

## Lichens of the Köprülü Canyon National Park in Turkey

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**Abstract** — This is the first comprehensive survey on lichens of the Köprülü Canyon National Park. Totally 1266 lichen samples were collected during the field studies between June 2006 and August 2008 in Köprülü Canyon National Park. 217 lichen taxa which belong to 8 orders, 28 families and 76 genera were determined from the research area. Of the determined lichens 203 taxa were recorded for the first time in the national park. In addition 67 taxa are new records for Antalya and 7 taxa for Turkey.

**Key words** — Lichenized fungi, Lichen biodiversity, New records

### Introduction

Lichens are very specific symbiotic organisms classified in Fungi Kingdom and they comprise 25% of this kingdom (Margulis and Chapman 2009). It is one of the most interesting groups of fungi and many researches have also been carried out recently in Turkey, like antibacterial (Türk et al. 2003, Cansaran et al. 2007, Akpınar et al. 2009), antioxidant (Aslan et al. 2006), cytotoxic (Zeytinoglu et al. 2008), insecticidal (Cetin et al. 2008) effects of their secondary compounds. The basis for these researches is a serious detection of the lichen diversity. With this background, the number of the studies about the lichen diversity increased in Turkey in recent years (John 2007). Some of these researches focus on natural protected areas (e.g. Çobanoğlu & Akdemir 2004, Halici & Cansaran-Duman 2007, Tufan et al. 2005).

As from Köprülü Canyon National Park (KCNP) only 14 taxa have been reported so far (Ayaşlıgil 1987, Cansaran-Duman et al. 2008) a serious survey was required.

### Study area

Köprülü Canyon National Park (KCNP) located in southwestern Turkey has a surface of 36616 ha, located northeast of Antalya City (Figure 1). The surface of area is in Manavgat (95 %) and Serik (5%) counties. The altitudes range from 125 to 2504 m. The area was declared a National Park in 1973,

based on natural, cultural and recreational aspects. The historical monuments are represented by the ancient Roman city of Selge and a Roman canyon bridge (Oluk Köprü). Orographic structures reflect the geological formations. While the area mostly covers with calcareous rocks, in some regions of the area, it can be existed siliceous rocks mixed with calcareous ones. Also in the area, there are conglomeratic rocks that formed by pressing the moved siliceous and/or calcareous stones with cement. More than 50% of KCNP is covered by those bare rocks.

For evaluating the climate of the area, meteorological data of the counties Manavgat (20 m), Serik (60 m) and Sütçüler (1000 m) were used. Emberger's index of summer dryness (S) and pluviothermic quotient ( $Q_2$ ) were calculated according to the data of these counties, showing that KCNP is in Mediterranean climate region ( $S_{\text{Manavgat}}=0.45$ ,  $S_{\text{Serik}}=0.40$ ,  $S_{\text{Sütçüler}}=2.89$ ) in humid to hyper-humid Mediterranean bioclimatic subdivision ( $Q_{2\text{Manavgat}}=142.347$ ,  $Q_{2\text{Serik}}=120.92$ ,  $Q_{2\text{Sütçüler}}=211.618$ ). The yearly total precipitation is more than 1000 mm and the drought period starts May-June, ending September-October in KCNP.

Nearly half of the national park's surface is covered by forest trees like *Pinus brutia* Ten., *Cupressus sempervirens* L., *Juniperus excelsa* Bieb., *Abies cilicica* (Ant. et Kotschy) Carr. subsp. *isaurica*, *Cedrus libani* A. Rich., *Pinus nigra* Arnold subsp. *pallasiana* (Lamb.) Holmboe., and *Quercus cerris* L. subsp. *cerris* Important scrubs are *Quercus coccifera* L., *Myrtus communis* L. subsp. *communis* and *Olea europea* L. var. *sylvestris*.

## Materials & methods

A total of 1266 lichen samples was collected from 168 localities between July 2006 and August 2008 (Table 1). The coordinates and altitudes of each locality were measured by GPS. The localities were chosen with respect to the factors like as vegetation, topographical structure, climate, altitudes of the different regions of the research area and being at least a locality per 1x1 km square. With sampling from different habitats were aimed to found special lichen taxa of these habitats. The lichen samples were dried under room conditions and the determinations were done with examining the macroscopic characters with a light microscope (Olympus CH20BIMF200) and microscopic characters of the samples with a stereoscopic zoom microscope (Nikon SMZ645). For identification, different floras (Clauzade and Roux 1985, Goward et al. 1994, Purvis et al. 1992, Wasser and Nevo 2005, Wirth 1995), monographs (Breuss 1990, Giralt 2001, Moberg 1977) and relevant papers (Fryday and Coppins 1997, Giordani et al. 2002, Jørgensen 1997, Mc Cune 2006, Tucker and Thiers 1998, Wetmore 2005) were used. Spot test and UV test were used according to the standart procedure. The samples are deposited in Akdeniz University Herbarium (AKDU).

## Results

217 lichen taxa, 3 lichenicolous fungi taxa and 1 non-lichenized fungi taxa were identified from Köprülü Canyon National Park (KCNP). They are listed below in alphabetic order. The nomenclature in general follows a more modern concept. Authors' abbreviations follow Brummitt & Powell (1992). In addition the numbers of localities and substrates are given. Lichen taxa new to Turkey are indicated by \*, new to Antalya by #. Literature records are included.

- Acarospora cervina* (Ach.) A.Massal. 35, 43, 46, 59, 62, 65, 93, 113, 117, 146 on calcareous rock
- Acarospora fuscata* (Nyl.) Arnold 35 on siliceous rock
- Acarospora macrospora* subsp. *macrospora* (Hepp) A.Massal. ex Bagl. 62, 75, 76, 120, 143 on calcareous rock
- # *Acarospora macrospora* subsp. *murorum* (A.Massal.) Clauzade & Cl.Roux 8 on siliceous rock
- Anaptychia ciliaris* subsp. *ciliaris* (L.) Körb. 22 on *Pinus brutia*; 36 on *Quercus coccifera*; 69, 72 on *Juniperus excelsa*; 89, 120 on *Abies cilicica* subsp. *isaurica*, 103 on *Juniperus oxycedrus*; 121, 123, 132 on *Cedrus libani*; Ayaşlıgil (1987).
- \*# *Arthonia nephromiaria* Nyl. 39 on *Nephroma laevigatum* (det: G.M. Halıcı)
- # *Aspicilia caesiocinerea* (Nyl. ex Malbr.) Arnold 11 on siliceous rock
- Aspicilia calcarea* (L.) Körb. 4, 11, 15, 16, 17, 20, 22, 32, 34, 36, 39, 42, 43, 45, 52, 62, 63, 65, 70, 87, 89, 101, 102, 104, 127, 141 on calcareous rock
- # *Aspicilia cheresina* (Müll.Arg.) Hue 35 on calcareous rock
- Aspicilia contorta* subsp. *contorta* (Hoffm.) Kremp. 2, 3, 4, 5, 7, 10, 14, 15, 17, 26, 55 on calcareous rock
- Aspicilia contorta* subsp. *hoffmanniana* S.Ekman & Fröberg ex R.Sant. 4, 7, 17, 20, 21, 22, 48, 55, 116, 141 on calcareous rock
- Aspicilia desertorum* (Kremp.) Mereschk. 90, 93, 160, 161 on calcareous rock
- Aspicilia farinosa* (Flörke) Flagey 11, 26, 42, 50, 65, 73, 92, 105, 128, 143, 153 on calcareous rock
- Aspicilia viridescens* (A.Massal.) Hue 35, 107 on calcareous rock
- # *Bacidia bagliettoana* (A.Massal. & de Not.) Jatta 70 on moss
- # *Bacidina phacodes* (Körb.) Vězda 27 on *Quercus coccifera*
- Bagliettoa calciseda* (DC.) Gueidan & Cl.Roux 16, 100 on calcareous rock
- Bagliettoa marmorea* (Scop.) Gueidan & Cl.Roux 4, 15, 16, 17, 20, 26, 27, 28, 29, 31, 32, 35, 41, 42, 45, 46, 50, 51, 53, 62, 66, 73, 87, 89, 101,

- 102, 105, 113, 127, 141 on calcareous rock; Ayaşlıgil (1987) (as *Verrucaria marmorea*).
- Bagliettoa parmigera* (J.Steiner) Vězda & Poelt 7, 11, 26, 28, 30, 34, 51, 110, 113, 142 on calcareous rock
- # *Bilimbia lobulata* (Sommerf.) Hafellner & Coppins 90 on soil
- Bryoria fuscescens* (Gyeln.) Brodo & D.Hawksw. var. *fuscescens* 69, 136 on *Pinus nigra*; Ayaşlıgil (1987).
- Caloplaca adriatica* (Zahlbr.) Servit 31, 32, 35, 42, 51, 59, 86, 89, 94, 107, 128, 140 on calcareous rock
- Caloplaca aurantia* (Pers.) Hellb. 6, 12, 15, 30, 31, 42, 65, 114, 137 on calcareous rock
- Caloplaca cerina* var. *cerina* (Ehrh. ex Hedw.) Th. Fr. 1 on *Quercus coccifera*; 22 on *Pinus brutia*; 69, 75, 135, 149 on *Juniperus excelsa*; 103 on *Quercus infectoria* subsp. *boissieri*; 120 on *Abies cilicica* subsp. *isaurica*
- Caloplaca cerinelloides* (Erichsen) Poelt 22 on *Pinus brutia*
- # *Caloplaca cerinoides* (Anzi) Jatta 15 on *Olea europea* var. *sylvestris*
- Caloplaca chalybaea* (Fr.) Müll.Arg. 22, 26 on calcareous rock
- Caloplaca chrysodeta* (Vain. ex Räsänen) Dombr. 34, 46, 52, 55, 80, 113 on calcareous rock
- Caloplaca dalmatica* (A.Massal.) H.Olivier 15, 31, 39, 73, 88, 89, 104, 125, 140, 152 on calcareous rock
- # *Caloplaca ferruginea* (Huds.) Th.Fr. 45 on *Pinus brutia*; 46 on *Quercus cerris* subsp. *cerris*
- Caloplaca flavescens* (Huds.) J.R.Laundon 31, 35, 39, 45, 59, 95, 104, 126, 140, 142 on calcareous rock
- Caloplaca flavorubescens* (Huds.) J.R.Laundon 22 on *Pinus brutia*; 35, 107 on *Quercus cerris* subsp. *cerris*; 120 on *Abies cilicica* subsp. *isaurica*
- Caloplaca holocarpa* (Hoffm.) A.E.Wade 6 on *Populus alba*; 20 on *Pinus brutia*; 35 on siliceous rock; 45, 63, 144 on calcareous rock
- Caloplaca lactea* (A.Massal.) Zahlbr. 4, 5, 17, 18, 26, 31, 34, 35 on calcareous rock
- Caloplaca ochracea* (Schaer.) Flagey 31, 45 on calcareous rock
- Caloplaca pollinii* (A.Massal.) Jatta 1 on *Quercus coccifera*, on *Populus alba*
- Caloplaca polycarpa* (A.Massal.) Zahlbr. 22 on *Verrucaria* sp.; 27 on *Bagliettoa parmigera*
- # *Caloplaca schistidii* (Anzi) Zahlbr. 74, 105 on moss
- Caloplaca teicholyta* (Ach.) J.Steiner 4, 6, 7, 17, 20, 24, 26, 45, 48, 51, 52, 62 on siliceous rock
- Caloplaca variabilis* (Pers.) Müll.Arg. 22, 26, 30, 50, 88, 103 on calcareous rock

- Caloplaca xantholyta* (Nyl.) Jatta 35, 42, 46, 59, 79, 103, 104, 108, 152 on calcareous rock
- Candelariella aurella* f. *aurella* (Hoffm.) Zahlbr. 74, 154 on *Juniperus excelsa*
- # *Candelariella reflexa* (Nyl.) Lettau 102, 147 on *Juniperus excelsa*
- Candelariella xanthostigma* (Pers.) Lettau 1, 20 on *Pinus brutia*; 69, 74, 120, 135, 149 on *Juniperus excelsa*
- Catapyrenium pilosellum* Breuss 28 on soil
- # *Catapyrenium rufescens* (Ach.) Breuss 30, 35, 42, 45, 107 on calcareous rock
- Catapyrenium squamulosum* (Ach.) Breuss 16, 17, 47, 71, 125, 150 on soil
- Catillaria nigroclavata* (Nyl.) Schuler 4, 20, 22 on *Pinus brutia*
- Cladonia fimbriata* (L.) Fr. 18 on *Pinus brutia*; 90 on *Pinus nigra*
- Cladonia furcata* subsp. *furcata* (Huds.) Schrad. 1 on soil; Ayaşlıgil (1987).
- # *Cladonia humilis* (With.) J.R.Laundon 19 on *Pinus brutia*
- Cladonia pocillum* (Ach.) O.J.Rich. 1, 11, 15 on moss
- Cladonia pyxidata* (L.) Hoffm. 1, 23, 51, 55, 81, 110 on moss on *Pinus brutia*; 26 on moss; 30 on moss on *Juniperus oxycedrus*
- # *Cladonia ramulosa* (With.) J.R.Laundon 18 on *Pinus brutia*
- \*# *Cladonia magyarica* Vain. on moss over rock Oluk Bridge, 37°11'40"N, 31°10'52"E (near loc 11) TLC133-1: FPC, Atranorin 14.04.2010 leg & det: C. Dolnik
- Cladonia rangiformis* Hoffm. 4, 17, 19, 20, 26, 52 on soil
- Clauzadea immersa* (Hoffm.) Hafellner & Bellem. 59, 104 on calcareous rock
- # *Collema callopismum* var. *callopismum* A.Massal. 4 on calcareous rock
- Collema crispum* var. *crispum* (Huds.) Weber ex F.H.Wigg. 11, 45 on moss on calcareous rock; 13 on soil; 19 on calcareous rock
- Collema cristatum* var. *cristatum* (L.) Weber ex F.H.Wigg. 2, 3, 4, 6, 7, 9, 16, 20, 25, 26, 32, 42, 48, 52, 58, 62, 68, 88, 89, 96, 135, 137 on calcareous rock
- Collema cristatum* var. *marginale* (Huds.) Degel. 1 on moss on calcareous rock and soil
- # *Collema flaccidum* (Ach.) Ach. 1 on *Pinus brutia*; 31 on *Cupressus sempervirens*; 39, 46 on *Quercus cerris* subsp. *cerris*; 48 on calcareous rock
- Collema nigrescens* (Huds.) DC. 7 on *Ceratonia siliqua*; 23, 27, 28 on *Quercus coccifera*; 46 on *Quercus cerris* subsp. *cerris*; 50, 111 on *Cupressus sempervirens*; 89 on *Abies cilicica* subsp. *isaurica*; 102 on *Juniperus excelsa*
- Collema tenax* var. *tenax* (Sw.) Ach. 1, 58 on moss on soil

- Degelia atlantica* (Degel.) P.M. Jørg. & P. James 31 on *Cupressus sempervirens*; 85 on *Quercus cerris* subsp. *cerris*; 103 on *Pinus brutia*
- Degelia plumbea* (Lightf.) P.M. Jørg. & P. James 19, 20, 21, 23 on *Quercus coccifera*; 31 on *Cupressus sempervirens*; 37, 40, 59, 84, 103 on *Pinus brutia*; 104, 106 on *Quercus cerris* subsp. *cerris*
- Dermatocarpon miniatum* var. *miniatum* (L.) W.Mann 35, 49, 80, 90, 91, 97, 107, 129 on calcareous rock
- # *Diploschistes diacapsis* (Ach.) Lumbsch 59 on calcareous rock
- Diploschistes gypsaceus* (Ach.) Zahlbr. 26, 45, 82, 104 on calcareous rock
- Diploschistes muscorum* (Scop.) R.Sant. 26 on *Cladonia pyxidata*; 70 on *Cladonia* sp
- Diploschistes ocellatus* (Fr.) Norman 15, 20, 24, 26, 30, 32, 35, 50, 52, 54, 82, 102, 128, 138, 148 on calcareous rock
- # *Diplotomma venustum* (Körb.) Lettau 69 on calcareous rock
- Evernia divaricata* (L.) Ach. 69, 135 on *Juniperus excelsa*
- Evernia prunastri* (L.) Ach. 17, 18, 20, 23, 34, 62 on *Pinus brutia*; 70 on *Juniperus oxycedrus*; Cansaran-Duman et al. (2008).
- Farnoldia jurana* (Schaer.) Hertel 6, 34, 35, 83, 98, 107, 144 on calcareous rock
- # *Fulgensia bracteata* var. *bracteata* (Hoffm.) Räsänen 6 on moss on soil
- Fulgensia fulgens* (Sw.) Elenkin 11 on *Squamarina cartilaginea*; 35 on calcareous rock; 39 on moss; 46, 83, 104, 145 on calcareous rock
- Fuscopannaria olivacea* (P.M.Jørg.) P.M.Jørg. 1, 18, 60 on *Pinus brutia*, 27, 36 on *Quercus coccifera*, 30, 45 on *Juniperus oxycedrus*, 89 on *Abies cilicica* subsp. *isaurica*
- Obryzum corniculatum* (Hoffm.) Wallr. 46 on *Leptogium gelatinosum*
- # *Hypogymnia farinacea* Zopf 34, 37, 88 on *Pinus brutia*; 63, 69, 124 on *Pinus nigra*
- Hypogymnia physodes* (L.) Nyl. 18 on *Pinus brutia*; Cansaran-Duman et al. (2008).
- Hypogymnia tubulosa* (Schaer.) Hav. 1, 19, 20, 21, 37, 60, 69 on *Pinus brutia*; 70 on *Juniperus oxycedrus*; 120 on *Cedrus libani*; 136 on *Pinus nigra*; Cansaran-Duman et al. (2008).
- # *Lecania atrynoides* M.Knowles 27 on calcareous rock
- Lecanora bolcana* (Pollini) Poelt 70, 71, 125, 150 on siliceous rock
- # *Lecanora campestris* subsp. *campestris* (Schaer.) Hue 51 on siliceous rock
- Lecanora chlarotera* Nyl. 27 on *Quercus coccifera*; 35, 36 *Quercus cerris* subsp. *cerris*; 74 on *Juniperus excelsa*; 88 on *Pinus brutia*; 120 on *Abies cilicica* subsp. *isaurica*
- Lecanora expallens* Ach. 18, 61, 79 on *Pinus brutia*
- Lecanora flotoviana* Spreng. 17, 43, 116, 118 on calcareous rock
- Lecanora hagenii* (Ach.) Ach. 69 on *Juniperus excelsa*

- # *Lecanora persimilis* (Th.Fr.) Nyl. 20 on *Pinus brutia*  
*Lecanora pruinoso* Chaub. 11, 30, 35, 42 on calcareous rock  
*Lecanora pulicaris* (Pers.) Ach. 15 on *Olea europea*  
*Lecanora saligna* (Schrad.) Zahlbr 62 on *Pinus nigra*  
# *Lecanora subintricata* (Nyl.) Th.Fr. 1 on *Quercus coccifera*  
*Lecanora varia* (Hoffm.) Ach. 20 on *Pinus brutia*; 74 on *Juniperus excelsa*;  
120, 122 on *Cedrus libani*; 125 on *Pinus nigra*  
*Lecidea fuscoatra* (L.) Ach. 11 on siliceous rock  
*Lecidella carpathica* Körb. 88 on calcareous rock, 94 on siliceous rock  
*Lecidella elaeochroma* f. *elaeochroma* (Ach.) M.Choisy 1 on *Myrtus communis*; 7 on *Ceratonia siliqua*; 20, 21 on *Pinus brutia*; 28 on *Quercus coccifera*; 35, 39, 46 on *Quercus cerris* subsp. *cerris*; 69, 74 on *Juniperus excelsa*; 89 on *Cedrus libani*; 45, 56, 115 on *Pinus brutia*  
*Lecidella stigmata* (Ach.) Hertel & Leuckert 8, 17, 39 on siliceous rock  
*Lepraria lobificans* Nyl. 80 on calcareous rock  
*Lepraria nivalis* J.R.Laundon 11, 23, 27, 30, 34, 35, 43, 45, 46, 51, 52, 59, 107, 111, 113, 116, 118 on calcareous rock  
# *Lepraria vouauxii* (Hue) R.C.Harris 11 on calcareous rock; 39, 42 on moss  
# *Leptogium cyanescens* (Pers.) Körb. 27 on *Quercus coccifera*  
*Leptogium furfuraceum* (Harm.) Sierk 27 on *Quercus coccifera*; 31, 111 on *Cupressus sempervirens*  
*Leptogium gelatinosum* (With.) J.R. Laundon 19, 46, 110, 112 on moss  
*Leptogium lichenoides* (L.) Zahlbr. 1, 11 on moss  
# *Leptogium minutissimum* (Flörke) Fr. 7 on calcareous rock  
*Leptogium plicatile* (Ach.) Leight. 31, 43, 117 on calcareous rock  
\*# *Leptogium pseudopapillosum* P.M.Jørg. 27, 28 on *Quercus coccifera*; 50 on *Cupressus sempervirens* (det: P.M. Jørgensen)  
# *Leptogium schraderi* (Bernh.) Nyl. 7 on moss on soil; 30 on soil  
*Leptogium subtile* (Schrad.) Torss. 1 on soil; 8 on siliceous rock  
# *Leptogium tenuissimum* (Hoffm.) Körb. 7 on calcareous rock  
# *Leptogium teretiusculum* (Flörke) Arnold 17 on moss on soil, 19 on *Pinus brutia*; 31, 50 on *Cupressus sempervirens*; 42 on calcareous rock  
*Letharia vulpina* (L.) Hue 71, 125 on *Pinus brutia*; 90 on *Pinus nigra*; 123, 133 on *Cedrus libani*; Ayaşlıgil (1987).  
# *Lobothallia alphoplaca* (Wahlenb.) Hafellner 34 on moss; on calcareous rock  
*Lobothallia radiosa* (Hoffm.) Hafellner 3, 4, 7, 9, 11, 14, 15, 16, 17, 20, 25, 26, 30, 31, 32, 34, 35, 42, 43, 45, 46, 51, 54, 57, 62, 63, 68, 73, 77, 88, 89, 91, 102, 105, 108, 118, 120, 138 on calcareous rock  
*Megaspora verrucosa* (Ach.) Hafellner & V.Wirth 35, 36, 46, 108 on *Quercus cerris* subsp. *cerris*; 123, 132 on *Cedrus libani*

- Melanelixia glabra* (Schaer.) O.Blanco et al. 27, 28 on *Quercus coccifera*; 35, 36, 46, 59, 103, 104 on *Quercus cerris* subsp. *cerris*  
# *Melanohalea elegantula* (Zahlbr.) O.Blanco et al. 69, 74, 75 on *Juniperus excelsa*  
*Melanohalea exasperata* (De Not.) O.Blanco et al. 69 on *Juniperus excelsa*; 120 on *Abies cilicica* subsp. *isaurica* (OTC 3098 (loc.120) det: V. Rico)  
*Melanohalea exasperatula* (Nyl.) O.Blanco et al. 70 on *Juniperus oxycedrus*  
# *Mycobilimbia hypnorum* (Lib.) Kalb & Hafellner 36 on moss  
*Mycocalicium subtile* (Pers.) Szatala 45 on *Juniperus oxycedrus*; 74, 102, 151 on *Juniperus excelsa*; 120 on *Abies cilicica* subsp. *isaurica*  
*Neocatapyrenium rhizinosum* (Müll.Arg.) Breuss 11, 47 on soil  
*Nephroma laevigatum* Ach. 23, 31, 111, 112 on *Cupressus sempervirens*; 36 on *Quercus coccifera*; 39, 81 on *Quercus cerris* subsp. *cerris*, 44 on *Juniperus oxycedrus*; 83 on moss; on *Cercis siliquastrum*; 89 on *Pinus nigra*  
*Nephroma tangeriense* (Maheu & A.Gillet) Zahlbr. 36 on *Quercus cerris* subsp. *cerris*; 47 on *Castanea sativa*  
# *Normandina pulchella* (Borrer) Nyl. 23 on moss *Quercus coccifera*  
# *Ochrolechia balcanica* Verseghe 36, 37, 38, 89, 106 on *Quercus cerris* subsp. *cerris*, 120, 121, 123, 132 on *Cedrus libani*  
*Ochrolechia turneri* (Sm.) Hasselrot 34 on *Pinus brutia*  
*Opegrapha pulvinata* Rehm. 80 on *Dermatocarpon miniatum* var. *miniatum* (det: G.M. Halıcı)  
*Parmelia saxatilis* (L.) Ach. 34, 37, 44, 51, 105, 111, 119 on *Pinus brutia*; 120 on *Cedrus libani*; 125 on *Pinus nigra*; Ayaşlıgil (1987).  
*Parmelia sulcata* Taylor 18, 20, 21, 51, 60, 110, 115, 125 on *Pinus brutia*; 62 on *Pinus nigra*; 89 on *Cedrus libani*  
# *Parmeliella triptophylla* (Ach.) Müll.Arg. 18 on moss on *Pinus brutia*  
*Parmelina quercina* (Willd.) Hale 36 on *Quercus coccifera*  
*Parmelina tiliacea* (Hoffm.) Hale 1, 13, 20, 21, 33, 51, 60, 62, 103 on *Pinus brutia*; 7 *Ceratonia siliqua*; 27, 28 on *Olea europea*; 29, 36 on *Quercus coccifera*; 30 on *Juniperus oxycedrus*; 37, 46 on *Quercus cerris* subsp. *cerris*; 72 on *Juniperus excelsa*; 120 on *Abies cilicica* subsp. *isaurica*; Cansaran-Duman et al. (2008)  
*Peltigera canina* (L.) Willd. 19, 43, 64, 69, 117 on moss; on soil.  
# *Peltigera collina* (Ach.) Röhl. 36 on moss on *Quercus coccifera*; 83 on moss on *Cercis siliquastrum*  
*Peltigera neckeri* Hepp ex Müll.Arg. 19 on soil; 23 on moss on soil; Ayaşlıgil (1987).  
*Peltigera praetextata* (Flörke ex Sommerf.) Vain. 82 on moss on calcareous rock



- Pertusaria albescens* var. *albescens* (Huds.) M.Choisy & Werner 7, 51 on *Ceratonia siliqua*; 27 on *Quercus coccifera*; 36, 59, 84, 104 on *Quercus cerris* subsp. *cerris*; 37, 105 on *Pinus brutia*; 39 on *Quercus cerris* subsp. *cerris*; 72 on *Juniperus excelsa*; 89 on *Pinus nigra*; 103 on *Quercus infectoria* subsp. *boissieri*
- # *Pertusaria coccodes* (Ach.) Nyl. 39 on *Quercus cerris* subsp. *cerris*
- # *Pertusaria flavida* (DC.) J.R.Laundon 36, 37, 38, 59, 104, 106 on *Quercus cerris* subsp. *cerris*
- Pertusaria hemisphaerica* (Flörke) Erichsen 39 on *Quercus cerris* subsp. *cerris*; 51 on *Pinus brutia*
- Pertusaria hymenea* (Ach.) Schaer. 46 on *Quercus cerris* subsp. *cerris*
- Pertusaria leioplaca* DC. 1 on *Myrtus communis*; 4 on *Pinus brutia*
- # *Pertusaria ophthalmiza* (Nyl.) Nyl. 89, 91 on *Juniperus excelsa*
- Pertusaria pertusa* (L.) Tuck. 37, 47 on *Castanea sativa*; 59, 104 on *Quercus cerris* subsp. *cerris*
- # *Pertusaria pupillaris* (Nyl.) Th.Fr. 44 on *Pinus brutia*
- Pertusaria pustulata* (Ach.) Duby 20 on *Pinus brutia*
- Petractis clausa* (Hoffm.) Kremp. 35 on calcareous rock
- Phaeophyscia ciliata* (Hoffm.) Moberg 7 on *Ceratonia siliqua*; 103 on *Quercus infectoria* subsp. *boissieri*
- Phaeophyscia orbicularis* (Neck.) Moberg 35, 102, 147 on *Juniperus excelsa*; 103, 108 on *Juniperus oxycedrus*
- Phlyctis argena* (Ach.) Flot. 19 on *Pinus brutia*; 36 on *Quercus coccifera*; 39, 40, 59, 104 on *Quercus cerris* subsp. *cerris*, 47 on *Castanea sativa*
- \*# *Phylliscum demangeonii* (Moug. & Mont.) Nyl. 30 on calcareous rock
- Physcia adscendens* (Th. Fr.) H. Olivier 1, 4, 17, 26, 56 on *Pinus brutia*; 15 on *Olea europea*; 62 on calcareous rock; 69, 72 on *Juniperus excelsa*; 103 on *Quercus infectoria* subsp. *boissieri*; 120 on *Abies cilicica* subsp. *isaurica*
- Physcia aipolia* (Ehrh. ex Humb.) Fűrnr. 27 on *Quercus coccifera*; 35, 46, 108 on *Quercus cerris* subsp. *cerris*
- # *Physcia biziana* (A.Massal.) Zahlbr. 102 on *Juniperus excelsa* (det: M. Candan, R. Moberg), 37°12'55"N, 31°08'36,5"E, 900 m, on *Cupressus sempervirens* (near loc 112) (leg & det: C. Dolnik)
- Physcia leptalea* (Ach.) DC. 4, 5, 22 on *Pinus brutia*; 103 on *Quercus infectoria* subsp. *boissieri*; 120 on *Abies cilicica* subsp. *isaurica*
- Physcia stellaris* (L.) Nyl. 35 on *Quercus cerris* subsp. *cerris*; 70 on *Juniperus oxycedrus*; 74 on *Juniperus excelsa*; 103 on *Quercus infectoria* subsp. *boissieri*
- Physconia distorta* (With.) J.R.Laundon 28 on *Quercus coccifera*; 31, 50, 111, 112 on *Cupressus sempervirens*; 35, 36, 46, 59, 104 on *Quercus*

- cerris* subsp. *cerris*; 69, 72, 102, 120 on *Juniperus excelsa*; 103 on *Quercus infectoria* subsp. *boissieri*
- Physconia muscigena* (Ach.) Poelt 70, 163 on moss
- Physconia perisidiosa* (Erichsen) Moberg 75 on *Juniperus excelsa*; 89 on *Abies cilicica* subsp. *isaurica*
- Physconia venusta* (Ach.) Poelt 123 on *Cedrus libani* (det: R. Moberg), 37°12'55"N, 31°08'36,5"E, 900 m, on *Cupressus sempervirens* (near loc 112) (leg & det: C. Dolnik)
- Placolecis opaca* (Dufour) Hafellner 15, 30, 51 on calcareous rock (OTC 2322 (loc 30) det: M. Candan, O. Breuss)
- # *Placopyrenium bucekii* (Nádv. & Servit) Breuss 15, 35, 45, 47, 49 on calcareous rock (OTC 2153 (loc 15), 2404-b (loc 35) det: O. Breuss)
- Placynthium nigrum* (Huds.) Gray 1, 10, 15, 16, 17, 20, 21, 26, 29, 33, 41, 44, 48, 51, 52, 54, 57, 61, 62, 68, 110, 120, 125, 126, 137 on calcareous rock; 3, 4, 6 on siliceous rock
- # *Placynthium subradiatum* (Nyl.) Arnold 75, 76 on calcareous rock
- Platismatia glauca* (L.) W.L.Culb. & C.F.Culb. 34, 37, 105, 119 on *Pinus brutia*; 63, 89, 124, 125 on *Pinus nigra*; 123, 133 on *Cedrus libani*; Ayaşlıgil (1987).
- Pleurosticta acetabulum* (Neck.) Elix & Lumbsch 102, 147 on *Juniperus excelsa*
- # *Polyblastia albida* Arnold 11 on calcareous rock
- # *Porocyphus coccodes* (Flot.) Körb. 27 on calcareous rock
- Protoblastenia incrustans* (DC.) J.Steiner 40, 59, 82, 89 on calcareous rock
- Protoparmeliopsis muralis* (Schreb.) M.Choisy 7, 8, 15, 17, 20, 26, 28, 30, 32, 35, 45, 48, 50, 51, 52, 56, 64, 91, 102, 107, 120, 125, 129, 132, 138 on siliceous rock
- Pseudevernia furfuracea* var. *ceratea* (Ach.) D.Hawksw. 34, 37, 44, 62, 69, 105, 119 on *Pinus brutia*; 63, 89, 125, 136 on *Pinus nigra*; 120, 121, 123, 133 on *Cedrus libani*; Ayaşlıgil (1987).
- Psora decipiens* (Hedw.) Hoffm. 26, 30, 32, 35, 45, 53, 58, 59, 62, 64, 109, 125, 142 on calcareous rock
- Psora testacea* Hoffm. 7, 26, 35, 45, 47, 51, 64, 81 on calcareous rock (OTC 2392 (loc 35) det: V. Rico)
- # *Psora vallesiaca* (Schaer.) Timdal 47, 74, 75, 83, 145 on calcareous rock (OTC 2586 (loc 47) det: O. Breuss; OTC 2817 (loc 74) det: V. Rico)
- \*# *Psorotichia montinii* (A. Massal.) Forssell 51 on calcareous rock
- Ramalina farinacea* (L.) Ach. 18, 22 on *Pinus brutia*
- Rhizocarpon geographicum* (L.) DC. 35, 91, 94, 99, 109, 123, 129, 134 on siliceous rock
- \*# *Rhizocarpon grande* (Flörke ex Flot.) Arnold 35 on siliceous rock
- # *Rhizocarpon lecanorinum* Anders 35, 62, 67, 82 on siliceous rock

- Rhizocarpon reductum* Th. Fr. 39 on siliceous rock  
# *Rhizocarpon umbilicatum* (Ramond) Flagey 35 on calcareous rock  
*Rinodina capensis* Hampe 1, 46 on *Quercus cerris* subsp. *cerris*; 69, 120, 135, 149 on *Juniperus excelsa*; 103 on *Quercus infectoria* subsp. *boissieri*  
# *Rinodina immersa* (Körb.) Arnold 31 on calcareous rock  
# *Rinodina lecanorina* (A.Massal.) A.Massal. 75 on calcareous rock  
# *Rinodina oxydata* (A.Massal.) A.Massal. 15 on siliceous rock  
*Rinodina trevisanii* (Hepp) Körb. 62 on *Pinus brutia*  
*Romjularia lurida* (Ach.) Timdal 49, 90 on soil; 75 on moss  
# *Sarcogyne privigna* (Ach.) A.Massal. 45 on siliceous rock (granite)  
*Sarcogyne regularis* Körb. 17, 18, 26, 34, 62 on calcareous rock  
*Solenopsora liparina* (Nyl.) Zahlbr. 30, 35, 45, 59, 79, 106, 114 on calcareous rock  
\*# *Solenopsora marina* (Zahlbr.) Zahlbr. 42, 43, 45, 51, 59, 87, 104, 116 on calcareous rock  
*Solenopsora olivacea* subsp. *olbiensis* (Nyl.) Clauzade & Cl.Roux 11, 27, 51 on calcareous rock  
*Squamarina cartilaginea* var. *cartilaginea* (With.) P.James 11, 12, 103, 139 on moss; 28 on *Catapyrenium pilosellum*; 15, 16, 20, 26, 27, 30, 32, 35, 50, 51, 53, 57, 63, 66, 70, 78, 81 on calcareous rock; Ayaşlıgil (1987).  
# *Squamarina concrescens* (Müll.Arg.) Poelt 35, 69, 103, 109, 139 on calcareous rock  
*Squamarina gypsacea* (Sm.) Poelt 19, 43, 70, 81, 125 on calcareous rock (OTC 2781 (loc 70) det: O. Breuss)  
*Squamarina lentigera* (Weber) Poelt 59 on calcareous rock  
*Staurolemma omphalarioides* (Anzi) P.M.Jørg. & Henssen 23, 36 on *Quercus cerris* subsp. *cerris*  
# *Staurothele caesia* (Arnold) Arnold 11 on calcareous rock  
*Staurothele hymenogonia* (Nyl.) Th.Fr. 1, 7, 16, 17, 26, 41, 44, 53, 57, 63, 65, 125, 126 on calcareous rock  
# *Synalissa symphorea* (Ach.) Nyl. 35, 59 on calcareous rock  
*Tephromela atra* var. *atra* (Huds.) Hafellner 74 on *Juniperus excelsa*  
*Toninia candida* (Weber) Th.Fr. 45, 77, 93, 100, 125, 155 on calcareous rock  
*Toninia diffracta* (A.Massal.) Zahlbr. 34 on soil; 35 on *Catapyrenium rufescens*; 109 on calcareous rock  
# *Toninia opuntiioides* (Vill.) Timdal 30, 51, 125 on calcareous rock  
*Toninia sedifolia* (Scop.) Timdal 17, 48, 53, 58, 62, 66, 67, 125, 134 on moss on calcareous rock  
# *Toninia tumidula* (Sm.) Zahlbr. 30, 31, 43, 115, 117, 146 on calcareous rock

- # *Trapelia coarctata* (Turner ex Sm.) M.Choisy 16 on calcareous rock (det: V. Rico)  
*Verrucaria hochstetteri* Fr. 4 on calcareous rock  
*Verrucaria macrostoma* f. *macrostoma* Dufour ex DC 1, 5, 17, 22, 35, 51 on calcareous rock  
*Verrucaria muralis* Ach. 35, 42, 44, 48, 49, 53, 62, 67, 77, 89, 120, 122, 123, 130, 131, 134 on calcareous rock  
*Verrucaria nigrescens* Pers. 1, 4, 6, 17, 26, 31, 32, 34, 41, 42, 45, 48, 51, 54, 63, 89, 101, 127, 137 on calcareous rock  
# *Verrucaria viridula* (Schrad.) Ach. 4 on calcareous rock  
*Verruculopsis lecideoides* (A.Massal.) Gueidan & Cl.Roux 31, 45, 115 on calcareous rock  
# *Xanthomendoza fulva* (Hoffm.) Söchting, Kärnefelt & S.Y.Kondr. 69 on *Juniperus excelsa*  
# *Xanthoparmelia conspersa* (Ehrh. ex Ach.) Hale 1, 21, 115 on *Pinus brutia*  
*Xanthoparmelia pulla* (Ach.) O.Blanco et al. 71, 80 on calcareous rock  
*Xanthoparmelia somloënsis* (Gyeln.) Hale 63, 64 on siliceous rock  
*Xanthoria parietina* (L.) Th.Fr. 4, 15, 17, 18, 22, 26, 56 on *Pinus brutia*; 27, 28 on *Quercus coccifera*; 102, 149 on *Juniperus excelsa*; 103 *Quercus infectoria* subsp. *boissieri*

### Discussion

In the list seven species are new records for Turkey. The world distribution of *Leptogium pseudopapillosum* was in Ethiopia, India, Nepal, China and Taiwan (Jørgensen 1997). All of the other taxa are distributed in Europe (Clauzade and Roux 1985, Nimis and Martellos 2008, GBIF 2009).

The most important factors influencing lichen diversity are altitude, moisture, precipitation, light, temperature, substrate and eutrophication. Habitat types change along the altitude gradient and within different vegetation zones. Typically Mediterranean vegetation zones change at every 500 meters beginning from sea level (Akman & Ketenoğlu 1986). The most prominent lichen diversity of KCNP was detected in altitudes between 500 and 1000 m by 129 taxa. In the altitude ranges from 1000 to 1500 m 126 taxa have been recorded, 111 taxa between 100 and 500 m and 48 taxa between 1500 and 2000 m. Altitudes higher than 2000 m have not been studied. The number of different favorable habitats for the lichens decreases above 1500 m. The ratios and the species numbers of KCNP lichens classified according to morphological structures were shown in Figure 2. The most diverse group is this of crustose lichens with 120 taxa. Crustose lichens with thick cortex and small surface are more resistant to stress conditions than the other growth forms (Roggers 1990). Crustose lichens were found in all altitude ranges and represent more than half of the lichen diversity of each range (Table 2).

Crustose lichens are followed by the foliose, squamulose and fruticose lichens regarding the number of taxa (Figure 2). Since the foliose lichens have broader cortex surfaces and thicker medulla layers than the other morphological groups', they need more moisture and lower light than the others (Ellis and Coppins 2006). Therefore their diversity was determined lower than belong to crustose lichens in KCNP. However, the amount of moisture that is needed by lichens change depending on their morphological characters (Hartard et al. 2009). While in high humidity and low light environments, the foliose lichens have non-lower cortexes, thin upper cortexes and thick medulla layers, in low humidity and sunny places, the foliose lichens with thick upper-lower cortexes and thin medulla layers are observed. So the foliose lichens can be found living chance in many habitats and each altitudes in KCNP (Table 2). Also, the squamulose lichens live in the similar habitat with crustose lichens.

Fruticose lichens have the lowest diversity in KCNP (Figure 2). Most species of this group are epiphytic taxa, sensitive to changes of environmental conditions. However, the epiphytic lichens show a clear altitudinal gradient (Pinokiyo et al. 2008, Baniya et al. 2010), the diversity ratio of the fruticose lichens increases with increasing the altitudes, like as in the KCNP (Table 2). Their hydrophobic surface of cortex, which is trapped the moisture inside by surrounding the medulla layers, obtain this lichens to able to live in low-humidity, high altitude areas (Hartard et al. 2009). Furthermore, for protecting to intense radiation according to the UV spectrum, they content high concentration of the secondary compounds like as usnic asid or vulpinic acid (Waring 2008). Due to these acids cause the lichens to be sensitive to the air pollution (Hauck and Jürgens 2008), they have to localize to unpolluted and high altitude areas. Like as this case; *Byoria fuscescens* var. *fuscescens* content with usnic asid and *Letharia vulpina* content with vulpinic asid distribute above the 1000 m in KCNP.

A similar study to this research was done in Termessos National Park located in the west of Antalya Province (Tufan et al. 2005). For the two Parks value of Sorensen Similarity Index (Dahl 1960) is 58.29%. This high degree similarity originates that Termessos National Park and KCNP have similar climate, topography, ecology, vegetation, canyons, karstic structures and altitude composition.

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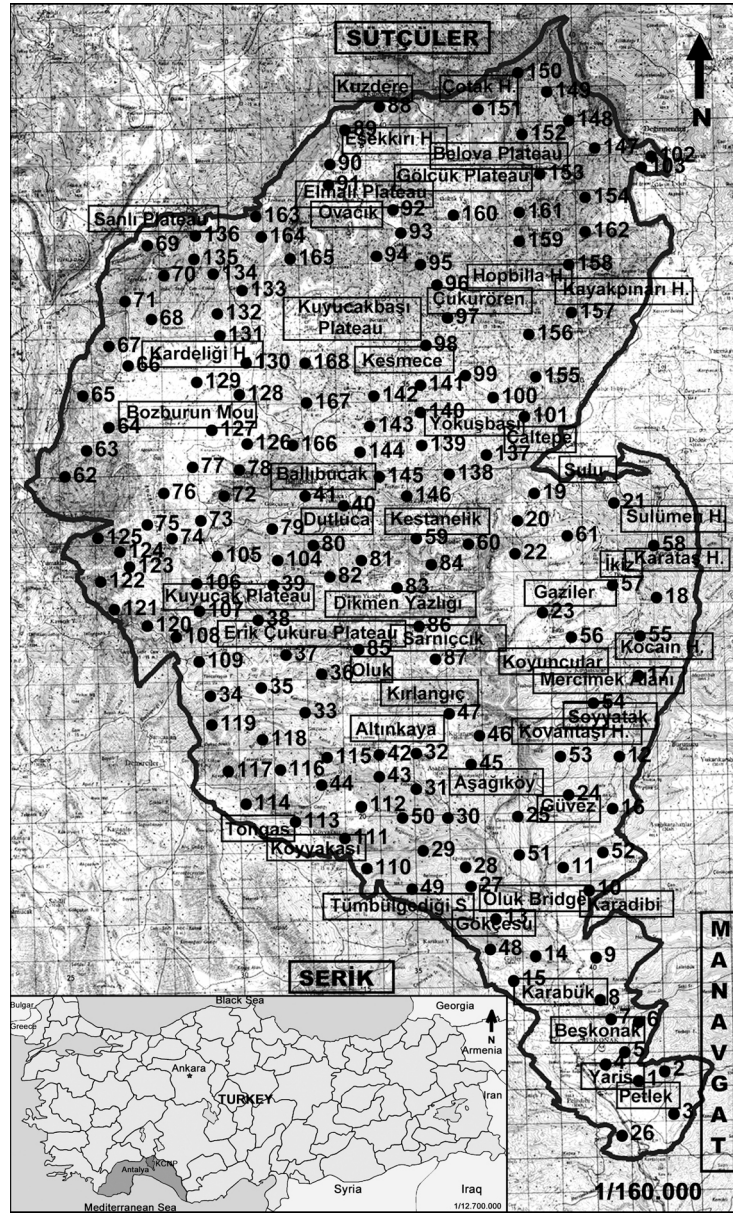


Figure 1: Map of Köprülü Kanyon National Park with the research localities. Detailed information about the 168 numbered localities can be found in Table 1.



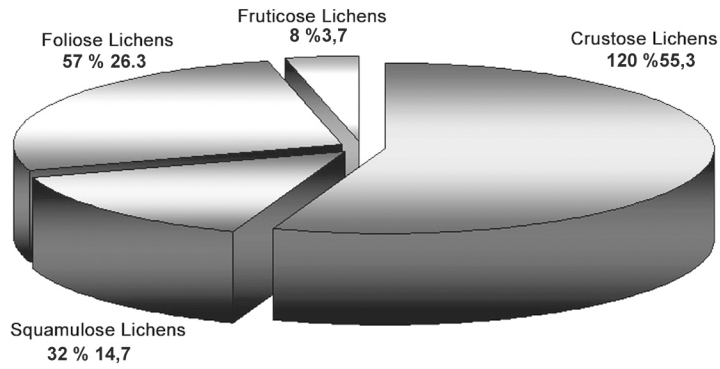


Figure 2: The distribution rates and the taxa numbers of Köprülü Canyon National Park's lichens as morphological structures

Table 1: The 168 localities, their altitudes, coordinates and locality research dates

No	Localities	Altitudes	Coordinates	Dates
1	Petlek, <i>Pinus brutia</i> forest	274 m	37° 08.362' N 31° 13.141' E	20.06.2006
2	Ortayurt Hill, scrubs area	356 m	37° 08.588' N 31° 14.086' E	20.06.2006
3	West of the fire lookout tower hill, open area	265 m	37° 08.214' N 31° 14.388' E	26.07.2006
4	East of Yaris, around of agricultural areas	178 m	37° 08.635' N 31° 12.393' E	26.07.2006
5	5 km east of Yaris, scrubs area	178 m	37° 09.053' N 31° 12.704' E	26.07.2006
6	The hill east of Beşkonak, open area	433 m	37° 09.878' N 31° 13.684' E	26.07.2006
7	Köylüler, around of agricultural area	362 m	37° 09.526' N 31° 12.373' E	23.09.2006
8	West slopes of Kocabelen Hill, scrubs area	303 m	37° 09.808' N 31° 12.366' E	23.09.2006
9	Çay, scrubs area	186 m	37° 10.941' N 31° 12.178' E	14.10.2006
10	Karadibi, <i>Pinus brutia</i> forest	323 m	37° 11.332' N 31° 11.945' E	14.10.2006
11	East of Oluk Bridge, rocky area	209 m	37° 11.801' N 31° 10.988' E	14.10.2006

12	Krkgeçit Creek, <i>Pinus brutia</i> forest	387 m	37° 14.759' N 31° 13.944' E	17.11.2006
13	Gkçesu, scrubs area	166 m	37° 11.035' N 31° 10.777' E	17.11.2006
14	North slopes of Tmblgediđi Srt	313 m	37° 10.876' N 31° 10.812' E	17.11.2006
15	Karabk, open area	190 m	37° 08.982' N 31° 10.344' E	17.11.2006
16	Turnout of the Çaltepe-Aađıkarahanlar Road, edge of creek	290 m	37° 14.278' N 31° 13.384' E	30.03.2007
17	Mercimek Alanı, open area	519 m	37° 15.387' N 31° 13.909' E	30.03.2007
18	North slopes of Karata Hill, <i>Pinus brutia</i> forest	494 m	37° 15.474' N 31° 13.030' E	30.03.2007
19	Sulu, <i>Pinus brutia</i> forest	522 m	37° 17.639' N 31° 11.239' E	30.03.2007
20	North west slopes of Sulmen Hill, <i>Pinus brutia</i> forest	650 m	37° 17.287' N 31° 11.096' E	30.03.2007
21	Sulmen Hill, around of the lookout tower, <i>Pinus brutia</i> forest	878 m	37° 16.885' N 31° 12.241' E	03.04.2007
22	Around of İbiz	580 m	37° 15.720' N 31° 11.029' E	03.04.2007
23	Around of Gaziler, open area	514 m	37° 15.121' N 31° 11.171' E	03.04.2007
24	Gvez, open area	665 m	37° 14.543' N 31° 12.385' E	03.04.2007
25	Northwest of Demircidllđ, <i>Pinus brutia</i> forest	645 m	37° 12.822' N 31° 12.125' E	03.04.2007
26	Pelidibi, scrubs area	126 m	37° 07.713' N 31° 12.366' E	14.04.2007
27	The road of Altnkaya, scrubs area	241 m	37° 11.429' N 31° 10.636' E	14.04.2007
28	The road of Altnkaya, scrubs area	378 m	37° 11.627' N 31° 10.318' E	14.04.2007
29	Eđrikaya Hill, open area	531 m	37° 12.329' N 31° 08.924' E	14.04.2007
30	Kepez Hill, <i>Cupressus sempervirens</i> forest	630 m	37° 12.544' N 31° 09.743' E	14.04.2007
31	Altnkaya, <i>Cupressus sempervirens</i> forest	752 m	37° 12.967' N 31° 08.735' E	14.04.2007
32	Zerk Ruins, rocky area	965 m	37° 13.892' N 31° 07.636' E	14.04.2007

33	Kağlakbaşı Sırtı, rocky area	961 m	37° 14.212' N 31° 06.939' E	14.04.2007
34	Kurukopru kemeri, Dereoluk Fountain, <i>Pinus brutia</i> forest	1036 m	37° 14.333' N 31° 05.626' E	14.04.2007
35	Kağlakbaşı Sırtı, rocky area	1013 m	37° 14.582' N 31° 07.187' E	12.05.2007
36	Oluk, oak grove	1075 m	37° 14.776' N 31° 06.996' E	12.05.2007
37	Erik Çukuru Plateau, <i>Quercus-Pinus nigra</i> forest	1185 m	37° 15.347' N 31° 07.078' E	12.05.2007
38	Between Plateaus of Erik Çukuru and Kuyucuk, open area	1136 m	37° 15.347' N 31° 07.078' E	12.05.2007
39	Kuyucuk Plateau (Derinsarıç Plateau), open area	1007 m	37° 16.092' N 31° 07.626' E	12.05.2007
40	Dutluca, rocky area	862 m	37° 17.126' N 31° 08.108' E	12.05.2007
41	Ballıbucağ, open area	1122 m	37° 17.755' N 31° 06.739' E	12.05.2007
42	Selge Antique Theatre	986 m	37° 13.692' N 31° 07.536' E	19.05.2007
43	Edge of Değirmen creek, open area	710 m	37° 13.234' N 31° 07.827' E	19.05.2007
44	Karakorum Sırtı, <i>Pinus brutia</i> forest	856 m	37° 13.321' N 31° 07.165' E	19.05.2007
45	Aşağıköy, rocky area	639 m	37° 13.867' N 31° 09.853' E	26.05.2007
46	East of Altınkaya	632 m	37° 13.953' N 31° 09.976' E	26.05.2007
47	Kırlangıç, rocky area	627 m	37° 13.953' N 31° 10.067' E	26.05.2007
48	Southwest skirts of Tümbülgediği Sırtı	219 m	37° 10.910' N 31° 09.065' E	27.05.2007
49	Northwest skirts of Tümbülgediği Sırtı	196 m	37° 11.836' N 31° 10.995' E	27.05.2007
50	North skirts of Kepez Hill, <i>Cupressus sempervirens</i> forest	330 m	37° 12.603' N 31° 08.986' E	27.05.2007
51	South of Demircidöllüğü, edge of creek	196 m	37° 11.836' N 31° 10.995' E	09.06.2007
52	Bozlar, <i>Pinus brutia</i> forest	310 m	37° 11.945' N 31° 12.768' E	09.06.2007
53	East skirts of Kovantaşı Hill, <i>Pinus brutia</i> forest	345 m	37° 13.787' N 31° 11.646' E	09.06.2007

54	Soyyatak, <i>Pinus brutia</i> forest	256 m	37° 14.162' N 31° 12.534' E	09.06.2007
55	North slopes of Kocain Hill, <i>Pinus brutia</i> forest	325 m	37° 15.212' N 31° 13.327' E	09.06.2007
56	Between Koyuncular-Gaziler, <i>Pinus brutia</i> forest	438 m	37° 15.523' N 31° 11.742' E	14.06.2007
57	İbiz, <i>Pinus brutia</i> forest	523 m	37° 16.436' N 31° 12.529' E	14.06.2007
58	East slopes of Karataş Hill, <i>Pinus brutia</i> forest	432 m	37° 16.436' N 31° 12.529' E	14.06.2007
59	Kestanelik Plateau, scrubs area	839 m	37° 17.169' N 31° 08.839' E	15.06.2007
60	The road of Ballıbcak-Kestanelik Plateau, <i>Pinus brutia</i> forest	650 m	37° 17.324' N 31° 10.549' E	15.06.2007
61	The Sulümen Hill road, <i>Pinus brutia</i> forest	545 m	37° 17.027' N 31° 11.957' E	15.06.2007
62	West slopes of Bozburun Mountain, mixed forest	1125 m	37° 18.007' N 31° 03.927' E	21.09.2007
63	West slopes of Bozburun Mountain, mixed forest	1129 m	37° 18.563' N 31° 04.288' E	21.09.2007
64	West slopes of Bozburun Mountain, mixed forest	1158 m	37° 18.812' N 31° 04.158' E	21.09.2007
65	West slopes of Bozburun Mountain, mixed forest	1212 m	37° 19.342' N 31° 04.428' E	21.09.2007
66	North west slopes of Bozburun Mountain, mixed forest	1348 m	37° 19.973' N 31° 04.492' E	21.09.2007
67	North west slopes of Bozburun Mountain, mixed forest	1404 m	37° 20.251' N 31° 04.988' E	21.09.2007
68	North west slopes of Bozburun Mountain, mixed forest	1348 m	37° 20.672' N 31° 05.265' E	21.09.2007
69	North west slopes of Bozburun Mountain, Sanli Plateau, mixed forest	1287 m	37° 21.837' N 31° 05.017' E	21.09.2007
70	North west slopes of Bozburun Mountain, Karakaya Hill; mixed forest	1543 m	37° 21.249' N 31° 05.453' E	21.09.2007
71	North west slopes of Bozburun Mountain, mixed forest	1491 m	37° 20.979' N 31° 04.992' E	21.09.2007
72	South east slopes of Bozburun Mountain, mixed forest	1265 m	37° 17.562' N 31° 06.031' E	28.09.2007
73	South east slopes of Bozburun Mountain, mixed forest	1285 m	37° 17.384' N 31° 05.987' E	28.09.2007
74	South east slopes of Bozburun Mountain, mixed forest	1409 m	37° 17.253' N 31° 05.543' E	28.09.2007

75	South east slopes of Bozburun Mountain, mixed forest	1455 m	37° 17.274' N 31° 05.110' E	28.09.2007
76	South east slopes of Bozburun Mountain, mixed forest	1650 m	37° 17.852' N 31° 05.579' E	28.09.2007
77	South east slopes of Bozburun Mountain, mixed forest	1523 m	37° 18.109' N 31° 06.002' E	28.09.2007
78	South east slopes of Bozburun Mountain, mixed forest	1345 m	37° 18.203' N 31° 06.693' E	28.09.2007
79	South west of Dutluca, natural calcareous structures	843 m	37° 17.181' N 31° 07.192' E	04.10.2007
80	South of Dutluca, natural calcareous structures	839 m	37° 17.003' N 31° 07.857' E	04.10.2007
81	North of Dikmen Yazlığı, oak grove	891 m	37° 16.628' N 31° 08.527' E	04.10.2007
82	North west of Dikmen Yazlığı, oak grove	893 m	37° 16.564' N 31° 08.005' E	04.10.2007
83	Dikmen Yazlığı, natural calcareous structures	856 m	37° 16.233' N 31° 09.025' E	04.10.2007
84	Kestanelik Plateau, natural calcareous structures	879 m	37° 16.621' N 31° 09.638' E	04.10.2007
85	East of Erik Çukuru Plateau, rocky area	995 m	37° 15.621' N 31° 08.261' E	05.10.2007
86	Sarıçık, rocky area	769 m	37° 15.638' N 31° 09.549' E	05.10.2007
87	Sarıçık, rocky area	689 m	37° 15.263' N 31° 09.855' E	05.10.2007
88	Kuzdere, rocky area	1151 m	37° 23.708' N 31° 07.430' E	20.10.2007
89	Eşekkırı Hill, rocky area	1435 m	37° 23.460' N 31° 07.160' E	20.10.2007
90	Eşekkırı Hill, Salmaca, rocky area	1562 m	37° 23.035' N 31° 07.183' E	20.10.2007
91	Elmalı Plateau, open area	1730 m	37° 22.398' N 31° 07.235' E	20.10.2007
92	Ovacık, open area	1561 m	37° 21.968' N 31° 07.747' E	20.10.2007
93	Kuzova, rocky area	1429 m	37° 21.652' N 31° 08.086' E	20.10.2007
94	Kapıbaşı, rocky area	1423 m	37° 21.160' N 31° 08.167' E	20.10.2007
95	Obruklu, rocky area	1313 m	37° 21.087' N 31° 08.737' E	20.10.2007

96	Çukurören, rocky area	1275 m	37° 20.722' N 31° 09.128' E	20.10.2007
97	Kuyucakbaşı Plateau, rocky area	1296 m	37° 20.298' N 31° 09.631' E	20.10.2007
98	Kesmece, rocky area	1250 m	37° 19.519' N 31° 09.329' E	20.10.2007
99	Çukurören, rocky area	1049 m	37° 18.863' N 31° 09.896' E	20.10.2007
100	Çaltepe, Yenyol, rocky area	920 m	37° 18.629' N 31° 10.300' E	20.10.2007
101	Çaltepe, Yokuşbaşı, rocky area	686 m	37° 18.400' N 31° 10.669' E	20.10.2007
102	Değirmenözü, east slopes of the Belme Hill, <i>Juniperus excelsa</i> forest	509 m	37° 23.026' N 31° 13.129' E	14.05.2008
103	Değirmenözü, top of Belme Hill, <i>Juniperus excelsa</i> forest	685 m	37° 23.038' N 31° 12.414' E	14.05.2008
104	Göğün Hill, mixed forest	920 m	37° 16.750' N 31° 07.621' E	16.05.2008
105	İkiz Yayla, mixed forest	1005 m	37° 16.813' N 31° 06.632' E	16.05.2008
106	North of Kuyucak Plateau, mixed forest	1120 m	37° 16.517' N 31° 05.940' E	16.05.2008
107	South of Kuyucak Plateau, mixed forest	1204 m	37° 16.003' N 31° 06.011' E	16.05.2008
108	South slopes of Karambaşı Hill, mixed forest	1286 m	37° 15.671' N 31° 05.822' E	16.05.2008
109	South west of Erik Çukuru Plateau, rocky area	1294 m	37° 15.242' N 31° 05.973' E	16.05.2008
110	Kepez, servi- <i>Pinus brutia</i> forest	410 m	37° 11.050' N 31° 08.729' E	03.06.2008
111	Köyyakası, <i>Cupressus sempervirens</i> - <i>Pinus brutia</i> forest	520 m	37° 12.142' N 31° 08.875' E	03.06.2008
112	North slopes of Seyricek Hill, <i>Cupressus sempervirens</i> forest	774 m	37° 12.670' N 31° 08.528' E	03.06.2008
113	Tongas, <i>Cupressus sempervirens</i> - <i>Pinus brutia</i> forest	645 m	37° 12.423' N 31° 07.396' E	03.06.2008
114	Cumalık, <i>Cupressus sempervirens</i> forest	638 m	37° 12.524' N 31° 06.421' E	03.06.2008
115	Karakorum Sırtı, <i>Pinus brutia</i> forest	765 m	37° 13.498' N 31° 08.007' E	04.06.2008
116	East slope of Tekerekkatran Hill, <i>Pinus brutia</i> forest	789 m	37° 13.621' N 31° 07.274' E	04.06.2008

117	Kavak Çatağı, <i>Pinus brutia</i> forest	813 m	37° 13.362' N 31° 06.574' E	04.06.2008
118	Burçaklı Sırtı, <i>Pinus brutia</i> forest	903 m	37° 13.796' N 31° 06.979' E	04.06.2008
119	North slopes of Dokuzdirekli Hill, <i>Pinus brutia</i> forest	1008 m	37° 14.204' N 31° 06.273' E	04.06.2008
120	South slopes of Bozburun Mountain, <i>Cedrus libani</i> - <i>Abies cilicica</i> subsp. <i>isaurica</i> forest	1537 m	37° 15.611' N 31° 04.686' E	05.06.2008
121	South slopes of Bozburun Mountain, <i>Cedrus libani</i> - <i>Abies cilicica</i> subsp. <i>isaurica</i> forest	1667 m	37° 15.702' N 31° 02.542' E	05.06.2008
122	South slopes of Bozburun Mountain, <i>Cedrus libani</i> - <i>Abies cilicica</i> subsp. <i>isaurica</i> forest	1673 m	37° 16.243' N 31° 02.575' E	05.06.2008
123	South west slopes of Bozburun Mountain, <i>Cedrus libani</i> - <i>Abies cilicica</i> subsp. <i>isaurica</i> forest	1756 m	37° 16.493' N 31° 02.826' E	05.06.2008
124	South west slopes of Bozburun Mountain, <i>Cedrus libani</i> - <i>Abies cilicica</i> subsp. <i>isaurica</i> forest	1435 m	37° 16.646' N 31° 02.242' E	05.06.2008
125	South west slopes of Bozburun Mountain, karışık <i>Cedrus libani</i> - <i>Abies cilicica</i> subsp. <i>isaurica</i> forest	1379 m	37° 17.082' N 31° 02.147' E	05.06.2008
126	East slopes of Bozburun Mountain, north of Ballıbucağ, rocky area	1213 m	37° 18.029' N 31° 06.299' E	07.06.2008
127	East slopes of Bozburun Mountain, north of Ballıbucağ, rocky area	1374 m	37° 18.680' N 31° 05.963' E	07.06.2008
128	East slopes of Bozburun Mountain, north of Ballıbucağ, rocky area	1524 m	37° 17.082' N 31° 02.147' E	07.06.2008
129	East slopes of Bozburun Mountain, north of Ballıbucağ, rocky area	1736 m	37° 18.979' N 31° 05.224' E	07.06.2008
130	East slopes of Bozburun Mountain, north of Ballıbucağ, rocky area	1862 m	37° 19.957' N 31° 05.462' E	07.06.2008
131	Bozburun Mountain, rocky area	2006 m	37° 20.160' N 31° 05.282' E	07.06.2008
132	Bozburun Mountain, <i>Cedrus libani</i> forest	1795 m	37° 20.276' N 31° 05.135' E	07.06.2008
133	North west slopes of Bozburun Mountain, <i>Cedrus libani</i> forest	1505 m	37° 20.951' N 31° 04.927' E	07.06.2008
134	North west slopes of Bozburun Mountain, mixed forest	1415 m	37° 21.192' N 31° 04.988' E	07.06.2008
135	North west slopes of Bozburun Mountain, mixed forest	1329 m	37° 21.862' N 31° 04.806' E	07.06.2008
136	North west slopes of Bozburun Mountain, mixed forest	1291 m	37° 21.947' N 31° 04.473' E	07.06.2008

137	North slopes of the hill that is the north of Çaltepe, rocky area	456 m	37° 18.161' N 31° 10.943' E	08.06.2008
138	North slopes of the hill that is the north of Çaltepe, rocky area	476 m	37° 18.071' N 31° 10.829' E	08.06.2008
139	North slopes of the hill that is the north of Çaltepe, rocky area	609 m	37° 18.116' N 31° 10.484' E	08.06.2008
140	North slopes of the hill that is the north of Çaltepe, rocky area	767 m	37° 18.209' N 31° 10.059' E	08.06.2008
141	North slopes of the hill that is the north of Çaltepe, rocky area	842 m	37° 18.233' N 31° 09.486' E	08.06.2008
142	The hill north of Kestanelik Plateau, rocky area	960 m	37° 18.219' N 31° 09.217' E	08.06.2008
143	The hill north of Kestanelik Plateau, rocky area	871 m	37° 17.582' N 31° 09.000' E	08.06.2008
144	The hill north of Kestanelik Plateau, rocky area	803 m	37° 17.394' N 31° 08.778' E	08.06.2008
145	The hill north of Kestanelik Plateau, rocky area	790 m	37° 17.150' N 31° 08.942' E	08.06.2008
146	The hill north of Kestanelik Plateau, rocky area	761 m	37° 17.015' N 31° 09.102' E	08.06.2008
147	West of Değirmenözü, open area	823 m	37° 23.053' N 31° 12.032' E	08.07.2008
148	South slopes of Çatalca Hill, <i>Quercus-Juniperus excelsa</i> forest	1082 m	37° 23.521' N 31° 11.363' E	08.07.2008
149	North slopes of Çatalca Hill, <i>Juniperus excelsa – Cedrus libani</i> forest	1347 m	37° 23.521' N 31° 11.014' E	08.07.2008
150	Çotak Hill, <i>Juniperus excelsa – Cedrus libani</i> forest	1388 m	37° 23.514' N 31° 10.330' E	08.07.2008
151	South slopes of Çotak Hill, <i>Juniperus excelsa – Cedrus libani</i> forest	1351 m	37° 23.129' N 31° 10.223' E	08.07.2008
152	Kargatuzu Hill, open area	1296 m	37° 22.468' N 31° 11.061' E	08.07.2008
153	West slopes of Çamçaylı Hill, <i>Juniperus excelsa</i> forest	1071 m	37° 22.133' N 31° 11.347' E	08.07.2008
154	South slopes of Çamçaylı Hill, <i>Quercus-Juniperus excelsa</i> forest	730 m	37° 22.055' N 31° 11.579' E	08.07.2008
155	North east of Çaltepe, rocky and open area	640 m	37° 20.018' N 31° 12.366' E	26.07.2008
156	North east of Çaltepe, rocky and open area	1169 m	37° 20.298' N 31° 11.297' E	26.07.2008
157	South slopes of Kavakpınarı Hill, open area	1277 m	37° 20.510' N 31° 11.384' E	26.07.2008



158	North slopes of Kavakpınarı Hill, open area	1237 m	37° 21.128' N 31° 11.305' E	26.07.2008
159	The hill south of Çamcaaylı Hill, South slopes, open area	1160 m	37° 21.491' N 31° 11.088' E	26.07.2008
160	Oruçbey Plateau, open area	1496 m	37° 22.092' N 31° 09.510' E	26.07.2008
161	The hill south of Çamcaaylı Hill, north slopes, open area	1466 m	37° 22.158' N 31° 11.089' E	26.07.2008
162	South west of Değirmenözü, open area	594 m	37° 21.532' N 31° 12.165' E	26.07.2008
163	West skirts of Eşekkırı Hill, <i>Quercus-Juniperus excelsa</i> forest	1284 m	37° 22.097' N 31° 05.293' E	27.07.2008
164	West skirts of Eşekkırı Hill, <i>Quercus-Juniperus excelsa- Cedrus libani</i> forest	1380 m	37° 21.494' N 31° 05.301' E	27.07.2008
165	West skirts of Eşekkırı Hill, <i>Quercus-Juniperus excelsa- Cedrus libani</i> forest	1589 m	37° 21.512' N 31° 05.537' E	27.07.2008
166	East slopes of Bozburun Mountain, <i>Juniperus excelsa</i> forest	1169 m	37° 18.139' N 31° 06.372' E	03.08.2008
167	East slopes of Bozburun Mountain, <i>Juniperus excelsa</i> forest	1319 m	37° 18.334' N 31° 06.330' E	03.08.2008
168	East slopes of Bozburun Mountain, <i>Juniperus excelsa</i> forest	1169 m	37° 19.137' N 31° 06.336' E	03.08.2008

Table 2. The distribution rates of Köprülü Canyon National Park's lichens as morphological structures in different altitude ranges

Lichens as Morphological Structures	100-500 m	500-1000 m	1000-1500 m	1500-2000 m
Crustose Lichens	59%	53%	59%	52%
Squamulose Lichens	15%	17%	11%	13%
Foliose Lichens	25%	26%	23%	27%
Fruticose Lichens	1%	4%	6%	8%