

THE FLORA OF GÖLCÜK AREA (BOLU)

NURSEL İKİNCİ



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MARCH 2000

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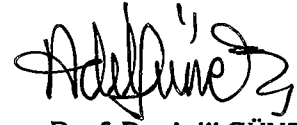
by

NURSEL İKİNCİ

**THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES
OF
THE ABANT İZZET BAYSAL UNIVERSITY
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF SCIENCE
IN
THE DEPARTMENT OF BIOLOGY**

MARCH 2000

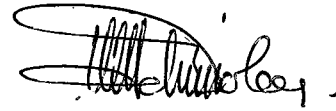
Approval of the Graduate School of Natural and Applied Sciences



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I certify that this thesis satisfies all the requirements as a thesis for the degree of Master of Science.



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This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Science.



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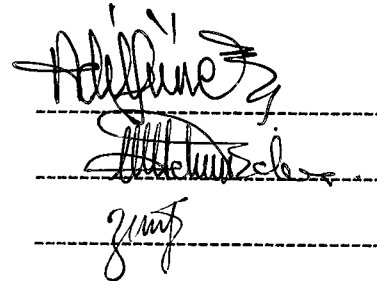
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ABSTRACT

THE FLORA OF GÖLCÜK AREA (BOLU)

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MSc, Department of Biology

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March 2000, 120 pages

This research covers the vascular flora of the Gölcük Area. During 1997-1998, 737 plant specimens have been collected from the research area. At the end of the evaluation of the identification of the collected specimens and the results of the previous researches, 78 families, 271 genera, 438 species, 102 subspecies and 48 varieties, 451 taxa as a total have been determined. From these 451 taxa, 35 taxa are the new records for the A3 Grid square.

The rates of the species belonging to the certain phytogeographical regions are as follows: the Euro-Siberians 31.8% (140) (the Euxines 6.1% (27)), the Irano-Turanians 1.6% (7), the Mediterraneans 5.5% (24). The rates of cosmopolitan and phytogeographically unknown species are 0.23% (1) and 60.9% (266), respectively.

The number of endemic taxa found in the research area is 15, so that the endemism ratio is 3.4%.

From 438 species, 4 species belong to the *Pteridophyta* division whereas 434 species belong to the *Spermatophyta* division. Out of 434 species belonging to the *Spermatophyta* division, *Gymnospermae* and *Angiospermae* subdivisions have 4 and 430 species, respectively. 76 species of *Angiospermae* belong to *Monocotyledones* and the rest (355 species) belongs to *Dicotyledones*.

The largest 10 families according to their species number in the area are as follows: *Asteraceae* (43 ; 9.8%), *Poaceae* (43 ; 9.8%), *Fabaceae* (38 ; 8.6%), *Rosaceae* (25 ; 5.7%), *Lamiaceae* (22 ; 5.0%), *Brassicaceae* (18 ; 4.1%), *Caryophyllaceae* (17 ; 3.9%), *Apiaceae* (17 ; 3.9%), *Scrophulariaceae* (14 ; 3.2%), and *Boraginaceae* (13 ; 3.0%).

The largest 10 genera according to their species number in the area are as follows: *Vicia* (9 ; 2%), *Trifolium* (8 ; 1.8%), *Veronica* (7 ; 1.6 %), *Poa* (6 ; 1.4%), *Bromus* (6 ; 1.4 %) *Carex* (5 ; 1.1 %), *Dianthus* (5 ; 1.1 %), *Geranium* (5 ; 1.1 %), *Galium* (5 ; 1.1%), *Viola* (5 ; 1.1 %).

ÖZET

GÖLCÜK (BOLU) FLORASI

İkinci, Nursel

Yüksek Lisans, Biyoloji Bölümü

Tez Danışmanı: Prof. Dr. Adil Güner

Mart 2000, 120 sayfa

Bu çalışmada 1997-1998 yılları arasında Gölcük bölgesinin damarlı bitkiler florası araştırılmıştır. Araştırma sonucunda 737 bitki örneği toplanmıştır. Gölcük ile ilgili daha önceki araştırmalar da gözönüne alınarak, bu örneklerin adlandırılması sonucu 78 familyaya ait 271 cins, 438 tür, 102 alttür ve 48 varyete, toplam 451 takson tespit edilmiştir. Bu taksonlardan 35 tanesi A3 karesi için yeni kayıttır.

Toplam 438 türden 140 (%31.8) tanesi Avrupa-Sibiry elementleri (%6.1 (27) Euxine provinsine ait), 24 (%5.5) tanesi Akdeniz elementleri, 7 (%1.6) tanesi İran-Turan elementleri, Geriye kalan 266 (%60.5) türün ise fitocoğrafik bölgesi ya belli değildir yada kozmopolittir.

Alanda bulunan endemik taksonların sayısı 15'dir. Dolayısı ile alanın endemizm oranı %3.4'dur.

Toplam 438 türden, 4 tür *Pteridophyta*, geriye kalan 434 tür ise *Spermatophyta* bölümüne aittir. 434 *Spermatophyta* 'dan 4 tanesi *Gymnospermae* altbölümüne ve 430 tanesi de *Angiospermae* altbölümüne aittir. 430 *Angiospermae* 'den ise 355 tanesi *Dicotyledones* 76 tanesi ise *Monocotyledones* sınıfındandır.

Arařtırma alanında, ierdiđi tr sayısına gre en byk 10 familya sırasıyla řunlardır: *Asteraceae* (43 ; 9.8%), *Poaceae* (43 ; 9.8%), *Fabaceae* (38 ; 8.6%), *Rosaceae* (25 ; 5.7%), *Lamiaceae* (22 ; 5.0%), *Brassicaceae* (18 ; 4.1%), *Caryophyllaceae* (17 ; 3.9%), *Apiaceae* (17 ; 3.9%), *Scrophulariaceae* (14 ; 3.2%), and *Boraginaceae* (13 ; 3.0%).

Arařtırma alanında, ierdiđi tr sayısına gre en byk 10 cins ise sırasıyla řunlardır: *Vicia* (9 ; % 2.0) *Trifolium* (8 ; %1.8), *Veronica* (7; %1.6), *Poa* (6; %1.4), *Bromus* (6; %1.4), *Carex* (5; %1.1), *Dianthus* (5; %1.1), *Geranium* (5; %1.1), *Galium* (5; %1.1), *Viola* (5; %1.1).



ACKNOWLEDGEMENTS

I will begin by thanking my advisor, Adil Güner for his support, help in field work and critical reading of this thesis and also suggestive discussions. I thank my advisory committee; Adil Güner, M.Tekin Babaç, and Zeki Aytaç.

I owe thanks to Y. Ilker Özer, Ömür Umut, Mustafa Ünal, Mehtap Erdoğan, Joe Ackerman, Banu Efeoğlu, and to my brothers Orkun and Erkal İkinci for field assistance. I am grateful to Dr. Musa Doğan for his help in the control and identification of specimens belonging to Poaceae family. I would particularly thank Selma Özçelik (Secretary of the Graduate School of Natural Sciences, A. I.B.U) for her help in computer use, Nihat Metin for providing the map, Dr. Okan Külköylüoğlu for his review on the earlier draft of this thesis.

Finally, I would like to take the opportunity to thank my mother, Melahat İkinci, and my father, Faruk İkinci for their constant support and encouragement, and to my close friends who have helped me through these years in more ways than they can ever know.

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1- INTRODUCTION

Taxonomically important studies about Turkey started at the beginning of 18th Century (1). Tournefort is known as the first scientist who made floristic studies in Turkey in 1701 (2).

Since 19th Century, there was an enormous increase in the number of visitors who collected plants from Turkey. Among these, the followings are the major ones:

Aucher-Eloy, Aznavour, Balansa, Boissier, Bornmueller, Bourgeau, Calvert, Clarke, Clementi, Fleisher, Handel-Mazzetti, Haussknecht, Heldreich, Huet, Jaubert, Koch, Kotschy, Lorent, Nabelek, Nöe, Parolini, Pestalozza, Pinard, Sibthorp, Sintenis, Tchihatcheff, Weeb and Wiedemann (2).

In the second half of the 19th Century, Boissier had collected and put all the related studies together above mentioned botanists and wrote "Flora Orientalis". Turkish flora and its richness was first outlined in his study.

Later on Balls, Bornmueller, Chamberlain, Czeaczott, Davis, Hayek, Hedge, Huber-Morath, Krause, Matthews, Plitmann, Rechinger, Reese, Regel, Schwarz, Songer, Tobey and Zohary have visited Turkey and collected plants.

The most extensive study on the flora of Turkey was exclusively made by P. H. Davis. He published results of his collections and included plants collected by previous researchers in 10 volumes of "Flora of Turkey and The East Aegean Islands" (3, 4). He collected around 27000 plant specimens from Turkey. Huber-Morath's contribution to the Turkish flora was also enormous that he collected nearly 25000 plant specimens from Turkey. Since then, many species not mentioned in Davis's monumental work have been reported from Turkey. Thus, it was considered to prepare an additional volume (11th Volume) which will include all recent data. 11th volume of Flora of Turkey has been prepared by A. Güner et al. (pers. comm.).

Recently, Turkish Botanists have increased their attention about Turkish flora. The researchers usually chose their study areas after consulting the map provided by P.H. Davis. The map was prepared by P. H. Davis with an evaluation of the floristic researches about Turkey (5). In the map, based on the floristic point of view he showed the "well known", "moderately known" and "little known/unknown" regions of Turkey.

According to P. H. Davis (5), our research area is included in moderately known areas. Also, until this time, there has been no other work on the flora of Gölcük Area.

At the same time, the area has some touristic importance due to its natural beauty and its geographical location since it is located between Istanbul and Ankara. The area has been visited and used by many people at weekends. Another reason to choose this area is that it is very close to the University and also to Bolu. It is only 15 km away from Bolu. Because of these reasons, the Gölcük region was chosen as a research area.

The aims of this study are as follows: (1) to determine the flora of the area, (2) to determine unknown plant species that might be present in the region, (3) to determine the endemic species and their phytogeographic regions of the area, (4) to prepare identification keys to the species and genera, (5) to contribute to the other related sciences, (6) ultimately, to prepare a handbook including the Flora of Gölcük Area for native and foreign tourists, because Gölcük is an important touristic region between Ankara and Istanbul.

1.1 - Investigations Related With Research Area

So far, there is no floristic study about the Gölcük Area. Therefore, this is the first extensive study on the area. During my investigation, I used the " Flora of Turkey " and publications about Bolu as main reference source. Several botanists have visited and collected plants from different parts of Bolu. Some of these researchers are O. Alpaya (1954), J. Mc Neil (1963), H. Walther (1955), G. Gassner (1935), J. Kühne (1957), B. V. D. Post (1906), G. E. Post (1906), A. Soyerman

(1956), M. Özgen (1947-1950), D. Zohary (1959-1962), M. Zohary (1959), F. Sorger (1962), H. Demiriz (1950), G. Wagenitz (1957), E. Sezik (1964), A. Huber-Morath (1935), A. & T. Baytop (1949-1954), B. Tözün (1956) and F. Markgraft (1957-1958), (Davis, 1967).

Other than these, there are also some researchers who came to Bolu and made several floristic and vegetational researches. These include N. Tanker (6), M. Koyuncu, S. Kurucu, Y. Akman (7-15), M. Aydoğdu, R. Ilarslan, E. Yurdakulol, N. Özhatay (16), O. Ketenoğlu (17), T. Ekim (18), T. Turgut (19) and A. Uçar (20).



2- GENERAL INFORMATION

2.1 Geographical Location

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. It is present in the A3 grid square (Map 1). It is located on the 13th km of Bolu-Seben-Nallıhan road. Gölcük region lays approximately at the latitudes of 40° 37' 03"- 40° 42' 25" N and the longitudes of 31° 29' 31"- 31° 38' 18" E. It is at a distance of 15 km to E-5 highway and 13 km far from the city centre. Its distance from İstanbul and Ankara is approximately 250 km and 200 km respectively. The surface area of the lake is 54 000 m². The perimeter of the lake is 1310 m. Gölcük Lake has a circular shape. Study area is not restricted to the lake and surrounding area. The study area located at the upper side of Karacasu Village extending from 800 m to 1350 m of altitude. The Lake is at about 1240 m altitude. (21, 22).

2.2 History

Until 1956 the area was covered with reedbed and marsh, where there was a small *Alnus* population. Then between 1956-57 a man-made stone wall set was built up on the northern part and consequently water deposited there after which the Lake begun to take its current state (21).

In 1963, the area with increasing interest of visitors was assigned as a recreational area by the General Forest Managment. In 1974, after a big flood which broke some parts of the wall, the area was redesigned to its current shape. Then after, in 1975 juvenile salmon fishes from Yedigöller National Park deliberately introduced to the lake.

The area has been recieving heavily-flowing attention from visitors that resulted in a big problem of pollution. As a result, the lake water quality has changed to eutrophic condition where invader species have been found abundant in number. Then after, the lake has turned into a reedbed and a wetland habitat.

In 1992, the lake was cleaned up and filtering material was placed at the bottom of the lake. Consequently, the lake has reached to its current quality and condition (21).

2.3 Soil Type and Structure

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. pH of the soil is alkaline and rarely neutral (21, 23).

2.4 Geological Information

The study site, dating back to upper-Eocene (35-40 mya) of Tertiary in Cenozoic era, consists of different types of rock, including basalt, andezite, turf and aglomera of variety of colors from pink, black to claret red. The surface morphology formed by erosion and tectonic activities, was elaborated by metamorphite and volcanic rocky types (23).

2.5 Climate

There is no meteorological station in the area of Lake Gölcük. The nearest station is in Bolu which is in the northeast of the region with an altitude of about 750 m. Therefore, values of Bolu Meteorological Station was extrapolated for the Gölcük Area.

According to Table 2, mean annual temperature of Bolu is 10.1°C. The Study area is 100- 600 m higher than Bolu. Therefore, Mean Annual Temperature of area is expected to be between 7.1 -9.6 °C. This value is calculated according to the Elevation Factor (24).

If we look at the Table 1 and/or Figure I, the coldest months of the year in Bolu are December, January and February. The month with highest temperature is August (39.4°C) and the month with lowest temperature is February (-34.0°C). According to Absolute Minimum Temperatures of Bolu, at the nine months of the year, temperature is below 0°C and we can say that lake freezes at the certain time of the year.

6

Mean Annual Precipitation in Bolu is 545.6 mm. From this precipitation 32% is at Winter, 29% is at Spring, 21% is at Autumn and 18% is at Summer. According to the Elevation Factor, Mean Annual Precipitation of our research area is expected to be between 599.6-.869.6 mm. The most rainy months of the year are December, January and February. The least rainy month is August.



	M O N T H S												
Meteorological Observations	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Mean Temperature (°C)	0.1	1.5	4.2	9.3	13.9	17.0	19.4	19.2	15.6	11.6	7.0	2.6	10.1
Maximum Temperature (°C)	17.5	21.2	29.3	31.8	34.4	35.1	37.6	39.4	37.1	34.0	27.0	21.0	39.4
Minimum Temperature (°C)	-31.5	-34.0	-19.8	-11.5	-2.3	0.0	2.8	1.4	-2.5	-5.8	-24.8	-29.1	-34.0
Mean Precipitation (mm)	60.3	50.6	50.5	51.6	60.0	51.5	25.4	20.5	29.8	36.3	48.7	60.4	545.6
Mean Relative Humidity(%)	78	77	73	70	73	72	68	67	71	74	77	79	73

Table 1: Meteorological Observation Values of Bolu According to Last 50 years. Meteorology Station: Bolu, Altitude: 741.78 m. Latitude: 40°44', Longitude: 31°36'.

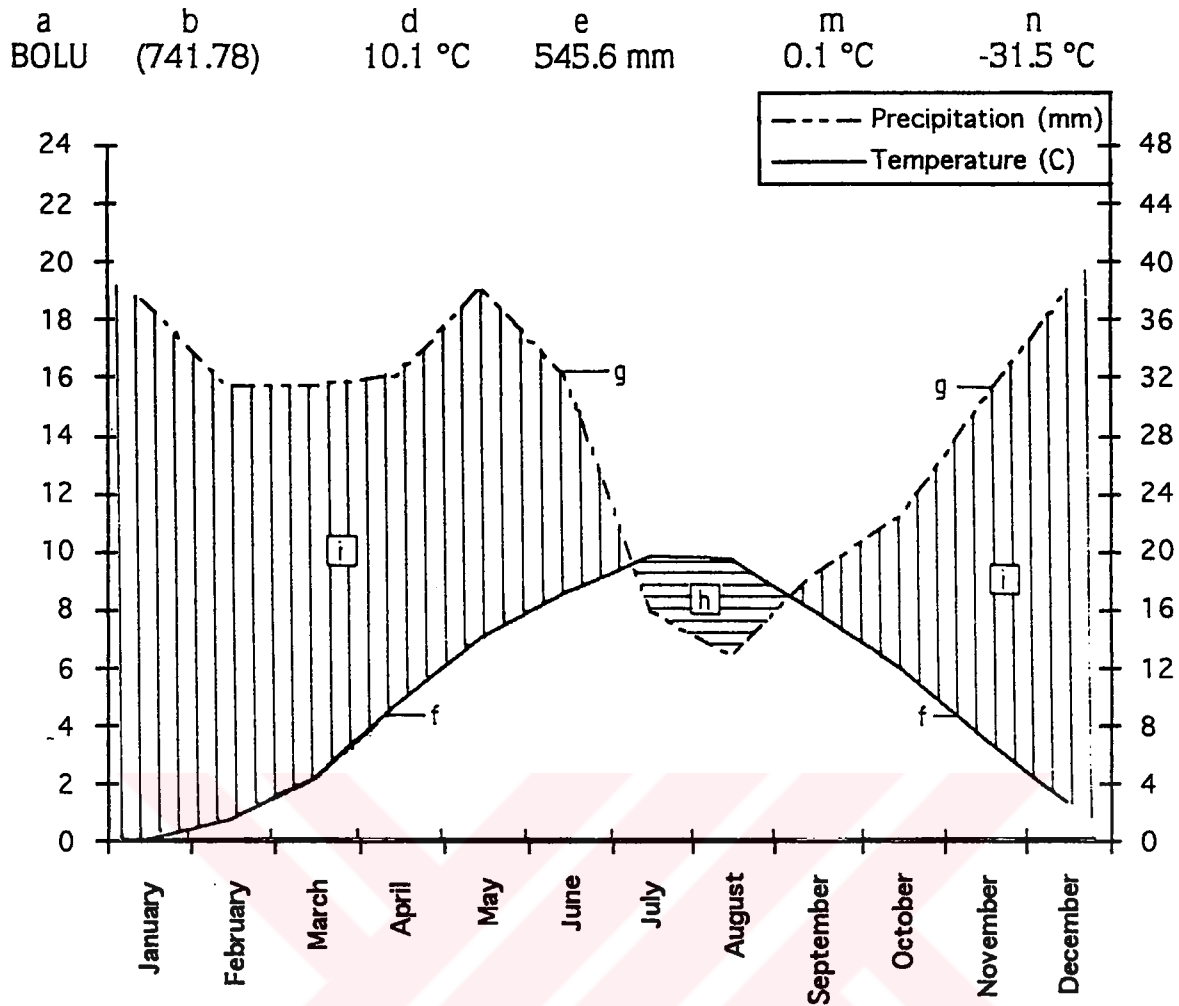


Figure I: Climatic Diagram of Bolu.

a: Meteorological Station

b: Altitude of Meteorological Station

c: Data Collection Period (Data obtained according to last 50 years)

d: Mean Annual Temperature

e: Mean Annual Precipitation

f: Temperature

g: Precipitation

h: Dry season

i: Humid season

m: Minimum Temperature of Coldest Month

n: Absolute Minimum Temperature

2.6 Vegetation

Study area mainly consists of forest vegetation, at lower elevations deciduous mixed forests are dominant (*Fagus orientalis* Lipsky., *Quercus robur* L. subsp. *robur*, *Quercus petraea* (Mattuschka) Liebl. subsp. *iberica* (Steven ex Bieb.) Krassiln., *Quercus pubescens* Willd., *Acer campestre* L. subsp. *campestre*, *Acer platanoides* L., *Crataegus microphylla* C. Koch, *Crataegus monogyna* Jacq. subsp. *azarella* (Gris.) Franco, *Crataegus orientalis* Pallas, *Carpinus betulus* L., *Juniperus oxycedrus* L. subsp. *oxycedrus*., *Sorbus torminalis* (L.) Crantz var. *torminalis*). After these trees there is nearly pure *Abies nordmanniana* (Stev.) Spach subsp. *bormmuelleriana* (Mattf.) Coode & Cullen forests. Only a few *Pinus nigra* Arn. and *Pinus sylvestris* L. trees are found around the road and the Lake. Study area is also rich in marshy habitats. There are water plants in the lake (like *Nuphar lutea* (L.) Sm., *Potamogeton natans* L., *Potamogeton gramineus* L. and *Polygonum amphibium* L.) and marshy plants surrounded the edge of the lake (like *Carex flacca* Schreber subsp. *flacca*, *Carex remota* L., *Carex otrubae* Podp. *Juncus effusus* L., *Typha latifolia* L., *Phragmites australis* (Cav.) Trin.). Meadows occur near the lake. After meadows, there are wild fruit trees (*Malus sylvestris* Miller subsp. *orientalis* (A. Uglitzkich) Browicz var. *orientalis*, *Pyrus communis* L. subsp. *communis*, *Pyrus elaeagnifolia* Pallas subsp. *elaegnifolia*, *Prunus spinosa* L.) *Salix amplexicaulis* Bory & Chaub. L., *Salix caprea* L. *Salix caucasica* Anderson, *Salix elaeagnos* Scop., *Populus tremula* L. and *Alnus glutinosa* (L.) Gaertner subsp. *glutinosa* trees at the lake environs and also around small streams. There are bushes around roadsides, such as *Rubus canescens* DC., *Rubus sanctus* Schreber, *Cornus mas* L., *Rosa canina* L..

3- MATERIALS AND METHODS

Seven hundred and thirty seven plant specimen collected from the research area, during March 1997- October 1998, between March and October in each year. Remaining months were not suitable for material collection. Field works were made 2-3 days every 15-20 days by visiting the research area. The peak period of collection was June–July. I tried to do my best for collecting the flowering and fruiting specimens of all species. In addition some field notes were taken necessary for easy identification.

Collected 737 specimens were dried according to the certain herbarium techniques and processes. After drying of specimens, firstly we classified the plant specimens at the family level and then they were identified at generic and species levels. During the identification of plant specimens, "Flora of Turkey and the East Aegean Islands" was used as a main reference source (3, 4). Some doubtful identifications were checked from "Flora Europaea" (25), and from "Flora of Iraq" (26) During identification some other books were also used (27, 28, 29, 30, 31, 33, 34, 35, 36, 37). All taxa in the floristic list were given according to the order in the "Flora of Turkey". Order numbers of families, genera and species are independent from each other.

24 species mentioned in the "Flora of Turkey" as to be found in our research area, also included in the result part, but they are not given numbers. It is not known that those 24 species collected from exactly our research area.

The identification keys to genera and species were prepared to become a reference for future researchers, students, tourists and enthusiasts. Identification keys were prepared according to the collected plant specimens, meanwhile, the descriptions giving in the "Flora of Turkey" have been regarded during the preparations.

The citation of floristic list is in the following order:

- i- Family name,
- ii- Key to genera (if necessary),

- iii- Genus name, author(s) name,
- iv- Key to species (if necessary),
- v- Species name, author(s) name,
- vi- Name of subspecific taxa (subspecies and/or variety if present), author(s) name,
- vii- Habitat and altitude,
- vii- Citation of specimens: Locality, date of collection, name of collector and collector number were given respectively. All collected specimens, have been identified by N. İkinici, otherwise stated. Grid square of all localities were 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 were collected from the same locality, one's citation was written completely. The name of collector and collector number of others were added at the end of the same locality (by writing "same place").
- viii- Endemism,
- ix- Phytogeographic regions,
- x- New record for A3 Grid square, these were obtained by searching many publications (6, 7-15, 16, 17, 18, 19, 20, 38, 39, 40, 41).
- xi- Discussion: This section covers field observations and discussions related to the species.

Tables showing Phytogeographic regions of collected specimens were drawn. The list of the largest 10 families and 10 genera were determined. The results were compared with other survey's and given as tables. Also, a list of endemic species was given in the result section. Because of the absence of a meteorological station in the area of Gölcük Area, data related with climate were obtained from the nearest station present in Bolu. A climate diagram was prepared for Bolu to explain the relation between temperature and precipitation. Because of the establishment stage of the University herbarium (AIBU), collected specimens will be mounted to sheets and placed to the cupboards in the future.

4- RESULTS

4.1- List of Vascular Plants

PTERIDOPHYTA

EQUISETALES

1- Equisetaceae

1- Equisetum L.

1- Stem unbranched

1- Stem branched

E. palustre

E. telmateia

1- Equisetum palustre L.

Damp places, stream sides, 880 - 950 m.

24/06/97 N. İkinci 1264 .

2- Equisetum telmateia Ehrh.

Damp places, 1200 - 1350 m.

Road sides, 20/07/97 N. İkinci 1456- Ö.Umut.

FILICALES

2- Hypolepidaceae

2- Pteridium Scop.

3- P. aquilinum (L.) Kuhn

Damp places, 890 m.

17/06/97 N. İkinci 1231-A. Güner.

3- Aspidiaceae

3- Dryopteris Adans

4- Dryopteris filix-mas (L.) Schott

Abies forests, wet places, 1240 m.

17/06/97 N. İkinci 1237-A. Güner.

SPERMATOPHYTA

GYMNOSPERMAE

4- Pinaceae

1- Leaves borne on short shoots, in fascicles of two, acute, without glaucous stomatal band beneath; cones ovoid, pendulous

Pinus

1- Leaves borne spirally on long shoots, truncate or emarginate

with two glaucous stomatal bands beneath; cones cylindrical, erect **Abies**

4- Abies Miller

5- A. nordmanniana (Stev.) Spach

subsp. **bommuelleriana** (Mattf.) Coode & Cullen.

1000- 1250 m.

11/09/97 N. İkinci 1643-M. Ünal. 11/10/98 N. İkinci 1835-O. İkinci

Endemic. Euxine element.

5- Pinus L.

1- Twigs reddish; leaves glaucous, twisted; cone pendulous

P. sylvestris

1- Twigs blackish; leaves dark green, not twisted; cone erect or ascending

P. nigra subsp. **pallasiana**

6- P. sylvestris L.

1100 - 1250 m, Road sides.

11/10/98 N. İkinci 1833-O. İkinci. 01/07/97 N. İkinci 1370 -A.Güner. 24/06/97 N. İkinci 1309. 11/10/98 N. İkinci 1788-O. İkinci.

Euro-Siberian element.

7- P. nigra Arn.

subsp. **pallasiana** (Lamb.) Holmboe

Roadsides, 870 - 1000 m.

29/09/98 N. İkinci 1756-O. İkinci.

5- Cupressaceae

6- Juniperus L.

8- J. oxycedrus L.

subsp. **oxycedrus**

Quercus sp. forest, road sides, 870 - 1000 m.

29/09/98 N. İkinci 1738-O. İkinci. 24/06/97 N. İkinci 1246.

ANGIOSPERMAE

DICOTYLEDONES

6- Ranunculaceae

1- Petals cream

2- Plant climbing

2- Plant not climbing

1- Petals not as above

3- Flowers zygomorphic

3- Flowers actinomorphic

4- Flowers yellow

4- Flowers pale blue

Clematis
Helleborus

Consolida

Ranunculus
Nigella

7- Helleborus L.

9- H. orientalis Lam.

Abies forests, mixed forests, 900-1235 m.

30/04/97 N. İkinci 1038-A. Güner.

Euxine element.

8- Nigella L.

10- Nigella arvensis L.

var. **glauca** Boiss.

Road sides, 850 - 900 m.

16/07/97 N. İkinci 1443.

9-Consolida (DC.) S. F. Gray

11- Consolida orientalis (Gay) schröd.

Fields, road sides, 850 - 950 m.

02/06/98 N. İkinci 1705-N. Yaşar. 24/06/97 N. İkinci 1314.

10- Clematis L.

12- Clematis vitalba L.

Road sides, 870 - 1250 m,

29/09/98 N. İkinci 1717-O. İkinci. Same place 29/09/98 N. İkinci 1716-O. İkinci.

12/07/97 N. İkinci 1397-M.Erdoğan.

11- Ranunculus L.

1 - Plant with long, leafy stolons, rooting at nodes

1 - Plant not stoloniferous

2- Root tubers present

2- Root tubers absent

R. repens

R. ficaria
R. arvensis

13- Ranunculus repens L.

Road sides, under Abies forests, 1180 - 1190 m.

25/05/97 N. İkinci 1135. 02/06/97 N. İkinci 1172- A. Güner.

14- Ranunculus arvensis L.

Road sides, open places, 810-1160 m.

11/09/97 N. İkinci 1687-A.Güner. 25/05/97 N. İkinci 1121.

15- Ranunculus ficaria L.

subsp. **ficariliformis** Rouy and Fouc.

Open places, near the Lake, 1240 m.

06/05/97 N. İkinci 1064-A. Güner.

7- Nymphaeaceae

12- Nuphar Sm.

16- N. lutea (L.) Sm

In shallow water, 1240 m.

12/07/97 N. İkinci 1403-M.Erdoğan.

8- Papaveraceae

- 1 - Flowers zygomorphic; petals pink or mauvish pink
- 1 - Flowers actinomorphic; petals red or yellow
- 2- Petals red
- 2- Petals yellow

Corydalis

Papaver
Chelidonium

13- Chelidonium L.

17- Chelidonium majus L.

Roadsides, 1120 m.

21/05/97 N. İkinci 1088-A. Güner.

Euro-Siberian element.

14- Papaver L.

18- Papaver rhoeas L.

Roadsides, open places, fields, 880- 950 m.

24/06/97 N. İkinci 1299.

15- Corydalis Medik

19- Corydalis caucasica DC.

Under mixed and Abies forests, 900- 1235 m.

30/04/97 N. İkinci 1036 A. Güner.

Euxine element.

9- Brassicaceae/ Cruciferae

- 1 - Fruit and ovary strongly compressed at right angles to the septum
- 2- Basal leaves obovate, toothed
- 2- Basal leaves rosette forming, pinnatifid
- 1 - Fruit strongly compressed parallel to the septum or inflated
- 3- Leaves pinnatisect or pinnate
- 4- Petals white or purple
- 4- Petals yellow
- 5- Cauline leaves not auriculate
- 5- Cauline leaves auriculate
- 6- Seeds in 2 rows in each loculus
- 6- Seeds in 1 row in each loculus
- 3- Leaves simple, entire or pinnatifid
- 7- Plant glabrous or with simple hairs only
- 8- Flowers white
- 8- Flowers yellow
- 7- Plant with at least some branched or stellate hairs
- 9- Perennials, hairs stellate
- 9- Annuals, hairs forked

Cardaria
Capsella

Cardamine

Sisymbrium

Rorippa
Barbarea

Alliaria
Congringia

Alyssum
Erophila

16- Congringia Adans.

20- Congringia orientalis (L.) Andr.

Under Abies Forest, 1120 m.

Türk- Alman Ormanı, 21/05/97 N. İkinci 1100-A. Güner.

17-Cardaria Desv.

21-Cardaria draba (L.)Desv.

subsp. **draba**

Road sides, 990- 1300 m.

10/06/97 N. İkinci 1208. Same place 25/05/97 N. İkinci 1130. 02/06/97 N.

İkinci 1146 -A. Güner. 08/07/97 N. İkinci 1387-B.Efeoglu.

18- Thlaspi L.

22- Thlaspi perfoliatum L.

Open places, near lake, 1240-1250 m.

30/04/97 N. İkinci 1028 A. Güner. Same place 06/05/97 N. İkinci 1062-A.

Güner.

Thlaspi arvense L.

Near Karacasu Village, 700 m.

19- Capsella Medik

23- Capsella bursa-pastoris (L.) Medik.

Under mixed forests, 850-950 m.

11/09/97 N. İkinci 1627-M.Ünal.

20- Alyssum L.

24- Alyssum repens Baumg.

var. **stenophyllum** Hal.

Road sides, 850 - 900 m,

16/07/97 N. İkinci 1445.

25- Alyssum minus (L.)Rothm.

subsp. **minus**

Open places, 1240 m.

06/05/97 N. İkinci 1060-A. Güner.

21- Erophila DC.

26- Erophila verna (L.) Chevall.

subsp. **verna**

Open places, Abies forests, 1120 m.

21/05/97 N. İkinci 1098-A. Güner. 06/05/97 N. İkinci 1061-A. Güner.

22- Arabis L.

27- Arabis sagittata (Bertol.) DC.

By roads, 1150 - 1160 m.

25/05/97 N. İkinci 1131.

23- Rorippa Scop.

28- Rorippa sylvestre (L.) Bess.

Swampy ground, near lake, 1240 m.

01/07/97 N. İkinci 1318- A.Güner.

24- Barbarea R. Br.

1- Basal leaves with 0-1 (-2) pairs of lateral leaflets

1- Basal leaves with (-2)3-10 pairs of lateral leaflets

B. plantaginea

B. vulgaris

29- Barbarea vulgaris R.Br.

Open places, road sides, 1150-1250 m.

1200 - 1250 m, Açık alan, Petals yellow, 11/10/98 N. İkinci 1827-O. İkinci.

Same place 11/10/98 N. İkinci 1829-O. İkinci. 25/05/97 N. İkinci 1129 . 02/06/97 N. İkinci 1150 -A. Güner.

30- Barbarea plantaginea DC

Road sides, 990 - 1140 m.

10/06/97 N. İkinci 1204.

25- Cardamine L.

1- Rhizome fleshy and scaly

1- Rhizome neither fleshy nor scaly, sometimes absent

2- Petioles with small semiamplexicaul auricles

2- Petioles without auricles

3- Petals up to 3 mm

3- Petals more than 4 mm

C. bulbifera

C. impatiens

C. hirsuta

C. tenera

31- Cardamine bulbifera (L.) Crantz

Abies forest, 1120 m.

Türk- Alman Ormanı, 21/05/97 N. İkinci 1106 A. Güner.

Euro-Siberian element.

32- Cardamine tenera Gmel

Road sides, 1180 - 1190 m.

25/05/97 N. İkinci 1140.

Hyrcano-Euxine element.

33- Cardamine impatiens L.

var. **pectinata** (Pallas) Trautv.

Under Abies forests, 1120 m.

Türk-Alman Ormanı, 21/05/97 N. İkinci 1099-A. Güner.

Euro-Siberian element.

34- Cardamine hirsuta L.

Open places near lake, 1240 m.

06/05/97 N. İkinci 1058-A. Güner. Same place 03/05/97 N. İkinci 1044.

26- Alliaria Scop.

35- Alliaria petiolata (Bieb.) Cavara & Grande

Under Abies forests, shady places, 1200 m.

25/05/97 N. İkinci 1117.

27- Sisymbrium L.

1 - Cauline leaves lanceolate or hastate

1 - Cauline leaves pinnatisect

S. orientale

S. officinale

36- Sisymbrium officinale (L.) Scop.

Wet places, forest borders, open places, road sides, 850-1250 m.

11/09/97 N. İkinci 1639-M.Ünal. 29/09/98 N. İkinci 1747-O. İkinci. 11/10/98 N.

İkinci 1802-O. İkinci. 24/06/97 N. İkinci 1250. 28/10/97 N. İkinci 1685-Y. İlker

Özer.

37- Sisymbrium orientale L.

Road sides and waste places, 1200 - 1250 m.

Around lake, 11/10/98 N. İkinci 1778-O. İkinci. Same place 11/10/98 N. İkinci 1825-O. İkinci.

New record for A3.

10- Resedaceae

28- Reseda L.

38- Reseda luteola L.

Road sides, open places, 850 - 1250 m.

22/07/97 N. İkinci 1467 A. Güner. 12/07/97 N. İkinci 1394-M. Erdoğan.

11- Cistaceae

29- *Helianthemum* Adans

39- *Helianthemum nummularium* (L.) Miller

subsp. **nummularium**

Open places, road sides, 880-980 m. 10/06/97 N. İkinci 1184. 24/06/97 N. İkinci 1262.

12- Violaceae

30- *Viola* L.

1- Plant annual

V. kitaibeliana

1- Plant perennial

2- Leaves ovate-orbicular, cordate at base; flowers purple

V. odorata

2- Leaves ovate-cordate; flowers light blue-violet, light violet to white or blue

3- Leaves pilose

V. alba

3- Leaves $\pm$ glabrous

4- Main axis not terminating in a rosette; flowers blue, spur yellow

V. canina

4- Main axis terminating in a rosette; flowers lilac with dark purple spur

V. sieheana

40- *Viola odorata* L.

Shady places, 1240 m.

06/05/97 N. İkinci 1067-A. Güner.

41- *Viola alba* Besser

Under Abies forests, 1235 m.

30/04/97 N. İkinci 1037-A. Güner.

Viola reichenbachiana Jord.

Bolu Dağı (Ala Da.) up to 500 m.

42- *Viola sieheana* Becker

Abies forests, 1200 - 1250 m.

02/06/98 N. İkinci 1690-J. Ackerman.

43- *Viola canina* L.

Road sides, 1150 - 1160 m.

25/05/97 N. İkinci 1126.

New record for A3.

44- *Viola kitaibeliana* Roem. & Schult.

Wheat field, 850 - 950 m.

11/09/97 N. İkinci 1659-M. Ünal.

13- Polygalaceae

31- Polygala L.

45- Polygala supina Schreb.

Road sides and open places, 810-950 m.

02/06/97 N. İkinci 1151 -A. Güner. 24/06/97 N. İkinci 1311.

14- Caryophyllaceae

1- Sepals free to the base

2- Styles 2

2- Styles 3-5

3- Petals not exceeding sepals

3- Petals longer than sepals

1- Sepals connate at least below

4- Styles 3-5

5- Capsule teeth as many as styles, style 5

5- Capsule teeth twice as many as styles, style 3

4- Styles 2

6- Calyx with 5 wings

6- Calyx without wings

7- Bracteolles closely adpressed to the calyx

7- Bracteolles not adpressed to the calyx

8- Petals 20-30 mm

8- Petals 12-15 mm

Stellaria

Myosoton

Moenchia

Lychnis

Silene

Vaccaria

Dianthus

Saponaria

Velezia

32- Stellaria L.

46- Stellaria media (L.) Vill.

subsp. **pallida** (Dumort.) Aschers

Open and wet places near lake, 1240 m.

Around the Lake, 06/05/97 N. İkinci 1069-A. Güner. Same place 06/05/97 N.

İkinci 1068-A. Güner. Same place 30/04/97 N. İkinci 1027-A. Güner.

33- Myosoton Moench

47- Myosoton aquaticum (L.) Moench

Damp places, 1100- 1250 m.

Around the Lake, 11/10/98 N. İkinci 1801-O. İkinci. Same place 11/10/98 N.

İkinci 1826-O. İkinci. 31/07/97 N. İkinci 1493.

Euro-Siberian element.

34- Moenchia Ehrh.

48- Moenchia mantica (L.) Bartl.

subsp. **mantica**

Meadows, 930-1050 m.

02/06/98 N. İkinci 1694-J. Ackerman. 10/06/97 N. İkinci 1180.

35- Dianthus L.

- 1- Inflorescence capitate, flowers sessile
- 2- Bracteoles 1/4- 1/3 calyx length
- 2- Bracteoles 1/2 to equaling calyx length
- 3- Bracteoles coriaceous, pale
- 3- Bracteoles membranous, brown
- 1- Flowers pedicellate, sometimes very shortly so
- 4- Flowers in pairs; pedicels 2-10 mm
- 4- Flowers not in pairs; pedicels 10 mm or more

D. calocephalus

D. lydus

D. carthusianorum

D. corymbosus

D. zonatus

Dianthus leucophaeus Sibth. & Sm. var. **leucophaeus**

Endemic. Ala Dağ.

49- Dianthus corymbosus Sibth.

Open places, road sides, 850-950 m.

24/06/97 N. İkinci 1313. 16/07/97 N. İkinci 1417.

50- Dianthus zonatus Fenzl

var. **hypochlorus** (Boiss. & Heldr.) Reeve

Wet places, 850 - 950 m.

11/09/97 N. İkinci 1636-M.Ünal.

51- Dianthus carthusianorum L.

Open places, 850 - 1250 m.

11/09/97 N. İkinci 1649-M.Ünal. 12/07/97 N. İkinci 1395-M. Erdoğan.

52- Dianthus calocephalus Boiss.

Open woodlands, 850 - 900 m.

16/07/97 N. İkinci 1408.

53- Dianthus lydus Boiss.

Under mixed forests, 850 - 950 m.

11/09/97 N. İkinci 1633 M.Ünal.

Endemic.

36- Velezia L.

54- Velezia rigida L.

Open fields, 850 - 900 m.

16/07/97 N. İkinci 1411.

37- Saponaria L.

1- Petals bifid, dark pink

1- Petals entire or slightly retuse, whitish pink

S. glutinosa

S. officinalis

55- Saponaria glutinosa Bieb.

Road sides, 1050 - 1100 m.

01/07/97 N. İkinci 1356- A. Güner.

56- Saponaria officinalis L.

Shady places, damp woods, 850 - 950 m.

13/08/97 N. İkinci 1597.

38- Vaccaria Medik

57- Vaccaria pyramidata Medik

var. **grandiflora** (Fish. ex DC.) Cullen

Open places and road sides, 880 - 950 m.

24/06/97 N. İkinci 1283.

39- Silene L.

1- Petals pink

1- Petals white

2- Calyx glabrous

2- Calyx hairy or scaly

3- Calyx up to 11 mm

3- Calyx 11.5 mm or more

S. compacta

S. vulgaris

S. alba

S. italica

58- Silene italica (L.) Pers.

Open places, 810 m.

02/06/97 N. İkinci 1149 A. Güner.

59- Silene vulgaris (Moench) Gracke

var. **vulgaris**

Scrub, slopes, open places, 1200 m.

10/06/97 N. İkinci 1176.

60- Silene compacta Fischer

Slopes, open forests, 1180 m.

27/08/97 N. İkinci 1601 A. Güner.

61- Silene alba (Miller) Krause

subsp. **divaricata** (Reichb.) Walters

Road sides, 880 - 950 m.

24/06/97 N. İkinci 1298.

40- Lychnis L.

62- Lychnis coronaria (L.) Desr.

Roadside banks, 880 - 950 m.

24/06/97 N. İkinci 1282.

Euro-Siberian element.

Illecebraceae

Herniaria L.

Herniaria glabra L.

Ala Dağ. Kartal Kaya, 1200 m.

15- Polygonaceae

1- Perianth segments 6; stamens 6

1- Perianth segments 5; stamens usually 8

Rumex
Polygonum

41- Polygonum L.

1- Ochreae brown, truncate; inflorescence a dense oblong spike,

2- Perennial with creeping rhizomes

2- Annuals

1- Ochreae hyaline, tapered to the apex;

3- Perianth tube about as long as the lobes

3- Perianth tube much shorter than the lobes

P. amphibium

P. persicaria

P. arenastrum

P. aviculare

Polygonum bistorta L.

Aladağ 1700 m.

63- Polygonum amphibium L.

In water, 1240 m.

01/07/97 N. İkinci 1331 -A.Güner

64- Polygonum persicaria L.

Damp places, near lake, 1240 m.

27/08/97 N. İkinci 1609 -A.Güner.

65- Polygonum arenastrum Bor.

Roadsides, waste places, 850-950 m.

11/09/97 N. İkinci 1622-M.Ünal. Same place 11/09/97 N. İkinci 1624-M.Ünal.

66- Polygonum aviculare L.

Waste places, 850-950 m.

06/10/98 N. İkinci 1763-E.İkinci. 11/09/97 N. İkinci 1658-M.Ünal.

42- Rumex L.

1- Flowers unisexual; leaves hastate

R. acetosella

1- Flowers hermaphrodite; leaves not as above

2- Inner perianth segments lingulate in fruit, the tubercle almost as broad as the segments

R. conglomeratus

2- Inner perianth segments broadly cordate orbicular

in fruit, the tubercle much narrower than the segments

R. crispus

67- Rumex acetosella L.

Roadsides, 880- 1190 m.

25/05/97 N. İkinci 1136. 10/06/97 N. İkinci 1212. 24/06/97 N. İkinci 1241

(det. A.Güner).

68- Rumex crispus L.

Roadsides, 1200 - 1350 m.

20/07/97 N. İkinci 1454 -Ö.Umut.

69- Rumex conglomeratus Murray

Lake shores, roadsides, 850- 1250 m

31/07/97 N. İkinci 1481. 13/08/97 N. İkinci 1596.

16- Chenopodiaceae

43- Chenopodium L.

70- Chenopodium album L.

var. album

Fields, open places, roadsides, 850-1250 m.

29/09/98 N. İkinci 1710-O. İkinci. 11/09/97 N. İkinci 1626-M. Ünal.

11/10/98 N. İkinci 1796-O. İkinci.

17- Amaranthaceae

44- Amaranthus L.

71- Amaranthus retroflexus L.

Fields, 870 - 1000 m.

29/09/98 N. İkinci 1758-O. İkinci.

18- Hypericaceae/Guttiferae

45- Hypericum L.

72- Hypericum perforatum L.

Open places and roadsides, 880- 1250 m.

11/10/98 N. İkinci 1818-O. İkinci. 11/10/98 N. İkinci 1834-O. İkinci. 24/06/97 N. İkinci 1302. 01/07/97 N. İkinci 1365- A. Güner.

19- Malvaceae

1- Epicalyx segments 3

Malva

1- Epicalyx segments 6-9

2- Petals 9-16 mm

Althaea

2- Petals 30 mm or more

Alcea

46- Malva L.

1- Petals pink

M. sylvestris

1- Petals white

M. neglecta

73- Malva sylvestris L.

Open places and roadsides, 880-1300 m.

24/06/97 N. İkinci 1284. 08/07/97 N. İkinci 1373-B. Efeoglu.

74- Malva neglecta Wallr.

Roadsides, 1000 - 1250 m.

12/07/97 N. İkinci 1396-M. Erdoğan.

47- Alcea L.

75- Alcea pallida L.

Roadsides, open fields, 870 - 1000 m.

29/09/98 N. İkinci 1751-O. İkinci. 31/07/97 N. İkinci 1500.

48- Althaea L.

76- Althaea hirsuta L.

Roadsides, 850 - 900 m.

16/07/97 N. İkinci 1413.

20- Geraniaceae

1- Leaves not longer than broad, palmately nerved

1- Leaves longer than broad, pinnately nerved

Geranium

Erodium

49- Geranium L.

1- Petals long-clawed, entire; sepals convinent in flower or in fruit

2- Leaves divided to 1/2-2/3 of the radius; sepals keeled

2- Leaves divided to the base; sepals not keeled

1- Petals very shortly-clawed, entire or notched; sepals always erect or spreading

3- Annual with slender root

3- Perennnial with a rhizome or stout tap root

4- Petals entire

4- Petals distinctly emarginate or bilobed

G. lucidum

G. robertianum

G. dissectum

G. sylvaticum

G. pyrenaicum

77- Geranium lucidum L.

Shady places, Abies forests, 1080-1200 m.

Türk Alman Ormanı, 25/05/97 N. İkinci 1112. Same place 02/06/97 N. İkinci 1168- A. Güner.

78- Geranium robertianum L.

Abies forests, open places and roadsides, 1080-1250 m.

11/10/98 N. İkinci 1828 O. İkinci. 11/10/98 N. İkinci 1791-O. İkinci 25/05/97 N. İkinci 1122. Türk-Alman Ormanı, 02/06/97 N. İkinci 1173 A. Güner.

79- Geranium dissectum L.

Roadsides, 890 m.

17/06/97 N. İkinci 1240 A. Güner.

80- Geranium sylvaticum L.

Abies forosts, 1060 m.

17/06/97 N. İkinci 1222 A. Güner.

81- Geranium pyrenaicum Burm.

Meadows, roadsides, 850 - 1250 m.

06/10/98 N. İkinci 1759-E. İkinci. 11/10/98 N. İkinci 1811-O. İkinci. 10/06/97 N. İkinci 1213. 25/05/97 N. İkinci 1125.

50- Erodium L'Hérit.

1- Perennial; acaulous

1- Annual; caulescent

E. acaule

E. cicutarium

82- *Erodium cicutarium* (L.) L'Herit.

subsp. **cutarium**

Abies forests, 1200 m.

27/08/97 N. İkinci 1606 -A.Güner.

83- *Erodium acaule* (L.) Becherer & Thell.

Damp places, roadsides, 850 - 950 m.

06/05/97 N. İkinci 1057 A. Güner.

Mediterranean element.

21- Oxalidaceae

51- *Oxalis* L.

83- *Oxalis acetosella* L.

Abies forests, 1200 m.

25/05/97 N. İkinci 1109.

22- Aceraceae

52- *Acer* L.

1- Leaf lobes entire and long acuminate, or bearing finely acuminate lobules

A. platanoides

1- Leaf lobes entire but not acuminate, or lobulate or toothed, never with finely acuminate lobules

2- Wings of fruit spreading horizontally; petiole lactiferous **A. campestre**

2- Wings of fruit divaricate or parallel; petiole not lactiferous

A. pseudoplatanus

84- *Acer pseudoplatanus* L.

By roads, 1160 m.

02/06/97 N. İkinci 1161 -A. Güner.

Euro-siberian element.

85- *Acer platanoides* L.

By roads, 1200 - 1350 m.

20/07/97 N. İkinci 1452- Ö.Umut.

Euro-siberian element.

86- *Acer campestre* L.

subsp. **campestre**

By roads, mixed forests, 870 - 1000 m.

29/09/98 N. İkinci 1741-O.İkinci. 10/06/97 N. İkinci 1182. 17/06/97 N. İkinci 1228-A. Güner.

Euro-siberian element.

23- Staphyleaceae

53- Staphylea L.

87- Staphylea pinnata L.

Mixed forests, shady places, 1000 m.

11/09/97 N. İkinci 1616 M.Ünal.

24- Aquifoliaceae

54- Ilex L.

88- Ilex colchica Poj.

Shady places, 1240 m.

Around lake, 27/08/97 N. İkinci 1612- A.Güner.

Euxine element.

25- Celastraceae

55- Euonymus L.

1- Fruit winged

1- Fruit unwinged

E. latifolius
E. europaeus

89- Euonymus latifolius (L.) Miller

subsp. **latifolius**

By roads, forests, 900 - 1000 m.

31/07/97 N. İkinci 1475. Same place, 11/09/97 N. İkinci 1615-M.Ünal.

Euro-siberian element.

90- Euonymus europaeus L.

By roads, 1160 m.

02/06/97 N. İkinci 1162 -A. Güner.

Euro-siberian element.

26- Fabaceae/Leguminosae

1- Leaves simple

1- Leaves compound

2- Plant and/or leaf rachis spiny

3- Leaves pinnate with spiny rachis; keel obtuse

3- Upper leaves often unifoliate, other trifoliate without
spiny rachis; keel beaked

2- Plant and/or leaf rachis not spiny

4- Stipules sagittate or semi-sagittate

5- Leaves imparipinnate

5- Leaves paripinnate or subdigitate ending in
a mucro or tendril

4- Stipules simple

6- Leaves 3-5 or 7-foliolate

Genista

Astragalus

Ononis

Galega

Lathyrus

- 7- Terminal leaflet much enlarged than the laterals **Coronilla**
- 7- Terminal leaflets almost same size with the laterals
- 8- Keel beaked **Lotus**
- 8- Keel obtuse, truncate, acute but not beaked
- 9- Principal lateral veins of leaflets obscure and not terminating at the margin
- 10- Herbs; flowers, white **Dorycnium**
- 10- Shrubs or suffruticose herbs; flowers yellow
- 11- Shrubs **Chamaecytisus**
- 11- Suffruticose herbs **Argyrolobium**
- 9- Principal lateral veins of leaflets distinct and terminating at the margin
- 12- Flowers in an elongate raceme up to 10 cm **Mellilotus**
- 12- Flowers in pedunculate heads or short contracted raceme or solitary
- 13- Legume exceeding calyx usually spirally coiled, sometimes falcate **Medicago**
- 13- Legume usually included in calyx or slightly exserted, not coiled **Trifolium**
- 6- Leaves paripinnate, imparipinnate or digitate
- 14- Leaves paripinnate, ending in a mucro or tendril
- 15- Leaf rachis spiny **Astragalus**
- 15- Leaf rachis not spiny ending in a mucro or tendril
- 16- Style pubescent all around or on the lower side or glabrous **Vicia**
- 16- Style pubescent on the upper side only **Lathyrus**
- 14- Leaves imparipinnate, ending in a leaflets
- 17- Keel beaked **Coronilla**
- 17- Keel obtuse, truncate or acute, but not beaked
- 18- Ovary 1-2 ovules; fruit 1 (-2)-seeded **Onobrychis**
- 18- Ovary 3 or more ovules; fruit 3-many seeded **Astragalus**

56- Chamaecytisus Link

1- Flowers in heads

1- Flowers in leafy raceme

C. supinus
C. hirsutus

91- Chamaecytisus hirsutus (L.) Link

Mixed forests, Abies forests, 910- 1120 m.

Above Karacasu village, 21/05/97 N. İkinci 1081-A. Güner. Türk-Alman

Ormanı, 21/05/97 N. İkinci 1093-A. Güner (det. A.Güner)

92- Chamaecytisus supinus (L.) Link

Open places, 880 - 950 m.

24/06/97 N. İkinci 1286.

Euro-Siberian element.

57- Genista L.

93- Genista lydia Boiss.

var. **lydia**

Roadsides, open places, 850-950 m.

Above Karacasu Village, 02/06/97 N. İkinci 1141 A. Güner. Same place,
28/10/97 N. İkinci 1684-I. Özer.

58- Argyrolobium Eckl. & Zeyh.

94- Argyrolobium blebersteinii Ball

Roadsides, 1050 - 1100 m.

01/07/97 N. İkinci 1369 -A.Güner.

59- Galega L.

95- Galega officinalis L.

Roadsides, open places, 880 - 1250 m.

Above Karacasu Village, 24/06/97 N. İkinci 1293. Around the Lake, 11/10/98
N. İkinci 1798-O. İkinci. Same place, 11/10/98 N. İkinci 1803-O. İkinci.

Euro-Siberian element.

60- Astragalus L.

96- Astragalus glycyphyllos L.

Roadsides, 930 - 980 m.

10/06/97 N. İkinci 1186.

Euro-Siberian element.

Astragalus mitchellianus Boiss.

Aladağ, 700 m.

Astragalus ponticus Pall.

6 km S of Bolu, 900 m.

61- Vicia L.

1- Leaves without tendrils, the rachis ending in a mucro
or rarely a terminal leaflet

2- Leaf rachis ending in a terminal leaflet

V. freyniana

2- Leaf rachis ending in a mucro

3- Flowers orange, leaflets 35-60 mm

V. crocea

3- Flowers violet, leaflets smaller

V. canescens

1- At least the upper leaves ending in a well-developed
tendrill

4- Peduncle shorter than the flowers, or absent; flowers 1-7

5- Standard hairy on the upper surface

6- Peduncle at least as long as pedicels, 2-4 flowered

V. pannonica

6- Peduncles very short or absent, flowers 1-2 in
the leaf axils

V. hybrida

- 5- Standard glabrous throughout, sometimes papillose on the upper surface
 7- Calyx with a straight mouth;teeth subequal; flowers 1-2(3) **V. sativa**
 7- Calyx with a oblique mouth;lower tooth usually longer than the upper; flowers 1-7 **V. monantha**
 4- Peduncle much longer than the flowers; flowers 1-40
 8- Leaflets (4)5-10 paired; annual **V. hirsuta**
 8- Leaflets 11-17 paired; perennial **V. cassubica**
- 97- *Vicia crocea*** (Desf.) B. Fedtsh.
Abies forests, 1060-1120 m.
 Türk-Alman ormanı, 17/06/97 N. İkinci 1223-A. Güner. Same place, 21/05/97 N. İkinci 1107-A. Güner.
 Hyrcano-Euxine element.
- 98- *Vicia freyniana*** Bornm.
Roadsides, 850 - 900 m.
 Just above Karacasu Village, 16/07/97 N. İkinci 1447
 Endemic. Euxine element.
- 99- *Vicia cassubica*** L.
Meadows, open places and roadsides, 880-1250 m.
 Around the Lake, 01/07/97 N. İkinci 1321 A.Güner. Above Karacasu Village, 24/06/97 N. İkinci 1301.
 Euro-Siberian element.
- 100- *Vicia canescens*** Lab.
 subsp. **gregaria** (Boiss. & Heldr.) Davis
Meadows, open places, 1240 m.
 Around the Lake, 02/06/98 N. İkinci 1703-N. Yaşar (det. A. Güner).
 New record for A3.
 Irano-Turanian element.
- 101- *Vicia monantha*** Retz.
 subsp. **monantha**
Abies forests, 1060 m.
 Türk-Alman ormanı, 17/06/97 N. İkinci 1224-A. Güner.
 New record for A3.
- 102- *Vicia hirsuta*** (L.) S. F. Gray
Mixed forests, roadsides, 810-1160 m.
 Above Karacasu Village, 02/06/97 N. İkinci 1154 -A. Güner. Deliklitaş, 25/05/97 N. İkinci 1127.
Vicia ciliatula Lipsky
 S of Bolu Karacasu

103- *Vicia pannonica* Crantz

var. **pannonica**

Abies forests, 1060 m.

Türk-Alman ormanı, 17/06/97 N. İkinci 1218-A.Güner.

104- *Vicia hybrida* L.

Roadsides, open places, 880 - 950 m.

Above Karacasu Village, 24/06/97 N. İkinci 1273.

105- *Vicia sativa* L. subsp. **nigra (L.) Ehrh.**

1- Corolla blue

1- Corolla purple

var. **nigra** (L.) Ehrh

Roadsides, 810 m.

Above Karacasu Village, 02/06/97 N. İkinci 1147- A. Güner.

var. **segetalis** (Thuill.) Ser.

Roadsides, 880 -950 m.

Above Karacasu Village, 24/06/97 N. İkinci 1292 .

var. **nigra**
var. **segetalis**

62- *Lathyrus* L.

1- Leaflets absent

1- Leaflets present

2- Stipules sagittate

3- Leaflets 1-paired

3- Leaflets 2-5-paired

2- Stipules semi-sagittate

L. nissolia

L. laxiflorus

L. aureus

L. digidatus

106- *Lathyrus aureus* (Stev.) Brandza

Mixed forests, 910 m.

Euxine element.

107- *Lathyrus digidatus* (Bieb.)

Quercus-Fagus forests, 910 m.

21/05/97 N. İkinci 1078-A. Güner.

Mediterranean element.

108- *Lathyrus laxiflorus* (Desf.)

subsp. **laxiflorus**

Quercus-Fagus forests, roadsides, 810-910 m.

On Karacasu -Gölcük way, 21/05/97 N. İkinci 1079-A. Güner. Above Karacasu Village, 02/06/97 N. İkinci 1156 A. Güner.

109- *Lathyrus nissolia* L.

Roadsides, 1150 - 1160 m.

25/05/97 N. İkinci 1120.

63- Ononis L.

- 1- Flowers 6-10(-15) mm, solitary
- 1- Flowers 15-20 mm, paired

O. spinosa
O. anvensis

110- Ononis arvensis L.

Ala Dağ., 1300 m.

Euro-Siberian element.

111- Ononis spinosa L.

subsp. **leiosperma** (Boiss.) Sirj.

By roads, open places, 850 - 950 m.

22/07/97 N. İkinci 1466- A.Güner.

64- Trifolium L.

- 1- Calyx tube 5-nerved
- 2- Terminal leaflets distinctly petiolulate
- 2- Terminal leaflets sessile
- 1- Calyx tube 10-20-nerved or more
- 3- Flowers bracteate; calyx throat naked and open
- 4- Stems creeping, rooting at the nodes
- 4- Stems erect or ascending, not rooting at the nodes
- 3- Flowers ebracteate, sessile; calyx throat thickened by annular or 2-lipped callosity or provided with a ring of hairs, mostly closed when mature
- 5- Plants perennial with an indurated stock
- 6- Calyx tube glabrous
- 6- Calyx tube hairy
- 5- Plants annual or biennial
- 7- Calyx tube c. 20-nerved
- 7- Calyx tube 10-nerved

T. campestre
T. barbulatum

T. repens
T. hybridum

T. medium
T. pratense

T. lappaceum
T. arvense

112- Trifolium repens L.

- 1- Umbels 1.5-2 cm diam.
- 1- Umbels 1.2 cm diam.

var. **repens**
var. **orphanideum**

var. **repens**

Open places, 1240 m.

Around lake, 01/07/97 N. İkinci 1338-A.Güner.

var. **orphanideum** (Boiss.) Boiss.

Roadsides and open places, 880 - 950 m.

24/06/97 N. İkinci 1261.

New record for A3.

113- Trifolium hybridum L.

var. **anatolicum** (Boiss.) Boiss.

Meadows, damp places, roadsides, 810 m.

Above Karacasu Village, 02/06/97 N. İkinci 1155- A. Güner (det. A. Güner).

114- Trifolium barbulatum (Freyn & Sint.) Zoh.

Abies forest, 1050 - 1100 m.

Türk-Alman Ormanı, 01/07/97 N. İkinci 1351- A.Güner.

Endemic.

115- Trifolium campestre Schreb.

Waste places, 890 m.

17/06/97 N. İkinci 1229-A. Güner.

Trifolium fragiferum L.

var. **fragiferum**

Karacasu, 700 m.

116- Trifolium pratense L.

var. **pratense**

Mixed forests, roadsides, meadows, 850-1250 m.

Above Karacasu Village, 11/09/97 N. İkinci 1629-M.Ünal. Same place.

29/09/98 N. İkinci 1714-O. İkinci. 11/10/98 N. İkinci 1812-O. İkinci. Around lake,

11/10/98 N. İkinci 1805 O. İkinci.

Trifolium diffusum Ehrh.

Karacasu, 700 m.

117- Trifolium medium L. subsp.

var. **ericalycinum** Hausskn

Roadsides, open places, 850-950 m.

Above Karacasu Village, 24/06/97 N. İkinci 1289.

New record for A3.

118- Trifolium lappaceum L.

Roadsides, wet places, meadows, 850-1000 m.

10/06/97 N. İkinci 1190. Roadsides, 06/10/98 N. İkinci 1764-E. İkinci. 29/09/98

N. İkinci 1715-O. İkinci.

119- Trifolium arvense L.

var. **arvense**

Roadsides, 1050-1100m.

01/07/97 N. İkinci 1355 A.Güner.

65- Melilotus L.

120- Melilotus officinalis (L.) Desr

Roadsides, open places, 880-1250 m..

24/06/97 N. İkinci 1291. Around lake, 11/10/98 N. İkinci 1780-O. İkinci.

66- Medicago L.

1- Perennial herbs or shrubs

2- Fruit a 1-seeded nut with distal part coiled

2- Fruit nearly straight, or coiled, several seeded

1- Annual herbs

M. lupulina

M. sativa

M. polymorpha

121- Medicago lupulina L.

Open places, 1200 - 1250 m.

Around Lake, 11/10/98 N. İkinci 1776-O.İkinci.

122- Medicago sativa L.

subsp. **sativa**

Meadows, roadsides, fields, 850-1240 m.

On Karacasu- Gölcük way, 16/07/97 N. İkinci 1405. Around Lake, 2/08/98 N.

İkinci 1707-O.İkinci.

123- Medicago polymorpha L.

var. **polymorpha**

Waste places, 810 m.

02/06/97 N. İkinci 1152-A.Güner.

New record for A3.

67- Dorycnium Miller

1 - Calyx equally 5-toothed, teeth longer than tube

1 - Calyx slightly 2-lipped, teeth not longer than tube

D. graceum

D. pentaphyllum

124- Dorycnium graceum (L.) Ser.

Abies forest, 1060 m.

Türk-Alman Ormanı, 17/06/97 N. İkinci 1221-A. Güner.

Euxine element.

125- Dorycnium pentaphyllum Scop.

subsp. **herbaceum** (Vill.) Rouy

Roadsides, 850 - 900 m.

Above Karacasu village, 16/07/97 N. İkinci 1425.

68- Lotus L.

126- Lotus corniculatus L.

var. **corniculatus**

Wet places, open places, roadsides, 850-1250 m.

Above Karacasu Village, 24/06/97 N. İkinci 1285. Same place, 11/09/97 N.

İkinci 1640-M.Ünal. Around Lake, 11/10/98 N. İkinci 1773 O. İkinci. On Karacasu-

Gölcük way, 29/09/98 N. İkinci 1744-O. İkinci.

69- Coronilla L.

127- Coronilla varia L.

subsp. **varia**

Open places, roadsides, 880 - 950 m.

Above Karacasu Village, 24/06/97 N. İkinci 1288.

70- Onobrychis Adans.

128- Onobrychis vicilifolia Scop.

Roadsides, meadows, 880-950 m.

Above Karacasu Village, 24/06/97 N. İkinci 1303.

Onobrychis oxyodonta Boiss.

Foothills of Ala Da.,

27- Rosaceae

- 1- Shrubs or trees
 - 2- Stem and branches usually with prickles; leaves pinnate
 - 3- Leaves imparipinnate; flowers solitary or in corymbs; hypanthium urceolate, becoming coloured and fleshy in fruit; fruit a pseudocarp of numerous achenes enclosed in hypanthium **Rosa**
 - 3- Leaves 3-5(-7)-foliolate; flowers in panicle; hypanthium flat, with a large, usually, convex receptacle **Rubus**
 - 2- Stem and branches unarmed or spiny; leaves simple
 - 4- Ovary superior
 - 5- Leaves convolute in bud; flowers borne before or with leaves; drupe pruinose, stone more or less compressed **Prunus**
 - 5- Leaves conduplicate in bud; flowers borne with or after leaves; drupe not pruinose, stone globose or ovoid **Cerasus**
 - 4- Ovary inferior or semi-inferior
 - 6- Flowers solitary, terminal **Mespilus**
 - 6- Flowers in 2-to many-flowered
 - 7- Flowers in simple or compound corymbs
 - 8- Carpel walls cartilaginous or membranous in fruit **Sorbus**
 - 8- Carpel walls stony in fruit **Crataegus**
 - 7- Flowers in umbels, racemes or few-flowered clusters
 - 9- Styles free; flesh of fruit with stone-cells **Pyrus**
 - 9- Styles connate at base; flesh of fruit with few or no stone-cells **Malus**
 - 1- Annual or perennial herb
 - 10- Petals absent
 - 11- Leaves frequently in rosettes, imparipinnate; flowers in terminal head-like spikes **Sanguisorba**
 - 11- Leaves palmate or palmately lobed; flowers in compound cyme **Alchemilla**
 - 10- Petals present
 - 12- Epicalyx absent
 - 13- Basal leaves unequally pinnate; inflorescence a many flowered spicate raceme; corolla yellow; upper part of hypanthium crowned with hooked bristles **Agrimonia**

- 13- Basal leaves interruptedly pinnate, large pairs of leaflets alternating with small ones; inflorescence a many-flowered panicle-like cyme; petals pale cream, usually purplish beneath; hypanthium without hooked bristles **Filipendula**
- 12- Epicalyx present
 - 14- Petals yellow or purple
 - 15- Carpels and achenes enclosed in hypanthium **Aremonia**
 - 15- Carpels and achenes exposed
 - 16- Style persistent elongating in fruit with hooked proximal rostrum and a deciduous distal portion **Geum**
 - 16- Style deciduous in fruit **Potentilla**
 - 14- Petals white
 - 17- Receptacle enlarged, fleshy and bright red in fruit **Fragaria**
 - 17- Receptacle not enlarged, not fleshy and not bright red in fruit **Potentilla**

71- Prunus L.

- 1- Fruits erect, globose, up to 15 mm diam. **P. spinosa**
- 1- Fruits pendant, ovoid or globose, up to 40 mm long **P. x domestica**

129- Prunus spinosa L.

subsp. **dasyphylla** (Schur) Domin

Forest remnants and in scrub, 850 - 1240 m.

Fields above Karacasu, 11/09/97 N. İkinci 1664-M.Ünal. Around Lake, 06/05/97 N. İkinci 1049-A. Güner.

Euro-Siberian element.

130- Prunus x domestica L.

Field borders, roadsides, 850-950 m.

Above Karacasu Village, 11/09/97 N. İkinci 1651-M.Ünal.

72- Cerasus Duhamel

131- Cerasus avium (L.) Moench

By roads, 930 - 980 m.

On Karacasu-Gölcük Way, 10/06/97 N. İkinci 1197.

73- Filipendula Miller

132- Filipendula vulgaris Moench

Open places, roadsides, 880 - 950 m.

Above Karacasu Village, 24/06/97 N. İkinci 1263.

Euro-Siberian element.

74- Rubus L.

- 1- Stipules attached at base of petiole **R. canescens**
- 1- Stipules attached above base of petiole **R. sanctus**

133- Rubus sanctus Schreber

Stream sides, wet places, Abies forests, 850 - 1100 m.

28/10/97 N. İkinci 1686-I. Özer (det. A. Güner). Türk-Alman Ormanı, 01/07/97
N. İkinci 1342- A.Güner.

134- Rubus canescens DC.

var. **canescens**

Roadsides, open places,, 870-1250 m.

On Karacasu-Gölcük Way, 29/09/98 N. İkinci 1708-O.İkinci. Around Lake,
11/10/98 N. İkinci 1774-O.İkinci. Same place, 11/09/97 N. İkinci 1668-M.Ünal
(det. A. Güner).

Euro-Siberian element.

75- Potentilla L.

1- Leaves pinnate or trifoliate; petals purple or white,
rarely pinkish

P. micrantha

1- Leaves digitate; petals yellow

2- Plant stoloniferous; stem pubescent or glabrous,
eglandular

-P. reptans

2- Plants erect or ascending

3- Leaflets incised dentate to pinnatifid

P. argentea

3- Leaflets crenate

P. crantzii

135- Potentilla argentea L.

Under mixed forests, open places, 880-980 m.

10/06/97 N. İkinci 1188 (det. A. Güner).

24/06/97 N. İkinci 1296. On Karacasu-Gölcük Way, 24/06/97 N. İkinci 1294.

136- Potentilla crantzii (Crantz)G.Beck

var. **crantzii**

Roadsides, 880-950 m.

On Karacasu-Gölcük Way, 24/06/97 N. İkinci 1295.

Euro-Siberian element.

137- Potentilla reptans L.

Abies forest, roadsides, 1050-1250 m.

Abies forests around lake, 11/10/98 N. İkinci 1794-O.İkinci. 01/07/97 N. İkinci
1361 -A.Güner.

138- Potentilla micrantha Ramond

Abies forests,damp places, 1250 m.

Abies forests around lake, 30/04/97 N. İkinci 1040-A. Güner.

76- Fragaria L.

139- Fragaria vesca L.

Damp places, Abies forests, by roads, 1000-1120 m.

Türk-Alman Ormanı, 21/05/97 N.İkinci 1105 -A.Güner.

77- Geum L.

140- Geum rivale L.

Damp meadows, roadsides, 880 - 950 m.

Karacasu-Gölcük way, 24/06/97 N. İkinci 1272.

New record for A3.

78- Agrimonia L.

141- Agrimonia eupatoria L.

Mixed forests, 850 - 950 m.

Above Karacasu Village, 11/09/97 N. İkinci 1631 M.Ünal. Same place,

22/07/97 N. İkinci 1465 A.Güner.

79- Aremonia Nestler

142- Aremonia agrimonoides (L.) DC.

Abies forests, 1050-1120 m.

Türk-Alman ormanı, 02/06/98 N. İkinci 1695-J. Ackerman. 1080 m. Same place, 02/06/97 N. İkinci 1164- A. Güner. Same place, 21/05/97 N. İkinci 1104-A. Güner (det. A. Güner).

Euro-Siberian element.

80- Sangulsorba L.

143- Sangulsorba minor Scop.

subsp. *muricata* (Spach) Briq.

Forest borders, 880-950 m.

On Karacasu-Gölcük Way, 24/06/97 N. İkinci 1269.

81- Alchemilla L.

144- Alchemilla pseudocartalinica Juz.

Damp meadows, 1200-1350 m.

From Lake to Temasa Tepesi, 20/07/97 N. İkinci 1463-Ö.Umut.

82- Rosa L.

145- Rosa canina L.

Mixed forests, open places and roadsides, 850-1250 m.

Above Karacasu Village, 11/09/97 N. İkinci 1637-M.Ünal. Around Lake,

11/10/98 N. İkinci 1799-O.İkinci. Quercus forests on Gölcük-Seben way, 10/06/97 N. İkinci 1183. Same place, 17/06/97 N. İkinci 1230-A. Güner. Same place, 01/07/97 N. İkinci 1364- A.Güner.

83- Mespilus L.

146- Mespilus germanica L.

Forest border, roadsides and open places, 850-1250 m.

Wheat fields on Karacasu-Gölcük way, 11/09/97 N. İkinci 1653-M.Ünal. Same place, 29/09/98 N. İkinci 1719-O.İkinci. Around lake, 11/10/98 N. İkinci 1786-O.İkinci. On Gölcük-Karacasu way, 02/06/97 N. İkinci 1158- A. Güner.

Hyrcano-Euxine element.

84- Crataegus L.

1 - Styles 4-5; fruit with (4)-5 pyrenes

C. orientalis

1 - Styles 1; fruit with 1 pyrene

2- Leaves 1-3 cm; fruit with erect sepals

C. microphylla

2- Leaves more than 3 cm; fruit with reflexed sepals

C. monogyna

147- Crataegus orientalis Pallas

var. **orientalis**

Forests, roadsides, 880-1000 m.

On Karacasu-Gölcük way, 11/09/97 N. İkinci 1645-M.Ünal. Above Karacasu Village, 24/06/97 N. İkinci 1304.

New record for A3.

148- Crataegus monogyna Jacq.

1 - Twigs, leaves and hypanthium glabrous

subsp. **monogyna**

1 - Twigs, leaves and hypanthium pubescent

subsp. **azarella**

subsp. **azarella** (Gris.) Franco

Forest-Field border, 850 - 950 m.

Fields on Karacasu-Gölcük way, 11/09/97 N. İkinci 1654-M.Ünal.

subsp. **monogyna**

Forest borders, roadsides, 870-1250 m.

On Gölcük-Karacasu Village, 29/09/98 N. İkinci 1746-O.İkinci. Around Lake, 11/10/98 N. İkinci 1783-O.İkinci. Same places, 25/05/97 N. İkinci 1119.

149- Crataegus microphylla C.Koch

Mixed forest borders, roadsides and open places, 850-1000 m.

Mixed forests on Gölcük-Karacasu way, 11/09/97 N. İkinci 1620-M.Ünal. Same places, 02/06/97 N. İkinci 1160 A. Güner. Same place, 29/09/98 N. İkinci 1745 O.İkinci. Above Karacasu Village, 11/09/97 N. İkinci 1638 M.Ünal.

Hyrcano-Euxine element.

85- Sorbus L.

150- Sorbus torminalis (L.) Crantz

var. **torminalis**

Mixed forests, forest borders, 870-1250 m.

On Gölcük-Karacasu way, 29/09/98 N. İkinci 1742-O.İkinci. Around lake,
11/10/98 N. İkinci 1819-O.İkinci. Same place, 11/10/98 N. İkinci 1817-O.İkinci.
Euro-Siberian element.

86- Malus Miller

151- Malus sylvestris Miller

subsp. **orientalis** (A. Uglitzkich) Browicz

var. **orientalis**

Open places, 1200-1250 m.

Around Lake, 11/10/98 N. İkinci 1843-O.İkinci. Same place, 11/09/97 N. İkinci
1677-M.Ünal. Same place, 27/08/97 N. İkinci 1613 -A.Güner.

87- Pyrus L.

152- Pyrus communis L.

subsp. **communis**

Forest border, 850-950 m.

On fields on Karacasu-Gölcük way, 11/09/97 N. İkinci 1665-M.Ünal.

153- Pyrus elaeagnifolia Pallas

subsp. **elaegnifolia**

On forest-field border, 850-950 m.

On Karacasu-Gölcük way, 11/09/97 N. İkinci 1656-M.Ünal.

28- Lythraceae

88- Lythrum L.

1- Inflorescence a compound spike composed of
3-8-flowered axillary cymes

L. salicaria

1- Flowers in the leaf axils, not forming clearly defined
inflorescences

L. hyssopifolia

154- Lythrum salicaria L.

Lake shores, damp places, 1200-1300 m.

Around lake, 11/10/98 N. İkinci 1804-O.İkinci. Same place, 08/07/97 N. İkinci
1393-B.Efeoglu.

Euro-Siberian element.

155- Lythrum hyssopifolia L.

Damp and open places, 850-950 m.

850 - 950 m, Acık alan, Petals purple, 11/09/97 N. İkinci 1648-M.Ünal.

29- Onagraceae

- 1- Sepals and petals 2
- 1- Sepals and petals 4

Circaea
Epilobium

89- **Circaea** L.

156- **Circaea lutetiana** L.

Wet and shady places, 1100 - 1250 m.

Around lake, 31/07/97 N. İkinci 1483 (det. A.Güner).

90- **Epilobium** L.

- 1- Lower leaves spirally arranged; flowers zygomorphic
- 1- Lower leaves opposite or whorled; flowers regular
- 2- Stems covered with long spreading hairs
- 2- Stems crisped hairy or glabrous

E. angustifolium

E. hirsutum

E. lanceolatum

157- **Epilobium angustifolium** L.

Roadsides, 1200 - 1300 m.

On Karacasu-Gölcük way, 08/07/97 N. İkinci 1375-B.Efeoglu.

158- **Epilobium hirsutum** L.

Lake shores, 1200-1250 m.

Around lake, 11/10/98 N. İkinci 1820-O. İkinci. Same place, 11/10/98 N. İkinci 1841-O. İkinci. Same place, 01/07/97 N. İkinci 1323 -A.Güner.

159- **Epilobium lanceolatum** Seb & Mauri

Abies forests, 1050 - 1100 m.

Turk- Alman ormanı, 01/07/97 N. İkinci 1348 A.Güner.

Epilobium algidum Bieb.

Ala Da., 1550 m.

30- Haloragidaceae

91- **Myriophyllum** L.

160- **Myriophyllum spicatum** L.

In water, 1250 m.

In lake, 02/06/98 N. İkinci 1700-N.Yaşar. Same place, 01/07/97 N. İkinci 1330-A.Güner.

31- Crassulaceae

92- **Sedum** L.

161- **Sedum pallidum** Bieb.

- 1- Sterile shoots absent
- 1- Sterile shoots present

var. **pallidum**
var. **bithynicum**

var. **bithynicum** (Boiss.)Chamberlain

Abies forests, roadsides, 1050-1100 m.

Karacasu-Gölcük way, 01/07/97 N. İkinci 1362- A.Güner. Same place,
01/07/97 N. İkinci 1363- A.Güner. Turk-Alman ormanı, 01/07/97 N. İkinci 1354
-A.Güner.

Euxine element.

var. **pallidum**

Open places and roadsides, 880-950 m.

On Karcasu-Gölcük way, 24/06/97 N. İkinci 1300.

32- Saxifragaceae

93- Saxifraga L.

162- Saxifraga cymbalaria L.

var. **cymbalaria**

Damp places, roadsides, 990-1140 m.

On Karcasu-Gölcük way, 10/06/97 N. İkinci 1202. Same places, 01/07/97 N.
İkinci 1366- A.Güner.

33- Apiaceae/Umbelliferae

1- Roots tuberous	Oenanthe
1- Roots not tuberous	
2- Stem purple spotted; plant aromatic	Conium
2- Characters not as above	
3- Leaves spiny	Eryngium
3- Leaves not spiny	
4- All leaves leaves simple	Bupleurum
4- Leaves compound	
5- Basal leaves 3-7 palmate	
6- Stem 15-60 cm	Sanicula
6- Stem longer than 60 cm.	Heracleum
5- Basal leaves 1-2-3 to 4 pinnate	
7- Leaves 1-pinnate	
8- Petals white	Pimpinella
8- Petals yellow	Pastinaca
7- Leaves 2- to many pinnate	
9- Plant densely villous	Laserpitium
9- Plant not as above	
10- Fruit rugulose, hard	Bifora
10- Fruit not as above	
11- Bracts absent, Leaves 3-4 pinnate	Anthriscus
11- Bracts 1-2 pinnatisect; leaves 2-3 pinnate	Daucus

94- Sanicula L.

163- Sanicula europaea L.

Abies forests, 1120 m.

Turk-Alman Ormanı, 21/05/97 N. İkinci 1102-A. Güner.

Euro-Siberian element.

95- Eryngium L.

- 1- Bracts linear-lanceolate to subulate, entire;
bracteoles entire

E. campestre

- 1- Bracts incised-spinose or spinulose margined;
bracteoles tricuspidate

- 2- Cauline leaves more than 2.5 cm broad;
capitula ovate to oblong, 10-25 mm diameter;
bracts 6-9, ovate-oblong

E. giganteum

- 2- Cauline leaves less than 2.5 cm broad; capitula
hemispherical, 6-10 mm diameter; bracts 5(-6),
lanceolate

E. bithynicum

164- Eryngium giganteum Bieb.

Open places and roadsides, 1240 m.

On Karcasu-Gölcük way, 12/08/98 N. İkinci 1706-O. İkinci.

Euxine element.

165- Eryngium bithynicum Boiss.

Open places and roadsides, 870-1000 m.

On Karcasu-Gölcük way, 29/09/98 N. İkinci 1737-O. İkinci. On Karcasu-Gölcük way, 31/07/97 N. İkinci 1472.

Endemic. Irano-Turanian element.

166- Eryngium campestre L.

var. **virens** Link

Roadsides, 850-950 m.

On Karcasu-Gölcük way, 13/08/97 N. İkinci 1598.

Endemic.

96-Anthriscus

167- Anthriscus nemorosa (Bieb.) Sprengel

Roadsides, 1000-1250 m.

On Karcasu-Gölcük way, 12/07/97 N. İkinci 1398-B.Efeoglu. On Karcasu-Gölcük way, 01/07/97 N. İkinci 1360 -A.Güner.

97- Bifora Hoffm.

168- Bifora radlans Bieb.

Open places and roadsides, 880-950 m.

On Karcasu-Gölcük way, 24/06/97 N. İkinci 1260.

98- Pimpinella L.

169- Pimpinella saxifraga L.

Open places, 1200-1250 m.

Around lake, 11/10/98 N. İkinci 1782 O. İkinci.

99- Oenanthe

1- Basal leaves 1-2 pinnate

1- Basal leaves 3-4 pinnate

O. fistulosa

O. silaifolia

170- Oenanthe fistulosa L.

Marshy ground, 850-900 m.

On Karcasu-Gölcük way, 16/07/97 N. İkinci 1437.

171- Oenanthe silaifolia Bieb.

Marshy ground, edges of lake, 1250 m.

Around lake, 01/07/97 N. İkinci 1322 -A.Güner.

On Karcasu-Gölcük way, 16/07/97 N. İkinci 1424.

100- Conium L.

172- Conium maculatum L.

Wet places, near water, 870-1250 m.

On Karcasu-Gölcük way, 29/09/98 N. İkinci 1731 -O. İkinci. Around lake,
01/07/97 N. İkinci 1325- A.Güner.

101- Bupleurum L.

1- Leaves broad, upper ones perfoliate

1- Leaves narrow, $\pm$ linear

B. rotundifolium

B. affine

173- Bupleurum rotundifolium L.

Fields, open places, 880-950 m.

On Karcasu-Gölcük way, 24/06/97 N. İkinci 1287.

174- Bupleurum affine Sadler

Open woods, roadsides, 850-950 m.

On Karcasu-Gölcük way, 13/08/97 N. İkinci 1590. Same places, 13/08/97 N.
İkinci 1598.

102- Pastinaca L.

175- Pastinaca sativa L.

subsp. **urens** (Req. ex Godron) Celak

Lake shores, roadsides, 1200-1300 m.

Around lake, 08/07/97 N. İkinci 1378-B.Efeoglu

103- Heracleum

176- Heracleum sphondylium L.

subsp. **ternatum** (Velen.) Brummitt

Wet places, 1200-1300 m.

Around lake, 08/07/97 N. İkinci 1386-B.Efeoglu (det. A.Güner).

New record for A3.

Euro-Siberian element.

104- Laserpitium L.

177- Laserpitium hispidum Bieb.

Edges of forests, 900-1000 m.

On Karcasu-Gölcük way, 31/07/97 N. İkinci 1477.

Euro-Siberian element.

Torilis leptophylla (L.) Reichb.
5 km S of Bolu

105- Caulalis L.

178- Caulalis platycarpus L.

Fields, roadsides and waste places, 850 - 900 m.

On Karcasu-Gölcük way, 16/07/97 N. İkinci 1420.

106- Daucus L.

179- Daucus carota L.

Open places, 1200-1250 m.

Around lake, 11/10/98 N. İkinci 1837-O.İkinci.

34- Araliaceae

107- Hedera L.

180- Hedera helix L.

Climbing over trees, 870-1250 m.

On Karcasu-Gölcük way, 29/09/98 N. İkinci 1720-O.İkinci. Over Abies trees
around lake, 03/10/97 N. İkinci 1681-A. Uçar.

35- Cornaceae

108- *Cornus* L.

- 1- Inflorescence a terminal cymose corymb; drupe spherical **C. sanguinea**
- 1- Inflorescence an axillary umbel; drupe elongate **C. mas**

181- *Cornus sanguinea* L.

- 1- Hairs on underside of leaf crisped, simple subsp. **sanguinea**
- 1- Hairs on underside of leaf straight, medifixed subsp. **australis**

subsp. **sanguinea**

Forest-field border, 850 - 950 m.

Fields on Gölcük-Karacasu way, 11/09/97 N. İkinci 1663-M.Ünal.

New record for A3.

subsp. **australis** (C. A. Meyer) Jaw.

Forest borders, 890-980 m.

10/06/97 N. İkinci 1185. 890 m, Açık alan, 17/06/97 N. İkinci 1227 A. Güner.

Euro-Siberian element.

182- *Cornus mas* L.

Broad-leaved forests, roadsides, 850-1250 m.

Mixed forests on Gölcük-Karacasu way, 06/10/98 N. İkinci 1762-E.İkinci.

Same places, 29/09/98 N. İkinci 1724-O.İkinci. Same places, 11/09/97 N. İkinci

1621 M.Ünal. Around lake, 11/10/98 N. İkinci 1809-O.İkinci.

Euro-Siberian element.

36- Caprifoliaceae

- 1- Leaves pinnate **Sambucus**
- 1- Leaves simple
- 2- Flowers in compound cymes **Viburnum**
- 2- Flowers in pairs **Lonicera**

109- *Sambucus* L.

- 1- Herbs **S. ebulus**
- 1- Shrubs or small trees **S. nigra**

183- *Sambucus ebulus* L.

Mixed forests and roadside banks, 870-1250 m.

On Karacasu-Gölcük way, 29/09/98 N. İkinci 1732-O.İkinci. Same places,

12/07/97 N. İkinci 1401-M.Erdoğan. 850 - 950 m, Wet places, 11/09/97 N. İkinci

1641-M.Ünal. Around lake, 11/10/98 N. İkinci 1814-O.İkinci.

Euro-Siberian element.

184- Sambucus nigra L.

Roadsides, 1060-1250 m.

On Karacasu-Gölcük way, 17/06/97 N. İkinci 1226-A. Güner. Around lake,
11/09/97 N. İkinci 1675 M.Ünal.

Euro-Siberian element.

110- Viburnum L.

185- Viburnum opulus L.

Forest edges, 990 - 1140 m.

Forests around Gölcük-Karacasu way, 10/06/97 N. İkinci 1201.

Euro-Siberian element.

111- Lonicera L.

186- Lonicera caucasica Pallas

subsp. **orientalis** (Lam.) Champ. & Long

Abies forest, 1060 m.

Türk-Alman ormanı, 17/06/97 N. İkinci 1225-A. Güner.

Endemic.

37- Rubiaceae

1- Corolla tube longer than lobes

2- Flowers in spikes, with 1 (-3) sessile flower in axil
of each bract

Crucianella

2- Flowers in cymose panicles or heads

3- Calyx 4-6 dentate, persisting in fruit

Sherardia

3-Calyx obsolete

4- Flowers sessile or with pedicels shorter than
ovary, ebracteolate

Gallium

4- Flowers with pedicels longer than ovary, bracteolate

Asperula

1- Corolla tube shorter than lobes

5- Leaves in whorls of 4

Cruciata

5- Leaves at least in whorls of 6

Gallium

112- Sherardia

187- Sherardia arvensis L.

Open forests, road margins, 810 m.

Above Karacasu village, 02/06/97 N. İkinci 1157 -A. Güner.

Mediterranean element.

113- Crucianella

188- Crucianella gilanica Trin

subsp. **pontica** (Ehrend.) Ehrend.

Roadsides, 850 - 900 m.

On Karacasu-Gölcük way, 16/07/97 N. İkinci 1428.

New record for A3.

Euxine element.

114- Asperula

- 1- Leaves 30-80 x 10-27 mm; flowers in dense capitate cymes; rhizome with orange subterranean runners
- 1- leaves smaller, to 10-25 x 3-7 mm ; flowers in less dense capitate to reduced cymes; rhizome different

A. taurina

A. involucrata

189- Asperula taurina L.

subsp. **taurina**

Abies forest, 1000-1250 m.

Abies forests around lake, 25/05/97 N. İkinci 1114. Same places, 25/05/97 N. İkinci 1139. Same places, 10/06/97 N. İkinci 1215.

190- Asperula involucrata Wahlenb.

Open places and roadsides, 810-950 m.

On Karacasu-Gölcük way, 24/06/97 N. İkinci 1279. On Karacasu-Gölcük way, 02/06/97 N. İkinci 1148 -A. Güner.

Euxine element.

115- Galium

- 1- Stem glabrous except for a rings of hairs at nodes
- 1- Stem completely glabrous, hairy or aculeolate
- 2- Fruit subglobose; leaves ± obtuse
- 2- Fruit ovoid; leaves often acute or with hyaline apex
- 3- Leaves discoloured, green above, pale glaucous-pruinose beneath
- 3- Leaves concolorous on both sides, glabrous-pruinose or green
- 4 Corolla golden-yellow
- 4 Corolla white

G. odoratum

G. palustre

G. paschale

G. verum

G. album

191- Galium odoratum (L.) Scop.

Abies forest, 1080-1120 m.

Türk-Alman Ormanı, 02/06/97 N. İkinci 1170- A. Güner. Same place, 21/05/97 N. İkinci 1096-A. Güner.

Euro-Siberian element.

192- Gallum palustre L.

Wet places, 1250 m.

Around lake, 01/07/97 N. İkinci 1340 -A.Güner.

Euro-Siberian element.

193- Gallum verum L.

subsp. **glabrescens** Ehrend

Open places and roadsides, 850-1250 m.

On Karacasu-Gölcük way, 16/07/97 N. İkinci 1429. Around lake, 11/10/98 N. İkinci 1821-O.İkinci.

Euro-Siberian element.

194- Gallum album Miller

subsp. **prusense** (C.Koch) Ehrend & Krendl

By roads, 1200 - 1300 m.

On Karacasu-Gölcük way, 08/07/97 N. İkinci 1390-B.Efeoglu. Near lake, 08/07/97 N. İkinci 1391-B.Efeoglu.

195- Gallum pashale Forsskal

Roadsides, 1200 - 1300 m.

Roads around lake, 08/07/97 N. İkinci 1383-B.Efeoglu.

Mediterranean element.

116- Cruciata

196- Cruciata laevipes Opiz

Openwoods and grasslands, 930-1140 m.

On Karacasu-Gölcük way, 10/06/97 N. İkinci 1195. On Karacasu-Gölcük way, 10/06/97 N. İkinci 1214.

Euro-Siberian element.

38- Valerianaceae

1 - Perennials; stems simple; calyx pappus like

1 - Annuals; stems branched; calyx various

Valeriana
Valerianella

117- Valeriana L.

197- Valeriana alliarifolia Adams

Wet places, Abies forests, 1200-1350 m.

Around lake, 02/06/98 N. İkinci 1701-N. Yaşar. Above Gölcük Lake, 20/07/97 N. İkinci 1462-Ö.Umut.

118- Valerianella Miller

198- Valerianella lasiocarpa (Stev.) Betsche

Meadows, 1150-1160 m.

Around lake, 06/05/97 N. İkinci 1052-A. Güner. On Karacasu-Gölcük way,
25/05/97 N. İkinci 1123.

Irano-Turanian element.

39- Dipsacaceae

- 1- Stem with prickles; receptacular bracts spine-tipped
- 1- Stem without prickles; receptacular bracts not spine-tipped
- 2- Corolla 4-fid; receptacle hairy
- 2- Corolla 5-fid; receptacle not hairy

Dipsacus

Knautia
Scabiosa

119- Dipsacus L.

199- Dipsacus laciniatus L.

Roadsides, banks, 1100 - 1250 m.

On Gölcük-Seben way, 31/07/97 N. İkinci 1486.

120- Knautia L.

- 1- Upper stem leaves pinnatisect
- 1- Upper stem leaves simple

K. degenii
K. byzantina

200- Knautia degenii Borbaş

Roadsides, 850 - 900 m.

On Karacasu-Gölcük way, 16/07/97 N. İkinci 1415.

Endemic.

Mediterranean element.

201- Knautia byzantina Fritsch

Roadsides, 850 - 900 m.

On Karacasu-Gölcük way, 16/07/97 N. İkinci 1414.

New record for A3. Endemic.

121- Scabiosa L.

- 1- Flowers cream or yellow
- 1- Flowers pink, lilac or bluish
- 2- Lower leaves simple or lyrate, rarely entire
- 2- Lower leaves pinnatisect

S. argentea

S. columbaria
S. atropurpurea

202- Scabiosa columbaria L.

subsp. **columbaria**

var. **columbaria**

Open places and roadsides, 850-950 m.

On Karacasu-Gölcük way, 06/10/98 N. İkinci 1769-E. İkinci. Same places,
16/07/97 N. İkinci 1416.

203- Scabiosa atropurpurea L.

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

Roadsides, open places, 850-1000 m.

On Karacasu-Gölcük way, 29/09/98 N. İkinci 1743-O.İkinci. Same places,
16/07/97 N. İkinci 1444.

204- Scabiosa argentea L.

Roadsides, 850 - 900 m.

On Karacasu-Gölcük way, 16/07/97 N. İkinci 1432.

40- Asteraceae/Compositae

- 1- Leaves or phyllaries spiny
- 2- Capitula unisexual, males terminally and female nearer base of shoots **Xanthium**
- 2- Capitula bisexual
- 3- Phyllaries terminating in hooked spines **Arctium**
- 3- Phyllaries terminating in a simple spine, not hooked spines
- 4- Stem winged
- 5- Receptacle long hairy or paleaceous
- 6- Receptacle long hairy **Carduus**
- 6- Receptacle paleaceous **Scolymus**
- 4- Stem unwinged
- 7- Corolla yellow or pale pink; appendage of phyllary ending in an at least 6 mm long spine **Centaurea**
- 7- Corolla light purple to purple; appendage of phyllary ending in an at most 2.5 mm long spine **Cirsium**
- 1- Neither leaves nor phyllaries spiny
- 8- Receptacle paleaceous
- 9- Achenes completely epappose **Achillea**
- 9- Achenes bearing a pappus
- 10- Achenes cylindrical, papillose; pappus hairs white **Filago**
- 10- Achenes coronate or bearing a pappus of scales
- 11- Phyllaries pluriserial, inner ones often bright pink to purple; pappus of 5 aristate-attenuate scales **Xeranthemum**
- 11- Phyllaries 3 or 5-6-seriate
- 12- Phyllaries 3-seriate, inner ones not coloured; pappus ± coronate **Anthemis**
- 12- Phyllaries 5-6-seriate, outer ones herbaceous **Telekia**
- 8- Receptacle naked, ciliate or ± hairy
- 13- Capitula heterogamous
- 14- Disc flowers yellow
- 15- Ligules whitish
- 16- Plant acaulescent, leaves rosulate; ligules often pinkish beneath **Bellis**
- 16- Plant caulescent, leaves not rosulate; ligules white beneath **Tripleurospermum**

- 15- Ligules yellow
- 17- Scapes bearing numerous purplish scales; leaves not developed at flowering time; capitula solitary **Tussilago**
- 17- Scapes without purplish scales; leaves developed at anthesis; capitula solitary or not
- 18- Phyllaries 3-5-seriate
- 19- Pappus consistinng of entirely of hairs; phyllaries 4-5 seriate **Inula**
- 19- Pappus absent; phyllaries 3-4 seriate
- 20- Achenes all $\pm$ alike; capitula few to numerous in corymbs, rarely solitary **Tanacetum**
- 20- Achenes dimorphic; capitula solitary at branch ends **Chrysanthemum**
- 18- Phyllaries 1-3-seriate
- 21- Stem eglandular hairy or glabrous, more than 1 capitulum; calycular bracts present; phyllaries 1-seriate **Senecio**
- 21- Stem glandular-hairy bearing a single capitulum; calycular bracts absent; phyllaries 2-3-seriate **Doronicum**
- 14- Disc flowers white, purplish or violet-purple or pink
- 22- Receptacle naked; phyllaries without a conspicuous appendage **Conyza**
- 22- Receptacle with smooth bristles; phyllaries with a conspicuous decurrent border of appendage **Centaurea**
- 13- Capitula homogamous
- 23- Capitula discoid
- 24- Phyllaries 1-seriate **Senecio**
- 24- Phyllaries pluriseriate **Helichrysum**
- 23- Capitula ligulate
- 25- Flowers blue **Cichorium**
- 25- Flowers yellow
- 26- Pappus absent from all achenes **Lapsana**
- 26- Pappus present at least in inner achenes
- 27- Beak absent
- 28- Pappus plumose **Leontodon**
- 28- Pappus consisting of simple smooth scabrous or barbellate hairs
- 29- All leaves spinulose-dentate **Sonchus**
- 29- All leaves not spinulose-dentate
- 30- Receptacle ciliate **Crepis**
- 30- Receptacle flat, pitted, margins of pits $\pm$ dentate, sometimes with $\pm$ long fimbriae
- 31- Plant stoloniferous; pappus hairs in 1 series, sacbrous and fragile **Pilosella**
- 31- Plant not stoloniferous; pappus hairs in 2 series, scabrous or barbellate but not fragile **Hieracium**
- 27- Beak present
- 32- Pappus plumose
- 33- Phyllaries pluriseriate **Leontodon**

33- Phyllaries 2-3-seriate	Tragopogon
32- Pappus consisting of simple smooth scabrous or barbellate hairs or cilia	
34- Receptacle ciliate	Crepis
34- Receptacle naked	
35- Capitula solitary on leafless scapes	Taraxacum
35- Capitula several to many on $\pm$ leafy scape	Lactuca

122- Xanthium L.

205- Xanthium spinosum L.

Mixed forests and roadsides, 850-1000 m.

Forests just above Karacasu, 11/09/97 N. İkinci 1628-M.Ünal. On Karacasu-Gölcük way, 29/09/98 N. İkinci 1727-O.İkinci.

123- Telekia Baumg.

206- Telekia speciosa (Schreber) Baumg.

Forest border, 1200 - 1350 m.

Above Gölcük, on Aladag way, 20/07/97 N. İkinci 1461 -Ö.Umut.
Euro-Siberian element.

124- Inula L.

207- Inula britannica L.

Moist grounds, 850-1250 m.

On Karacasu-Gölcük way, 29/09/98 N. İkinci 1711-O.İkinci. Same place,
13/08/97 N. İkinci 1589. Around lake, 11/10/98 N. İkinci 1784-O.İkinci.
Euro-Siberian element.

125- Helichrysum Gaertner

208- Helichrysum plicatum DC.

subsp. **plicatum**

Roadsides, 1200 - 1350 m.

On Karacasu-Gölcük way, 20/07/97 N. İkinci 1458 Ö.Umut.

126- Filago L.

209- Filago vulgaris Lam.

Abies forest, 1100 - 1250 m.

On Karacasu-Gölcük way, 31/07/97 N. İkinci 1478.

127- Conyza Less.

210- Conyza bonariensis (L.) Cronquist

Open places, roadsides, 900-1350 m.

On Karacasu-Gölcük way, 31/07/97 N. İkinci 1473.

Above Gölcük lake, 20/07/97 N. İkinci 1464.

New record for A3.

128- Bellis L.

211- Bellis perennis L.

Open and moist places, 850-1250 m.

Around lake, 11/10/98 N. İkinci 1775-O. İkinci. Same places, 03/05/97 N. İkinci 1045. Same places, 06/05/97 N. İkinci 1051-A. Güner.

Euro-Siberian element.

129- Doronicum L.

212- Doronicum orientale Hoffm.

Open places and Abies forests, 1120 m.

On Karacasu-Gölcük way, 21/05/97 N. İkinci 1090-A. Güner.

130- Senecio L.

1- Capitula discoid

1- Capitula radiate

2- Calycular bracts 8-10 mm, exceeding involucre

2- Calycular bracts 2-8 mm, shorter than involucre

S. vulgaris

S. nemorensis

S. vernalis

213- Senecio nemorensis L.

subsp. **nemorensis**

Damp places, 1100-1250 m.

Around lake, 11/09/97 N. İkinci 1670-M.Ünal. Same place, 31/07/97 N. İkinci 1480.

New record for A3.

Euro-Siberian element.

214- Senecio vulgaris L.

Meadows, open places and by roads,

On Karacasu-Gölcük way, 29/09/98 N. İkinci 1729-O. İkinci. Around lake, 03/05/97 N. İkinci 1048.

215- Senecio vernalis Waldst. & Kit.

Open places and roadsides, 850 - 950 m.

On Karacasu-Gölcük way, 11/09/97 N. İkinci 1623-M.Ünal.

131- Tussilago L.

216- Tussilago farfara L.

Wet places, 1250 m.

Around lake, 30/04/97 N. İkinci 1033-A. Güner. Same place, 30/04/97 N. İkinci 1030-A. Güner.

Euro-Siberian element.

132- Petasites Miller

217- Petasites hybridus (L.) Gaertner

Wet places, 1250 m.

Around lake, 30/04/97 1033-A. Güner.

Euro-Siberian element.

133- Anthemis L.

1- Achenes coronate, persistent on receptacle at maturity

1- Achenes ecoronate, persistent or not on receptacle at maturity

A. pseudocotula

A.coelopoda

218- Anthemis coelopoda Boiss.

var. **bourgaei** Boiss.

Roadsides, 850 - 950 m.

On Karacasu-Gölcük way, 13/08/97 N. İkinci 1591.

Anthemis tinctoria L.

var. **dioscoldea** (All.) DC.

Ala Da., 700 m.

219- Anthemis pseudocotula Boiss.

Foerst border, 850-1250 m.

Fields on Karacasu-Gölcük way, 11/09/97 N. İkinci 1661-M.Ünal. Same place, 29/09/98 N. İkinci 1734-O. İkinci. Around lake, 11/10/98 N. İkinci 1777-O. İkinci.

134- Achillea L.

220- Achillea nobilis L.

subsp. **neilreichii** (Kerner) Formanek

Roadsides, open places, 880-950 m.

Karacasu-Gölcük way, 24/06/97 N. İkinci 1290.

Euro-Siberian element.

135- Chrysanthemum L.

221- Chrysanthemum segetum L.

Roadsides, 1200 - 1300 m.

Karacasu-Gölcük way, 08/07/97 N. İkinci 1381 B.Efeoglu.

Mediterranean element.

New record for A3.

136- Tanacetum L.

222- Tanacetum armenum (DC.) Schultz Bip.

Ala Dağ. 1300 m.

137- Tripleurospermum Schultz Bip.

223- Tripleurospermum tenuifolium (Kit.) Freyn

Meadows and open places, 930-1250 m.

Around lake, 02/06/98 N. İkinci 1702-N. Yaşar.Karacas-Gölcük way, 10/06/97

N. İkinci 1181.

Euro-Siberian element.

138- Arctium L.

224- Arctium minus (Hill) Bernh.

subsp. **minus**

Roadsides, 1100 - 1250 m.

Around lake, 31/07/97 N. İkinci 1499.

139- Cirsium Miller

1- Median caulline leaves with large auricles

1- Median caulline leaves without auricles

C.hypoleucum

C. arvense

225- Cirsium arvense (Desf.) DC.

1- Leaves ± glabrous above and bellow

1- Leaves tomentose bellow, sparsely aracnoid above

subsp. **arvense**

subsp. **vestitum**

subsp. **arvense**

Roadsides, 1100 - 1250 m.

Karacasu-Gölcük way, 31/07/97 N. İkinci 1479.

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

Fields, 870 - 1000 m.

Fields on Karacasu-Gölcük way, 29/09/98 N. İkinci 1739-O.İkinci

226- Cirsium hypoleucum DC.

Open places, 880 - 950 m.

Karacasu-Gölcük way, 24/06/97 N. İkinci 1249.

Euxine element.

140- Carduus L.

227- Carduus acanthoides L.

subsp. **acanthoides**

Roadsides, 850-1300 m.

Karacasu-Gölcük way, 16/07/97 N. İkinci 1439. Above Gölcük lake, 08/07/97 N. İkinci 1389-B.Efeoglu. Karacasu-Gölcük way, 13/08/97 N. İkinci 1599. Karacasu-Gölcük way, 13/08/97 N. İkinci 1600.

Euro-Siberian element.

141- Centaurea L.

1- Phyllaries spiny

2- Petals yellow

2- Petals pink

1- Phyllaries not spiny

C. solstitialis

C. iberica

C. stenolepis

228- Centaurea solstitialis L.

subsp. **solstitialis**

Roadsides, 850- 1350 m.

Karacasu-Gölcük way, 16/07/97 N. İkinci 1435. Karacasu-Gölcük way, 06/10/98 N. İkinci 1767-E.İkinci. Around lake, 20/07/97 N. İkinci 1455- Ö.Umut.

229- Centaurea iberica Trev.

Open places, 870 - 1000 m.

Karacasu-Gölcük way, 29/09/98 N. İkinci 1754 O.İkinci. Same place, 16/07/97 N. İkinci 1449.

230- Centaurea stenolepis Kerner

Forest openings, 1000 m.

Türk-Alman Ormanı, 11/09/97 N. İkinci 1642-M.Ünal.

Euro-Siberian element.

142- Xeranthemum L.

231- Xeranthemum annum L.

Open places, 870 - 1000 m.

Karacasu-Gölcük way, 29/09/98 N. İkinci 1726-O.İkinci. Karacasu-Gölcük way, 16/07/97 N. İkinci 1406.

143- Scolymus L.

232- Scolymus hispanicus L.

Open places, 850 - 950 m.

06/10/98 N. İkinci 1761-E.İkinci. Karacasu-Gölcük way, 16/07/97 N. İkinci 1450.

144- Cichorium L.

233- Cichorium intybus L.

Open places, 850 - 1000 m.

Karacasu-Gölcük way, 29/09/98 N. İkinci 1753-O. İkinci. Karacasu-Gölcük way, 06/10/98 N. İkinci 1765-E. İkinci.

145- Tragopogon L.

234- Tragopogon pratensis L.

subsp. **pratensis**

Wet places, 1250 m.

Around lake, 01/07/97 N. İkinci 1320- A.Güner.

New record for A3.

Euro-Siberian element.

146- Leontodon L.

1 - Achenes fusiform but not beaked; leaves with an indumentum of forked hairs

L. hispidus

1 - Achenes tapering to a distinct beak; leaves indumentum of 3- or more branched or stellate hairs

L. crispus

235- Leontodon hispidus L.

subsp. **hispidus**

Open places, 880-1000 m.

Karacasu-Gölcük way, 11/09/97 N. İkinci 1617-M.Ünal. Same place 24/06/97 N. İkinci 1252.

Euro-Siberian element.

236- Leontodon crispus Vill.

subsp. **asper** (Waldst. & Kit) Rohl.

var. **asper**

Roadsides, open places, 880 - 950 m.

Karacasu-Gölcük way, 24/06/97 N. İkinci 1251.

147- Sonchus L.

237- Sonchus asper (L.)

subsp. **glaucescens** (Jordan) Ball

Abies forest, roadsides, 1200-1300 m.

Above Gölcük Lake, 08/07/97 N. İkinci 1371-B.Efeoglu. Turk-Alman ormanı, 01/07/97 N. İkinci 1347- A.Güner. Around Lake, 08/07/97 N. İkinci 1392-B.Efeoglu.

148- Hieracium L.

238- Hieracium ovalifrons (Woronow & Zah) Juxip

Abies forest, 1060 m.

Turk-Alman Ormanı, 17/06/97 N. İkinci 1220-A. Güner.

Endemic.

New record for A3.

Euxine element.

149- Pilosella Hill

1- Flowering stems scabose, each with 1 capitulum

P. hoppeana

1- Flowering stems scabose or leafy at least one stem
with more than 1 capitulum

P. piloselloides

239- Pilosella piloselloides (Vill) Sojak

subsp. **piloselloides**

Open places, roadsides, 880 - 950 m.

Karacasu-Gölcük way, 24/06/97 N. İkinci 1253.

240- Pilosella hoppeana (Schultes) C.H. & F. W. Schultz

subsp. **trilca** (Zahn) Sell & West

Roadsides, 880 - 950 m.

Karacasu-Gölcük way, 24/06/97 N. İkinci 1270.

150- Lactuca L.

1- Inflorescence paniculiform; achenes with long conspicuous
whitish hair

L. serriola

1- Inflorescence spiciform; achenes without long conspicuous
whitish hair

L. saligna

241- Lactuca saligna L.

Open places and roadsides, 850 - 1000 m.

Karacasu-Gölcük way, 29/09/98 N. İkinci 1718-O. İkinci. Same place, 13/08/97
N. İkinci 1593. Same place, 13/08/97 N. İkinci 1594

242- Lactuca serriola L.

Roadsides, 1050-1300 m.

Karacasu-Gölcük way, 01/07/97 N. İkinci 1367-A. Güner. Around lake,
08/07/97 N. İkinci 1388-B. Efeoglu.

Euro-Siberian element.

151- Lapsana L.

243- Lapsana communis L.

subsp. **alpina** (Boiss. & Bal.) Sell

Open places, 1200 - 1250 m.

Around lake, 11/10/98 N. İkinci 1790 O. İkinci.

Euxine element.

152- Taraxacum Wiggers

1- Achenes reddish

T. buttleri

1- Achenes straw-colored

2- Achenes up to 3,5 mm long (incl. cone)

T. aznavourii

2- Achenes 5 mm long (incl. cone)

T. turcicum

244- Taraxacum aznavourii van Soest.

Meadows, open places, 870-1240.

Karacasu-Gölcük way, 29/09/98 N. İkinci 1736 O. İkinci. Around lake, 06/05/97 N. İkinci 1053-A. Güner.

Endemic.

245- Taraxacum buttleri van Soest

Roadsides, 850 - 950 m.

Karacasu-Gölcük way, 06/10/98 N. İkinci 1760-E. İkinci.

246- Taraxacum turcicum van Soest

Open places, 850 - 950 m.

Karacasu-Gölcük way, 13/08/97 N. İkinci 1586.

New record for A3.

Endemic.

153- Crepis L.

247- Crepis foetida L.

subsp. **foetida**

Meadows, fields, 850-1250 m.

Around lake, 12/07/97 N. İkinci 1402-M. Erdoğan. Karacasu-Gölcük way, 16/07/97 N. İkinci 1442.

41- Campanulaceae

1- Corolla divided nearly to base

Asyneuma

1- Corolla campanulate, cylindrical or infundibular

2- Corolla usually rotate, limb flat

Legousia

2- Corolla usually not rotate, campanulate

Campanula

154- Campanula L.

1- Plant glabrous; leaves linear lanceolate, acuminate

C. persicifolia

1- Plant shortly pubescent or hispid-setose; leaves ovate to oblong, sometimes ovate-lanceolate

2- Plant shortly pubescent or glabrous; inflorescence secund

C. rapunculoides

2- Plant hispid-setose; inflorescence not secund

3- Flowers sessile, erect in dense axillary clusters and terminal head, rarely with only terminal head

C. glomerata

3- Flowers pedicellate, 1-4 axillary or at apex of branches

C. trachelium

248- Campanula rapunculoides L.

1- Median cauline leaves ovate with obtuse base; corolla 2-2.5(-3) cm

subsp. **rapunculoides**

1- Median cauline leaves deeply cordate; corolla 1-2.3 cm

subsp. **cordifolia**

subsp. **rapunculoides**

Open places, roadsides, 1200-1250 m.

Karacasu-Gölcük way, 11/10/98 N. İkinci 1789 O. İkinci. Same place, 11/10/98 N. İkinci 1830-O. İkinci. Same place, 11/10/98 N. İkinci 1785-O. İkinci. Above lake, 20/07/97 N. İkinci 1451 -Ö. Umut.

Euro-Siberian element.

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

Roadsides, 1090 m.

Karacasu-Gölcük way, 27/08/97 N. İkinci 1602- A.Güner.

249- Campanula trachelium L.

subsp. **athoa** (Boiss. & Heldr.) Hayek

Meadows, 1200 - 1300 m.

Around lake, 08/07/97 N. İkinci 1379-B.Efeoglu.

New record for A3.

250- Campanula glomerata L.

subsp. **hispidula** (Witasek) Hayet

Roadsides, 1200 - 1300 m.

Above lake, 08/07/97 N. İkinci 1377-B.Efeoglu.

Euro-Siberian element.

251- Campanula persicifolia L.

Wet places, roadsides, 900-1100 m.

Karacasu-Gölcük way, 02/06/98 N. İkinci 1704-N. Yaşar. Same place, 01/07/97 N. İkinci 1357 -A.Güner.

Euro-Siberian element.

155- Asyneuma Griseb. & Schenk

252- Asyneuma limonifolium (L.) Janchen

subsp. **limonifolium**

Roadsides, 850 - 900 m.

Karacasu-Gölcük way, 16/07/97 N. İkinci 1407.

156- Legousia Durande

253- Legousia pentagonia (L.) Thellung

Open places, roadsides, 880-1140 m.

Karacasu-Gölcük way, 10/06/97 N. İkinci 1205. Same place, 24/06/97 N. İkinci

1315.

Mediterranean element.

42- Ericaceae

1- Plants without chlorophyll; leaves all cauline,
not separable into petiole and lamina

Monotropa

1- Plants with chlorophyll; leaves mainly basal,
separable into petiole and lamina

2- Flowers solitary; leaves opposite or whorled

Moneses

2- Flowers in racemes; leaves alternate

3- Raceme not secund

Pyrola

3- Raceme secund

Orthilla

157- Pyrola L.

254- Pyrola chlorantha Swartz

Abies forest, 1100 - 1250 m.

Türk-Alman ormanı, 31/07/97 N. İkinci 1491.

158- Orthilla Rafin.

255- Orthilla secunda (L.) House

Abies forests, 1050-1250 m.

Türk-Alman ormanı, 11/10/98 N. İkinci 1792-O. İkinci. Same place, 01/07/97 N.
İkinci 1350 -A.Güner.

159- Moneses salisb.

256- Moneses uniflora (L.) A. Gray

Abies forests, wet places, 1050 m.

Abies forests on Karacasu-Gölcük way, 02/06/98 N. İkinci 1692-J. Ackerman.

160- Monotropa L.

257- Monotropa hypopithys L.

Abies forests, 1100 - 1250 m.

Turk-Alman ormani, 31/07/97 N. İkinci 1492.

43- Primulaceae

1 - Plant with tuber; leaves cordate, purple beneath; petiole at least 8 cm

Cyclamen

1 - Plant without tuber; leaves linear lanceolate, ovate to oblong ovate; petiole at most 4 cm

2- Perennial; cauline leaves absent; corolla yellow

Primula

2- Annual; cauline leaves present; corolla blue, red or reddish-purple

3- Leaves alternate; flowers in racemes, corolla redish-purple

Lysimachia

3- Leaves opposite; flowers axillary; corolla blue or red

Anagallis

161- Primula L.

258- Primula vulgaris Huds.

subsp. **vulgaris**

Abies forests, 1250 m.

Abies forests around lake, 30/04/97 N. İkinci 1039-A. Güner. Same places, 06/05/97 N. İkinci 1071-A. Güner.

Euro-Siberian element.

162-Cyclamen L.

259- Cyclamen coum Miller

var. **coum**

Abies forests, 1240 m.

Abies forests around lake, 06/05/97 N. İkinci 1072-A. Güner. Same places, 30/04/97 N. İkinci 1042-A. Güner.

163- Lysimachia L.

1 - Inflorescence paniculate, calyx margin brownish-red

L. vulgaris

1 - Inflorescence whorled, calyx margin green

L. verticillaris

260- Lysimachia vulgaris L.

Wet and shady places, 1200 - 1250 m.

Around lake, 03/10/97 N. İkinci 1679-A. Uçar.

261- Lysimachia verticillaris Sprengel

Roadsides, wet places, 1050-1250 m.

Around lake, 31/07/97 N. İkinci 1498. On Gölcük-Karacasu way, 01/07/97 N. İkinci 1368- A.Güner. Same places, 01/07/97 N. İkinci 1317-A.Güner. Same places, 11/09/97 N. İkinci 1673-M.Ünal. Turk-Alman ormanı, 01/07/97 N. İkinci 1352 -A.Güner.

Hyrcano-Euxine element.

162- Anagallis L.

1 - Pedicels shorter than or as long as subtending leaves;
corolla blue

A. foemina

1 - Pedicels longer than subtending leaves; corolla red

A. arvensis

262- Anagallis arvensis L.

var. **arvensis**

Open places, 850 - 1000 m.

On Gölcük-Karacasu way, 13/08/97 N. İkinci 1585. On Gölcük-Karacasu way, 29/09/98 N. İkinci 1713-O.İkinci.

263- Anagallis foemina Miller

Open places, roadsides, 870-1250 m.

Around lake, 31/07/97 N. İkinci 1496. On Gölcük-Karacasu way, 29/09/98 N. İkinci 1712-O.İkinci.

Mediterranean element.

44- Oleaceae

163- Ligustrum L.

264- Ligustrum vulgare L.

Open places, forest borders, 870-1000 m.

On Gölcük-Karacasu way, 29/09/98 N. İkinci 1721 O.İkinci. Same place, 11/09/97 N. İkinci 1646-M.Ünal. Same place, 24/06/97 N. İkinci 1316.

Euro-Siberian element.

45- Gentianaceae

1 - Corolla pink

Centaurium

1 - Corolla blue

Gentiana

164- Centaurium Hill

265- Centaurium erythraea Rafn

subsp. **erythraea**

Abies forest, 970 m.

Turk-Alman ormanı, 27/08/97 N. İkinci 1603- A.Güner.

165- Gentiana L.

266- Gentiana asclepladea L.

Roadsides, 1250 - 1300 m.

Above lake, 11/09/97 N. İkinci 1618-M.Ünal.

Euro-Siberian element.

46- Convolvulaceae

1 - Bracteoles large; corolla at least 55 mm

1 - Bracteoles small; corolla at most 25 mm

Calystegia
Convolvulus

166- Convolvulus L.

267- Convolvulus arvensis L.

Roadsides, open places, 880-980 m.

On Gölcük-Karacasu way, 10/06/97 N. İkinci 1191. Same place, 24/06/97 N. İkinci 1310.

167- Calystegia R. Br.

268- Calystegia silvatica (Kit) Griseb.

Open places and roadsides, 880 - 950 m.

On Gölcük-Karacasu way, 24/06/97 N. İkinci 1305.

47- Cuscutaceae

168- Cuscuta L.

1 - Flowers usually 4-merous; style + stigma usually shorter than ovary

C. europaea

1 - Flowers usually 5-merous; style + stigma usually equaling or longer than ovary

2- Flowers 1.5-2.5 mm, sessile; inflorescence 3-6 mm diam.

C. planiflora

2- Flowers 2.5-4 mm, subsessile or sessile; inflorescence 5-10 mm diam.

C. epithymum

269- Cuscuta europaea L.

On herbs and shrubs, 850 - 900 m.

On Gölcük-Karacasu way, 16/07/97 N. İkinci 1448.

270- Cuscuta epithymum (L.) L.

var. **epithymum**

On Sambucus ebulus, 850-1200 m.

On Gölcük-Karacasu way, 13/08/97 N. İkinci 1592. Around lake, L. 27/08/97 N. İkinci 1607-A.Güner.

271- Cuscuta planiflora Ten.

Abies forest, on herbs, 970 m.

Türk-Alman ormanı, 27/08/97 N. İkinci 1604 -A.Güner.

New record for A3.

48- Boraginaceae

- | | |
|--|---------------------|
| 1- Corolla throat glabrous, smooth, with tufts or a zone of hairs | |
| 2- Anthers ± sagittate to hastate | |
| 3- Plant glabrous or subglabrous | Cerinthe |
| 3- Plant hispid with patent to adpressed setae | Onosma |
| 2- Anthers simple | |
| 4- Plant with ± soft adpressed hairs; style bearing a depressed- to elongate- conical stigmatic cone | Heliotropium |
| 4- Plant adpressed- to patent-setulose or hispidsetose; style not bearing a conical stigmatic cone | |
| 5- Corolla throat with 5 longitudinal bands or hairs; stamens equal, inserted below middle of corolla tube | Buglossoides |
| 5- Corolla tube with tufts of hairs or an annulus at base; stamens unequal, inserted at different levels in tube | Echium |
| 1- Corolla throat with well developed appendages | |
| 6- Flowers nodding at anthesis; scales in two series of 5; filaments hairy at base | Trachystemon |
| 6- Flowers erect at anthesis; scales in one series of 5; filaments glabrous at base | |
| 7- Faucal scales penicillate | Anchusa |
| 7- Faucal scales not penicillate | |
| 8- Plant with rhizome; flowers bracteate | Lithospermum |
| 8- Plant without rhizome; flowers ebracteate | |
| 9- Corolla whitish, pink, deep pink or maroon; nutlets glochidiate | Cynoglossum |
| 9- Corolla bright blue; nutlets smooth | Myosotis |

169- Heliotropium L.

272- Heliotropium europaeum L.

On field border, 850 - 950 m.

On Gölcük-Karacasu way, 11/09/97 N. İkinci 1657 M.Ünal.

Mediterranean element.

Heliotropium suaveolens Bieb.

Foothills of Ala da., 700 m.

170- Myosotis L.

273- Myosotis lithospermifolia (Willd.) Hornem.

Dry open places, 1150 - 1160 m.

On Gölcük-Karacasu way, 25/05/97 N. İkinci 1124.

171- Cynoglossum L.

1 - Corolla whitish or pale blue with deep blue reticulate venation

1 - Corolla dark purple, concolorous

C. creticum
C. officinale

274- Cynoglossum officinale L.

Abies forest, roadsides, 1080-1160 m.

On Gölcük-Karacasu way, 25/05/97 N. İkinci 1128.

Türk-Alman ormanı, 02/06/97 N. İkinci 1165 -A. Güner.

Euro-Siberian element.

275- Cynoglossum creticum Miller

Roadsides, 810 m.

On Gölcük-Karacasu way, 02/06/97 N. İkinci 1145 -A. Güner.

172- Lithospermum L.

276- Lithospermum purpureocaeruleum L.

Quercus forest, 910 m.

On Gölcük-Karacasu way, 21/05/97 N. İkinci 1084-A. Güner

Euro-Siberian element.

173- Buglossoides Moench

277- Buglossoides arvensis (L.) Johnston

Roadsides, 990 - 1140 m.

On Gölcük-Karacasu way, 10/06/97 N. İkinci 1207.

174- Echium L.

1 - Corolla intensely blue; filaments blue

1 - Corolla pale blue, lilac, pinkish or whitish; filaments pale brown to orange

E. vulgare

E. italicum

278- Echium italicum L.

Roadsides, 850-1250 m.

On Gölcük-Karacasu way, 16/07/97 N. İkinci 1438. Same places, 31/07/97 N. İkinci 1495.

Mediterranean element.

279- Echium vulgare L.

Roadsides and open places, 990-1250 m.

Around lake, 11/10/98 N. İkinci 1797-O. İkinci. Same places, 11/10/98 N. İkinci 1831-O. İkinci. Same places, 11/10/98 N. İkinci 1836 O. İkinci. Same places, 11/09/97 N. İkinci 1667-M. Ünal. On Gölcük-Karacasu way, 10/06/97 N. İkinci 1203. Around lake, 01/07/97 N. İkinci 1339- A. Güner.

Euro-Siberian element.

175- Onosma L.

280- Onosma tauricum Pallas

var. **tauricum**

Roadsides, 850 - 900 m.

On Gölcük-Karacasu way, 16/07/97 N. İkinci 1446.

176- Cerinthe L.

281- Cerinthe minor L.

1 - Pedicels glabrous

1 - Pedicels scabrous to hispidulous

subsp. **minor**

subsp. **auriculata**

subsp. **minor**

Meadows, open places, 1050 m.

On Gölcük-Karacasu way, 02/06/98 N. İkinci 1691-J. Ackerman.

New record for A3.

Euro-Siberian element.

subsp. **auriculata** (Ten.) Domac

Roadsides, open places, 880 - 950 m.

On Gölcük-Karacasu way, 24/06/97 N. İkinci 1280.

177- Trachystemon D. Don

282- Trachystemon orientalis (L.) G. Don

Abies forests, by roads, 1250 m.

Around lake, 30/04/97 N. İkinci 1034-A. Güner. Same places, 06/05/97 N.

İkinci 1073-A. Güner

Euxine element.

178- Anchusa L.

1 - Plant strigulose to canescent-strigulose, without
tubercled based hairs; corolla blue with white throat

1 - Plant hispid to strigose, often with tubercled based hairs;
corolla violet to blue

A. leptophylla

A. azurea

283- Anchusa leptophylla Roemer & Schultes

subsp. **leptophylla**

Roadsides, 930 - 980 m.

On Gölcük-Karacasu way, 10/06/97 N. İkinci 1192.

284- Anchusa azurea Miller

var. **azurea**

Roadsides, 850-980 m.

On Gölcük-Karacasu way, 16/07/97 N. İkinci 1433.

Same places, 10/06/97 N. İkinci 1196.

49- Solanaceae

- 1- Fruit a capsule
- 1- Fruit a berry
- 2- Corolla campanulate; anthers not connivent
- 2- Corolla rotate; anthers connivent

Datura

Atropa
Solanum

179- Solanum L.

285- Solanum nigrum L.

subsp. **schultesii** (Opiz) Wessely

Fields, 870 - 1000 m.

On Gölcük-Karacasu way, 29/09/98 N. İkinci 1750-O.İkinci.

180- Atropa L.

286- Atropa belladonna L.

Abies forests and open places, 1060-1250 m.

Around lake, 11/10/98 N. İkinci 1824-O.İkinci. Same place, 11/09/97 N. İkinci

1674-M.Ünal. Turk-Alman ormanı, 17/06/97 N. İkinci 1219-A. Güner.

Euro-Siberian element.

181- Datura L.

287- Datura stramonium L.

Waste places, roadsides, 850 - 950 m.

On Gölcük-Karacasu way, 06/10/98 N. İkinci 1770-E.İkinci. On Gölcük-

Karacasu way, 16/07/97 N. İkinci 1404.

50- Scrophulariaceae

- 1- Herbs lacking chlorophyll, wholly parasitic; leaves reduced to fleshy scales
- 1- Green herbs or subshrubs with chlorophyll; leaves neither scale-like nor fleshy
- 2- Fertile stamens 2
- 2- Fertile stamens more than 2
- 3- Corolla actinomorphic
- 4- Corolla rotate, yellow; fertile stamens 5
- 4- Corolla with $\pm$ inflated tube, maroon; fertile stamens 4
- 3- Corolla zygomorphic
- 5- Corolla pink or reddish-purple
- 5- Corolla white or yellow

Lathraea

Veronica

Verbascum

Scrophularia

Odontites

Digitalis

182- Verbascum L.

- 1- Plant without branched hairs; hairs simple or plant glabrous

V. blattaria

- 1- Plant at least in part with branched hairs

- 2- Anthers of two anterior (lower) stamens elongate,
longitudinally inserted, anthers of 3 posterior (upper)
stamens reniform, transversely medifixed
2- Anthers all reniform, transversely medifixed

V. thapsus
V. mucronatum

288- Verbascum blattaria L.

Waste places, roadsides, 1200 - 1250 m.

Lake entrance, 11/10/98 N. İkinci 1781-O.İkinci (det. A. Güner).

289- Verbascum thapsus L.

Roadsides, open places, 880 - 950 m.

On Gölcük-Karacasu way, 24/06/97 N. İkinci 1312.

New record for A3.

290- Verbascum mucronatum Lam.

Roadsides, 1050-1200 m.

On Gölcük-Karacasu way, 02/06/98 N. İkinci 1697-J. Ackerman. Around lake,
10/06/97 N. İkinci 1175.

Mediterranean element.

New record for A3.

183- Scrophularia L.

- 1- Median leaves undivided, though often toothed
1- Median leaves pinnatifid to 3-pinnatisect

S. scopolii
S. canina

291- Scrophularia scopolii [Hoppe ex] Pers.

var. **scopolii** ,

Roadsides, 1120 m.

On Gölcük-Karacasu way, 21/05/97 N. İkinci 1089-A. Güner.

292- Scrophularia canina L.

subsp. **bicolor** (Sm.)Greuter

Roadsides, open places, 880-980 m.

On Gölcük-Karacasu way, 10/06/97 N. İkinci 1199. On Gölcük-Karacasu way,
24/06/97 N. İkinci 1271.

Mediterranean element.

184- Digitalis L.

294- Digitalis ferruginea L.

subsp. **ferruginea**

Roadsides and open places, 1200-1350 m.

Around lake, 11/10/98 N. İkinci 1793-O.İkinci. Same place, 20/07/97 N. İkinci
1453- Ö.Umut.

Euro-Siberian element.

185- Veronica L.

1- Annual

2- Flowers borne singly in leaf axils

V. triloba

2- Flowers in terminal or lateral racemes or spikes

3- Main shoot and branches with 1 terminal or

2-3 pseudo-terminal racemes or spikes

V. bozokmanii

3- Main shoot and branches with lateral
racemes only

V. anagallis-aquatica

1- Perennial

4- Stem ending in a terminal raceme, or flowers borne
singly in leaf axils

V. persica

4- Stem with 1 or more lateral racemes

5- Leaves glabrous

V. anagallis-aquatica

5- Leaves puberulent, pubescent or tomentose

6- Leaf margin slightly revolute

V. jacquinii

6- Leaf margin flat

V. chamaedrys

294- Veronica bozakmanii M.A. Fischer

Abies forest, 1080 m.

Turk-Alman ormani, 02/06/97 N. İkinci 1169 -A. Güner.

Irano-Turanian element.

295- Veronica persica Poiret

Open places, meadows, 1240 m.

Around lake, 06/05/97 N. İkinci 1054-A. Güner. Same place, 06/05/97 N. İkinci

1055-A. Güner.

296- Veronica triloba (Opiz) Kerner

Wet places, 1250 m.

Around lake, 30/04/97 N. İkinci 1031-A. Güner.

297- Veronica anagallis-aquatica L.

Wet places, 1200 - 1300 m.

Around lake, 08/07/97 N. İkinci 1385-B.Efeoglu.

298- Veronica chamaedrys L.

Abies forest, 1120 m.

Turk-Alman ormani, 21/05/97 N. İkinci 1095-A. Güner.

Euro-siberian element.

299- Veronica jacquinii Baumg.

Roadsides and open places, 880 - 950 m.

On Gölcük-Karacasu way, 24/06/97 N. İkinci 1297.

Euro-Siberian element.

186- Odondites Ludwig

300- Odontites verna (Bellardi) Dumort.

Abies forest, 1200 m.

Turk-Alman ormani, 27/08/97 N. İkinci 1605-A.Güner.

Euro-siberian element.

187- Lathraea L.

301- Lathraea squamaria L.

Abies forests, 900-1200 m.

Turk-Alman ormani, 25/05/97 N. İkinci 1111. Same place, 01/07/97 N. İkinci 1341 -A.Güner. Same place, 31/07/97 N. İkinci 1476.

51- Orobanchaceae

188- Orobanche L.

1 - Flowers with each 1 bract and 2 bracteoles;
gamosepalous

O. nana

1 - Flowers with each 1 bract only, lacking bracteoles
calyx divided into two lateral halves

O. minor

302- Orobanche nana Noë

Abies forest, near Asperula, 1050-1100 m.

Turk-Alman ormani, 01/07/97 N. İkinci 1345 -A.Güner.

New record for A3.

303- Orobanche minor Sm.

Abies forest, 1050 - 1100 m.

Turk-Alman ormani, 01/07/97 N. İkinci 1349 -A.Güner.

52- Verbenaceae

189- Verbena L.

304- Verbena officinalis L.

Open places, 1200 - 1300 m.

Around lake, 11/10/98 N. İkinci 1823-O. İkinci. Same place, 08/07/97 N. İkinci 1384-B.Efeoglu.

53- Labiatae/Lamiaceae

1 - Upper part of calyx with a rounded, scale-like appendage

Scutellaria

1 - Calyx not as above

2 - Upper lip of corolla much reduced or absent

3 - Upper lip of corolla reduced, usually very short;

lower lip 3-lobed, corolla tube with a ring of hairs inside

Ajuga

3 - Upper lip of corolla absent, lower lip 5-lobed, corolla tube
without a ring of hairs inside

Teucrium

- 2- Upper lip of corolla present or corolla with 4 subequal lobes
 - 4- Corolla 4 subequal lobes
 - 5- Verticillasters globose, dense, many flowered, small, remote; corolla white with small dark purple spots; fertile stamens 2 **Lycopus**
 - 5- Verticillasters many flowered, forming a long spike like inflorescence or a terminal head; corolla lilac rarely white; fertile stamens 4 **Mentha**
 - 4- Corolla bilabiate
 - 6- Fertile stamens 2 **Salvia**
 - 6- Fertile stamens 4
 - 7- Style-branches distinctly unequal
 - 8- Calyx tube 11-veined; corolla at least 25 mm **Calamintha**
 - 8- Calyx tube 13-veined; corolla up to 20 mm **Clinopodium**
 - 7- Style-branches equal or subequal
 - 9- Calyx throat glabrous
 - 10- Anther theca hairy **Lamium**
 - 10- Anther theca glabrous
 - 11- Bracteoles present
 - 12- Plant stoloniferous; corolla deep yellow **Galeobdolon**
 - 12- Plant not stoloniferous; corolla sometimes cream but not yellow **Stachys**
 - 11- Bracteoles absent
 - 13- Calyx throat closed in fruit when dry; filaments with a subulate appendage below the apex **Prunella**
 - 13- Calyx throat open; filaments without an appendage **Stachys**
 - 9- Calyx throat hairy
 - 14- Leaves usually basally ciliate **Thymus**
 - 14- Leaves without basal cilia
 - 15- Verticillasters aggregated into spicules, spicules ovoid, oblong or prismatic, forming a corymb; bracts imbricate usually hiding individual calyces or verticillasters **Origanum**
 - 15- Verticillasters not as above; bracts not hiding individual calyces or verticillasters **Stachys**

190- Ajuga L.

305- Ajuga reptans L.

Mixed forest, 910 m.

On Gölcük-Karacasu way, 21/05/97 1086. Same place, 21/05/97 N. İkinci

1085-A. Güner.

Euro-Siberian element.

191- Teucrium L.

- 1- Stem white, grey lanuginose-tomentose; verticillasters forming a globose head; corolla whitish
- 1- Stem green, hairy or shortly villous; flowers borne in axils of upper leaves or in raceme; corolla pink or mauve cuneate at base

T. pollium

T. chamaedrys

306- Teucrium chamaedyris L.

subsp. **chamaedyris**

Roadsides, 850-1250 m.

Around lake, 12/07/97 N. İkinci 1400-M.Erdoğan. Same place, 27/08/97 N.

İkinci 1611 -A.Güner. On Gölcük-Karacasu way, 16/07/97 N. İkinci 1434.

Euro-Siberian element.

307- Teucrium pollium L.

Roadsides, 850 - 900 m.

On Gölcük-Karacasu way, 16/07/97 N. İkinci 1431.

192- Scutellaria L.

308- Scutellaria galericulata L.

Wet places, 1100-1250 m.

Around lake, 11/09/97 N. İkinci 1666-M.Ünal. Same place, 31/07/97 N. İkinci 1494.

193- Lamium L.

1- Annual

1- Perennial

2-Corolla white or cream

2- Corolla purplish or pink

L. purpureum

L. leucolophum

L. maculatum

309- Lamium purpureum L.

var. **purpureum**

Damp places, 1250 m.

Around lake, 30/04/97 N. İkinci 1026-A. Güner.

310- Lamium maculatum L.

var. **maculatum**

Abies forest, 1200 m.

Around lake, 25/05/97 N. İkinci 1115.

New record for A3.

Euro-Siberian element.

311- Lamium leucolophum Hausskn.

Meadows, 1240 m.

Around lake, 06/05/97 N. İkinci 1056-A. Güner.

Endemic. New record for A3.

194- Galeobdolon Hudson

312- Galeobdolon luteum Hudson

subsp. **montanum** (Pers.) R.Mill

Abies forest, roadsides, 1180-1240 m.

Around lake, 17/06/97 N. İkinci 1235-A. Güner. On Gölcük-Karacasu way.

25/05/97 N. İkinci 1137.

Euro-Siberian element.

195- Stachys L.

1- Corolla creamy yellow

1- Corolla purple

S. annua

S. byzantina

313- Stachys byzantina C.Koch

Roadsides, 850-950 m.

On Gölcük-Karacasu way, 16/07/97 N. İkinci 1423. Same place, 13/08/97 N.

İkinci 1588.

Euro-Siberian element.

314- Stachys annua (L.) L.

subsp. **annua**

var. **lycaonica** Bhattacharjee

Abies forest, 1050 m.

Türk-Alman ormanı, 02/06/98 N. İkinci 1689 J. Ackerman.

Irano-Turanian element.

196- Prunella L.

1- Stem or leaves glabrous or hairy; corolla violet-purple

1- Stem and leaves hispid; corolla white

P. vulgaris

P. laciniata

315- Prunella vulgaris L.

Abies forest, 1050 - 1250 m.

Türk-Alman ormanı, 01/07/97 N. İkinci 1353-A.Güner.

Euro-Siberian element.

316- Prunella laciniata (L.) L.

Open places and roadsides, 880 - 950 m.

On Gölcük-Karacasu way, 24/06/97 N. İkinci 1244.

Euro-Siberian element.

197- Origanum L.

317- Origanum vulgare L.

subsp. **vulgare**

Roadsides, 850 - 900 m.

On Gölcük-Karacasu way, 16/07/97 N. İkinci 1426.

Euro-Siberian element.

198- Calamintha Miller

318- Calamintha grandiflora (L.) Moench

By roads, 1000 - 1050 m.

On Gölcük-Karacasu way, 01/07/97 N. İkinci 1358 -A.Güner.

Euro-Siberian element.

199- Clinopodium L.

319- Clinopodium vulgare L.

1- Corolla 11-20 mm; calyx 7-12 mm; verticillasters
dense

subsp. **vulgare**

1- Corolla 7-10 mm; calyx 5-7.5 mm; verticillasters
± spreading

subsp. **arundanum**

subsp. **vulgare**

Open places and roadsides, 880 - 950 m.

On Gölcük-Karacasu way, 24/06/97 N. İkinci 1268.

subsp. **arundanum** (Boiss.) Nyman

Roadsides, 1050 - 1100 m.

On Gölcük-Karacasu way, 01/07/97 N. İkinci 1359- A.Güner.

200- Thymus L.

320- Thymus longicaulis C. Presl

subsp. **longicaulis**

var. **subisophyllus** (Barbas) Jalas

Open places, and roadsides, 880 - 950 m.

On Gölcük-Karacasu way, 24/06/97 N. İkinci 1242.

201- Mentha L.

1- Calyx hairy in throat, with distinctly unequal teeth

M. pulegium

1- Calyx glabrous in throat, with ± equal teeth

2- Cauline leaves broadest at or below middle, green
or grey; spikes compact, usually much branched

M. longifolia

2- cauline leaves broadest below middle, green and
glabrous; spikes interrupted below, little branched

M. spicata

321- Mentha pulegium L.

Damp places, 870-1000 m.

On Gölcük-Karacasu way, 29/09/98 N. İkinci 1709 O. İkinci. Same places,
31/07/97 N. İkinci 1471.

322- Mentha longifolia (L.) Hudson

subsp. **longifolia**

Marshes, 1200 - 1250 m.

Around lake, 11/10/98 N. İkinci 1813-O. İkinci.

New record for A3.

subsp. **typhoides** (Briq.)Harley

var. **typhoides**

Damp places, 850 - 900 m.

On Gölcük-Karacasu way, 16/07/97 N. İkinci 1441.

323- Mentha spicata L.

1 - Plant glabrous or hairy; cauline leaves 35-75 mm long
and over 12 mm broad; spike 40-80 mm

subsp. **spicata**

1 - Plant always hairy; cauline leaves 30-38 mm long and
under 12 mm broad; spike 70-110 mm

subsp. **tomentosa**

subsp. **spicata**

Wet places, 850 - 950 m.

On Gölcük-Karacasu way, 06/10/98 N. İkinci 1766-E. İkinci.

subsp. **tomentosa** (Briq.7)Harley

Wet places, 870 - 1000 m.

Wet places, 29/09/98 N. İkinci 1740-O. İkinci.

202- Lycopus L.

324- Lycopus europaeus L.

Damp and open places, 1100-1250 m.

Around lake, 11/10/98 N. İkinci 1808-O. İkinci. Same place, 31/07/97 N. İkinci
1488. Same place, 27/08/97 N. İkinci 1610- A.Güner.

Euro-Siberian element.

203- Salvia L.

1 - Upper lip of corolla straight

1 - Upper lip of corolla falcate

S. tomentosa

S. forskahlei

325- Salvia tomentosa Miller

Open places, 900 - 1000 m.

On Gölcük-Karacasu way, 31/07/97 N. İkinci 1474.

Mediterranean element.

326- Salvia forskahlei L.

Roadsides, 850 - 900 m.

On Gölcük-Karacasu way, 16/07/97 N. İkinci 1430.

Euxine element.

54- Plantaginaceae

204- *Plantago* L.

1 - Scape 5-sulcate; keel of posterior sepal hairy; leaves lanceolate

P. lanceolata

1 - Scape not sulcate, with 1-celled hairs; leaves elliptic

P. major

327- *Plantago major* L.

1 - Leaves 5-9-veined, $\pm$ cordate at base, thick, dark green, glabrescent

subsp. *major*

1 - Leaves 3-5-veined, gradually narrowed into petiole, thin, yellowish green, puberulent

subsp. *intermedia*

subsp. *major*

Open places, 1200 - 1250 m.

Around lake, 11/10/98 N. İkinci 1806-O. İkinci.

subsp. *intermedia* (Gilib) Lange

Roadsides, 1100 - 1250 m.

On Gölcük-Karacasu way, 31/07/97 N. İkinci 1482.

328- *Plantago lanceolata* L.

Open places and roadsides, 870 - 1000 m.

On Gölcük-Karacasu way, 29/09/98 N. İkinci 1728-O. İkinci. Same place, 24/06/97 N. İkinci 1274. Around lake, 11/10/98 N. İkinci 1772-O. İkinci. Same places, 25/05/97 N. İkinci 1133.

55- Thymelaeaceae

205- *Daphne*

329- *Daphne pontica* L.

Mixed forest, 910 m.

On Karacasu-Gölcük way, 21/05/97 N. İkinci 1080-A. Güner.

Euxine element.

56- Loranthaceae

206- *Viscum*

330- *Viscum album* L.

subsp. *abietis* (Wiesb.) Abromeit

On Abies and Pyrus trees, 850 - 950 m.

On Karacasu-Gölcük way, 11/09/97 N. İkinci 1650-M. Ünal. Around lake, 31/07/97 N. İkinci 1497.

57- Aristolochiaceae

1 - Perianth of two equal persistent lobes; stamens 12, free; ovary hemispherical

Asarum

- 1- Perianth zygomorphic with a unilaterally expanded limb, deciduous; stamens 6, adnate to style; ovary elongate

Aristolochia

207- Asarum L.

331- Asarum europaeum L.

Abies forest, 1200 m.

Around lake, 25/05/97 N. İkinci 1113.

Euro-Siberian element.

208- Aristolochia L.

- 1- Perianth tube ± straight or slightly bent above utricle, but not U-curved

- 1- Perianth tube U-curved

A. pallida
A. pontica

332- Aristolochia pallida Willd.

Quercus forests, 910 m.

On Karacasu-Gölcük way, 21/05/97 N. İkinci 1077-A. Güner.

333- Aristolochia pontica Lam.

Damp shady places, 1200 m.

Around lake, 25/05/97 N. İkinci 1118.

Euxine element.

58-Euphorbiaceae

- 1- Flowers without a perianth, consisting of stamens and ovaries, several male flowers and a female flower being enclosed in each glanduliferous involucre; latex present

- 1- Flowers with perianth, not involucre; latex absent

Euphorbia
Mercurialis

209- Mercurialis L.

334- Mercurialis perennis L.

Damp places, Abies forests, 1240 m.

Around lake, 17/06/97 N. İkinci 1236-A. Güner.

Euro-Siberian element.

210- Euphorbia L.

- 1- Perennial

- 1- Annual

- 2- Seeds smooth; axillary rays 1-3; fruit tuberculate

- 2- Seeds variously ornamented or sculptured; axillary ray 0-3(-4); fruit smooth

E. amygdaloides

E. stricta

E. helioscopia

335- Euphorbia stricta L.

Roadsides, 1000 m.

On Karacasu-Gölcük way, 02/06/97 N. İkinci 1159 -A. Güner.

Euro-Siberian element.

336- Euphorbia helioscopia L.

Open places, roadsides, 810-1240 m.

Around lake, 06/05/97 N. İkinci 1070-A. Güner. On Karacasu-Gölcük way,
02/06/97 N. İkinci 1153 -A. Güner. Same places, 24/06/97 N. İkinci 1281.

Euphorbia aleppica L.

Ala Da., 700 m.

Euphorbia falcata L. subsp. falcata var. falcata

Ala Da., 700 m.

Euphorbia seguieriana Necker

subsp. *niciana* (Borbas ex Novak) Rech.

Ala Da., 700 m.

337- Euphorbia amygdaloides L.

var. **amygdaloides**

Abies forest, 1080-1245 m.

Around lake, 30/04/97 N. İkinci 1041-A. Güner. Turk-Alman ormanı,
02/06/97 N. İkinci 1167 -A. Güner.

Euro-Siberian element.

59- Buxaceae

211- Buxus L.

338- Buxus sempervirens L.

Mixed forest, 1000 m.

On Karacasu-Gölcük way, 11/09/97 N. İkinci 1644-M.Ünal.

Euro-Siberian element.

60- Urticaceae

212- Urtica L.

339- Urtica dioica L.

Open places, 890 m.

On Karacasu-Gölcük way, 17/06/97 N. İkinci 1232-A. Güner.

Euro-Siberian element.

61- Ulmaceae

213- Ulmus L.

340- Ulmus minor Miller

subsp. **minor**

Road sides, open places, 870-1000 m.

On Karacasu-Gölcük way, 29/09/98 N. İkinci 1725-O. İkinci. Same place,
11/09/97 N. İkinci 1619-M.Ünal.

62- Fagaceae

1- Buds fusiform; male flowers in long stalked pendent heads; nuts triangular ovoid

Fagus

1- Buds ovoid; male flowers in pendent catkins; nuts oblong, cylindrical, subglobose or ovoid

Quercus

214- **Fagus L.**

341- **Fagus orientalis** Lipsky

Mixed forests, by roads, 870-1000 m.

On Karacasu-Gölcük way, 10/06/97 N. İkinci 1198. Same places, 29/09/98 N. İkinci 1733-O. İkinci.

Euro-Siberian element.

215- **Quercus L.**

1- Peduncle prominent, (2-)4-12 cm

Q. robur

1- Peduncle absent, or to 5 mm

2- Leaves densely stellate-pubescent beneath

Q. pubescens

2- Leaves with a ± thin indumentum beneath

Q. petraea

342- **Quercus robur L.**

1- Leaves sessile

1- Leaves with a distinct petiole to 2 cm

subsp. **robur**

subsp. **pedunculiflora**

subsp. **robur**

Scattered in the deciduous forest, 850 - 1000 m.

On Karacasu-Gölcük way, 11/09/97 N. İkinci 1635-M.Ünal . Same place, 29/09/98 N. İkinci 1749-O. İkinci. Same place, 29/09/98 N. İkinci 1755-O. İkinci.

Euro-Siberian element.

subsp. **pedunculiflora** (C.Koch) Menitsky

Scattered in the deciduous forest, 900 - 1000 m.

Above Karacasu village, 22/07/97 N. İkinci 1468.

New record for A3.

Irano-Turanian element.

343- **Quercus petraea** (Mattuschka) Liebl.

subsp. **iberica** (Steven ex Bieb.) Krassiln

Mixed forest, 850-1000 m.

On Karacasu-Gölcük way, 11/09/97 N. İkinci 1662-M.Ünal. Same place, 29/09/98 N. İkinci 1748-O. İkinci. Same place, 29/09/98 N. İkinci 1752-O. İkinci . Same place, 29/09/98 N. İkinci 1757-O. İkinci.

344- **Quercus pubescens** Willd.

Mixed forest, 850-950 m.

Above Karacasu village, 06/10/98 N. İkinci 1768-E. İkinci.

63- Corylaceae

- 1- Nuts in clusters of 1-8, each cupped by a leafy lacerate involucre; leaves bidentate

Corylus
Carpinus

- 1- Nuts in pendent spikes, involucre not as above; leaves biserrate

216- *Carpinus* L.

345- *Carpinus betulus* L.

Quercus forests, open places and roadsides, 870-1000 m.

Around lake, 06/05/97 N. İkinci 1050-A. Güner. On Karacasu-Gölcük way, 11/09/97 N. İkinci 1614-M. Ünal. Same places, 29/09/98 N. İkinci 1735-O. İkinci.

Euro-Siberian element.

217- *Corylus* L.

- 1- Involucre shorter or slightly longer than nut

C. avellana
C. columna

- 1- Involucre much longer than nut, divided almost to base

346- *Corylus columna* L.

Quercus forest, 850 - 950 m.

On Karacasu-Gölcük way, 06/10/98 N. İkinci 1771 E. İkinci.

Euro-Siberian element.

347- *Corylus avellana* L.

var. **avellana**

Forest-Field border, 850-1000 m.

On Karacasu-Gölcük way, 31/07/97 N. İkinci 1469. Same places, 11/09/97 N. İkinci 1652-M. Ünal.

Euro-Siberian element.

64- Betulaceae

218- *Alnus* Miller

348- *Alnus glutinosa* (L.) Gaertner

subsp. **glutinosa**

Deciduous forest, damp places, by streams, 870-1250 m.

On Karacasu-Gölcük way, 29/09/98 N. İkinci 1722-O. İkinci. On Karacasu-Gölcük way, 29/09/98 N. İkinci 1723-O. İkinci. Around lake, 11/10/98 N. İkinci 1787-O. İkinci. Same place, 03/10/97 N. İkinci 1682-A. Uçar. Same place, 11/10/98 N. İkinci 1815-O. İkinci. Same places, 30/04/97 N. İkinci 1032-A. Güner.

Euro-Siberian element.

65- Salicaceae

- 1- Buds with a single outer scale; bracts entire

Salix

- 1- Buds with several outer scales; bracts dentate or fimbriate

Populus

219- Salix L.

1- Leaves opposite or subopposite, subsessile or petioles to 3 mm, oblanceolate

S. amplexicaulis

1- Leaves alternate, ± distinctly petiolate, usually widest at or below middle

2- Lower surface of leaves white-tomentose or sericeous, densely hairy, upper glabrous or weakly pubescent; leaves usually narrowly lanceolate or linear

S. elaeagnos

2- Lower surface of leaves glabrous or pubescent, never sericeous or white-tomentose; leaves lanceolate or broader

3- Leaves less than 2.5 x as long as broad, dark green above, glaucous below, glabrous or hairy only on midrib beneath

S. caucasica

3- Leaves usually more than twice as long as broad, dark green and glabrous above, softly grey-tomentose below

S. caprea

349- Salix caucasica Anderson

Lake shores, 1200 - 1250 m.

Around lake, 11/10/98 N. İkinci 1842-O. İkinci.

Euxine element.

New record for A3.

350- Salix caprea L.

Lake shores, Abies forest, 1250 m.

Around Lake, 30/04/97 N. İkinci 1025-A. Güner. Same place, 30/04/97 N.

İkinci 1029-A. Güner. On Karacasu-Gölcük way, 02/06/98 N. İkinci 1696-J.

Ackerman. Turk-Alman ormanı, 21/05/97 N. İkinci 1094-A. Güner.

Euro-Siberian element.

351- Salix elaeagnos Scop.

Lake shores, 1200 - 1250 m.

Around lake, 11/09/97 N. İkinci 1672-M. Ünal.

Euro-Siberian element.

352- Salix amplexicaulis Bory & Chaub.

Lake shores and streamsides, 900 - 1250 m.

On Karacasu-Gölcük way, 02/06/98 N. İkinci 1699-N. Yaşar. Around lake, 02/06/98 N. İkinci 1693-J. Ackerman.

Mediterranean element.

220- Populus L.

353- Populus tremula L.

Lake shores, by roads, 1200 - 1250 m.

Around lake, 11/09/97 N. İkinci 1671-M. Ünal. Same place, 01/07/97 N. İkinci 1333-A. Güner. Same places, 11/10/98 N. İkinci 1838-O. İkinci.

Euro-Siberian element.

66- Butomaceae

221-Butomus L.

354- Butomus umbellatus L.

Lake shores, in shallow water, 1200 - 1250 m.

Around lake, 11/10/98 N. İkinci 1807-O. İkinci. Same place, 01/07/97 N. İkinci 1336 -A.Güner.

Euro-siberian element.

67- Alismataceae

222- Alisma L.

355- Alisma plantago-aquatica L.

Lake, shores, 1200 - 1250 m.

Around lake, 11/10/98 N. İkinci 1810-O. İkinci. Same place, 20/07/97 N. İkinci 1459- Ö.Umut.

Euro-Siberian element.

68- Potamogetonaceae

223- Potamogeton L.

1- Floating leaves present

1- All leaves submerged

P. natans
P. gramineus

356- Potamogeton natans L.

Lake, 1250 m.

Gölcük Lake, 01/07/97 N. İkinci 1328- A.Güner.

357-Potamogeton gramineus L.

Lake, 1250 m.

Gölcük Lake, 01/07/97 N. İkinci 1329 -A.Güner.

69- Araceae

224-Arum L.

358- Arum euxinum R. Mill

Deciduous forest, 910 m.

On Karacasu-Gölcük way, 21/05/97 N. İkinci 1082-A. Güner.

Endemic. Euxine element.

70- Lemnaceae

225- Lemna L.

359- Lemna minor L.

Ala da. above Bolu, 1200 m.

71- Liliaceae

- | | |
|--|---------------------|
| 1- Plant in flower without stem or peduncle above ground; ovary subterranean | Colchicum |
| 1- Plant in flower with stem or peduncle appearant above ground | |
| 2- Flowers white with a green fascia outside | Ornithogalum |
| 2- Flowers not white, if white without a green fascia outside | |
| 3- Flowers in an umbel; umbel subtended by 1 or 2 spathe-like bracts | Allium |
| 3- Flowers solitary, or in racemes, panicles or cymes; bracts present or absent but not spathe-like | |
| 4- Flowering stems or peduncles bearing leaves or leaf-like bracts | |
| 5- Perianth segments united into cylindrical tube with short free lobes; flowers axillary; fruit a berry | Polygonatum |
| 5- Perianth segments free to base; flowers or inflorescence terminal; fruit a capsule | |
| 6- Flowers erect or ascending, yellow; perianth segments 1-2 cm; | Gagea |
| 6- Flowers pendent, greenish-yellow; perianth campanulate; perianth segments 2-4 cm | Fritillaria |
| 4- Flowering stems or peduncles leafless, bracts (if present) not leaf-like; leaves basal, perianth blue or purple | Scilla |

226- *Polygonatum* Miller

360- *Polygonatum orientale* Desf.

Mixed forests, roadsides, 850-1170 m.

On Karacasu-Gölcük way, 02/06/97 N. İkinci 1163-A. Güner. Same place, 11/09/97 N. İkinci 1630-M.Ünal.

Euxine element.

227- *Allium* L.

1- Pedicels distinctly unequal; umbel lax

A. paniculatum

1- Pedicels subequal or slightly unequal; umbel dense

A. pallens

361- *Allium paniculatum* L.

subsp. **paniculatum**

Quercus forest, 850 - 950 m.

Above Karacasu Village, 13/08/97 N. İkinci 1587. Same place, 11/09/97 N. İkinci 1625-M.Ünal.

Mediterranean element.

362- *Allium pallens* L.

subsp. **pallens**

Roadsides, 1200 - 1350 m.

Above Gölcük Lake, 20/07/97 N. İkinci 1457- Ö.Umut.

New record for A3. Mediterranean element.

228- Scilla L.

363- Scilla bifolia L.

Open places, Abies forest, 900-1250 m.

Around lake, 06/05/97 N. İkinci 1066-A. Güner. Same place, 06/05/97 N. İkinci 1065 A. Güner. On Karacasu-Gölcük way, 30/04/97 N. İkinci 1035-A. Güner.

Mediterranean element.

229- Ornithogalum L.

1 - Leaves with ciliate margins lower surface pilose

1 - Leaf margins and surfaces totally glabrous

O. fimbriatum

O. oligophyllum

364-Ornithogallum oligophyllum E.D.Clarke

Abies forest, 1200 m.

Around lake, 25/05/97 N. İkinci 1108.

365- Ornithogalum fimbriatum Wild.

Open places, 1240 m.

Around lake, 06/05/97 N. İkinci 1059-A. Güner.

Mediterranean element.

230- Fritillaria L.

366- Fritillaria pontica Wahlenb.

Quercus forest, 910 m.

Above Karacasu village, 21/05/97 N. İkinci 1074-A. Güner.

Euro-Siberian element.

231- Gagea Salisb.

367- Gagea taurica Steven

Open places and meadows, 1240 m.

Around lake, 03/05/97 N. İkinci 1047.

Irano-Turanian element.

232- Colchicum L.

368- Colchicum umbrosum Steven

Open places, 850 - 950 m.

On Karacasu-Gölcük way, 11/09/97 N. İkinci 1647-M.Ünal.

Euxine element.

72- Iridaceae

1 - Plant with rhizome; flowers yellow

1 - Plant with corm; flowers pink or purple

Iris
Crocus

233- Iris L.

369- Iris sintenisli Janka in Term.

Open places, 890 m.

On Karacasu-Gölcük way, 17/06/97 N. İkinci 1233-A. Güner.

Euro-Siberian element.

234- Crocus L.

1- Flowers produced in autumn

C. speciosus

1- Flowers produced in spring

C. biflorus

370- Crocus biflorus Miller

subsp. **pulchricolor** (Herbert) Mathew

Open places, 1240 m.

Around Lake, 03/05/97 N. İkinci 1046.

Endemic. Euro-Siberian element.

371- Crocus speciosus Bieb.

subsp. **speciosus**

Open places, 1200 - 1250 m.

Around lake, 11/10/98 N. İkinci 1816-O. İkinci. Same places, 03/10/97 N. İkinci 1680 A. Uçar.

73- Orchidaceae

1- Plants with leaves reduced to sheaths, lacking chlorophyll

Neottia

1- Plants with green leaves

2- Labellum divided by lateral incisions into basal half and distal half

Cephalanthera

2- Labellum entire or lobed

3- Plants with 1 or 2 basal leaves

Platanthera

3- Plant with numerous leaves

4- Labellum with 2 longitudinal parallel ridges at base

Anacamptis

4- Labellum without ridges at base

5- Spur less than 0.5 x ovary; middle lobe of labellum strap-shaped, spirally twisted, to 10 cm, apex split into 2 segments

Himantoglossum

5- Spur c. 0.5-2 x ovary; labellum not as above

6- Emerging spike enclosed by spathe-like

leaves; all bracts membranous; tubers undivided

Orchis

6- Emerging spike not enclosed by spathe-like

leaves; lower bracts herbaceous; tubers divided **Dactylorhiza**

235- Neottia Guettard

372- Neottia nidus-avis (L.) L.C.M. Richard

Abies forest, 990-1200 m.

On Gölcük Karacasu way, 25/05/97 N. İkinci 1110. Same places, 10/06/97 N. İkinci 1200.

Euro-Siberian element.

236- Cephalanthera L.C.M. Richard

1- Flowers rose; ovary $\pm$ pubescent

C. rubra

1- Flowers white or creamy; ovary glabrous

2- Flowers pure white rather small; leaves narrow,

$\pm$ alternate and distichous

C. longifolia

2- Flowers creamy-white, large; leaves broad,
not distichous

C. damasonium

373- Cephalanthera rubra (L.) L.C.M. Richard

Abies and mixed forests, 880 - 1100 m.

On Gölcük Karacasu way, 24/06/97 N. İkinci 1306. Same places, 24/06/97 N.

İkinci 1307. Turk-Alman Ormanı, 01/07/97 N. İkinci 1344 A.Güner.

376- Cephalanthera longifolia (L.) Fritsch in Öst

Deciduous forests, 910 m.

On Gölcük Karacasu way, 21/05/97 N. İkinci 1075-A. Güner.

Euro-Siberian element.

377- Cephalanthera damasonium (Miller) Druce

Deciduous forests, 930 - 980 m.

On Gölcük-Karacasu way, 10/06/97 N. İkinci 1177.

Euro-Siberian element.

236- Platanthera L.C.M. Richard

378- Platanthera chlorantha (Custer) Reichb

Deciduous forests, 930 - 980 m.

10/06/97 N. İkinci 1178.

237- Himantoglossum W. D. Koch

379- Himantoglossum caprinum (Bieb.) Sprengel

Open Quercus woodland and scrub, grassy edges of forests, 850 - 900 m.

On Gölcük-Karacasu way, 16/07/97 N. İkinci 1436.

Euxine element.

238- Anacamptis L.C.M. Richard

380- Anacamptis pyramidalis (L.) L.C.M. Richard

Roadsides, 850 - 900 m.

On Gölcük-Karacasu way, 16/07/97 N. İkinci 1409 .

239- Orchis L.

1- Spur curving upwards, equaling ovary

O. mascula

1- Spur clearly directed downwards, c. 0.5 x ovary

O. purpurea

381- Orchis purpurea Hudson

Edges of deciduous forests and Abies forests, 930-1150 m.

Around lake, 02/06/98 N. İkinci 1688-J. Ackerman. On Gölcük-Karacasu way, 20/06/97 N. İkinci 1179.

Euro-Siberian element.

382- Orchis mascula (L.) L.

subsp. **pinetorum** (Boiss. & Kotschy) G. Camus

Edges of deciduous forests and Abies forests, 910 m.

On Gölcük-Karacasu way, 21/05/97 N. İkinci 1076 A. Güner.

Mediterranean element.

240- Dactylorhiza Necker ex Nevski

1- Leaves always unspotted

D. incarnata

1- Leaves usually spotted

2- Leaves mostly ± heavily spotted; labellum usually distinctly 3-lobed at apex

D. urvilleana

2- Leaves usually with smaller roundish spots, mainly concentrated towards apex; labellum subentire or shallowly lobed at apex

D. nischalkorum

383- Dactylorhiza urvilleana (Steudel) Baumann & Künkele

Abies forests, shady places, 1240 m.

Around Lake, 02/06/98 N. İkinci 1698-N. Yaşar.

Euxine element. New record for A3.

384- Dactylorhiza nischalkorum H. Bauman & Künkele

Wet and open places, Abies forests, 880- 1250 m.

Around Lake, 31/07/97 N. İkinci 1501. On Gölcük-Karacasu way, 24/06/97 N. İkinci 1308.

Endemic.

385- Dactylorhiza incarnata (L.) Soo

Wet and open places, Abies forests, 1200- 1300 m.

Above Gölcük Lake, 08/07/97 N. İkinci 1380-B.Efeoglu.

74- Dioscoreaceae

241- Tamus L.

386- Tamus communis L.

subsp. **communis**

Roadsides, 890 m.

On Gölcük-Karacasu way, 17/06/97 N. İkinci 1238-A. Güner.

75- Typhaceae

242- Typha

387- Typha latifolia L.

Lake shores, 1200 - 1250 m.

Around lake, 03/10/97 N. İkinci 1683-A. Uçar.

76- Juncaceae

1- Leaves not ciliate; capsule many-seeded

Juncus

1- Leaves ciliate, at least when young; capsule 3-seeded

Luzula

243- Juncus L.

388- Juncus effusus L.

Damp places, 1200-1250 m.

Gölcük Lake, 11/10/98 N. İkinci 1839-O. İkinci. Same place, 01/07/97 N. İkinci 1327- A.Güner.

244- Luzula DC.

389- Luzula forsteri (Sm.)DC.

Abies forest, 1200 m.

around Lake, 25/05/97 N. İkinci 1116 (det. A.Güner).

Euro-siberian Element.

77- Cyperaceae

1- All leaves reduced to bladeless sheaths

Eleocharis

1- All leaves with well-developed lamina

2- Perianth present

Scirpus

2- Perianth absent

Carex

245- Eleocharis R. Br.

1- Stylopodium longer than broad, conical-ovoid or $\pm$ bulbiform **E. palustris**

1- Stylopodium as broad as or broader than long, mitriform **E. mitracarpa**

390- Eleocharis palustris (L.)Roemer & Schultes

Lake shores, 1250 m.

Gölcük lake, 01/07/97 N. İkinci 1335- A.Güner.

391- Eleocharis mitracarpa Steudel

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

246- Scirpus L.

392- Scirpus sylvaticus L.

Marshes, meadows, 1200 - 1250 m.

Gölcük Lake, 11/09/97 N. İkinci 1676-M.Ünal. Same place, 01/07/97 N. İkinci 1324- A.Güner.

247- Carex L.

1- Spikes bisexual, sessile, $\pm$ similar, female flowers with 2 stigmas

2- All spikes gynecandrous

C. remota

2- At least 1 spike androgynous; remaining spikes of varying sexes

C. otrubae

1- Spikes bisexual or unisexual, pedunculate

3- Utricles hairy, at least in upper part

C. flacca

3- Utricles glabrous, but beak sometimes ciliate or hispid-denticulate

4- Leaves longer than stems; female glumes with long scabrid arista

C. pseudocyperus

4- Leaves shorter than stems; female glumes not aristate

C. pendula

393- Carex otrubae Podp.

Lake shores, roadsides, 1180 - 1300 m.

Gölcük Lake, 08/07/97 N. İkinci 1382-B.Efeoglu. On Gölcük-Karacasu way.

25/05/97 N. İkinci 1138. Same place, 01/07/97 N. İkinci 1334 A.Güner (det.

A.Güner). Same place, 11/10/98 N. İkinci 1840 O.İkinci. On Gölcük-Karacasu way, 25/05/97 N. İkinci 1138.

Euro-Siberian element.

394- Carex remota L.

Damp or marshy places, 1000 - 1250 m.

On Gölcük-Karacasu way, 12/07/97 N. İkinci 1399-M.Erdoğan.

Euro-Siberian element.

395- Carex pseudocyperus L.

Lake shores, 1250 m.

Gölcük Lake, 01/07/97 N. İkinci 1332 -A.Güner.

Euro-Siberian element.

396- Carex pendula Hudson

Lake shores, marshy places, 1200 - 1350 m.

Gölcük Lake, 20/07/97 N. İkinci 1460- Ö.Umut.

Euro-Siberian element.

397- Carex flacca Schreber

subsp. **serrulata** (Biv.) Greuter

Meadows, roadsides, 810-1000 m.

On Gölcük-Karacasu way, 02/06/97 N. İkinci 1143. Same places, 31/07/97 N. İkinci 1470.

Mediterranean element.

78- Poaceae

- | | |
|---|---------------------|
| 1- Spikelets strongly dimorphic, male and female spikelets sometimes in different inflorescences | Cynosorus |
| 1- Spikelets monomorphic, or differing only in the presence or absence of an awn | |
| 2- Inflorescens a spike (spikelets completely sessile) | |
| 3- Inflorescens an interrupted spike , with 1 spikelet at each node; internodes always visible | |
| 4- Lateral spikelets with only 1 glume | Lolium |
| 4- Lateral spikelets with 2 glumes | |
| 5- Glumes truncate or concave at apex | Aegilops |
| 5- Glumes obtuse, acute to acuminate, or aristate at apex | Elymus |
| 3- Inflorescens a dense spike , with 1 or more spikelets at each node; internodes hidden by spikelets | |
| 6- Spikelets solitary at each node of main axis | |
| 7- Glumes truncate, with or without 1 or more teeth or awn at apex | |
| 8- Glumes usually rounded dorsally, with 1 or more teeth or awn at apex; rachis fragile | Aegilops |
| 8- Glumes keeled, usually with 1-2 teeth at apex; rachis tough | Triticum |
| 7- Glumes gradually or abruptly terminating in an awn, or acuminate at apex | Elymus |
| 6- Spikelets 2 or more at each node of axis | |
| 9- Spikelets 2 at each node of main axis | Taeniatherum |
| 9- Spikelets usually 3 at each node of main axis | Hordeum |
| 2- Inflorescens a panicle, or of 2-7 branches at top of stem | |
| 10- Inflorescens of digitate or paired spike-like branches | Cynodon |
| 10- Inflorescens a panicle | |
| 11- Inflorescens a lax plumose (long haired) panicle | |
| 12- Spikelets with 1 floret | Agrostis |
| 12- Spikelets with 2-10 florets | |
| 13- Hairs on lemma and panicle branches; caryopsis with hairy terminal appendage | Bromus |
| 13- Combination of characters not as above | |
| 14- ligule clearly membraneous, without hairs or cilia | |
| 14- Ligule a fringe of hairs or appearing so | Melica |
| 11- Inflorescens a dense or lax non-plumose panicle | Phragmites |
| 15- Inflorescens a lax non-plumose panicle | |
| 16- Spikelets all awned , or only lowest lemma awnless | |
| 17- Lemmas terminally awned | Festuca |
| 17- Lemmas subterminally, dorsally, or subdorsally awned | |
| 18- Lowest lemma awnless or terminally awned | Holcus |
| 18- Lowest lemma with a dorsal or subterminal awn | |
| 19- Both glumes shorter than spikelet | Bromus |
| 19- At least 1 glume as long as spikelet | |
| 20- Spikelets longer than 10 mm; glumes 5-9-veined | Avena |

- 20- Spikelets 1.3-4.5 mm; glumes 1-3-veined **Apera**
- 16- Spikelets with all lemmas awnless
- 21- At least 1 glume as long as spikelet **Melica**
- 21- Both glumes shorter than spikelets
- 22- Spikelets $\pm$ orbicular; glumes 3-9-veined;
lemma 7-9-veined, cordate at base **Briza**
- 22- Spikelets ovate; glumes 1-3-veined;
lemma 5-veined, not cordate at base **Poa**
- 15- Inflorescens a dense panicle
- 23- Inflorescens a spike-like panicle (more than twice
as long as broad)
- 24- Ligule a fringe of hairs or absent **Setaria**
- 24- Ligule membranous **Beckmannia**
- 23- Inflorescens a head-like panicle (1-2 x as long
as broad)
- 25- Ligule a fringe of hairs **Crypsis**
- 25- Ligule membranous
- 26- Spikelets with 1 floret **Phleum**
- 26- Spikelets with 2 or more florets
- 27- Lemmas terminally awned **Dactylis**
- 27- Lemmas subterminally to dorsally awned,
or awnless
- 28- Lemmas without an awn
- 29- Spikelets with 3 florets; lower 2 sterile;
glumes equalling spikelet **Phalaris**
- 29- Spikelets with 3-many florets; lower 2
hermaphrodite; glumes shorter than spikelet **Briza**
- 28- Lemmas (except uppermost) with an awn **Bromus**

248- Elymus L.

398- Elymus hispidus (Opiz) Melderis

subsp. **hispidus**

Roadsides, 880 - 950 m.

On Gölcük-Karacasu way, 24/06/97 N. İkinci 1245 (det. M. Doğan).

249- Aegilops L.

1- Glumes of lateral spikelets with (3-)(4-)(5) awns **A. geniculata**

1- Glumes of lateral spikelets with 2-3 awns

2- Spike slender and attenuate; spikelets 4-6, vestigial
spikelets (-2)3 **A. triuncialis**

2- Spike with long diverging awns giving an obconical
outline; spikelets 4-6, vestigial spikelets 1-2(-4) **A. biuncialis**

399- Aegilops triuncialis L.

subsp. **triuncialis**

Waste places, roadsides, 850 - 900 m.

On Gölcük-Karacasu way, 16/07/97 N. İkinci 1422.

400- Aegilops biuncialis Vis.

Field margins, 850 - 900 m.

On Gölcük-Karacasu way, 16/07/97 N. İkinci 1418.

401- Aegilopus geniculata Roth

Meadows, 880 - 950 m.

On Gölcük-Karacasu way, 24/06/97 N. İkinci 1255.

Mediterranean element.

250- Triticum

402- Triticum aestivum L.

Field borders and roadsides, 880 - 950 m,

On Gölcük-Karacasu way, 24/06/97 N. İkinci 1278 (det. M. Doğan). Same place, 24/06/97 N. İkinci 1277 (det. M. Doğan).

251- Hordeum L.

1- Perennial

1- Annual

H. bulbosum

2- Glumes of central spikelet and inner glume of lateral spikelets ciliate at margin

H. murinum

2- Glumes not ciliate at margin

H. geniculatum

403- Hordeum geniculatum All.

Roadsides, open places, 880 - 950 m.

On Gölcük-Karacasu way, 24/06/97 N. İkinci 1258-A.Güner. Same places, 17/06/97 N. İkinci 1239-A. Güner.

Euro-Siberian element.

404- Hordeum murinum L.

subsp. **glaucum** (Steudel) Tzvelev

Open places, 1200 - 1250 m.

Around lake, 11/10/98 N. İkinci 1779-O. İkinci. On Gölcük-Karacasu way, 02/06/97 N. İkinci 1142 -A. Güner.

405- Hordeum bulbosum L.

Roadsides, 990 - 1250 m.

On Gölcük-Karacasu way, 10/06/97 N. İkinci 1206. Around Lake, 01/07/97 N. İkinci 1326- A.Güner.

252- Taeniatherum Nevski

406- Taeniatherum caput-medusa (L.) Nevski

subsp. **crinitum** (Schreber) Melderis

Open places, 890 m.

On Gölcük-Karacasu way, 17/06/97 N. İkinci 1234-A. Güner (det. M. Doğan)

Irano-Turanian element.

New record for A3.

253- Bromus L.

1- Lower glume 3-7-veined, upper glume 3-9-veined;
annual

2- Awn single, terete, arising not more than 1.5 mm
below lemma apex, straight or slightly divaricate
in fruit, never basally twisted

B. hordeaceus

2- Awn 1-3, flattened or sometimes twisted at base,
arising at least 1.5 mm below lemma apex,
markedly divaricate, patent or deflexed at maturity

3- At least upper lemmas with 3, commonly purple
awns; panicle ovoid, dense, often simple

B. danthoniae

3- Awns single; panicle various

B. japonicus

1- Lower glume 1-veined, upper glume 3-veined;
annual or perennial

4- Lemma at least 20 mm

B. diandrus

4- Lemma less than 20 mm

5- Panicle simple, branches bearing 1 (-3) remote
spikelets; lemma 14-19 mm

B. sterilis

5- Panicle compound, often secund, branches bearing

4-8 clustered, often parallel spikelets; lemma 8-12 mm **B. tectorum**

407- Bromus hordeaceus L.

subsp. **hordeaceus**

Roadsides, 810 m.

On Gölcük-Karacasu way, 02/06/97 N. İkinci 1144 A. Güner.

408- Bromus japonicus Thunb.

subsp. **japonicus**

Open places, roadsides, 850 - 1300 m.

On Gölcük-Karacasu way, 16/07/97 N. İkinci 1412. Above Gölcük Lake,
08/07/97 N. İkinci 1372-B.Efeoglu. same places, 24/06/97 N. İkinci 1243.

409- Bromus danthoniae Trin

Roadsides, 930 - 980 m.

On Gölcük-Karacasu way, 10/06/97 N. İkinci 1193.

New record for A3.

§410- Bromus tectorum L.

Dry, open grassland, as a weed, 880 - 980 m.

On Gölcük-Karacasu way, 10/06/97 N. İkinci 1187. Same places, 24/06/97 N.
İkinci 1247.

411- Bromus sterilis L.

Roadsides, 850-1300 m.

On Gölcük-Karacasu way, 16/07/97 N. İkinci 1427. Same place, 16/07/97 N.
İkinci 1419. Around lake, 08/07/97 N. İkinci 1374-B.Efeoglu.

412- Bromus diandrus Roth

Waste ground, 990 - 1140 m.

On Gölcük-Karacasu way, 10/06/97 N. İkinci 1210.

New record for A3.

254- Avena L.

413- Avena sterilis L.

subsp. **sterilis**

Open places, roadsides, 880 - 950 m.

On Gölcük-Karacasu way, 24/06/97 N. İkinci 1275 (det. M. Doğan).

255- Holcus L.

414- Holcus lanatus L.

Damp places, roadsides, 1100 - 1300 m.

On Gölcük-Karacasu way, 08/07/97 N. İkinci 1376-B.Efeoglu. Around lake, 31/07/97 N. İkinci 1484.

Euro-Siberian element.

256- Apera Adanson

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

Lake shores, open places, 880 - 1250 m.

Around lake, 11/10/98 N. İkinci 1822 O. İkinci (det. M. Doğan). On Gölcük-Karacasu way, 24/06/97 N. İkinci 1276 (det. M. Doğan) Same places, 24/06/97 N. İkinci 1248 (det. M. Doğan).

Euro-siberian element.

257- Agrostis L.

416- Agrostis stolonifera L.

Roadsides, 1100 - 1250 m.

On Gölcük-Karacasu way, 31/07/97 N. İkinci 1485.

Euro-Siberian element.

258- Phalaris L.

417- Phalaris arundinacea L.

Aladağ, 1300 m.

259- Beckmannia Host

418- Beckmannia eruciformis (L.) Host

Aladağ, 1300 m.

260- Phleum L.

1 - Panicle branches adnate to main axis

1 - Panicle branches not adnate to main axis

P. pratense

- 2- Spikelets 2-3 mm; glumes abruptly terminating in an aristate point c.0.3-0.5mm, glabrous on keel
2- Spikelets 3-4.8 mm; glumes gradually terminating in an aristate point c.0.5-1.2 mm, ciliate on keel

P. phleoides

P. montanum

419- Phleum pratense L.

Wet meadows, 930 - 980 m.

On Gölcük-Karacasu way, 10/06/97 N. İkinci 1189.

Euro-Siberian element.

420- Phleum montanum C. Koch

subsp. **montanum**

Open places, 880 - 950 m.

On Gölcük-Karacasu way, 24/06/97 N. İkinci 1256.

421- Phleum phleoides (L.)Karsten

Open places, roadsides, 850 - 950 m.

On Gölcük-Karacasu way, 24/06/97 N. İkinci 1265. Same places, 16/07/97 N. İkinci 1410.

Euro-siberian element.

261- Festuca L.

1- Plant stoloniferous

1- Plant not stoloniferous

F. drymeja

F. heterophylla

422- Festuca drymeja Mertens & Koch

Coniferous and mixed woodland, 850-1250 m.

On Gölcük-Karacasu way, 31/07/97 N. İkinci 1490 (det. M. Doğan). Turk-Alman Ormanı, 01/07/97 N. İkinci 1343 -A.Güner (det. M. Doğan). Same places, 16/07/97 N. İkinci 1440 (det. M. Doğan).

Euro-Siberian element.

423- Festuca heterophylla Lam.

Roadsides, open places, 880 - 980 m.

On Gölcük-Karacasu way, 24/06/97 N. İkinci 1266. On Gölcük-Karacasu way, 10/06/97 N. İkinci 1194.

Euro-Siberian element.

262- Lolium L.

424- Lolium perenne L.

Roadsides, open places, 880 - 950 m.

On Gölcük-Karacasu way, 24/06/97 N. İkinci 1257.

Euro Siberian element.

263- Poa L.

1- Plant annual

2- Spikelets 4.5-5.5 mm long, closely spaced
with 3-5 per branch; anthers 0.6-0.9 mm long

P. annua

2- Spikelets 3-4 mm long, closely spaced with
5-9 per branch; anthers 0.2-0.5 mm long

P. infirma

1- Plant perennial

3- Basal sheaths swollen, forming a bulb

P. bulbosa

3- Basal sheaths not forming a bulb

4- Ligule 3-8 mm long

P. trivialis

4- Ligule obsolete or to 1.5 mm long

5- Stem strongly compressed above

P. compressa

5- Stem terete

P. nemoralis

425- Poa annua L.

Abies forest, 1120 m.

Türk-Alman ormanı, 21/05/97 N. İkinci 1097 A. Güner.

426- Poa infirma Kunth

Mixed forests, roadsides, 850-1140 m.

On Gölcük-Karacasu way, 21/05/97 N. İkinci 1092-A. Güner. Same places,

16/07/97 N. İkinci 1421. Same places, 10/06/97 N. İkinci 1209.

427- Poa trivialis L.

Roadsides, 1180 - 1190 m.

On Gölcük-Karacasu way, 25/05/97 N. İkinci 1134.

428- Poa compressa L.

Abies forest, 1080 m.

Türk-Alman Ormanı, 02/06/97 N. İkinci 1171 -A. Güner.

429- Poa nemoralis L.

Roadsides, 1180 - 1190 m.

On Gölcük-Karacasu way, 25/05/97 N. İkinci 1132.

430- Poa bulbosa L.

Abies forest openings, roadsides, 1120 m.

Türk-Alman ormanı, 21/05/97 N. İkinci 1101-A. Güner. Same places, 21/05/97
N. İkinci 1091-A. Güner.

264- Dactylis L.

431- Dactylis glomerata L.

subsp. **hispanica** (Roth) Nyman

Roadsides, open places, 880 - 1140 m.

On Gölcük-Karacasu way, 10/06/97 N. İkinci 1211. same places, 24/06/97 N.
İkinci 1267.

265- Cynosurus L.

432- Cynosurus echinatus L.

Roadsides, 880-1250 m.

On Gölcük-Karacasu way, 11/10/98 N. İkinci 1832 O.İkinci (det. A. Güner).

Around Lake, 24/06/97 N. İkinci 1259 (det. A. Güner).

Mediterranean element.

266- Briza L.

433- Briza media L.

Open places, 880 - 950 m.

On Gölcük-Karacasu way, 24/06/97 N. İkinci 1254.

267- Melica L.

434- Melica uniflora Retz.

Abies forests, 1050-1100 m.

Türk-Alman ormanı, 28/09/98 N. İkinci 1103-A. Güner. Same places, 01/07/97 N. İkinci 1346 A.Güner.

Euro-Siberian element.

268- Phragmites L.

435- Phragmites australis (Cav.) Trin.

Marshy places, 1200 - 1250 m.

Gölcük Lake, 11/09/97 N. İkinci 1678-M.Ünal.

Euro-Siberian element.

269- Cynodon L.C.M. Richard

436- Cynodon dactylon (L.) Pers.

var. **villosus** Regel

Roadsides, open places, 870 - 1000 m.

On Gölcük-Karacasu way, 29/09/98 N. İkinci 1730-O.İkinci.

270- Crypsis Aiton

437- Crypsis schoenoides (L.) Lam.

Wet places, 1200 - 1250 m.

Gölcük Lake, 11/09/97 N. İkinci 1669-M.Ünal (det. M. Doğan).

271- Setaria P. Beauv.

438- Setaria viridis (L.) P. Beauv.

Open places, 1200 - 1250 m.

Around Lake, 11/10/98 N. İkinci 1795-O.İkinci (det. M. Doğan).

4.2- The list of Endemic Species

The number of the endemic taxa found in the research area is 15, so that the endemism ratio of this area is 3.4%. The list of these endemic species is given below;

- *Abies nordmanniana* (Stev.) Spach
 subsp. *bornmuelleriana* (Mattf.) Coode & Cullen
- *Dianthus lydus* Boiss.
- *Vicia freynianana* Bornm.
- *Trifolium barbulatum* (Freyn & Sint.) Zoh.
- *Eryngium bithynicum* Boiss.
- *Lonicera caucasica* Pallas subsp. *orientalis* (Lom.) Chamb. & Long
- *Knautia degenii* borbas
- *Knautia byzantina* Fritsch
- *Hieracium ovalifrons* (Woronow & Zah) Juxip
- *Taraxacum aznavourii* van Soest
- *Taraxacum turcicum* van Soest
- *Lamium leucolophum* Hausskn.
- *Arum euxinum* R. Mill
- *Crocus biflorus* Miller
 subsp. *pulchricolor* (Herbert) Mathew
- *Dactylorhiza nieschalkiorum* H. Bauman & Künkele

4.3- Following List covers the plants which known from the adjacent areas and may possibly be discovered in the area.

1- *Thlaspi arvense* L.

Near Karacasu Village, 700 m.

2- *Viola reichenbachiana* Jord.

Bolu Dağı (Ala Da.) up to 500 m.

3- *Dianthus leucophaeus* Sibth. & Sm. var. *leucophaeus*

Endemic. Ala Dağ.

4- *Herniaria glabra* L.

Ala Dağ. Kartal Kaya, 1200 m.

5- *Polygonum bistorta* L.

Aladağ 1700 m.

6- *Astragalus mitchellianus* Boiss.

Aladağ, 700 m.

7- *Astragalus ponticus* Pall.

6 km S of Bolu, 900 m.

8- *Vicia ciliatula* Lipsky

S of Bolu Karacasu

9- *Ononis arvensis* L. (inc. in list)

Ala Dağ., 1300 m.

Euro-Siberian element.

10- *Trifolium fragiferum* L. var. *fragiferum*

Karacasu, 700 m.

11- *Trifolium diffusum* Ehrh.

Karacasu, 700 m.

12- *Onobrychis oxyodonta* Boiss.

Foothills of Ala Da.,

13- *Epilobium algidum* Bieb.

Ala Da., 1550 m.

14- *Torilis leptophylla* (L.) Reichb.

5 km S of Bolu

15- *Heliotropium suaveolens* Bieb.

Foothills of Ala da., 700 m.

16- *Euphorbia aleppica* L.

Ala Da., 700 m.

17- *Euphorbia falcata* L. subsp. *falcata* var. *falcata*

Ala Da., 700 m.

18- *Euphorbia seguieriana* Necker

subsp. *niciana* (Borbas ex Novak) Rech.

Ala Da., 700 m.

19- *Anthemis tinctoria* L. var. *dioscoidea* (All.) DC.

Ala Da., 700 m.

20- *Tanacetum armenum* (DC.) Schultz Bip.

Ala Dağ. 1300 m. (inc. in list)

21- *Lemna minor* L.

Ala da. above Bolu, 1200 m. (inc. in list)

22- *Eleocharis mitracarpa* Steudel

Ala Da. in Orman G. above Bolu, 1200 m. (inc. in list)

23- *Phalaris arundinacea* L.

Aladağ, 1300 m. (inc. in list)

24- *Beckmannia eruciformis* (L.) Host

Aladağ, 1300 m. (inc. in list.)

4.4- Tables

Table 2- Distribution of specimens according to the taxonomic categories.

The number of Families	78
The number of Genera	271
The number of Species	438
The number of Subspecies	102
The number of Varieties	48
The number of Taxa	451
Total number of Collected Specimens	737

Table 3- Distribution of species and taxa to major taxa and their ratio to the total species and taxa number.

Name of Taxa	Number of Species	Ratio to Total Species Number (%)	Number of the Taxa	Ratio to Total Taxa Number (%)
Pteridophyta	4	0.92	4	0.9
Spermatophyta	434	99.8	447	99.1
Gymnospermae	4	0.91	4	0.9
Angiospermae	430	98.1	443	98.2
Dicotyledones	354	80.9	367	81.4
Monocotyledones	76	17.3	76	16.8

Table 4- The largest 10 families, their species and taxa number and percentages.

Name of Family	Number of Species	Ratio to Total Species Number (%)	Number of Taxon	Ratio to Total Taxa Number(%)
Asteraceae	43	9.8	44	9.8
Poaceae	43	9.8	43	9.5
Fabaceae	38	8.6	40	8.9
Rosaceae	25	5.7	26	5.8
Lamiaceae	22	5.0	24	5.4
Brassicaceae	18	4.1	18	4.0
Caryophyllaceae	17	3.9	17	3.8
Apiaceae	17	3.9	17	3.8
Scrophulariaceae	14	3.2	14	3.1
Boraginaceae	13	3.0	14	3.1
Remaining 68 Families	189	43.0	192	42.8

Table 5- The largest 10 genera, their species and taxa number and percentages.

Name of Species	Number of Species	Ratio to Total Species Number (%)	Number of Taxa	Ratio to Total Taxa Number (%)
Vicia	9	2.0	10	2.3
Trifolium	8	1.8	9	2.0
Veronica	7	1.6	7	1.6
Bromus	6	1.4	6	1.4
Poa	6	1.4	6	1.4
Carex	5	1.1	5	1.1
Dianthus	5	1.1	5	1.1
Geranium	5	1.1	5	1.1
Galium	5	1.1	5	1.1
Viola	5	1.1	5	1.1
Remaining 261 Genera	378	86.1	388	86.1

Table 6- Distribution of species in research area according to phytogeographic regions.

Phytogeographic Region	Number of Species	Ratio to Total Species Number (%)
Irano-Turanian	7	1.6
Mediterranean	24	5.5
Euro-Siberian	113	25.7
Euxine	23	5.2
Hyrcano-Euxine	4	0.92
Cosmopolitan	1	0.23
Pluriregional or Uncertain Distribution	266	60.9

Table 7- Comparison of Our Research with Other Surveys According to Largest 3 Families

Name of Resaerch Area	Largest 3 Family		
Yedigöller Milli Parkı'nın (Bolu) Florası	Fabaceae	Asteraceae	Rosaceae
Contributions to the Flora of Semen Mountains (Bolu)	Fabaceae	Rosaceae	Asteraceae
Flora of the Gerede-Aktaş Forest	Fabaceae	Asteraceae	Scrophulariaceae
Contributions to the Flora of Bolu Mountains	Fabaceae	Asteraceae	Lamiaceae
Vascular Plant List of Abant Lake	Asteraceae	Lamiaceae	Fabaceae
Flora of Abant	Asteraceae	Poaceae	Fabaceae
Flora of Gölköy Campus	Asteraceae	Fabaceae	Lamiaceae
Flora of Gölcük Area	Asteraceae	Poaceae	Fabaceae

Table 8: Comparison of Our Research with Other Surveys According to Largest 3 Genera

Name of Resaerch Area	Largest 3 Genera		
Yedigöller Milli Parkı'nın (Bolu) Florası	Trifolium	Lathyrus	Silene
Contributions to the Flora of Semen Mountains (Bolu)	Veronica	Ranunculus	Poa
Flora of the Gerede-Aktaş Forest	Veronica	Trifolium	Lathyrus
Contributions to the Flora of Bolu Mountains	Campanula	Quercus	Trifolium
Vascular Plant List of Abant Lake	Carex	Ranunculus	Dactylorhizae
Flora of Abant	Veronica	Ranunculus	Trifolium
Flora of Gököy Campus	Trifolium	Veronica	Euphorbia
Flora of Gölcük Area	Vicia	Trifolium	Veronica

Table 9: Comparison of the Endemism Ratios in Our Survey to the Results Other Researches

Name of Resaerch Area	the Ratio of the Endemic Species (%)
Yedigöller Milli Parkı'nın (Bolu) Florası	6.7
Contributions to the Flora of Semen Mountains (Bolu)	4.1
Flora of the Gerede-Aktaş Forest	5
Contributions to the Flora of Bolu Mountains	5
Vascular Plant List of Abant Lake	8.1
Flora of Abant	4.3
Flora of Gölköy Campus	7.6
Flora of Gölcük Area	3.4

Table 10: Comparison of the Distribution of Species According to Their Phytogeographic Region in Our Survey to the Results of Other Researches

Name of Resaerch Area	Euro-Siberian	Mediterranean	Irano-Turanian	Pluriregional or uncertain Distribution
Yedigöller Milli Parkı'nın (Bolu) Florası	32.4	-	2.3	55.5
Contributions to the Flora of Semen Mountains (Bolu)	27.6	7.6	3.8	36.7
Flora of the Gerede-Aktaş Forest	15.6	7.6	7.6	66.0
Contributions to the Flora of Bolu Mountains	31.8	5.3	2.6	55.1
Vascular Plant List of Abant Lake	32.6	5.2	2.9	58.8
Flora of Abant	24.7	10.1	4.3	61.1
Flora of Gököy Campus	29.2	5.8	4.7	60.6
Flora of Gölcük Area	32.1	5.5	1.6	60.5

5- DISCUSSION

The flora of the Gölcük Area consists of 451 taxa, belonging to 271 genera and 78 families, and 438 species, 102 subspecies and 48 varieties.

Some uncollected species mentioned in the literature were also included in our list. They are totally 24 species, I didn't give them any number, because I could not find them in the research area. When we add them, total number of species reaches to 446.

From 438 species, 35 species are the new record for the A3 Grid square. For obtaining these numbers "Flora of Turkey" and all the periodic publications were searched thoroughly (6, 7-15, 16, 17, 18, 19, 20, 38, 39, 40, 41).

From 438 species, 4 species belong to *Pteridophyta* division whereas 434 species belong to *Spermatophyta* division. From 429 species belong to *Spermatophyta* division, *Gymnospermae* and *Angiospermae* subdivisions have 4 and 431 species, respectively. 76 species of *Angiospermae* belong to *Monocotyledones* and the rest (355 species) belongs to *Dicotyledones*, (Table 2 and 3).

From total taxa found in Gölcük Area, 0.91% is *Pteridophyta* and 99.1% is *Spermatophyta*. 0.91% of total taxa is *Gymnospermae* and the rest (98.1%) is *Angiospermae*. 80.9% of total taxa is *Dicotyledones* and 17.3% is *Monocotyledones*, (Table 3).

Distribution of species according to largest 10 families is as follows;
Asteraceae (43 ; 9.8%), *Poaceae* (43 ; 9.8%), *Fabaceae* (38 ; 8.6%), *Rosaceae* (25 ; 5.7%), *Lamiaceae* (22 ; 5.0%), *Brassicaceae* (18 ; 4.1%), *Caryophyllaceae* (17 ; 3.9%), *Apiaceae* (17 ; 3.9%), *Scrophulariaceae* (14 ; 3.2%), and *Boraginaceae* (13 ; 3.0%). Remaining 68 families have 189 species and ratio to total number is 43.

Largest 11 family according to genus number is as follows;
Asteraceae (34 ; 12.7%), *Poaceae* (28 ; 10.5%), *Fabaceae* (19 ; 7.1%),
Rosaceae (18 ; 6.7%), *Lamiaceae* (15 ; 5.6%), *Apiaceae* (13 ; 4.9),
Brassicaceae (11 ; 4.1%), *Boraginaceae* (10 ; 3.7%), *Caryophyllaceae* (9 ; 3.4%),
Scrophulariaceae (14 ; 3.2%), *Liliaceae* (7 ; 2.6) and, *Orchidaceae* (7 ; 2.6).
Remaining 67 families have 97 genera and ratio to total number is 36.2 (Table 4).

The largest 10 genera according to their species number in the area are as follows: *Vicia* (9 ; 2.0%) *Trifolium* (8 ; 1.8%), *Veronica* (7 ; 1.6 %), *Poa* (6 ; 1.4%), *Bromus* (6 ; 1.4 %) *Carex* (5 ; 1.1 %), *Dianthus* (5 ; 1.1 %), *Geranium* (5 ; 1.1 %), *Galium* (5 ; 1.1%), *Viola* (5 ; 1.1 %), (Table 5).

Distribution of species according to phytogeographic regions was given in table 8. In this research, Euro-Siberian elements with 31.8% (together with Euxines and Hyrcano-Euxine) is present in the first sequence. Because of the presence of research area in the Euro-Siberian phytogeographic region, obtaining the much more Euro-Siberian elements are suitable. Also in other researches in the table 12, the number of Euro-Siberian elements are higher than the number of other phytogeographic regions. In our survey, the Mediterranean elements (5.5%) is present in the second order, and the Irano-Turanian elements (1.6%) in the third order. Although these results agree with the results of other researches (9, 13, 14, 16, 19, 20), there are not records for the Mediterranean elements in "Flora of Yedigöller Milli Parkı" survey (18). According to Akman and Ketenoğlu (11), 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 apparent. This kind of climate with the vegetation occurring as patches in the Black Sea region is seen also in our research area, as mediterranean semi-arid and mediterranean subhumid types. Therefore, the number of mediterranean elements in our research area is found in the second order.

The species occurring more than one phytogeographical area is defined as pluriregional. The uncertain species according to their distribution are found in a narrow spectrum and they do not belong to any phytogeographical region. The cosmopolitan species have a wide distribution pattern over the world.

Distribution of endemic species found in the research area according to their phytogeographic region was presented in Table 8. Endemism ratio of research area is 3.4%. As you see in Table 9, endemism ratio of Gölcük region is lower than the other researches'. There can be some reasons of obtaining low endemic ratio. According to P. H. Davis endemism ratio of Euro-Siberian phytogeographic region is lower than the other two phytogeographic regions (4). Presence of our research area in the Euro-Siberian phytogeographic region may be one reason of the low endemic ratio. In addition, research area is not the endemism center, so this may be the second reason.

When we compare the largest 3 families with other surveys, we see that Fabaceae and Asteraceae were present in all studies, but in different orders. These two families are the largest families in The Flora of Turkey. The Asteraceae family is also the largest family in The Flora of Turkey. This is because there are several advantages of the family, Asteraceae. For example, the family possesses easy dispersal ability and some members of this family have spines to protect them from grazing, and also the family has a wide ecological tolerance.

Among these, one family, Poaceae, was also found in my study area in large numbers. There may be at least two possible reasons of the occurrence of this family in the study site: i) the family (Poaceae) is mostly known as common in prairie habitats. This corresponds to my study site where the members of this family were found; ii) besides, 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.

In my study Poaceae is the second largest family but we do not see this family in other studies in the same order except in Flora of Abant (20). The similarities of the occurrence of this family between these two studies may be related to the both geological and ecological conditions, besides the reasons as mentioned above.

Lamiaceae, third largest family in The Flora of Turkey, is also present in third or fourth order in most study. However in my study it is present in the fifth order. A possible reason for this may be because the family is not common in forested areas and its members are common plants of mediterranean area (42).

When we compare largest genera, Trifolium is present in all studies except in Vascular Plant List of Abant Lake (16). Vicia is the largest genus in my study, but it is not present in the first three studies listed on Table 10. Veronica among largest genera was also common in three other studies . One reason of high number of Veronica is probably the presence of wet habitats.

Housing and development activities nearby the study site could also cause destruction of habitats. Environs of the lake are exposed to movement of many people especially at weekends and on holidays . Such activities bring about the destruction of flora due to heavily usage of the area, causing environmental pollution.

Studies on the grazing and its effect on natural habitats have been commonly discussed among conservation biologists (43, 44). Even though I did not measure the effect of grazing within the study area, my personal observation seems to support the idea that grazing can negatively affect the plant habitats in my study site.

6- CONCLUSION

At the end of this research, we determined the Flora of the Gölcük Area and obtained 35 new records for A3 Grid square. By doing this, we contributed to Flora of Bolu, planned to be written in the future. Also, we contributed to the herbarium of our University (AIBU), that has been establishing. During this research, we determined the endemic species. After identification of specimens, we prepared identification keys to the species and genera. By means of this research we suppose to contribute for the preperation of a handbook including the flora of Gölcük Area for native and foreign tourists. As a result of this research, we suppose to contribute to the floristic knowledge of the area and the other related sciences. However, the list of plants found in the area may well be increased by further research.

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