



## The Flora of Kavaklıdere (Muğla) Marble Quarry area, and the impacts of marble quarries on ecosystem

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### Kavaklıdere (Muğla) Mermer Ocakları bölgesinin florası ve mermer ocaklarının ekosistem üzerine etkileri

**Abstract:** Comprehensive floristic surveys conducted in and around the marble quarry areas of Kavaklıdere District (Muğla, Türkiye) resulted in the identification of 161 species and subspecies belonging to 43 plant families. This study evaluates the ecological impacts of marble quarrying activities on local flora and fauna, with particular emphasis on habitat loss, vegetation degradation, and changes in species composition. The results indicate that intensive quarrying activities have caused substantial direct and indirect ecological disturbances, highlighting the need for effective rehabilitation and conservation strategies in quarry-affected landscapes.

**Key words:** Flora, ecology, marble quarrying, Kavaklıdere

**Özet:** Kavaklıdere İlçesi (Muğla, Türkiye) ve çevresindeki mermer ocağı alanlarında yürütülen kapsamlı floristik araştırmalar sonucunda, 43 bitki familyasına ait 161 tür ve alttür tespit edilmiştir. Bu çalışma, mermer ocağı faaliyetlerinin yerel flora ve fauna üzerindeki ekolojik etkilerini; özellikle habitat kaybı, vejetasyonun bozulması ve tür kompozisyonundaki değişimler açısından değerlendirmektedir. Elde edilen bulgular, yoğun taş ocağı faaliyetlerinin belirgin doğrudan ve dolaylı ekolojik tahribatlara yol açtığını ortaya koymakta ve ocak faaliyetlerinden etkilenen alanlarda etkili rehabilitasyon ve koruma stratejilerinin gerekliliğine işaret etmektedir.

**Anahtar Kelimeler:** Flora, ekoloji, mermer ocağı, Kavaklıdere

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#### 1. Introduction

Muğla Province is recognized as one of Türkiye's most mineral-rich regions, with marble, chromium, and lignite representing its principal mineral resources. Among these, marble extraction and processing constitute a major economic sector, positioning Muğla as one of the leading provinces in national marble production and quarry management (Yavuz et al., 2002). The most significant marble reserves in the province are distributed along the Milas–Yatağan–Kavaklıdere axis, located south of the Menderes Crystalline Massif. Over the past two decades, this region has gained increasing prominence within the marble industry.

Marble quarrying activities in Kavaklıdere began in the early 1990s and have expanded steadily to the present day. Currently, approximately 15 active marble quarries operate within the district, accompanied by numerous large- and small-scale processing plants and workshops (Figs.1-2), (Anonymous, 2026)

Climatically, Kavaklıdere District lies within the warm Mediterranean zone and belongs to the Mediterranean phytogeographical region. Vegetation in this region exhibits a characteristic zonation, including coastal dune vegetation, maquis, garigue (frigana) formations resulting from maquis degradation, and relatively stable forest communities dominated by red pine (*Pinus brutia* Ten.), juniper (*Juniperus* L.), and maquis elements. Oak (*Quercus* L.) and red pine are the dominant tree species in

forested areas, while maquis vegetation commonly develops at lower elevations as a consequence of anthropogenic disturbance.

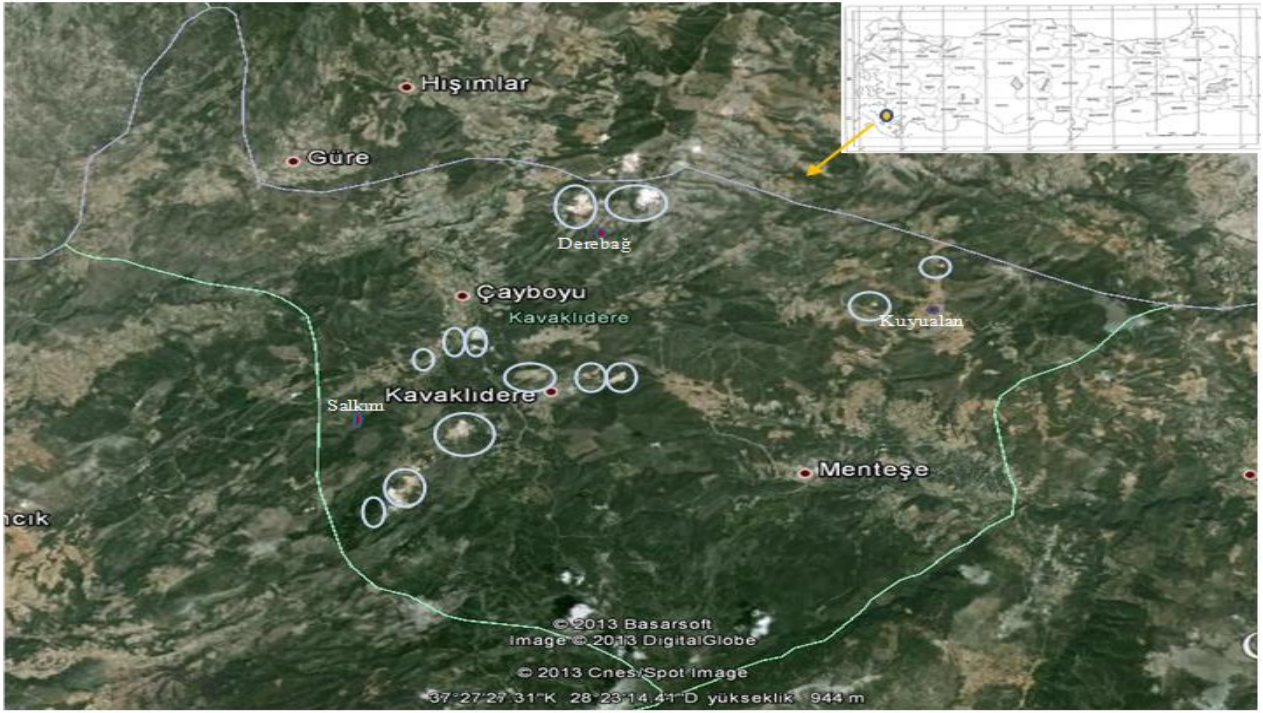
According to the grid system proposed by Davis et al. (1965–1985), the study area is located within grid square C2 of the Mediterranean phytogeographical region (Fig. 3). The presence of diverse habitat types and heterogeneous bedrock structures within the study area contributes to a high level of plant diversity, including taxa with differing phytogeographical affinities. The primary objective of this study is to document the floristic composition of the Kavaklıdere marble quarry area and to assess the ecological impacts of quarrying activities on regional biodiversity.

Our area spans different elevations and the bedrock structure differs from that in other habitats. Therefore, the aim of this study is to show the plant diversity in this different bedrock structure.

#### 2. Materials and Method

The primary material of this study comprises approximately 500 plant specimens collected from the surroundings of marble quarries in Kavaklıdere District over three consecutive vegetation periods between 2011 and 2013. Specimens were collected from four distinct localities representing different elevations and exposure conditions.

All collected specimens were identified using Flora of Turkey and the East Aegean Islands (Davis, 1965-1985;



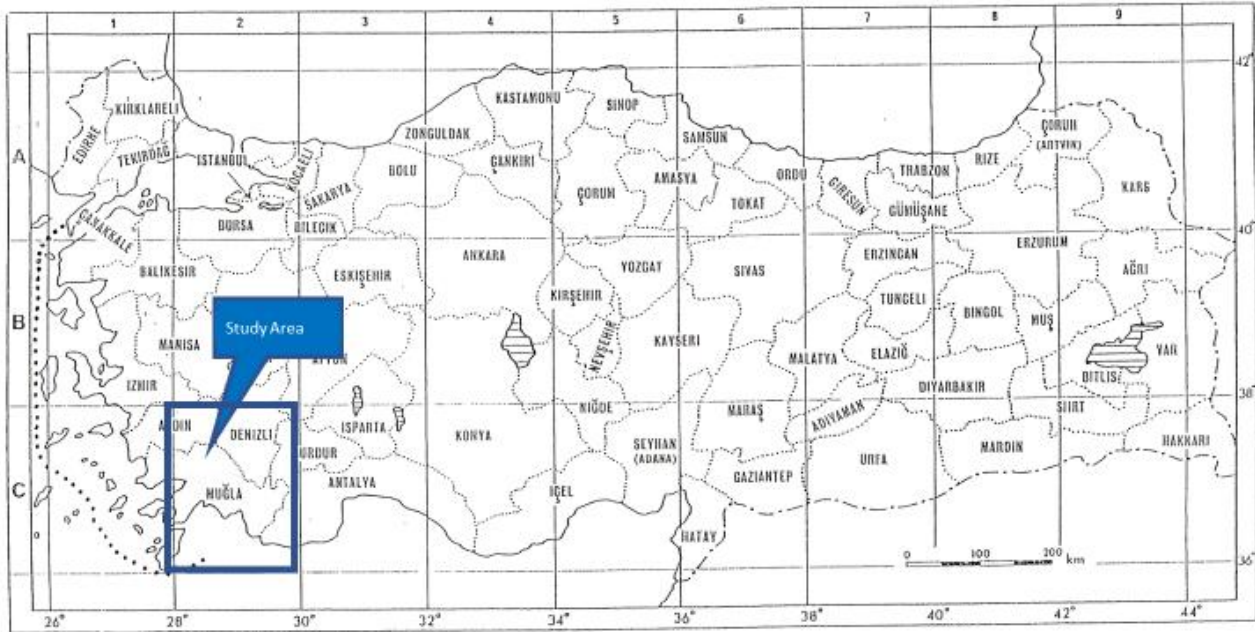
**Figure 1.** Marble quarries located in Kavaklıdere district



**Figure 2.** Kavaklıdere (a,b) and Burungöz (c) marble quarries

Davis et al., 1988; Güner et al., 2000). The list of the determined taxa are arranged alphabetically, regarding the family, genus and species names, and scientific name, locality information, phytogeographical element, and endemism status were recorded for each taxa (Appendix 1).

While presenting the list of plant taxa recorded from the research area, the taxonomic sequence followed that adopted in Flora of Turkey. The scientific names and author citations of the taxa were verified using The International Plant Names Index (IPNI, 2022), The Plant List (2013), and



**Figure 3.** Location of the Study Area in the Grid System (Davis, 1965-1985)

Türkiye Bitkileri Listesi (Güner et al., 2012). The Turkish scientific names of the plants were also provided in accordance with Türkiye Bitkileri Listesi (Güner et al., 2012).

Endemism status and conservation categories were determined based on regional studies (Yeşilyurt & Akaydin, 2012), the databases of the Nezahat Gökyiğit Botanical Garden and the ANG Foundation (Anonymous, 2023), and the Red Data Book of Turkish Plants (Ekim et al., 2000). For taxa lacking published conservation assessments, threat categories were assigned according to IUCN (2016) criteria based on field observations. Voucher specimens are preserved in the Herbarium of the Faculty of Science, Department of Biology, Muğla Sıtkı Koçman University.

Abbreviations used;

Med. Ele.: Mediterranean Element, Eur. Sib. Ele.: Euro-Siberian Element, E. Med. Ele.: Eastern Mediterranean Element, Ir. Tur. Ele.: Irano-Turanian Element, End.: Endemic, CR: Critical, EN: Endangered, LC: Least Concern, NT: Near Threatened, VU: Vulnerable, IUCN: The International Union for Conservation of Nature, Loc.: Locality, subsp.: Subspecies, var.: Variety, m: Meter

Plant samples were collected from 4 localities during the field study. The localities where the plant samples were collected are given Appendix 1.

### 3. Results

As a result of the field studies carried out around the marble quarries in the Kavaklıdere district, a total of 161 species and subspecies taxa belonging to 43 families were identified. 3 taxa belong to Pteridophyta, 1 taxa belong to Gymnospermae, 31 belong to Monocotyledoneae and 126 taxa belong to Dicotyledoneae, totalling 157 taxa that belong to Angiospermae.

Of the taxa identified, 58.4% are Mediterranean, 0.6% are Irano-Turanian, 2.5% are Euro-Siberian and 38.5% are widely distributed taxa of unknown origin (Table 1).

**Table 1.** Distribution of taxa to floristic regions and endemism rate

Phytogeographic region	Number of taxa (%)
Mediterranean Element	94 (58.4)
Iran-Turan Element	1 (0.6)
European-Siberian Element	4 (2.5)
Widely Distributed and of Unknown Origin	62 (38.5)
Endemics	9 (5.6)

The endemism rate of our study area is 5.6%. The rate of endemism in Türkiye is above 30% and most endemic species are distributed above 1000 m in altitude. When the endemism rate of our study area is compared to the total endemism rate in the flora of Türkiye, it appears quite low numerically.

The number of endemic taxa identified in the research area is 9 (5.6%), 1 of which is near threatened (NT), 7 of which are least concern (LC) and 1 of which is vulnerable (VU). As a result of the literature review, no data on the endangerment categories of *Crocus nerimaniae* among these endemic taxa were found. Threat categories of these taxa were determined based on our field observations (Table 2).

**Table 2.** The endemic taxa identified in the study area

Taxon name	Endemism status (Ekim et al., 2000)
<i>Astragalus condensatus</i>	LC
<i>Cyclamen mirabile</i>	NT
<i>Verbascum lyidium</i> var. <i>lyidium</i>	LC
<i>Digitalis cariensis</i>	LC
<i>Stachys cretica</i> subsp. <i>smyrnaea</i>	LC
<i>Quercus aucheri</i>	LC
<i>Biarum tenuifolium</i> var. <i>zeleborii</i>	LC
<i>Crocus nerimaniae</i>	LC
<i>Ophrys holoserica</i> subsp. <i>heterochila</i>	VU

In our study, the top three families containing the most species and subspecies taxa were Asteraceae (12.5%), Fabaceae (8.1%), and Lamiaceae (6.6%). These families are the largest in Türkiye in terms of both the number of species and distribution areas (Table 3).

**Table 3.** The six largest families identified in the research area

Family name	Number of taxa (%)
<i>Asteraceae</i>	19 (11.8)
<i>Fabaceae</i>	14 (8.7)
<i>Lamiaceae</i>	9 (5.6)
<i>Poaceae</i>	12 (7.5)
<i>Apiaceae</i>	8 (4.9)
<i>Brassicaceae</i>	7 (4.3)

The genera with the highest number of species and subspecies taxa in the research area belong to the Asteraceae family. Furthermore, the genera *Trifolium* L. (Liliaceae) and *Allium* L. (Fabaceae) are quite abundant in our area with many species and subspecies, as shown in Table 4.

**Table 4.** The genera with the most species and subspecies taxa in the research area

Genus name	Number of taxa (%)
<i>Allium</i> (Liliaceae)	4 (2.3)
<i>Trifolium</i> (Fabaceae)	3 (1.7)
<i>Verbascum</i> (Scrophulariaceae)	3 (1.7)
<i>Euphorbia</i> (Euphorbiaceae)	3 (1.7)
<i>Quercus</i> (Fagaceae)	3 (1.7)
<i>Ophrys</i> (Orchidaceae)	3 (1.7)

#### 4. Discussions

Numerous floristic studies have been conducted in the province of Muğla. Comparisons have been made with seven studies conducted in areas close to our research area. These studies;

1. Yerkesik Havzası (Menteşe-Muğla)'nın Florası (Akbaş, 2023)
2. Marçalı Dağı (Menteşe-Muğla) florası (Varol et al., 2021)
4. Bencik Dağı (Yatağan-Muğla) Florası (Aytepe & Varol., 2007)
5. Kavak Dağı (Milas-Muğla) Florası (Varol et al., 2022)
6. Kurukümes Dağı (Milas-Muğla) florası (Öz Arık & Görk., 2016)
7. Kavaklıdere Florası (Muğla) (Ceylan & Görk, 2017)

The endemism rate of studies conducted in our field of work and nearby regions is similar. In all studies, the

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number and proportion of Mediterranean elements are quite high because the research areas are located in the Mediterranean phytogeographical region. In all studies, Irano-Turanian and Euro-Siberian elements are represented by low numbers and percentages. The families with the highest number of species and subspecies across all studies are *Asteraceae*, *Fabaceae*, *Poaceae*, *Lamiaceae* and *Brassicaceae*.

The floristic composition and phytogeographical structure of the Kavaklıdere marble quarry area show strong similarities to those reported in previous studies conducted in adjacent regions of Muğla Province. In all comparable studies, Mediterranean elements predominate, while Irano-Turanian and Euro-Siberian elements occur at low frequencies, reflecting the climatic and biogeographical characteristics of southwestern Anatolia.

Despite its economic importance, marble quarrying in Kavaklıdere has resulted in pronounced ecological degradation. Quarrying activities cause complete removal of vegetation cover, disruption of soil structure, and habitat fragmentation. These impacts occur both directly, through physical destruction of habitats, and indirectly, through landscape fragmentation, species displacement, and the creation of ecological barriers (Öztürk, 2018).

Effective rehabilitation of quarry-affected areas requires careful management of topsoil, which contains seeds and vegetative propagules essential for ecological restoration. The separation, storage, and subsequent reuse of topsoil during rehabilitation processes can significantly enhance natural regeneration and landscape recovery. In addition, abandoned quarry pits should be prioritized for waste disposal and rehabilitation to prevent further forest loss and environmental degradation.

Quarrying activities also negatively affect fauna by reducing habitat availability and altering ecosystem structure. Restoration efforts must therefore consider the ecological requirements of local wildlife, particularly access to water, food resources, and adequate vegetation cover. Failure to rehabilitate waste dumping areas increases erosion risk and facilitates secondary disturbances such as pest outbreaks, further exacerbating ecological damage (Kantarıcı, 2005).

Overall, the findings of this study underscore the urgent need for integrated environmental management strategies that balance economic benefits with biodiversity conservation and ecosystem sustainability in marble quarry regions (Kantarıcı, 2005).

#### Conflict of Interest

Authors have declared no conflict of interest.

#### Authors' Contributions

The authors contributed equally.

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## Appendix 1. Floristic List

### *Pteridophyta* / Eğrelti Bölümü

#### *Aspidiaceae* / Pilunçgiller

1. *Dryopteris pallida* (Broy) Fomin (solucan eğreltisi), O.1989, Yeşilköy marble quarry surroundings, 615 m., east, 02.04.2013, Med. Ele.

#### *Aspleniaceae* / Saçakotugiller

2. *Asplenium officinarum* DC. (dalakotu), O.1223, Yeşilköy marble quarry surroundings, 613 m., east, 29.07.2011, Med.Ele.
3. *A. trichomanes* L. (saçaklı eğrelti), O.1259, Burnugöz, çayboyu between, marble quarry surroundings, 707 m., south-west, 06.08.2011.

### *Spermatophyta* / Tohumlu Bitkiler

#### *Gymnospermae* / Açık Tohumlular

#### *Pinaceae* / Çamgiller

4. *Pinus brutia* Ten.(kızılcım), O.1121, Kavaklıdere district exit, marble quarry surroundings, 998 m., east, 12.03.2011, E. Med. Ele.

#### *Angiospermae* / Kapalı Tohumlular

#### *Magnoliopsida (Dicotyledones)* / İki Çenekliler

#### *Amaranthaceae* / Horozibügigiller

5. *Chenopodium album* L. subsp. *album* var. *album* (aksirken), O.1770, Yeşilköy marble quarry surroundings, 619 m., east, 02.04.2013, Med. Ele.

6. *C. vulvaria* L. (kokar sirken), O.1769, Kavaklıdere district exit, marble quarry surroundings, 1000 m., east, 25.05.2013.

#### *Anacardiaceae* / Meneğiçgiller

7. *Pistacia lentiscus* L. (sakız ağacı), O.2081, Kavaklıdere district entrance, marble quarry surroundings, 1000 m., east, 22.09.2013., Med. Ele.

#### *Apiaceae (Umbelliferae)* / Maydanozgiller

8. *Berula erecta* (Huds.) Caville (su maydanozu), O.1583, Yeşilköy marble quarry surroundings, 612 m., east, , 17.06.2012.

9. *Daucus carota* L. subsp. *carota* (yabani havuç), O.1031, O.1771, Yeşilköy marble quarry surroundings, 615 m., east, 29.07.2011, 17.06.2012.

10. *Ferula tingitana* L. (kadı teresi), O.2085, Kavaklıdere district exit, marble quarry surroundings, 996 m., east, 25.05.2013., Med. Ele.

11. *Foeniculum vulgare* Mill. (rezene), O.1768, Burnugöz, çayboyu between, marble quarry surroundings, 709 m., south-west, 10.10.2012.

12. *Opopanax hispidus* (Friv.) Gris. (sarıot), O.1586, O.1708, Burnugöz, çayboyu between, marble quarry

- surroundings, 701 m., south-west, 06.08.2011, 10.10.2012., Med. Ele.
13. *Scandix australis* L. subsp. *grandifolia* (L.) Thell. (zühretarağı), O.1447, Kavaklıdere district exit, marble quarry surroundings, 1023 m., east, 23.06.2012, Med. Ele.
14. *S. iberica* M.Bieb. (atkişnekotu), O. 1279, O. 1335, Yeşilköy marble quarry surroundings, 610 m., east, 29.07.2011, 17.06.2012.
15. *Torilis nodosa* (L.) Gaertner. (dercikotu), O.2078, Kavaklıdere district entrance, marble quarry surroundings, 1021 m., east, 22.09.2013, Med. Ele.

#### **Apocynaceae / Zakkumgiller**

16. *Nerium oleander* L. (zakkum), O.1068, O.1734, Kavaklıdere district exit, marble quarry surroundings, 998 m., east, 12.03.2011, 25.05.2013., Med. Ele.

#### **Araceae / Yılanatastığıgiller**

17. *Biarum tenuifolium* (L.) Schott var. *zeleborii* (Schott) Engler, (ağukınası), O.1760, Yeşilköy marble quarry surroundings, 619 m., east, 17.06.2012, E. Med. Ele., **End. (LC)**

#### **Asteraceae (Compositae) / Papatyagiller**

18. *Anthemis cotula* L. (köpek papatyası) O. 1453, Burnugöz, çayboyu between, marble quarry surroundings, 707 m., south-west, 06.08.2011, 10.10.2012, E. Med. Ele.
19. *A. cretica* L. subsp. *leucanthemoides* (Boiss.) Grierson (kel papatya), O.1940, Burnugöz, çayboyu between, marble quarry surroundings, 707 m., south-west, 10.10.2012, Med. Ele.
20. *pseudocotula* Boiss. (acem papatyası), O.1241, Kavaklıdere district exit, marble quarry surroundings, 1018 m., east, 12.03.2011.
21. *Bellis annua* L. (akbubeçlik), O.1251, Kavaklıdere district exit, marble quarry surroundings, 1021 m., east, 12.03.2011, Med. Ele.
22. *Calendula arvensis* L. (öküzgözü), O.1118, O.1970, Yeşilköy marble quarry surroundings, 615 m., east, 29.07.2011, 02.04.2013, Med. Ele.
23. *Carthamus dentatus* Vahl. (kınadiken) O.1028, O.1143, Burnugöz, çayboyu between, marble quarry surroundings, 708 m., south-west, 06.08.2011, 10.10.2012.
24. *Cichorium intybus* L. (hindiba), O.1171, O.1697, Yeşilköy marble quarry surroundings, 610 m., east, 29.07.2011, 17.06.2012.
25. *Centaurea solstitialis* L. subsp. *solstitialis*, (çakır diken), O.1144, Kavaklıdere district entrance, marble quarry surroundings, 1000 m., east, 23.06.2012.
26. *Cirsium vulgare* (Savi) Ten. (deve diken), O.1099, O.1855, Kavaklıdere district entrance, marble quarry surroundings, 1025 m., east, 10.11.2012, 22.09.2013.
27. *Crepis foetida* L. subsp. *foetida*, (kohum) O.1258, Kavaklıdere district entrance, marble quarry surroundings, 1017 m., east, 23.06.2012.

28. *C. foetida* L. subsp. *rhoeadifolia* (M.Bieb.) Celak. (şahin sakalı), O.1176, Kavaklıdere district entrance, marble quarry surroundings, 1045 m., east, 23.06.2012.
29. *Crupina crupinastrum* (Moris) Vis., (gelin döndüren), O.1581, Kavaklıdere district exit, marble quarry surroundings, 1034 m., east, 23.06.2012.
30. *Filago eriocephala* Guss (delikeçotu), O.1533, Yeşilköy marble quarry surroundings, 619 m., east, 29.07.2011, E. Med. Ele.
31. *Lactuca tuberosa* Jacq. (topar marul), O.1647, O.1745, Kavaklıdere district entrance, marble quarry surroundings, 1011 m., east, 10.11.2012, 22.09.2013., D. Med. Ele.
32. *Leontodon tuberosus* L., (yumruku aslandışi), O.1252, O.1526, Yeşilköy marble quarry surroundings, 619 m., east, 29.07.2011, 17.06.2012, Med. Ele.
33. *L. asperrimus* (Willd.) J. Ball, (aşyemliği), O.2086, Yeşilköy marble quarry surroundings, 611 m., east, 02.04.2013, Ir. Tur. Ele.
34. *Logfia arvensis* (L.) Holub, (keçotu), O.1841, Kavaklıdere district exit, marble quarry surroundings, 1008 m., east, 23.06.2012.
35. *Picnomon acarna* (L.) Cass. (kılçık diken), O.1145, Kavaklıdere district entrance, marble quarry surroundings, 1014 m., east, 23.06.2012, Med. Ele.
36. *Scolymus hispanicus* L. (şevketibostan), O.1066, O.1750, Burnugöz, çayboyu between, marble quarry surroundings, 707 m., south-west, 06.08.2011, 10.10.2012., Med. Ele.

#### **Boraginaceae / Hodangiller**

37. *Alkanna tinctoria* (L.) Tausch subsp. *tinctoria*, (havacıva), O.1273, O.1411, Yeşilköy marble quarry surroundings, 615 m., east, 29.07.2011, 17.06.2012, Med. Ele.
38. *Anchusa undulata* L. subsp. *hybrida* (Ten.) Cout. (tatlıbaba), O.1132, Kavaklıdere district exit, marble quarry surroundings, 1007 m., east, 12.03.2011, Med. Ele.
39. *Onosma heterophylla* Griseb. (deliemzik), O.1949, Kavaklıdere district exit, marble quarry surroundings, 1012 m., east, 25.05.2013, Eur. Sib. Ele.

#### **Brassicaceae (Cruciferae) / Turpgiller**

40. *Alyssum hirsutum* M. Bieb. var. *hirsutum* (kılı kudzotu), O.1901, Yeşilköy marble quarry surroundings, 615 m., east, 02.04.2013, Med. Ele.
41. *A. smyrnaeum* C.A. Mey (izmir kudzotu), O.1281, O.1485, Burnugöz, çayboyu between, marble quarry surroundings, 707 m., south-west, 06.08.2011, 17.06.2012, E. Med. Ele.
42. *Arabis verna* (L.) DC. (mor kazteresi), O.1973, yeşilköy marble quarry surroundings, 613 M., east, 02.04.2013, Med. Ele.
43. *Capsella bursa-pastoris* (L.) Medik. (çoban çantası), O.1239, Yeşilköy marble quarry surroundings, 615 m., east, 29.07.2011, Med. Ele.

44. *Draba verna* L. (çırçırotu), O.1256, Kavaklıdere district exit, marble quarry surroundings, 1006 m., east, 12.03.2011.
45. *Raphanus raphanistrum* L. (eşek turpu), O.1426, Kavaklıdere district entrance, marble quarry surroundings, 1038 m., east, 10.11.2012.
46. *Sinapis alba* L. (mamamık), O.1346, Burnugöz, çayboyu between, marble quarry surroundings, 718 m., south-west, 06.08.2011.

#### Campanulaceae / Çançiçeğiller

47. *Campanula lyrata* Lam. subsp. *lyrata* (memek), O.1128, O.1619, Yeşilköy marble quarry surroundings, 615 m., east, 29.07.2011, 17.06.2012.
48. *L. pentagonia* (L.) Thell. (kadın aynası), O.1406, Kavaklıdere district entrance, marble quarry surroundings, 1003 m., east, 23.06.2012.
49. *Legousia speculum-veneris* (L.) Chaix, (kadınaynası) O.1508, Kavaklıdere district exit, marble quarry surroundings, 1000 m., east, 23.06.2012.

#### Caprifoliaceae / Hammeligiller

50. *Knautia integrifolia* (L.) Bert. var. *bidens* (Sm.) Borbás, (götürotu) O.1394, O.1582, Kavaklıdere district entrance, marble quarry surroundings, 1012 m., east, 23.06.2012, 10.11.2012, E. Med. Ele.
51. *Scabiosa calocephala* Boiss. (çayırüyuzotu), O.2076, burnugöz, çayboyu between, marble quarry surroundings, 707 m., south-west, 10.10.2012., Med. Ele.
52. *Valeriana sisymbriifolium* Vahl. (kediotu), O.2083, Kavaklıdere district exit, marble quarry surroundings, 1031 m., east, 25.05.2013., Med. Ele.
53. *Valerianella balansae* V. A. Matthes (kuzugevreği), O.1450, Burnugöz, çayboyu between, marble quarry surroundings, 707 m., south-west, 06.08.2011, E. Med. Ele.

#### Caryophyllaceae / Karanfilgiller

54. *Cerastium glomeratum* Thuill. (boynuzotu), O.1294, Kavaklıdere district exit, marble quarry surroundings, 1003 m., east, 12.03.2011, Med. Ele.
55. *Dianthus zonatus* Fenzl var. *zonatus* (halkalı karanfil), O.1761, Kavaklıdere district exit, marble quarry surroundings, 1000 m., east, 25.05.2013.
56. *Minuartia hybrida* (Vill.) Schischk. subsp. *turcica* Mc Neill (kır tıstısı), O.1515, Yeşilköy marble quarry surroundings, 615 m., east, 02.04.2013.
57. *Silene italica* (L.) Pers. (yuğuş yüreği), O.1507, O.1762, Kavaklıdere district entrance, marble quarry surroundings, 1001 m., east, 10.11.2012, 22.09.2013., Med. Ele.
58. *S. behen* L. (nakıl), O.1975, Burnugöz, çayboyu between, marble quarry surroundings, 705 m., south-west, 10.10.2013., Med. Ele.

#### Cistaceae / Ladengiller

59. *Cistus creticus* L. (laden), O.1124, O.1416, Burnugöz,

çayboyu between, marble quarry surroundings, 707 m., south-west, 06.08.2011, 10.10.2012., Med. Ele.

60. *Fumana arabica* (L.) Spach var. *arabica* (arap güneşotu), O.1588, Kavaklıdere district entrance, marble quarry surroundings, 1003 m., east, 22.09.2012.
61. *Helianthemum salicifolium* (L.) Mill. (güneş çiçeği), O.1443, Yeşilköy marble quarry surroundings, 614 m., east, 17.06.2012.

#### Euphorbiaceae / Sütleğengiller

62. *Euphorbia peplus* L. var. *peplus*, (morsütotu), O.1765, Yeşilköy marble quarry surroundings, 615 m., east, 17.06.2012, Med. Ele.
63. *E. rigida* M.Bieb. (sütleğen), O.1234, Burnugöz, çayboyu between, marble quarry surroundings, 707 m., south-west, 06.08.2011, Med. Ele.
64. *E. taurinensis* All. (tilkisütleğeni), O.1482, O.1578, Burnugöz, çayboyu between, marble quarry surroundings, 707 m., south-west, 06.08.2011, 10.10.2012, Med. Ele.

#### Fabaceae (Leguminosae) / Baklagiller

65. *Anthyllis vulneraria* L. subsp. *praepropera* (Kerner) Bornm.(çobangülü), O.1116, O.1584, Kavaklıdere district exit, marble quarry surroundings, 1013 m., east, 12.03.2011, 25.05.2013., Med. Ele.
66. *Astragalus condensatus* Ledeb. (geven), O.1187, O.1800, Burnugöz, çayboyu between, marble quarry surroundings, 707 m., south-west, 06.08.2011, 10.10.2012., Ir. Tur. Ele., **End. (LC)**.
67. *Aragryris foetida* L. (katır kuyruğu), O.1456, Burnugöz, çayboyu between, marble quarry surroundings, 707 m., south-west, 10.10.2012., Med. Ele.
68. *Genista anatolica* Boiss. (kandaş diken), O.1782, Yeşilköy marble quarry surroundings, 619 m., east, 29.07.2011, 17.06.2012, 02.04.2013, Med. Ele.
69. *Lathyrus aphaca* L. var. *aphaca* (mürdümük), O.1313, Kavaklıdere district exit, marble quarry surroundings, 950 m., east, 23.06.2012.
70. *Medicago disciformis* DC. (yassı yonca), O.1974, Kavaklıdere district entrance, marble quarry surroundings, 997 m., east, 10.11.2012, Med. Ele.
71. *M. orbicularis* (L.) Bart. (paralık), O.1307, kavaklıdere district entrance, marble quarry surroundings, 1000 m., east, 23.06.2012, Med. Ele.
72. *Onobrychis aequidentata* (Sibth.&Sm.) d'Urv. (korunga), O.1579, Burnugöz, çayboyu between, marble quarry surroundings, 707 m., south-west, 10.10.2012., Med. Ele.
73. *Trifolium arvense* L. var. *arvense* (tarla üçgülü), O.1212, O.1512, Kavaklıdere district exit, marble quarry surroundings, 1002 m., east, 12.03.2011, 23.06.2012.
74. *T. tomentosum* L.(yünlü yonca), O.1085, O.1309, O.1491, Yeşilköy marble quarry surroundings, 615 m., east, 29.07.2011, 17.06.2012, 02.04.2013.
75. *T. uniflorum* L. (maki üçgülü), O.1269, Kavaklıdere

district entrance, marble quarry surroundings, 1013 m., EAST, 23.06.2012, Med. Ele.

76. *Trigonella spruneriana* Boiss. var. *spruneriana* (çemen otu), O.2077, Kavaklıdere district entrance, marble quarry surroundings, 1018 m., east, 22.09.2013, Med. Ele.

77. *Vicia articulata* Hornem. (kulaklı fiğ), O.1137, Yeşilköy marble quarry surroundings, 611 m., east, 29.07.2011, Med. Ele.

78. *V. villosa* Roth subsp. *villosa* (tüylü fiğ), O.1331, Yeşilköy marble quarry surroundings, 619 m., east, 29.07.2011, 17.06.2012.

#### **Fagaceae / Kayıngiller**

79. *Quercus aucheri* Jaub. (boz pırnal), O.1151, O.1216, Yeşilköy marble quarry surroundings, 610 m., east, 29.07.2011, 17.06.2012, E. Med. Ele., **End. (LC)**.

80. *Q. coccifera* L. (kermez meşesi), O.1030, O.1217, O.1884, Burnugöz, çayboyu between, marble quarry surroundings, 709 m., south-west, 06.08.2011, 10.10.2012, 08.10.1013, Med. Ele.

81. *Q. infectoria* Olivier subsp. *infectoria*, (mazi meşesi), O.1215, Burnugöz, çayboyu between, marble quarry surroundings, 705 m., south-west, 06.08.2011, Eur. Sib. Ele.

#### **Geraniaceae / Turnagagasıgiller**

82. *Erodium cicutarium* (L.) L'Herit subsp. *cicutarium* (iğnelik), O.1343, Yeşilköy marble quarry surroundings, 619 m., east, 17.06.2012.

83. *E. moschatum* (L.) L'Herit (kulunç), O.1237, Kavaklıdere district exit, marble quarry surroundings, 1011 m., east, 12.03.2011, Med. Ele.

84. *Geranium molle* L. subsp. *molle* (ıtır), O.1238, O.1404, Burnugöz, çayboyu between, marble quarry surroundings, 707 m., south-west, 06.08.2011, 10.10.2012.

85. *G. purpureum* Vill. (ebedön), O.2079, Kavaklıdere district entrance, marble quarry surroundings, 1021 m., east, 22.09.2013., Med. Ele.

#### **Hypericaceae (Guttiferae) / Kantarongiller**

86. *Hypericum elegans* Step.ex. Willd. (kantaron otu), O.1589, O.1757, Kavaklıdere district exit, marble quarry surroundings, 1000 m., east, 12.03.2011, 25.05.2013., Eur. Sib. Ele.

87. *H. perforatum* L. (sarı kantaron), O.1089, O.1545, Yeşilköy marble quarry surroundings, 619 M., east, 29.07.2011, 17.06.2012, 02.04.2013

#### **Lamiaceae (Labiatae) / Ballıbabagiller**

88. *Lavandula stoechas* L.subsp. *stoechas*, (lavanta), O.1427, Burnugöz, çayboyu between, marble quarry surroundings, 707 m., south-west, 06.08.2011, Med. Ele.

89. *Marrubium parviflorum* Fisch. & C.A. Mey. subsp. *parviflorum*, (bozotu) O.1134, Kavaklıdere district entrance, marble quarry surroundings, 1018 m., east, 23.06.2012, İr. Tur. Ele.

90. *Micromeria myrtifolia* Boiss. & Hohen, (boğumluçay), O.1486, Yeşilköy marble quarry surroundings, 615 m., east, 17.06.2012.

91. *Origanum onites* L. (bilyalıkekik), O.1172, O.1743, Kavaklıdere district exit, marble quarry surroundings, 1057 m., east, 12.03.2011, Burnugöz, çayboyu between, marble quarry surroundings, 707 m., south-west, 06.08.2011, 10.10.2012, E. Med. Ele.

92. *Sideritis curvidens* Stapf, (eğriçay), O.2082, Kavaklıdere district exit, marble quarry surroundings, 1000 m., east, 25.05.2013, E. Med. Ele.

93. *Stachys cretica* L. subsp. *smyrnaea* Rech. fil. (ikidudaklı adaçayı), O.1701, O.1636, Burnugöz, çayboyu between, marble quarry surroundings, 703 m., south-west, 06.08.2011, 10.10.2012., E. Med. Ele., **End. (LC)**.

94. *Teucrium chamaedrys* L. subsp. *chamaedrys*, (dalakotu), O.1794, O.1713, Yeşilköy marble quarry surroundings, 615 m., east, 02.04.2013, Kavaklıdere district exit, marble quarry surroundings, 911 m., east, 23.06.2012, Eur. Sib. Ele.

95. *T. scordium* L. subsp. *scordioides* (Schreber) Maire & Petit Mengin, (kurtluca), O.1823, Burnugöz, çayboyu between, marble quarry surroundings, 711 m., south-west, 10.10.2012.

96. *Thymbra spicata* L. var. *spicata*, (zahter), O.1749, Burnugöz, çayboyu between, marble quarry surroundings, 705 m., south-west, 10.10.2012, E. Med. Ele.

#### **Malvaceae / Ebegümeçigiller**

97. *Alcea pallida* Waldst. & Kit. (hatmi çiçeği), O.1126, O.1095, Kavaklıdere district exit, marble quarry surroundings, 1010 m., east, 12.03.2011, 23.06.2012.

98. *Malva sylvestris* L. (ebegümeçi), O.1133, O.1568, Burnugöz, çayboyu between, marble quarry surroundings, 707 m., south-west, 06.08.2011, 10.10.2012.

#### **Oleaceae / Zeytingiller**

99. *Jasminum fruticans* L. (yaban mersini), O.1080, O.1377, Burnugöz, çayboyu between, marble quarry surroundings, 707 m., south-west, 06.08.2011, 10.10.2012., Med. Ele.

100. *Phillyrea latifolia* L. (akçakesme), O.1899, Kavaklıdere district entrance, marble quarry surroundings, 1009 m., east, 22.09.2013., Med. Ele.

#### **Orobanchaceae / Canavarotugiller**

101. *Orobanche crenata* Forsskål, (zıpirotu) O.2080, Yeşilköy marble quarry surroundings, 615 m., east, 02.04.2013, Med. Ele.

102. *O. minor* Sm, (göveotu) O.1580, Burnugöz, çayboyu between, marble quarry surroundings, 709 m., south-west, 10.10.2012, Med. Ele.

#### **Papaveraceae / Gelicikgiller**

103. *Glaucium flavum* Crantz (gündürmelalesi), O.1564, Kavaklıdere district exit, marble quarry surroundings, 1008 m., east, 23.06.2012.

104. *Papaver rhoeas* L. (gelincik), O.1328, Yeşilköy marble quarry surroundings, 615 m., east, 29.07.2011.

#### **Plantaginaceae / Sinirotugiller**

105. *Digitalis cariensis* Boiss. ex Jaub. & Spach, (yüksükotu), O.1796, Burnugöz, çayboyu between, marble quarry surroundings, 707 m., south-west, 10.10.2012, E. Med. Ele., **End. (LC)**.
106. *Plantago lagopus* L. (kırkdamarotu), O.2066, Kavaklıdere district exit, marble quarry surroundings, 1058 m., east, 25.05.2013, Med. Ele.
107. *P. lanceolata* L. (damarlıca), O.1131, O.1065, O.1422, Burnugöz, çayboyu between, marble quarry surroundings, 701 m., south-west, 06.08.2011, 10.10.2012.
108. *Veronica cymbalaria* Bodard.(venüşçiçeği), O.1240, Kavaklıdere district exit, marble quarry surroundings, 1038 m., east, 12.03.2011, Med. Ele.

#### **Primulaceae / Çuhaçiçeğigiller**

109. *Cyclamen mirabile* Hildebr. (domuzturpu), O.1229, O.1887, Burnugöz, çayboyu between, marble quarry surroundings, 705 m., south-west, 06.08.2011, 10.10.2012., E. Med. Ele., **End. (NT)**.
110. *Lysimachia arvensis* (L.) U.Manns & Anderb. (farekulağı) O.1054, O.1406, Yeşilköy marble quarry surroundings, 615 m., east, 29.07.2011, 17.06.2012.
111. *L. loeflingii* F.J.Jiménez & M.Talavera, (sıçan kulağı) O.1405, O.1766, Burnugöz, çayboyu between, marble quarry surroundings, 707 m., south-west, 06.08.2011, 10.10.2012.

#### **Ranunculaceae / Dügünçiçeğigiller**

112. *Anemone blanda* Schott & Kotchy (dağlalesi), O.1912, Kavaklıdere district exit, marble quarry surroundings, 1003 m., east, 25.05.2013., Med. Ele.
113. *Clematis cirrhosa* L. (bahar sarmaşığı), O.1235, Kavaklıdere district exit, marble quarry surroundings, 1001 m., east, 23.06.2012.
114. *Nigella arvensis* L. var. *glauca* Boiss. (çörekotu), O.1077, Yeşilköy marble quarry surroundings, 611 m., east, 29.07.2011.
115. *Ranunculus argyreus* Boiss. (çitemik), O.1448, Kavaklıdere district entrance, marble quarry surroundings, 1005 m., east, 23.06.2012.
116. *R. arvensis* L. (mustafa çiçeği), O.2007, kavaklıdere district entrance, marble quarry surroundings, 991 m., east, 23.06.2012.
117. *R. chius* DC. (meremcik), O.1938, Kavaklıdere district entrance, marble quarry surroundings, 993 m., east, 02.04.2013, E. Med. Ele.

#### **Rhamnaceae / Cehrigiller**

118. *Paliurus spina-christi* Mill. (karaçalı), O.2087, Yeşilköy marble quarry surroundings, 625 m., east, 02.04.2013, Med. Ele.

#### **Rosaceae / Gülgiller**

119. *Potentilla recta* L. (parmakotu), O.1716, O.2084,

- Yeşilköy marble quarry surroundings, 618 m., east, 17.06.2012, 02.04.2013, Med. Ele.

120. *Rubus canescens* DC. subsp. *canescens* (çoban kösteği), O.1177, O.1805, Burnugöz, çayboyu between, marble quarry surroundings, 701 m., south-west, 06.08.2011, 10.10.2012.

121. *Sanguisorba minor* Scop. subsp. *minor* (kelek ayağı), O.1469, Kavaklıdere district entrance, marble quarry surroundings, 1006 m., east, 10.11.2012.

#### **Rubiaceae / Kökboyagiller**

122. *Crucianella imbricata* Boiss. (kurak haçotu), O.1715, Yeşilköy marble quarry surroundings, 615 m., east, 02.04.2013, Med. Ele.

123. *Galium heldreichii* Hal. (yoğurtotu), O.1767, Burnugöz, çayboyu between, marble quarry surroundings, 707 m., south-west, 10.10.2012.4, E. Med. Ele.

#### **Santalaceae / Güvelekgiller**

124. *Thesium billardieri* Boiss. (meşegüveleği), O.1764, burnugöz, çayboyu between, marble quarry surroundings, 707 m., south-west, 10.10.2012, Ir. Tur. Ele.

#### **Scrophulariaceae / Siracaotugiller**

125. *Verbascum glomeratum* Boiss.(sıgırkulağı), O.1058, O.1127, Burnugöz, çayboyu between, marble quarry surroundings, 712 m., south-west, 06.08.2011, 10.10.2012.

126. *V. lyidium* Boiss. var. *lyidium* Murb. (akgömlek), O.1741, Yeşilköy marble quarry surroundings, 617 m., east, 17.06.2012, E. Med. Ele., **End. (LC)**

127. *V. sinuatum* L.var. *sinuatum*, (bodanotu), O.1891, Kavaklıdere district exit, marble quarry surroundings, 1024 m., east, 25.05.2013., Med. Ele.

#### **Styracaceae / Ayıfındığıgiller**

128. *Styrax officinalis* L. (ayıfındığı), O.2067, Yeşilköy marble quarry surroundings, 615 m., east, 02.04.2013, E. Med. Ele.

#### **Urticaceae / Isırgangiller**

129. *Urtica dioica* L.(ısırgan), O.1829, Yeşilköy marble quarry surroundings, 601 m., east, 02.04.2013.

#### **Zygophyllaceae / Çobançökertengiller**

130. *Tribulus terrestris* L. (çobançökerten), O.1815, Kavaklıdere district entrance, marble quarry surroundings, 998 m., east, 22.09.2013.

#### **Liliopsida (Monocotyledones) / Tek Çeneklikler**

##### **Amaryllidaceae / Nergisgiller**

131. *Allium ampeloprasum* L. (soğan), O.1119, Burnugöz, çayboyu between, marble quarry surroundings, 708 m., south-west, 06.08.2011.

132. *A. flavum* L. subsp. *flavum* var. *flavum*, (sarisoğan), O.1747, Kavaklıdere district exit, marble quarry surroundings, 1074 m., east, 25.05.2013., Med. Ele.

133. *A. scorodoprasum* L. subsp. *rotundum* (L.) Stearn,

(kumsoğanı) O.1635, O.1740, Burnugöz, çayboyu between, marble quarry surroundings, 713 m., south-west, 06.08.2011, 10.10.2012.

134. *A. sphaerocephalon* L. subsp. *sphaerocephalon*, (yılan sarımsağı), O.1740, Kavaklıdere district exit, marble quarry surroundings, 1005 m., east, 23.06.2012, Med. Ele.

#### **Asparagaceae / Kuşkonmazgiller**

135. *Muscari comosum* (L.) Mill. (morbaş), O.1325, O.1657, Yeşilköy marble quarry surroundings, 613 m., east, 29.07.2011, 02.04.2013.4, Med. Ele.
136. *Ornithogalum umbellatum* L. (sunbala), O.1446, Yeşilköy marble quarry surroundings, 634 m., east, 17.06.2012, Med. Ele.
137. *Ruscus aculeatus* L. (tavşan memesi), O.1900, Yeşilköy marble quarry surroundings, 615 m., east, 02.04.2013, Med. Ele.

#### **Cyperaceae / Hasırotugiller**

138. *Carex flacca* Schreb. subsp. *erythrostachys* (Hoppe) Holub (yanık çayırşazı), O.1114, O.1444, Yeşilköy marble quarry surroundings, 630 m., east, 29.07.2011, 17.06.2012, Med. Ele.

#### **Iridaceae / Süsengiller**

139. *Crocus pallasii* Goldb. subsp. *pallasii*, (palasçığdemi), O.1887, Kavaklıdere district entrance, marble quarry surroundings, 1020 m., east, 22.09.2013., Med. Ele.
140. *C. nerimaniae* Yüzbasıoğlu & Varol. (sultançığdemi), O.1889, Kavaklıdere district entrance, marble quarry surroundings, 1020 m., east, 22.09.2013., Med. Ele., **End. (LC)**
141. *Gynandrisis sisyrinchium* (L.) Parl. (keklik çiğdemi), O.1278, Yeşilköy marble quarry surroundings, 624 m., east, 29.07.2011, Med. Ele.

#### **Liliaceae / Zambakgiller**

142. *Fritilaria carica* Rix. (bodursarı), O.1937, Kavaklıdere district exit, marble quarry surroundings, 1000 m., east, 25.05.2013., E. Med. Ele.
143. *Gagea peduncularis* (J. Presl & C. Presl) Pascher, (kargasarımsağı) O.1257, Burnugöz, çayboyu between, marble quarry surroundings, 717 m., south-west, 06.08.2011, Med. Ele.

#### **Orchidaceae / Salepgiller**

144. *Comperia comperiana* (Steven) Aschers. & Graebn. (ibradiakseki), O.1585, O.1600, Burnugöz, çayboyu between, marble quarry surroundings, 714 m., south-west, 06.08.2011, 10.10.2012, Ir.-Tur. Ele.
145. *Ophrys fusca* Link. subsp. *fusca*, (kedigözü), O.1936, Kavaklıdere district exit, marble quarry surroundings, 1025 m., east, 25.05.2013., Med. Ele.
146. *O. holosericea* (Bum. fil.) Greuter subsp. *heterochila* Renz.& Taub. (örümcek orkidesi), O.1277, Kavaklıdere district entrance, marble quarry

surroundings, 1010 m., east, 23.06.2012, E. Med. Ele., **End. (VU)**.

147. *O. mammosa* Desf. subsp. *mammosa*, (kedikulağı), O.1935, Burnugöz, çayboyu between, marble quarry surroundings, 707 m., south-west, 10.10.2013., Med. Ele.
148. *Orchis anatolica* Boiss. (dildamak), O.1454, Yeşilköy marble quarry surroundings, 624 m., east, 29.07.2011, E. Med. Ele.
149. *O. anthropophora* (L.) All. (kuklasalebi), O.1992, Kavaklıdere district exit, marble quarry surroundings, 1055 m., east, 25.05.2013., Med. Ele.

#### **Poaceae (Gramineae) / Buğdaygiller**

150. *Aegilops umbellulata* Zhuk. (hanımbuğdayı), O.1521, Kavaklıdere district exit, marble quarry surroundings, 1000 m., east, 23.06.2012, Ir-Tur. Ele.
151. *Briza maxima* L. (tavşanküpeşi), O.1115, O.1386, Burnugöz, çayboyu between, marble quarry surroundings, 728 m., south-west, 06.08.2011, 10.10.2012.
152. *B. minor* L. (küçükzembil), O.1577, Burnugöz, çayboyu between, marble quarry surroundings, 730 m., south-west, 10.10.2012., Med. Ele.
153. *Chrysopogon gryllus* (L.) Trin. subsp. *gryllus*. (buzağıotu), O.1763, Kavaklıdere district exit, marble quarry surroundings, 1024 m., east, 12.03.2011, 23.06.2012, Med. Ele.
154. *Cynosurus echinatus* L. (tarakotu), O.1865, O.1991, Burnugöz, çayboyu between, marble quarry surroundings, 730 m., south-west, 06.08.2012, 22.09.2013, Med. Ele.
155. *Echinaria capitata* (L.) Desf. (dikenbaşotu), O.1449, Yeşilköy marble quarry surroundings, 610 m., east, , 17.06.2012.
156. *Hordeum murinum* L. subsp. *leporinum* (Link) Arcang., (pisipisiotu) O.1451,O.1520, Burnugöz, çayboyu between, marble quarry surroundings, 710 m., south-west, 06.08.2011, 10.10.2012., Med. Ele.
157. *Poa bulbosa* L. (yumrulu salkım), O.1434, Kavaklıdere district entrance, marble quarry surroundings, 1000 m., east, 23.06.2012.
158. *P. trivialis* L. (kaba salkımotu), O.1993, Kavaklıdere district exit, marble quarry surroundings, 1000 m., east, 25.05.2013., Med. Ele.
159. *Stipa bromoides* (L.) Dörfler, (kılaç), O.1120, Burnugöz, çayboyu between, marble quarry surroundings, 707 m., south-west, 06.08.2011, Med. Ele.
160. *Triticum aestivum* L. (ekmeklik buğday), O.1813, Kavaklıdere district exit, marble quarry surroundings, 1050 m., east, 25.05.2013.
161. *Vulpia myuros* (L.) C.C. Gmelin (arsız kirpikliçim), O.1442, Yeşilköy marble quarry surroundings, 610 m., east, 17.06.2012, Med. Ele.