *Quercus* forests, 850-950 m, 11 ix 1997, Nİ 1633.
- Endemic. Threat Category: NT.
- Velezia rigida* L.
Open fields, 850-900 m, 16 vii 1997, Nİ 1411.
- Saponaria glutinosa* M.Bieb.
Roadsides, 1050-1100 m, 01 vii 1997, Nİ 1356.
- S. officinalis* L.
Shady places, damp woods, 850-950 m, 13 viii 1997, Nİ 1597.
- Vaccaria pyramidata* Medik. var. *grandiflora* (Fisch.) Cullen
Open places and roadsides, 880-950 m, 24 vi 1997, Nİ 1283.
- Silene italica* (L.) Pers.
Open places, 810 m, 02 vi 1997, Nİ 1149.
- S. vulgaris* (Moench) Gracke var. *vulgaris*
Scrub, slopes, open places, 1200 m, 10 vi 1997, Nİ 1176.
- S. compacta* Fisch.
Slopes, open forests, 1180 m, 27 viii 1997, Nİ 1601.
- S. alba* (Mill.) Krause subsp. *divaricata* (Rchb.) Walters
Roadsides, 880-950 m, 24 vi 1997, Nİ 1298.
- Lychnis coronaria* (L.) Desr.
Roadside banks, 880-950 m, 24 vi 1997, Nİ 1282. Euro-Sib.
- Illecebraceae**
- Herniaria glabra* L.
Ala Dağ. Kartal Kaya, 1200 m, Khan et al.
- Polygonaceae**
- Polygonum bistorta* L. subsp. *bistorta*
Aladağ 1700 m, Alpay 437.
- P. amphibium* L.
In water, 1240 m, 01 vii 1997, Nİ 1331.
- P. persicaria* L.
Damp places, near lake, 1240 m, 27 viii 1997, Nİ 1609.

P. arenastrum Bor.
Meadows, waste places, 850-950 m, 11 ix 1997, Nİ 1622.

P. aviculare L.
Waste places, 850-950 m, 06 x 1998, Nİ 1763.

Rumex acetosella L.
Roadsides, 880-1190 m, 25 v 1997, Nİ 1136.

R. crispus L.
Roadsides, 1200-1350 m, 20 vii 1997, Nİ 1454.

R. conglomeratus Murray
Lake shores, roadsides, 850-1250 m, 31 vii 1997, Nİ 1481.

Chenopodiaceae

Chenopodium album L. var. *album*
Fields, open places, roadsides, 850-1250 m, 29 ix 1998, Nİ 1710.

Amaranthaceae

Amaranthus retroflexus L.
Fields, 870-1000 m, 29 ix 1998, Nİ 1758.

Hypericaceae/Guttiferae

Hypericum perforatum L.
Open places and roadsides, 880-1250 m, 11 x 1998, Nİ 1818.

Malvaceae

Malva sylvestris L.
Open places, meadows, 880-1300 m, 24 vi 1997, Nİ 1284.

M. neglecta Wallr.
Roadsides, 1000-1250 m, 12 vii 1997, Nİ 1396.

Alcea pallida L.
Roadsides, open fields, 870-1000 m, 29 ix 1998, Nİ 1751.

Althaea hirsuta L.
Roadsides, 850-900 m, 16 vii 1997, Nİ 1413.

Geraniaceae

Geranium lucidum L.
Shady, wet places, under *Abies* forests, Türk-Alman Research Forest, 1080-1200 m, 25 v 1997, Nİ 1112.

G. robertianum L.

Abies forests, open places and roadsides, 1080-1250 m, 11 x 1998, Nİ 1828. Türk-Alman Research Forest, 02 vi 1997, Nİ 1173.

G. dissectum L.

Meadows, 890 m, 17 vi 1997, Nİ 1240.

G. sylvaticum L.

Abies forests, 1060 m, 17 vi 1997, Nİ 1222.

G. pyrenaicum Burm.f.

Meadows, roadsides, 850-1250 m, 06 x 1998, Nİ 1759.

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

Abies forests, 1200 m, 27 viii 1997, Nİ 1606.

E. acaule (L.) Bech. & Thell.

Damp places, roadsides, 850-950 m, 06 v 1997, Nİ 1057. Medit.

Oxalidaceae

Oxalis acetosella L.

Abies forests, 1200 m, 25 v 1997, Nİ 1109.

Aceraceae

Acer pseudoplatanus L.

Mixed forest margins, 1160 m, 02 vi 1997, Nİ 1161. Euro-Sib.

A. platanoides L.

By roads, 1200-1350 m, 20 vii 1997, Nİ 1452. Euro-Sib.

A. campestre L. subsp. *campestre*

By roads, mixed forests, 870-1000 m, 29 ix 1998, Nİ 1741. Euro-Sib.

Staphyleaceae

Staphylea pinnata L.

Mixed forests, shady places, 1000 m, 11 ix 1997, Nİ 1616.

Aquifoliaceae

Ilex colchica Pojark.

Abies forests, shady places, around lake, 1240 m, 27 viii 1997, Nİ 1612. Euxine.

Celastraceae

Euonymus latifolius (L.) Mill. subsp. *latifolius*

Forest margins, 900-1000 m, 31 vii 1997, Nİ 1475. Euro-Sib.

E. europaeus L.

By roads, 1160 m, 02 vi 1997, Nİ 1162. Euro-Sib.

Fabaceae/Leguminosae

Chamaecytisus hirsutus (L.) Link

Mixed forests, *Abies* forests, above Karacasu village, 910-1120 m, 21 v 1997, Nİ 1081. Türk-Alman Research Forest, 21 v 1997, Nİ 1093.

C. supinus (L.) Link

Open places, 880-950 m, 24 vi 1997, Nİ 1286. Euro-Sib.

Genista lydia Boiss. var. *lydia*

Meadows, open places, above Karacasu Village, 850-950 m, 02 vi 1997, Nİ 1141.

Argyrolobium biebersteinii Ball

Roadsides, 1050-1100 m, 01 vii 1997, Nİ 1369.

Galega officinalis L.

Roadsides, open places, above Karacasu Village, 880-1250 m, 24 vi 1997, Nİ 1293. Around the lake, 11 x 1998, Nİ 1798. Euro-Sib.

Astragalus glycyphyllos L.

Meadows, 930-980 m, 10 vi 1997, Nİ 1186. Euro-Sib.

A. mitchelianus Boiss.

Aladağ, 700 m, Alpay 227.

A. ponticus Pall.

6 km S of Bolu, 900 m, D. 37309.

Vicia crocea (Desf.) B.Fedtsch.

Abies forests, Türk-Alman Research Forest, 1060-1120 m, 17 vi 1997, Nİ 1223. Hyrc.-Euxine.

- V. freyniana* Bornm.
Roadsides, above Karacasu Village, 850-900 m, 16 vii 1997, Nİ 1447. Euxine.
Endemic. Threat Category: NT.
- V. cassubica* L.
Meadows, open places and roadsides, around the lake, 880-1250 m, 01 vii 1997, Nİ 1321. Above Karacasu Village, 24 vi 1997, Nİ 1301. Euro-Sib.
- V. cracca* L. subsp. *stenophylla* Velen.
Meadows, around the lake, 1250 m, 09 vi 2000, Nİ 1847.
- **V. canescens* Lab. subsp. *gregaria* (Boiss. & Heldr.) P.H.Davis
Meadows, open places, around the lake, 1240 m, 02 vi 1998, Nİ 1703. Ir.-Tur.
- **V. monantha* Retz. subsp. *monantha*
Abies forests, 1060 m, Türk-Alman Research Forest, 17 vi 1997, Nİ 1224.
- V. hirsuta* (L.) Gray
Mixed forests, roadsides, above Karacasu Village, 810-1160 m, 02 vi 1997, Nİ 1154. Deliklitaş, 25 v 1997, Nİ 1127.
- V. ciliatula* Lipsky
S of Bolu, Karacasu, Kühne 939.
- V. pannonica* Crantz var. *pannonica*
Abies forests, Türk-Alman Research Forest, 1060 m, 17 vi 1997, Nİ 1218.
- V. hybrida* L.
Roadsides, open places, above Karacasu Village, 880-950 m, 24 vi 1997, Nİ 1273.
- V. sativa* L. subsp. *nigra* (L.) Ehrh. var. *nigra* (L.) Ehrh.
Roadsides, above Karacasu Village, 810 m, 02 vi 1997, Nİ 1147.
var. *segetalis* (Thuill.) Ser.
Roadsides, above Karacasu Village, 880-950 m, 24 vi 1997, Nİ 1292.
- Lathyrus aureus* (Steven) D.Brândza
Mixed forests, 910 m, 21 v 1997, Nİ 1083. Euxine.
- L. digitatus* (M.Bieb.) Fiori
Quercus-Fagus forests, 910 m, 21 v 1997, Nİ 1078. Medit.
- L. laxiflorus* (Desf.) Kuntze subsp. *laxiflorus*
Quercus-Fagus forests, roadsides, on Karacasu-Gölcük way, 810-910 m, 21 v 1997, Nİ 1079. Above Karacasu Village, 02 vi 1997, Nİ 1156.
- L. nissolia* L.
Meadows, 1150-1160 m, 25 v 1997, Nİ 1120.
- L. aphaca* L. var. *aphaca*
Fields, 1250 m, 09 vi 2000, Nİ 1848.
- Ononis arvensis* L.
Ala Dağ., 1300 m, Özgürel 135. Euro-Sib.
- O. spinosa* L. subsp. *leiosperma* (Boiss.) Sirj.
By roads, open places, 850-950 m, 22 vii 1997, Nİ 1466.
- Trifolium repens* L. var. *repens*
Open places, around lake, 1240 m, 01 vii 1997, Nİ 1338.
- *var. *orphanideum* (Boiss.) Boiss.
Roadsides and open places, 880-950 m, 24 vi 1997, Nİ 1261.
- T. hybridum* L. var. *anatolicum* (Boiss.) Boiss.
Meadows, damp places, roadsides, above Karacasu Village, 810 m, 02 vi 1997, Nİ 1155.
- T. barbulatum* (Frey & Sint.) Zohary
Abies forest, Türk-Alman Research Forest, 1050-1100 m, 01 vii 1997, Nİ 1351.
Endemic. Threat Category: NT.
- T. campestre* Schreb.
Waste places, 890 m, 17 vi 1997, Nİ 1229.
- T. fragiferum* L. var. *fragiferum*
Karacasu, 700 m, Alpay 242: Aladağ, 1350 m, Alpay (ANKO 2590).
- T. pratense* L. var. *pratense*
Mixed forests, roadsides, meadows, above Karacasu Village, 850-1250 m, 11 ix 1997, Nİ 1629. Around lake, 11 x 1998, Nİ 1805.
- T. diffusum* Ehrh.
Karacasu, 700 m, Alpay 486.
- **T. medium* L. subsp. var. *ericalycinum* Hauskn.
Roadsides, open places, above Karacasu Village, 850-950 m, 24 vi 1997, Nİ 1289.
- T. lappaceum* L.
Roadsides, wet places, meadows, 850-1000 m, 10 vi 1997, Nİ 1190.
- T. arvensis* L. var. *arvensis*
Roadsides, 1050-1100 m, 01 vii 1997, Nİ 1355.
- Melilotus officinalis* (L.) Desr.
Roadsides, open places, 880-1250 m, 24 vi 1997, Nİ 1291. Around lake, 11 x 1998, Nİ 1780.
- Medicago lupulina* L.
Open places, around lake, 1200-1250 m, 11 x 1998, Nİ 1776.
- M. sativa* L. subsp. *sativa*
Meadows, fields, on Karacasu-Gölcük way, 850-1240 m, 16 vii 1997, Nİ 1405. Around lake, 02 viii 1998, Nİ 1707.
- M. polymorpha* L. var. *polymorpha*
Waste places, 810 m, 02 vi 1997, Nİ 1152.
- Dorycnium graceum* (L.) Ser.
Abies forest, 1060 m, Türk-Alman Research Forest, 17 vi 1997, Nİ 1221. Euxine.
- D. pentaphyllum* Scop. subsp. *herbaceum* (Vill.) Rouy
Roadsides, above Karacasu village, 850-900 m, 16 vii 1997, Nİ 1425.
- Lotus corniculatus* L. var. *corniculatus*
Wet places, open places, roadsides, above Karacasu Village, 850-1250 m, 24 vi 1997, Nİ 1285. Around lake, 11 x 1998 Nİ 1773.
- Coronilla varia* L. subsp. *varia*
Open places, roadsides, above Karacasu Village, 880-950 m, 24 vi 1997, Nİ 1288.
- Onobrychis viciifolia* Scop.
Roadsides, meadows, above Karacasu Village, 880-950 m, 24 vi 1997, Nİ 1303.
- O. oxyodonta* Boiss.
Foothills of Ala Da., Khan et al. 527.
- Rosaceae**
Prunus spinosa L. subsp. *dasyphylla* (Schur) Domin
Forest remnants and in scrub, fields above Karacasu, 850-1240 m, 11 ix 1997, Nİ

1664. Around lake, 06 v 1997, Nİ 1049. Euro-Sib.

Prunus x domestica L.

Field borders, roadsides, above Karacasu Village, 850-950 m, 11 ix 1997, Nİ 1651.

Cerasus avium (L.) Moench

By roads, on Karacasu-Gölcük way, 930-980 m, 10 vi 1997, Nİ 1197.

Flipendula vulgaris Moench

Open places, roadsides, above Karacasu Village, 880-950 m, 24 vi 1997, Nİ 1263. Euro-Sib.

Rubus sanctus Schreber

Stream sides, wet places, *Abies* forests, 850-1100 m, 28 x 1997, Nİ 1686. Türk-Alman Research Forest, 01 vii 1997, Nİ 1342.

R. canescens DC. var. *canescens*

Roadsides, open places, on Karacasu-Gölcük way, 870-1250 m, 29 ix 1998, Nİ 1708. Around lake, 11 x 1998, Nİ 1774. Euro-Sib.

Potentilla argentea L.

Mixed forests, open places, 880-980 m, 10 vi 1997, Nİ 1188. On Karacasu-Gölcük way, 24 vi 1997, Nİ 1294.

P. crantzii (Crantz) G.Beck var. *crantzii*

Roadsides, on Karacasu-Gölcük way, 880-950 m, 24 vi 1997, Nİ 1295. Euro-Sib.

P. reptans L.

Meadows, *Abies* forests, 1050-1250 m, 11 x 1998, Nİ 1794. 01 vii 1997, Nİ 1361.

P. micrantha Ramond

Abies forests, damp places, 1250 m, 30 iv 1997, Nİ 1040.

Fragaria vesca L.

Damp places, *Abies* forests, roadsides, Türk-Alman Research Forest, 1000-1120 m, 21 v 1997, Nİ 1105.

Geum rivale L.

Damp meadows, roadsides, Karacasu-Gölcük way, 880-950 m, 24 vi 1997, Nİ 1272.

Agrimonia eupatoria L.

Mixed forests, above Karacasu Village, 850-950 m, 11 ix 1997, Nİ 1631.

Aremonia agrimonoides (L.) DC.

Abies forests, Türk-Alman Research Forest, 1050-1120 m, 02 vi 1998, Nİ 1695. Euro-Sib.

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

Forest borders, on Karacasu-Gölcük way, 880-950 m, 24 vi 1997, Nİ 1269.

Alchemilla pseudocartalinica Juz.

Wet meadows, from lake to Temasa Hill, 1200-1350 m, 20 vii 1997, Nİ 1463.

Rosa canina L.

Mixed forests, open places, above Karacasu Village, 850-1250 m, 11 ix 1997, Nİ 1637. *Quercus* forests on Gölcük-Seben way, 10 vi 1997, Nİ 1183.

Mespilus germanica L.

Forest borders, open places, wheat fields on Karacasu-Gölcük way, 850-1250 m, 11 ix 1997, Nİ 1653. Hyrc.-Euxine.

Crataegus orientalis Pall. var. *orientalis*

Forests, roadsides, on Karacasu-Gölcük way, 880-1000 m, 11 ix 1997, Nİ 1645. Above Karacasu Village, 24 vi 1997, Nİ 1304.

C. monogyna Jacq. subsp. *monogyna*

Forest borders, roadsides, on Gölcük-Karacasu way, 870-1250 m, 29 ix 1998, Nİ 1746.

subsp. *azarella* (Gris) Franco

Forest-field border, fields on Karacasu-Gölcük way, 850-950 m, 11 ix 1997, Nİ 1654.

C. microphylla C.Koch

Mixed forest borders, roadsides and open places, on Gölcük-Karacasu way, 850-1000 m, 11 ix 1997, Nİ 1620. Above Karacasu Village, 02 vi 1997, Nİ 1160. Hyrc.-Euxine.

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

Mixed forests, forest borders, on Gölcük-Karacasu way, 870-1250 m, 29 ix 1998, Nİ 1742. Around lake, 11 x 1998, Nİ 1819. Euro-Sib.

Malus sylvestris Mill. subsp. *orientalis* (Uglitzk.) Browicz var. *orientalis*

Open places, around lake, 1200-1250 m, 11 x 1998, Nİ 1843.

Pyrus communis L. subsp. *communis*

Forest border, on fields on Karacasu-Gölcük way, 850-950 m, 11 ix 1997, Nİ 1665.

P. elaeagnifolia Pall. subsp. *elaeagnifolia*

On forest-field border, on Karacasu-Gölcük way, 850-950 m, 11 ix 1997, Nİ 1656.

Lythraceae

Lythrum salicaria L.

Lake shores, damp places, 1200-1300 m, 11 x 1998, Nİ 1804. Euro-Sib.

L. hyssopifolia L.

Damp, open places, 850-950 m, 11 ix 1997, Nİ 1648.

Onagraceae

Circaea lutetiana L.

Wet and shady places, around lake, 1100-1250 m, 31 vii 1997, Nİ 1483.

Epilobium angustifolium L.

Roadsides, on Karacasu-Gölcük way, 1200-1300 m, 08 vii 1997, Nİ 1375.

E. hirsutum L.

Lake shores, 1200-1250 m, 11 x 1998, Nİ 1820.

E. lanceolatum Sebast. & Mauri

Abies forests, Türk-Alman Research Forest, 1050-1100 m, 01 vii 1997, Nİ 1348.

E. algidum M.Bieb.

Ala Da., 1550 m, Kühne 1252.

Haloragidaceae

Myriophyllum spicatum L.

In lake, 1250 m, 02 vi 1998, Nİ 1700.

Crassulaceae

Sedum pallidum M.Bieb. var. *bithynicum* (Boiss.) D.F.Chamb.

Abies forests, roadsides, on Karacasu-Gölcük way, 1050-1100 m, 01 vii 1997, Nİ 1362. Türk-Alman Research Forest, 01 vii 1997, Nİ 1354. Euxine.

var. *pallidum*

Open places, roadsides, on Karcasu-Gölcük way, 880-950 m, 24 vi 1997, Nİ 1300.

Saxifragaceae*Saxifraga rotundifolia* L.

Shady places, *Abies* forests, 1000 m, Türk-Alman Research Forest, 09 vi 2000, Nİ 1845. Euro-Sib.

S. cymbalaria L. var. *cymbalaria*

Damp places, roadsides, on Karcasu-Gölcük way, 990-1140 m, 10 vi 1997, Nİ 1202.

Apiaceae/Umbelliferae*Sanicula europaea* L.

Abies forests, Türk-Alman Research Forest, 1120 m, 21 v 1997, Nİ 1102. Euro-Sib.

Eryngium giganteum M.Bieb.

Open places, meadows, on Karcasu-Gölcük way, 1240 m, 12 viii 1998, Nİ 1706. Euxine.

E. bithynicum Boiss.

Open places, roadsides, on Karcasu-Gölcük way, 870-1000 m, 29 ix 1998, Nİ 1737. Ir.-Tur.

Endemic. Threat Category: LC.

E. campestre L. var. *virens* Link

Roadsides, on Karcasu-Gölcük way, 850-950 m, 13 viii 1997, Nİ 1598.

Endemic. Threat Category: LC.

Anthriscus nemorosa (M.Bieb.) Spreng.

Roadsides, on Karcasu-Gölcük way, 1000-1250 m, 12 vii 1997, Nİ 1398.

Bifora radians M.Bieb.

Open places, roadsides, on Karcasu-Gölcük way, 880-950 m, 24 vi 1997, Nİ 1260.

Pimpinella saxifraga L.

Open places, around lake, 1200-1250 m, 11 x 1998, Nİ 1782.

Oenanthe fistulosa L.

Marshy ground, on Karcasu-Gölcük way, 850-900 m, 16 vii 1997, Nİ 1437.

O. silaifolia M.Bieb.

Marshy ground, edges of lake, 1250 m, 01 vii 1997, Nİ 1322. Karcasu-Gölcük way, 16 vii 1997, Nİ 1424.

Conium maculatum L.

Wet meadows, on Karcasu-Gölcük way, 870-1250 m, 29 ix 1998, Nİ 1731. Around lake, 01 vii 1997, Nİ 1325.

Bupleurum rotundifolium L.

Fields, open places, on Karcasu-Gölcük way, 880-950 m, 24 vi 1997, Nİ 1287.

B. affine Sadler

Forest clearings, roadsides, on Karcasu-Gölcük way, 850-950 m, 13 viii 1997, Nİ 1590.

Pastinaca sativa L. subsp. *urens* (Req. ex Godr.) Celak.

Lake shores, roadsides, 1200-1300 m, 08 vii 1997, Nİ 1378.

Heracleum sphondylium L. subsp. *ternatum* (Velen.) Brummitt

Wet places, around lake, 1200-1300 m, 08 vii 1997, Nİ 1386. Euro-Sib.

Laserpitium hispidum M.Bieb.

Edges of forests, on Karcasu-Gölcük way, 900-1000 m, 31 vii 1997, Nİ 1477. Euro-Sib.

Torilis leptophylla (L.) Rchb.

5 km S. of Bolu, 750 m, Kühne 956.

Caucalis platycarpos L.

Fields, roadsides, waste places, on Karcasu-Gölcük way, 850-900 m, 16 vii 1997, Nİ 1420.

Daucus carota L.

Open places, around lake, 1200-1250 m, 11 x 1998, Nİ 1837.

Araliaceae*Hedera helix* L.

Climbers on *Abies* trees, on Karcasu-Gölcük way, 870-1250 m, 29 ix 1998, Nİ 1720. Around lake, 03 x 1997, Nİ 1681.

Cornaceae*Cornus sanguinea* L. subsp. *sanguinea*

Forest-field border, on Gölcük-Karacasu way, 850-950 m, 11 ix 1997, Nİ 1663.

subsp. *australis* (C.A.Mey.) Jáv.

Forest borders, 890-980 m, 10 vi 1997, Nİ 1185. Euro-Sib.

C. mas L.

Mixed deciduous forests, roadsides, on Gölcük-Karacasu way, 850-1250 m, 06 x 1998, Nİ 1762. Around lake, 11 x 1998, Nİ 1809. Euro-Sib.

Caprifoliaceae*Sambucus ebulus* L.

Mixed forests, road banks, on Karacasu-Gölcük way, 850-1250 m, 29 ix 1998, Nİ 1732. Around lake, 11 x 1998, Nİ 1641. Euro-Sib.

S. nigra L.

Roadsides, Karacasu-Gölcük way, 1060-1250 m, 17 vi 1997, Nİ 1226. Around lake, 11 ix 1997, Nİ 1675. Euro-Sib.

Viburnum opulus L.

Forest edges, around Gölcük-Karacasu way, 990-1140 m, 10 vi 1997 Nİ 1201. Euro-Sib.

Lonicera caucasica Pall. subsp. *orientalis* (Lam.) Chamb. & Long

Abies forests, Türk-Alman Research Forest, 1060 m, 17 vi 1997, Nİ 1225.

Endemic. Threat Category: LC.

Rubiaceae*Sherardia arvensis* L.

Forest clearings, road banks, above Karacasu village, 810 m, 02 vi 1997, Nİ 1157. Medit.

**Crucianella gilanica* Trin. subsp. *pontica* (Ehrend.) Ehrend.

Roadsides, on Karacasu-Gölcük way, 850-900 m, 16 vii 1997, Nİ 1428. Euxine.

Asperula taurina L. subsp. *taurina*

Abies forests around lake, 1000-1250 m, 25 v 1997, Nİ 1114.

A. involucrata Wahlenb.

Open places, roadsides, on Karacasu-Gölcük way, 810-950 m, 24 vi 1997, Nİ 1279. Euxine.

Galium odoratum (L.) Scop.

Abies forest, Türk-Alman Research Forest, 1080-1120 m, 02 vi 1997, Nİ 1170. Euro-Sib.

G. palustre L.

Wet places, around lake, 1250 m, 01 vii 1997, Nİ 1340. Euro-Sib.

G. verum L. subsp. *glabrescens* Ehrend.

Open places, roadsides, Karacasu-Gölcük way, 850-1250 m, 16 vii 1997, Nİ 1429. Around lake, 11 x 1998, Nİ 1821. Euro-Sib.

G. album Mill. subsp. *prusense* (C.Koch) Ehrend. & Krendl

Meadows, Karacasu-Gölcük way and around lake, 1200-1300 m, 08 vii 1997, Nİ 1390.

G. pashale Forssk.

Road sides, around lake, 1200-1300 m, 08 vii 1997, Nİ 1383. E. Medit.

Cruciata laevipes Opiz

Grasslands, on Karacasu-Gölcük way, 930-1140 m, 10 vi 1997, Nİ 1195. Euro-Sib.

Valerianaceae

Valeriana alliariifolia Adams

Wet places, *Abies* forests, around lake, 1200-1350 m, 02 vi 1998, Nİ 1701. Above Gölcük Lake, 20 vii 1997, Nİ 1462.

Valerianella lasiocarpa (Stev.) Betcke

Meadows, around lake, 1150-1160 m, 06 v 1997, Nİ 1052. On Karacasu-Gölcük way, 25 v 1997, Nİ 1123. Ir.-Tur.

Dipsacaceae

Dipsacus laciniatus L.

Meadows, road banks, on Gölcük-Seben way, 1100-1250 m, 31 vii 1997, Nİ 1486.

Knautia degenii Borbás

Roadsides, on Karacasu-Gölcük way, 850-900 m, 16 vii 1997, Nİ 1415. Medit.

Endemic. Threat Category: LC.

**K. byzantina* Fritsch

Roadsides, on Karacasu-Gölcük way, 850-900 m, 16 vii 1997, Nİ 1414.

Endemic. Threat Category: NT.

Scabiosa columbaria L. subsp. *columbaria* var. *columbaria*

Open places, roadsides, on Karacasu-Gölcük way, 850-950 m, 06 x 1998, Nİ 1769.

Threat Category: LC.

S. atropurpurea L. subsp. *maritima* (L.) Arc.

Meadows, open places, on Karacasu-Gölcük way, 850-1000 m, 29 ix 1998, Nİ 1743.

S. argentea L.

Roadsides, on Karacasu-Gölcük way, 850-900 m, 16 vii 1997, Nİ 1432.

Asteraceae/Compositae

Xanthium spinosum L.

Mixed forests, roadsides, forests just above Karacasu village, 850-1000 m, 11 ix 1997, Nİ 1628. On Karacasu-Gölcük way, 29 ix 1998, Nİ 1727.

Telekia speciosa (Schreb.) Baumg.

Forest borders, between Gölcük and Aladağ, 1200-1350 m, 20 vii 1997, Nİ 1461. Euro-Sib.

Inula britannica L.

Moist ground, on Karacasu-Gölcük way, 850-1250 m, 29 ix 1998, Nİ 1711. Around lake, 11 x 1998, Nİ 1784. Euro-Sib.

Helichrysum plicatum DC. subsp. *plicatum*

Roadsides, on Karacasu-Gölcük way, 1200-1350 m, 20 vii 1997, Nİ 1458.

Filago vulgaris Lam.

Abies forests, 1100-1250 m, on Karacasu-Gölcük way, 31 vii 1997, Nİ 1478.

**Conyza bonariensis* (L.) Cronquist

Open places, roadsides, on Karacasu-Gölcük way, 900-1350 m, 31 vii 1997, Nİ 1473. Above Gölcük Lake, 20 vii 1997, Nİ 1464.

Bellis perennis L.

Open, moist meadows, around lake, 850-1250 m, 11 x 1998, Nİ 1775. Euro-Sib.

Doronicum orientale Hoffm.

Open places, under *Abies* forests, on Karacasu-Gölcük way, 1120 m, 21 v 1997, Nİ 1090.

**Senecio nemorensis* L. subsp. *nemorensis*

Damp places, around lake, 1100-1250 m, 11 ix 1997, Nİ 1670. Euro-Sib.

S. vulgaris L.

Meadows, open places and by roads, on Karacasu-Gölcük way, 29 ix 1998, Nİ 1729.

S. vernalis Waldst. & Kit.

Open places and roadsides, on Karacasu-Gölcük way, 850-950 m, 11 ix 1997, Nİ 1623.

Tussilago farfara L.

Wet places, around lake, 1250 m, 30 iv 1997, Nİ 1033. Euro-Sib.

Petasites hybridus (L.) Gaertn.

Wet places, around lake, 1250 m, 30 iv 1997, Nİ 1033. Euro-Sib.

Anthemis coelopoda Boiss. var. *bourgaei* Boiss.

Roadsides, on Karacasu-Gölcük way, 850-950 m, 13 viii 1997, Nİ 1591.

A. tinctoria L. var. *dioscoidea* (All.) DC.

Ala Da., 700 m, Khan et al. 519.

A. pseudocotula Boiss.

Forest borders, fields on Karacasu-Gölcük way, 850-1250 m, 11 ix 1997, Nİ 1661. Around lake, 11 x 1998, Nİ 1777.

Achillea nobilis L. subsp. *neilreichii* (A.Kern.) Formánek

Roadsides, open places, Karacasu-Gölcük way, 880-950 m, 24 vi 1997, Nİ 1290. Euro-Sib.

Chrysanthemum segetum L.

Roadsides, on Karacasu-Gölcük way, 1200-1300 m, 08 vii 1997, Nİ 1381. Medit.

Tanacetum armenum (DC.) Sch.Bip.

Ala Dağ. 1300 m, Boyakman & Fitz 602.

Tripleurospermum tenuifolium (Kit.) Freyn

Meadows and open places, around lake, 930-1250 m, 02 vi 1998, Nİ 1702. Karacasu-Gölcük way, 10 vi 1997, Nİ 1181. Euro-Sib.

Arctium minus (Hill) Bernh. subsp. *minus*

Roadsides, around lake, 1100-1250 m, 31 vii 1997, Nİ 1499.

Cirsium arvense (L.) Scop. subsp. **arvense**

Roadsides, Karacasu-Gölcük way, 1100-1250 m, 31 vii 1997, Nİ 1479.

subsp. **vestitum** (Wimmer & Grab.) Petrak

Fields, fields on Karacasu-Gölcük way, 870-1000 m, 29 ix 1998, Nİ 1739.

C. hypoleucum DC.

Open places, Karacasu-Gölcük way, 880-950 m, 24 vi 1997, Nİ 1249. Euxine.

Carduus acanthoides L. subsp. **Acanthoides**

Roadsides, Karacasu-Gölcük way, 850-1300 m, 16 vii 1997, Nİ 1439. Above Gölcük Lake, 08 vii 1997, Nİ 1389.

Centaurea solstitialis L. subsp. **solstitialis**

Roadsides, Karacasu-Gölcük way, 850-1350 m, 16 vii 1997, Nİ 1435. Around lake, 20 vii 1997, Nİ 1455.

C. iberica Trevir.

Open places, Karacasu-Gölcük way, 870-1000 m, 29 ix 1998, Nİ 1754.

C. stenolepis A.Kern.

Forest openings, Türk-Alman Research Forest, 1000 m, 11 ix 1997, Nİ 1642. Euro-Sib.

Xeranthemum annum L.

Open places, Karacasu-Gölcük way, 870-1000 m, 29 ix 1998, Nİ 1726.

Scolymus hispanicus L.

Open places, Karacasu-Gölcük way, 850-950 m, 06 x 1998, Nİ 1761.

Cichorium intybus L.

Open palces, Karacasu-Gölcük way, 850-1000 m, 29 ix 1998, Nİ 1753.

Tragopogon pratensis* L. subsp. **pratensis

Wet places, around lake, 1250 m, 01 vii 1997, Nİ 1320. Euro-Sib.

Leontodon hispidus L. subsp. **hispidus**

Open places, Karacasu-Gölcük way, 880-1000 m, 11 ix 1997, Nİ 1617. Euro-Sib.

L. crispus Vill. subsp. **asper** (Waldst. & Kit.) Rohlena var. **asper**

Roadsides, open places, Karacasu-Gölcük way, 880-950 m, 24 vi 1997, Nİ 1251.

Sonchus asper (L.) subsp. **glaucescens** (Jord.) Ball

Abies forest, roadsides, above Gölcük Lake, 1200-1300 m, 08 vii 1997, Nİ 1371. Türk-Alman Research Forest, 01 vii 1997, Nİ 1347.

**Hieracium ovalifrons* (Woronow & Zahn) Juxip

Abies forests, Türk-Alman Research Forest, 1060 m, 17 vi 1997, Nİ 1220. Euxine.

Endemic. Threat Category: LC.

Pilosella piloselloides (Vill) Soják subsp. **piloselloides**

Open places, roadsides, Karacasu-Gölcük way, 880-950 m, 24 vi 1997, Nİ 1253.

P. hoppeana (H.Schult.) C.H. & F.W.Schultz subsp. **troica** (Zahn) P.D.Sell & West

Roadsides, Karacasu-Gölcük way, 880-950 m, 24 vi 1997, Nİ 1270.

Lactuca saligna L.

Open places, roadsides, Karacasu-Gölcük way, 850-1000 m, 29 ix 1998, Nİ 1718.

L. serriola L.

Roadsides, Karacasu-Gölcük way, 1050-1300 m, 01 vii 1997, Nİ 1367. Around lake, 08 vii 1997, Nİ 1388. Euro-Sib.

Lapsana communis L. subsp. **alpina** (Boiss. & Bal.) Y.Sell

Open places, around lake, 1200-1250 m, 11 x 1998, Nİ 1790. Euxine.

Taraxacum aznavourii Soest.

Meadows, open places, Karacasu-Gölcük way, 870-1240, 29 ix 1998, Nİ 1736. Around lake. 06 v 1997, Nİ 1053.

Endemic. Threat Category: According to the Turkish Red Data Book (Ekim et al., 2000), the species is in the Data Deficient Group. However, it has been collected from 3 localities in Bolu (pers. com.) and so the species is not 'Data Deficient' (DD) any more, but according to our estimations the species has an extent of occurrence less than 5000 km². Therefore, we assign the species in the 'Endangered' (EN) category.

T. buttleri Soest

Roadsides, Karacasu-Gölcük way, 850-950 m, 06 x 1998, Nİ 1760.

**T. turcicum* Soest

Open places, Karacasu-Gölcük way, 850-950 m, 13 viii 1997, Nİ 1586.

Endemic. Threat Category: The species is in the 'Vulnerable' (VU) category because it has an extent of occurrence less than 20,000 km².

Crepis foetida L. subsp. **foetida**

Meadows, fields, around lake, 850-1250 m, 12 vii 1997, Nİ 1402. Karacasu-Gölcük way, 16 vii 1997, Nİ 1442.

Campanulaceae

Campanula rapunculoides L.subsp. **rapunculoides**

Open places, roadsides, Karacasu-Gölcük way, 1200-1250 m, 11 x 1998, Nİ 1789. Above lake, 20 vii 1997, Nİ 1451. Euro-Sib.

subsp. **cordifolia** (C.Koch) Damboldt.

Roadsides, Karacasu-Gölcük way, 1090 m, 27 viii 1997, Nİ 1602.

C. trachelium* L. subsp. **athoa (Boiss. & Heldr.) Hayek

Meadows, around lake, 1200-1300 m, 08 vii 1997, Nİ 1379.

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

Roadsides, above lake, 1200-1300 m, 08 vii 1997, Nİ 1377. Euro-Sib.

C. persicifolia L.

Wet places, roadsides, Karacasu-Gölcük way, 900-1100 m, 02 vi 1998, Nİ 1704. Euro-Sib.

Asyneuma limonifolium (L.) Janch. subsp. **limonifolium**

Roadsides, Karacasu-Gölcük way, 850-900 m, 16 vii 1997, Nİ 1407.

Legousia pentagonia (L.) Thell.

Open places, roadsides, Karacasu-Gölcük way, 880-1140 m, 10 vi 1997, Nİ 1205. Medit.

Ericaceae

Pyrola chlorantha Sw.

Abies forest, Türk-Alman Research Forest, 1100-1250 m, 31 vii 1997, Nİ 1491.

Orthilia secunda (L.) House

Abies forests, Türk-Alman Research Forest, 1050-1250 m, 11 x 1998, Nİ 1792.

Moneses uniflora (L.) A.Gray

Abies forests, wet places, on Karacasu-Gölcük way, 1050 m, 02 vi 1998, Nİ 1692.

Monotropa hypopithys L.

Abies forests, Türk-Alman Research Forest, 1100-1250 m, 31 vii 1997, Nİ 1492.

Primulaceae

Primula vulgaris Huds. subsp. *vulgaris*

Abies forests around lake, meadows, 1250 m, 30 iv 1997, Nİ 1039. Euro-Sib.

Cyclamen coum Mill. var. *coum*

Abies forests around lake, 1240 m, 06 v 1997, Nİ 1072.

Lysimachia vulgaris L.

Wet and shady places, around lake, 1200-1250 m, 03 x 1997, Nİ 1679.

L. verticillaris Spreng.

Roadsides, wet places, around lake, 1050-1250 m, 31 vii 1997, Nİ 1498. Hyrc.-Euxine.

Anagallis arvensis L. var. *arvensis*

Open places, on Gölcük-Karacasu way, 850-1000 m, 13 viii 1997, Nİ 1585.

A. foemina Mill.

Open places, roadsides, around lake, 870-1250 m, 31 vii 1997, Nİ 1496. On Gölcük-Karacasu way, 29 ix 1998, Nİ 1712. Medit.

Oleaceae

Ligustrum vulgare L.

Forest borders, on Gölcük-Karacasu way, 870-1000 m, 29 ix 1998, Nİ 1721. Euro-Sib.

Gentianaceae

Centaurium erythraea Rafn subsp. *erythraea*

Abies forests, Türk-Alman Research Forest, 970 m, 27 viii 1997, Nİ 1603.

Gentiana asclepiadea L.

Roadbanks, above lake, 1250-1300 m, 11 ix 1997, Nİ 1618. Euro-Sib.

Convolvulaceae

Convolvulus arvensis L.

Roadsides, open places, on Gölcük-Karacasu way, 880-980 m, 10 vi 1997, Nİ 1191.

Calystegia silvatica (Kit.) Griseb.

Open places, roadsides, on Gölcük-Karacasu way, 880-950 m, 24 vi 1997, Nİ 1305.

Cuscutaceae

Cuscuta europaea L.

On herbs and shrubs, on Gölcük-Karacasu way, 850- 900 m, 16 vii 1997, Nİ 1448.

C. epithymum (L.) L. var. *epithymum*

On *Sambucus ebulus*, on Gölcük-Karacasu way, 850-1200 m, 13 viii 1997, Nİ 1592. Around lake, 27 viii 1997, Nİ 1607.

***C. planiflora** Ten.

Under *Abies* forests, on herbs, Türk-Alman Research Forest, 970 m, 27 viii 1997, Nİ 1604.

Boraginaceae

Heliotropium europaeum L.

On field borders, on Gölcük-Karacasu way, 850-950 m, 11 ix 1997, Nİ 1657. Medit.

H. suaveolens M.Bieb.

Foothills of Ala da., 700 m, Khan et al. 520.

Myosotis lithospermifolia (Willd.) Hornem.

Dry open places, on Gölcük-Karacasu way, 1150-1160 m, 25 v 1997, Nİ 1124.

Cynoglossum officinale L.

Abies forest, roadsides, on Gölcük-Karacasu way, 1080-1160 m, 25 v 1997, Nİ 1128.

Türk-Alman Research Forest, 02 vi 1997, Nİ 1165. Euro-Sib.

C. creticum Mill.

Roadsides, on Gölcük-Karacasu way, 810 m, 02 vi 1997, Nİ 1145.

Lithospermum purpurocaeruleum L.

Quercus forests, on Gölcük-Karacasu way, 910 m, 21 v 1997, Nİ 1084. Euro-Sib.

Buglossoides arvensis (L.) I.M.Johnst.

Roadsides, on Gölcük-Karacasu way, 990-1140 m, 10 vi 1997, Nİ 1207.

Echium italicum L.

Roadsides, on Gölcük-Karacasu way, 850-1250 m, 16 vii 1997, Nİ 1438. Medit.

E. vulgare L.

Roadsides, open places, around lake, 990-1250 m, 11 x 1998, Nİ 1797. On Gölcük-Karacasu way, 10 vi 1997, Nİ 1203. Euro-Sib.

Onosma tauricum Pall. var. *tauricum*

Roadsides, on Gölcük-Karacasu way, 850-900 m, 16 vii 1997, Nİ 1446.

***Cerinthe minor** L. subsp. *minor*

Wet meadows, on Gölcük-Karacasu way, 1050 m, 02 vi 1998, Nİ 1691. Euro-Sib.

subsp. *auriculata* (Ten.) Domac

Roadsides, open places, on Gölcük-Karacasu way, 880-950 m, 24 vi 1997, Nİ 1280.

Trachystemon orientalis (L.) G.Don

Abies forests, by roads, around lake, 1250 m, 30 iv 97, Nİ 1034. Euxine.

Anchusa leptophylla Roem. & H.Schult. subsp. *leptophylla*

Roadsides, on Gölcük-Karacasu way, 930-980 m, 10 vi 1997, Nİ 1192.

A. azurea Mill. var. *azurea*

Roadsides, on Gölcük-Karacasu way, 850-980 m, 16 vii 1997, Nİ 1433.

Solanaceae

Solanum nigrum L. subsp. *schultesii* (Opiz) Wessely

Fields, on Gölcük-Karacasu way, 870-1000 m, 29 ix 1998, Nİ 1750.

Atropa belladonna L.

Abies forests, open places, around lake, 1060-1250 m, 11 x 1998, Nİ 1824. Türk-Alman Research forest, 17 vi 1997, Nİ 1219. Euro-Sib.

Datura stramonium L.

Waste places, roadsides, on Gölcük-Karacasu way, 850-950 m, 06 x 1998, Nİ 1770.

Hyoscyamus niger L.

Wet places, roadsides, around the lake, 1250 m, 09 vi 2000 Nİ 1846.

Scrophulariaceae

Verbascum blattaria L.

Waste places, roadsides, lake entrance, 1200-1250 m, 11 x 1998, Nİ 1781.

- *V. thapsus L.**
Roadsides, open places, on Gölcük-Karacasu way, 880- 950 m, 24 vi 1997, Nİ 1312.
- *V. mucronatum Lam.**
Roadsides, on Gölcük-Karacasu way, 1050-1200 m, 02 vi 1998, Nİ 1697. Around lake, 10 vi 1997, Nİ 1175. Medit.
- Scrophularia scopolii** (Hoppe ex) Pers. var. **scopolii**
Roadsides, on Gölcük-Karacasu way, 1120 m, 21 v 1997, Nİ 1089.
- S. canina** L. subsp. **bicolor** (Sm.) Greuter
Roadsides, open places, on Gölcük-Karacasu way, 880-980 m, 10 vi 1997, Nİ 1199. Medit.
- Digitalis ferruginea** L. subsp. **ferruginea**
Roadsides, open places, around lake, 1200-1350 m, 11 x 1998, Nİ 1793. Euro-Sib.
- Veronica bozakmanii** M.A.Fisch.
Abies forest, Türk-Alman Research Forest, 1080 m, 02 vi 1997, Nİ 1169. Ir-Tur.
- V. persica** Poir.
Open places, meadows, around lake, 1240 m, 06 v 1997, Nİ 1054.
- V. triloba** (Opiz) A.Kern.
Wet places, around lake, 1250 m, 30 iv 1997, Nİ 1031.
- V. anagallis-aquatica** L.
Wet places, around lake, 1200-1300 m, 08 vii 1997, Nİ 1385.
- V. chamaedrys** L.
Abies forest, Türk-Alman Research Forest, 1120 m, 21 v 1997, Nİ 1095. Euro-Sib.
- V. jacquinii** Baumg.
Roadsides, open places, on Gölcük-Karacasu way, 880-950 m, 24 vi 1997, Nİ 1297. Euro-Sib.
- Odontites verna** (Bellardi) Dumort.
Abies forest, Türk-Alman Research Forest, 1200 m, 27 viii 1997, Nİ 1605. Euro-Sib.
- Lathraea squamaria** L.
Abies forests, Türk-Alman Research Forest, 900-1200 m, 25 v 1997, Nİ 1111.
- Orobanchaceae**
- Orobanche nana** Noë
Abies forest, near *Asperula*, Türk-Alman Research Forest, 1050-1100 m, 01 vii 1997, Nİ 1345.
- O. minor** Sm.
Abies forests, Türk-Alman Research Forest, 1050-1100 m, 01 vii 1997, Nİ 1349.
- Verbenaceae**
- Verbena officinalis** L.
Open places, around lake, 1200-1300 m, 11 x 1998, Nİ 1823.
- Labiatae/Lamiaceae**
- Ajuga reptans** L.
Mixed forest, on Gölcük-Karacasu way, 910 m, 21 v 1997, Nİ 1086. Euro-Sib.
- Teucrium chamaedyris** L. subsp. **chamaedyris**
Roadsides, around lake, 850-1250 m, 12 vii 1997, Nİ 1400. On Gölcük-Karacasu way, 16 vii 1997, Nİ 1434. Euro-Sib.
- T. polium** L.
Roadsides, on Gölcük-Karacasu way, 850-900 m, 16 vii 1997, Nİ 1431.
- Scutellaria galericulata** L.
Wet places, around lake, 1100-1250 m, 11 ix 1997, Nİ 1666.
- Lamium purpureum** L. var. **purpureum**
Damp places, around lake, 1250 m, 30 iv 1997, Nİ 1026.
- L. maculatum** L. var. **maculatum**
Abies forest, around lake, 1200 m, 25 v 1997, Nİ 1115. Euro-Sib.
- *L. leucolophum** Hauskn.
Meadows, around lake, 1240 m, 06 v 1997, Nİ 1056.
- Endemic. Threat Category: VU. This species is collected from only one locality.
- Galeobdolon luteum** Huds. subsp. **montanum** (Pers.) R.R.Mill
Abies forest, roadsides, around lake, 1180-1240 m, 17 vi 1997, Nİ 1235. On Gölcük-Karacasu way, 25 v 1997, Nİ 1137. Euro-Sib.
- Stachys byzantina** C.Koch
Roadsides, on Gölcük-Karacasu way, 850-950 m, 16 vii 1997, Nİ 1423. Euro-Sib.
- S. annua** (L.) L. subsp. **annua** var. **lycaonica** Bhattacharjee
Abies forests, Türk-Alman Research Forest, 1050 m, 02 vi 1998, Nİ 1689. Ir-Tur.
- Prunella vulgaris** L.
Abies forests, Türk-Alman Research Forest, 1050-1250 m, 01 vii 1997, Nİ 1353. Euro-Sib.
- P. laciniata** (L.) L.
Open places, roadsides, on Gölcük-Karacasu way, 880-950 m, 24 vi 1997, Nİ 1244. Euro-Sib.
- Origanum vulgare** L. subsp. **vulgare**
Roadsides, on Gölcük-Karacasu way, 850- 900 m, 16 vii 1997, Nİ 1426. Euro-Sib.
- Calamintha grandiflora** (L.) Moench
By roads, on Gölcük-Karacasu way, 1000-1050 m, 01 vii 1997, Nİ 1358. Euro-Sib.
- Clinopodium vulgare** L. subsp. **vulgare**
Open places, roadsides, on Gölcük-Karacasu way, 880-950 m, 24 vi 1997, Nİ 1268.
- subsp. **arundanum** (Boiss.) Nyman
Roadsides, on Gölcük-Karacasu way, 1050-1100 m, 01 vii 1997, Nİ 1359.
- Thymus longicaulis** C.Presl subsp. **longicaulis** var. **subisophyllus** (Borbás) Jalas
Open places, roadsides, on Gölcük-Karacasu way, 880-950 m, 24 vi 1997, Nİ 1242.
- Mentha pulegium** L.
Damp places, on Gölcük-Karacasu way, 870-1000 m, 29 ix 1998, Nİ 1709.
- M. longifolia** (L.) Huds. subsp. **longifolia**
Marshes, around lake, 1200-1250 m, 11 x 1998, Nİ 1813.
- subsp. **typhoides** (Briq.) Harley var. **typhoides**
Damp places, on Gölcük-Karacasu way, 850-900 m, 16 vii 1997, Nİ 1441.
- M. spicata** L. subsp. **spicata**
Wet places, on Gölcük-Karacasu way, 850-950 m, 06 x 1998, Nİ 1766.
- subsp. **tomentosa** (Briq.) Harley
Wet places, 870-1000 m, 29 ix 1998, Nİ 1740.

- Lycopus europaeus** L.
Damp, open places, around lake, 1100-1250 m, 11 x 1998, Nİ 1808. Euro-Sib.
- Salvia tomentosa** Mill.
Open places, on Gölcük-Karacasu way, 900-1000 m, 31 vii 1997, Nİ 1474. Medit.
- S. forskahlei** L.
Roadsides, on Gölcük-Karacasu way, 850-900 m, 16 vii 1997, Nİ 1430. Euxine.
- Plantaginaceae**
- Plantago major** L. subsp. **major**
Open places, around lake, 1200-1250 m, 11 x 1998, Nİ 1806.
subsp. **intermedia** (Gilib.) Lange
Roadsides, on Gölcük-Karacasu way, 1100-1250 m, 31 vii 1997, Nİ 1482.
- P. lanceolata** L.
Open places and roadsides, on Gölcük-Karacasu way, 870-1000 m, 29 ix 1998, Nİ 1728. Around lake, 11 x 1998, Nİ 1772.
- Thymelaeaceae**
- Daphne pontica** L.
Mixed forest, on Karacasu-Gölcük way, 910 m, 21 v 1997, Nİ 1080. Euxine.
- Loranthaceae**
- Viscum album** L. subsp. **abietis** (Wiesb.) Abrom.
On *Abies* and *Pyrus* trees, Karacasu-Gölcük way, 850-950 m, 11 ix 1997, Nİ 1650. Around lake, 31 vii 1997, Nİ 1497.
- Aristolochiaceae**
- Asarum europaeum** L.
Under *Abies* forests, around lake, 1200 m, 25 v 1997, Nİ 1113. Euro-Sib.
- Aristolochia pallida** Willd.
Quercus forests, on Karacasu-Gölcük way, 910 m, 21 v 1997, Nİ 1077.
- A. pontica** Lam.
Damp, shady places, around lake, 1200 m, 25 v 1997, Nİ 1118. Euxine.
- Euphobiaceae**
- Mercurialis perennis** L.
Damp, shady places, *Abies* forests, around lake, 1240 m, 17 vi 1997, Nİ 1236. Euro-Sib.
- Euphorbia stricta** L.
Roadsides, on Karacasu-Gölcük way, 1000 m, 02 vi 1997, Nİ 1159. Euro-Sib.
- E. helioscopia** L.
Open places, roadsides, around lake, 810-1240 m, 06 v 1997, Nİ 1070. On Karacasu-Gölcük way, 02 vi 1997, Nİ 1153.
- E. aleppica** L.
Ala Da., 700 m, Khan et al. 532.
- E. falcata** L. subsp. **falcata** var. **falcata**
Ala Da., 700 m, Khan et al. 530.
- E. seguieriana** Necker subsp. **niciana** (Borbás ex Novák) Rech.f.
Ala Da., 700 m, Khan et al. 529.
- E. amygdaloides** L. var. **amygdaloides**
Abies forest, around lake, 1080-1245 m, 30 iv 1997, Nİ 1041. Türk-Alman Research Forest, 02 vi 1997, Nİ 1167. Euro-Sib.
- Buxaceae**
- Buxus sempervirens** L.
Mixed forests, between Karacasu and Gölcük way, 1000 m, 11 ix 1997, Nİ 1644. Euro-Sib.
- Urticaceae**
- Urtica dioica** L.
Open places, meadows, on Karacasu-Gölcük way, 890 m, 17 vi 1997, Nİ 1232. Euro-Sib.
- Ulmaceae**
- Ulmus minor** Mill. subsp. **minor**
Road sides, open places, on Karacasu-Gölcük way, 870-1000 m, 29 ix 1998, Nİ 1725.
- Fagaceae**
- Fagus orientalis** Lipsky
Mixed forests, by roads, Karacasu-Gölcük way, 870-1000 m, 10 vi 1997, Nİ 1198. Euro-Sib.
- Quercus robur** L. subsp. **robur**
Scattered in deciduous forest, between Karacasu and Gölcük, 850-1000 m, 11 ix 1997, Nİ 1635. Euro-Sib.
subsp. **pedunculiflora** (C.Koch) Menitsky
Scattered in deciduous forest, above Karacasu village, 900-1000 m, 22 vii 1997, Nİ 1468. Ir-Tur.
- Q. petraea** (Matt.) Liebl. subsp. **iberica** (Steven ex M.Bieb.) Krassiln.
Mixed forest, on Karacasu-Gölcük way, 850-1000 m, 11 ix 1997, Nİ 1662.
- Q. pubescens** Willd.
Mixed forest, above Karacasu village, 850-950 m, 06 x 1998, Nİ 1768.
- Corylaceae**
- Carpinus betulus** L.
Quercus forests, open places and roadsides, 870-1000 m, 06 v 1997, Nİ 1050. On Karacasu-Gölcük way, 11 ix 1997, Nİ 1614. Euro-Sib.
- Corylus colurna** L.
Quercus forests, on Karacasu-Gölcük way, 850-950 m, 06 x 1998, Nİ 1771. Euro-Sib.
- C. avellana** L. var. **avellana**
Forest-field borders, on Karacasu-Gölcük way, 850-1000 m, 31 vii 1997, Nİ 1469. Euro-Sib.
- Betulaceae**
- Alnus glutinosa** (L.) Gaertn. subsp. **glutinosa**
Deciduous forests, damp places, by streams, on Karacasu-Gölcük way, 870-1250 m, 29 ix 1998, Nİ 1722. Around lake, 11 x 1998, Nİ 1787. Euro-Sib.
- Salicaceae**
- *Salix caucasica** Andersson
Lake shores, 1200-1250 m, 11 x 1998, Nİ 1842. Euxine.
- S. caprea** L.
Lake shores, *Abies* forests, 1250 m, 30 iv 97, Nİ 1025. Türk-Alman Research Forest, 21 v 1997, Nİ 1094. Euro-Sib.
- S. elaeagnos** Scop.
Lake shores, around lake, 1200-1250 m, 11 ix 1997, Nİ 1672. Euro-Sib.
- S. amplexicaulis** Bory & Chaub.
Lake shores, streamsides, on Karacasu-Gölcük way, 900-1250 m, 02 vi 1998, Nİ 1699. Around lake, 02 vi 1998, Nİ 1693. Medit.
- Populus tremula** L.
Lake shores, by roads, around lake, 1200-1250 m, 11 ix 1997, Nİ 1671. Euro-Sib.

ANGIOSPERMAE

MONOCOTYLEDONES

Butomaceae

Butomus umbellatus L.

Lake shores, in shallow water, 1200-1250 m, 11 x 1998, Nİ 1807. Euro-Sib.

Alismataceae

Alisma plantago-aquatica L.

Lake shores, around lake, 1200-1250 m, 11 x 1998, Nİ 1810. Euro-Sib.

Potamogetonaceae

Potamogeton natans L.

Aquatic, in lake, 1250 m, 01 vii 1997, Nİ 1328.

P. gramineus L.

Aquatic, in lake, 1250 m, 01 vii 1997, Nİ 1329.

Araceae

Arum euxinum R.Mill

Deciduous forest, on Karacasu-Gölcük way, 910 m, 21 v 1997, Nİ 1082. Euxine.

Endemic. Threat Category: LC.

Lemnaceae

Lemna minor L.

Ala da. above Bolu, 1200 m, D. 37329.

Liliaceae

Polygonatum orientale Desf.

Mixed forests, roadsides, Karacasu-Gölcük way, 850-1170 m, 02 vi 1997, Nİ 1163. Euxine.

Allium paniculatum L. subsp. *paniculatum*

Quercus forests, above Karacasu Village, 850-950 m, 13 viii 1997, Nİ 1587. Medit.

**A. pallens* L. subsp. *pallens*

Roadsides, above Gölcük Lake, 1200-1350 m, 20 vii 1997, Nİ 1457. Medit.

Scilla bifolia L.

Open places, *Abies* forest, around lake, 900-1250 m, 06 v 1997, Nİ 1066. On Karacasu-Gölcük way, 30 iv 1997, Nİ 1035. Medit.

Ornithogallum oligophyllum E.D.Clarke

Abies forest, around lake, 1200 m, 25 v 1997, Nİ 1108.

O. fimbriatum Wild.

Meadows, around lake, 1240 m, 06 v 1997, Nİ 1059. E. Medit.

Fritillaria pontica Wahlenb.

Quercus forests, above Karacasu village, 910 m, 21 v 1997, Nİ 1074. Euro-Sib.

Gagea taurica Steven

Open places and meadows, around lake, 1240 m, 03 v 1997, Nİ 1047. Ir-Tur.

Colchicum umbrosum Steven

Open places, on Karacasu-Gölcük way, 850-950 m, 11 ix 1997, Nİ 1647. Euxine.

Iridaceae

Iris sintenisii Janka

Meadows, on Karacasu-Gölcük way, 890 m, 17 vi 1997, Nİ 1233. Euro-Sib.

Crocus biflorus Mill. subsp. *pulchricolor* (Herb.) B.Mathew

Meadows, around lake, 1240 m, 03 v 1997, Nİ 1046. Euro-Sib.

Endemic. Threat Category: 'Near Threatened' (NT) category is suitable for this species. Although it is a widespread species, collection of bulbs by local people and habitat destruction are the major threatening factors (pers. com.).

C. speciosus M.Bieb. subsp. *speciosus*

Meadows, around lake, 1200-1250 m, 11 x 1998, Nİ 1816.

Orchidaceae

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

Abies forest, between Gölcük and Karacasu, 990-1200 m, 25 v 1997, Nİ 1110. Euro-Sib.

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

Abies and mixed forests, on Gölcük-Karacasu way, 880-1100 m, 24 vi 1997, Nİ 1306. Türk-Alman Research Forest, 01 vii 1997, Nİ 1344.

C. longifolia (L.) Fritsch

Deciduous forests, on Gölcük-Karacasu way, 910 m, 21 v 1997, Nİ 1075. Euro-Sib.

C. damasonium (Mill.) Druce

Deciduous forests, on Gölcük-Karacasu way, 930-980 m, 10 vi 1997, Nİ 1177. Euro-Sib.

Platanthera chlorantha (Custer) Rchb.

Deciduous forests, 930-980 m, 10 vi 1997, Nİ 1178.

Himantoglossum caprinum (M.Bieb.) Sprengel

Open *Quercus* woodland and scrub, grassy edges of forests, on Gölcük-Karacasu way, 850-900 m, 16 vii 1997, Nİ 1436. Euxine.

Anacamptis pyramidalis (L.) L.C.M.Rich.

Roadsides, on Gölcük-Karacasu way, 850-900 m, 16 vii 1997, Nİ 1409.

Orchis purpurea Huds.

Edges of deciduous forests and *Abies* forests, around lake, 930-1150 m, 02 vi 1998, Nİ 1688. On Gölcük-Karacasu way, 20 vi 1997, Nİ 1179. Euro-Sib.

O. mascula (L.) L. subsp. *pinetorum* (Boiss. & Kotschy) Camus

Edges of deciduous forests and *Abies* forests, on Gölcük-Karacasu way, 910 m, 21 v 1997, Nİ 1076. Medit.

O. pallens L.

Under *Abies* forests, 1340 m, 08.05.2004, Nİ 2038. Euro-Sib.

**Dactylorhiza urvilleana* (Steudel) H.Baumann & Künkele

Abies forests, shady places, around lake, 1240 m, 02 vi 1998, Nİ 1698. Euxine.

D. nieschalkiorum H.Baumann & Künkele

Wet and open places, *Abies* forests, around lake, 880-1250 m, 31 vii 1997, Nİ 1501. On Gölcük-Karacasu way, 24 vi 1997, Nİ 1308.

Endemic. Threat Category: The status of the species is 'Vulnerable' (VU) due to an estimated reduction in the population size, especially in the wet meadows around Abant Lake (Bolu), where overgrazing and habitat destruction due to the construction of large hotels are the threatening factors (Kreutz, 1998). Additionally, bulbs of the species are collected and sold by villagers (pers. com.).

D. incarnata (L.) Soó

Wet and open places, *Abies* forests, above Gölcük Lake, 1200-1300 m, 08 vii 1997, Nİ 1380.

Dioscoreaceae

Tamus communis L. subsp. **communis**
Roadsides, on Gölçük-Karacasu way, 890 m, 17 vi 1997, Nİ 1238.

Typhaceae

Typha latifolia L.
Lake shores, 1200-1250 m, 03 x 1997, Nİ 1683.

Juncaceae

Juncus effusus L.
Damp places, around lake, 1200-1250 m, 11 x 1998, Nİ 1839.

Luzula forsteri (Sm.) DC.

Abies forest, around lake, 1200 m, 25 v 1997, Nİ 1116. Euro-Sib.

Cyperaceae

Eleocharis palustris (L.) Roem. & Schult.

Lake shores, Gölçük Lake, 1250 m, 01 vii 1997, Nİ 1335.

E. mitracarpa Steud.

Ala Da. in Orman G. above Bolu, 1200 m, D. 37326.

Scirpus sylvaticus L.

Marshes, meadows, Gölçük Lake, 1200-1250 m, 11 ix 1997, Nİ 1676.

Carex otrubae Podp.

Lake shores, roadsides, 1180-1300 m, 08 vii 1997, Nİ 1382. On Gölçük-Karacasu way, 25 v 1997, Nİ 1138. Euro-Sib.

C. remota L.

Damp, marshy places, on Gölçük-Karacasu way, 1000-1250 m, 12 vii 1997, Nİ 1399. Euro-Sib.

C. pseudocyperus L.

Lake shores, Gölçük Lake, 1250 m, 01 vii 1997, Nİ 1332. Euro-Sib.

C. pendula Huds.

Lake shores, marshy places, 1200-1350 m, 20 vii 1997, Nİ 1460. Euro-Sib.

C. flacca Schreb. subsp. **serrulata** (Biv.) Greuter

Meadows, on Gölçük-Karacasu way, 810-1000 m, 02 vi 1997, Nİ 1143. Medit.

Poaceae

Elymus hispidus (Opiz) Melderis subsp. **hispidus**

Roadsides, on Gölçük-Karacasu way, 880-950 m, 24 vi 1997, Nİ 1245.

Aegilops triuncialis L. subsp. **triuncialis**

Waste places, meadows, on Gölçük-Karacasu way, 850-900 m, 16 vii 1997, Nİ 1422.

A. biuncialis Vis.

Field margins, on Gölçük-Karacasu way, 850-900 m, 16 vii 1997, Nİ 1418.

A. geniculata Roth

Meadows, on Gölçük-Karacasu way, 880-950 m, 24 vi 1997, Nİ 1255. Medit.

Triticum aestivum L.

Field borders, roadsides, on Gölçük-Karacasu way, 880-950 m, 24 vi 1997, Nİ 1278.

Hordeum geniculatum All.

Roadsides, open places, Gölçük-Karacasu way, 880-950 m, 24 vi 1997, Nİ 1258. Euro-Sib.

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

Open places, around lake, 1200-1250 m, 11 x 1998, Nİ 1779. On Gölçük-Karacasu way, 02 vi 1997, Nİ 1142.

H. bulbosum L.

Roadsides, on Gölçük-Karacasu way, 990-1250 m, 10 vi 1997, Nİ 1206. Around lake, 01 vii 1997, Nİ 1326.

***Taeniatherum caput-medusa** (L.) Nevski subsp. **crinitum** (Schreb.) Melderis

Open places, on Gölçük-Karacasu way, 890 m, 17 vi 1997, Nİ 1234. Ir.-Tur.

Bromus hordeaceus L. subsp. **hordeaceus**

Roadsides, on Gölçük-Karacasu way, 810 m, 02 vi 1997, Nİ 1144.

B. japonicus Thunb. subsp. **japonicus**

Open places, roadsides, on Gölçük-Karacasu way, 850-1300 m, 16 vii 1997, Nİ 1412. Above Gölçük Lake, 08 vii 1997, Nİ 1372.

B. danthoniae Trin.

Roadsides, on Gölçük-Karacasu way, 930-980 m, 10 vi 1997, Nİ 1193.

B. tectorum L.

Dry, open grassland, on Gölçük-Karacasu way, 880-980 m, 10 vi 1997, Nİ 1187.

B. sterilis L.

Roadsides, on Gölçük-Karacasu way, 850-1300 m, 16 vii 1997, Nİ 1427. Around lake, 08 vii 1997, Nİ 1374.

***B. diandrus** Roth

Waste ground, on Gölçük-Karacasu way, 990-1140 m, 10 vi 1997, Nİ 1210.

Avena sterilis L. subsp. **sterilis**

Open places, roadsides, on Gölçük-Karacasu way, 880- 950 m, 24 vi 1997, Nİ 1275.

Holcus lanatus L.

Wet places, Gölçük-Karacasu way, 1100-1300 m, 08 vii 1997, Nİ 1376. Euro-Sib.

Apera spica-venti (L.) P.Beauv.

Lake shores, open places, 880-1250 m, 11 x 1998, Nİ 1822. On Gölçük-Karacasu way, 24 vi 1997, Nİ 1276. Euro-Sib.

Agrostis stolonifera L.

Roadsides, on Gölçük-Karacasu way, 1100-1250 m, 31 vii 1997, Nİ 1485. Euro-Sib.

Phalaris arundinacea L.

Aladağ, 1300 m, Alpay (ANK 257).

Beckmannia eruciformis (L.) Host

Aladağ, 1300 m, Alpay 182.

Phleum pratense L.

Wet meadows, on Gölçük-Karacasu way, 930-980 m, 10 vi 1997, Nİ 1189. Euro-Sib.

P. montanum C.Koch subsp. **montanum**

Open places, on Gölçük-Karacasu way, 880-950 m, 24 vi 1997, Nİ 1256.

P. phleoides (L.) H.Karst.

Open places, roadsides, on Gölçük-Karacasu way, 850-950 m, 24 vi 1997, Nİ 1265. Euro-Sib.

Festuca drymeja Mertens & C.Koch

Coniferous and mixed woodland, on Gölcük-Karacasu way, 850-1250 m, 31 vii 1997, Nİ 1490. Euro-Sib.

F. heterophylla Lam.

Roadsides, open places, Gölcük-Karacasu way, 880-980 m, 24 vi 1997, Nİ 1266. Euro-Sib.

Lolium perenne L.

Roadsides, open places, Gölcük-Karacasu way, 880-950 m, 24 vi 1997, Nİ 1257. Euro-Sib.

Poa annua L.

Abies forests, Türk-Alman Research Forest, 1120 m, 21 v 1997, Nİ 1097.

P. infirma Kunth

Mixed forests, roadsides, on Gölcük-Karacasu way, 850-1140 m, 21 v 1997, Nİ 1092.

P. trivialis L.

Roadsides, on Gölcük-Karacasu way, 1180-1190 m, 25 v 1997, Nİ 1134.

P. compressa L.

Abies forests, Türk-Alman Research Forest, 1080 m, 02 vi 1997, Nİ 1171.

P. nemoralis L.

Roadsides, on Gölcük-Karacasu way, 1180-1190 m, 25 v 1997, Nİ 1132.

P. bulbosa L.

Abies forest clearings, Türk-Alman Research Forest, 1120 m, 21 v 1997, Nİ 1101.

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

Roadsides, open places, on Gölcük-Karacasu way, 880-1140 m, 10 vi 1997, Nİ 1211.

Cynosurus echinatus L.

Roadsides, on Gölcük-Karacasu way, around lake, 880-1250 m, 11 x 1998, Nİ 1832. Medit.

Briza media L.

Open places, on Gölcük-Karacasu way, 880- 950 m, 24 vi 1997, Nİ 1254.

Melica uniflora Retz.

Abies forests, Türk-Alman Research Forest, 1050-1100 m, 28 ix 1998, Nİ 1103. Euro-Sib.

Phragmites australis (Cav.) Trin. ex Steud.

Marshy places, Gölcük Lake, 1200-1250 m, 11 ix 1997, Nİ 1678. Euro-Sib.

Cynodon dactylon (L.) Pers. var. *villosus* Regel

Roadsides, open places, on Gölcük-Karacasu way, 870 -1000 m, 29 ix 1998, Nİ 1730.

Crypsis schoenoides (L.) Lam.

Wet places, Gölcük Lake, 1200-1250 m, 11 ix 1997, Nİ 1669.

Setaria viridis (L.) P.Beauv.

Open places, around lake, 1200-1250 m, 11 x 1998, Nİ 1795.