

## Lichen biota of Zonguldak, Turkey

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**Abstract**—A contribution to the lichen flora of Turkey is presented. A total of 222 lichen taxa, of which 2 are subspecies and 5 are varieties, and one lichenicolous fungus, are determined from 80 different localities in Zonguldak. *Arthonia pinastri*, *Aspicilia inornata*, *Cladonia humilis* var. *bourgeanica*, *Opegrapha culmigena*, *Psorula rufonigra* and *Strigula ziziphi* are new to Turkey and 205 lichen species and one lichenicolous fungus (*Lichenocodium erodens*) are new for Zonguldak. Distribution and substrata are presented.

**Keywords**—*Ascomycetes*, biodiversity, checklist

### Introduction

In recent years there has been substantial increase in the number of lichenological contributions referring to the lichen flora of Turkey (John & Breuss 2004, Nimis & John 1998, Yazıcı & Aslan 2003, Yazıcı et al. 2005). However several regions of Zonguldak province remains unexplored. Thirty one taxa are known from Zonguldak situated in western Black Sea region (Breuss & John 2004, Szatala 1960, Yazıcı & Aslan 2006). The present paper adds further informations to our knowledge of the lichen flora of Turkey.

### Material and Methods

The study area is situated between 41°00'35"–41°35'35" N and 31°17'55"–32°19'50" E (Fig. 1). Zonguldak region has a typical oceanic climate with a precipitation regime of type 2 (Akman 1990). The present report is based on samples collected on eighty different stations in Zonguldak between 07 July 2005 and 10 January 2006 (Table 1). After

drying at room temperature, the lichen samples were identified using a stereo and light microscope. Secondary metabolites were identified by usual spot tests and TLC methods (Mayrhofer 1988, Poelt 1974, Poelt & V\_ zda 1981, Purvis et al. 1992, Rambold 1989, Roux & Sérusiaux 2004, Wirth, 1995). Vouchers are stored in the herbarium of the Biology Department, Faculty of Sciences and Arts, Giresun University.

## Results

The taxonomic survey yielded 222 lichen taxa belonging to 73 genera in *Ascomycotina* and one lichenicolous fungus in Zonguldak province. The lichen taxa represented by locality number and substratum are listed below alphabetically. "#" indicates a new record for Turkey and "\*" for Zonguldak. "+" indicates a lichenicolous fungi.

- \**Acarospora veronensis* A.Massal., Locality 7, on siliceous rock
- \**Acarospora umbilicata* Bagl., Locality 10, 59, on siliceous rock
- \**Acrocordia gemmata* (Ach.) A. Massal., Locality 1, 4, on *Fagus* sp
- \**Arthonia dispersa* (Schrad.) Nyl., Locality 1, on young *Fraxinus* sp
- #\**Arthonia pinastri* Anzi, Locality 15, 52, on *Pinus sylvestris*
- Arthonia radiata* (Pers.) Ach., Locality 8, 31, on *Quercus* sp, *Corylus avellana*
- \**Aspicilia caesiocinerea* (Nyl. ex Malbr.) Arnold, Locality 3, on calcareous rock
- \**Aspicilia calcarea* (L.) Mudd, Locality 3, 8, on calcareous rock
- \**Aspicilia cinerea* (L.) Körb., Locality 3, 59, on siliceous rock
- \**Aspicilia contorta* (Hoffm.) Kremp. subsp. *contorta*, Locality 3, on calcareous rock
- \**Aspicilia contorta* (Hoffm.) Kremp. subsp. *hoffmanniana* S.Ekman & Fröberg, Locality 3, on calcareous rock
- #\**Aspicilia inornata* Arnold, Locality 3, on siliceous rock
- \**Bacidia arceutina* (Ach.) Arnold, Locality 63, on *Quercus* sp
- \**Bacidia laurocerasi* (Delise ex Duby) Zahlbr., Locality 31, on *Buxus* sp
- \**Bacidia rubella* (Hoffm.) A. Massal., Locality 22, on *Quercus* sp, *Fraxinus excelsior*
- \**Bacidia subincompta* (Nyl.) Arnold, Locality 10, on *Quercus* sp
- \**Baeomyces rufus* (Huds.) Rebert., Locality 2, on calcareous rock
- \**Bagliettoa baldensis* (A.Massal.) Vezda, Locality 8, on limestone
- \**Buellia disciformis* (Fr.) Mudd, Locality 31, on *Quercus* sp
- \**Buellia griseovirens* (Turner & Borrer ex Sm.) Almb., Locality 58, on *Quercus* sp
- \**Caloplaca alociza* (A. Massal.) Mig., Locality 8, on limestone
- \**Caloplaca arenaria* (Pers.) Müll. Arg., Locality 3, on siliceous rock
- \**Caloplaca citrina* (Hoffm.) Th. Fr., Locality 3, on calcareous rock
- Caloplaca crenularia* (With.) J.R. Laundon, Locality 44, 59, on siliceous rock
- \**Caloplaca flavorubescens* (Huds.) J.R.Laundon, Locality 10, on decayed bark of *Quercus* sp
- \**Caloplaca flavovirescens* (Wulfen) Dalla Torre & Sarnth., Locality 3, on calcareous rock
- \**Caloplaca holocarpa* (Hoffm.) A.E. Wade, Locality 3, on calcareous rock

- \**Caloplaca variabilis* (Pers.) Müll. Arg., Locality 3, on limestone  
 \**Caloplaca saxicola* (Hoffm.) Nordin, Locality 13, on calcareous rock  
 \**Candelariella aurella* (Hoffm.) Zahlbr. Locality 50, 55, 59, on calcareous rock  
 \**Candelariella coralliza* (Nyl.) H. Magn. Locality 14, on siliceous rock  
 \**Candelariella vitellina* (Hoffm.) Müll. Arg. Locality 16, 43, 49, on siliceous rock  
 \**Candelariella xanthostigma* (Pers. ex Ach.) Lettau, Locality 15, on *Pinus* sp  
 \**Catillaria lenticularis* (Ach.) Th. Fr. Locality 8, on limestone  
 \**Catillaria mediterranea* Hafellner, Locality 15, on *Pinus* sp  
 \**Chrysothrix candelaris* (L.) J.R. Laundon, Locality 12, 22, on *Quercus* sp, *Pinus* sp  
 \**Chrysothrix chlorina* (Ach.) J.R. Laundon, Locality 22, 52, on *Quercus* sp, *Ulmus* sp  
*Cladonia awasthiana* Ahti & Upreti, Locality 2, on soil  
 \**Cladonia bellidiflora* (Ach.) Schaer Locality 12, on soil  
 \**Cladonia caespiticia* (Pers.) Flörke, Locality 2, on soil  
 \**Cladonia cariosa* (Ach.) Spreng. Locality 4, on soil  
 \**Cladonia cervicornis* (Ach.) Flot, Locality 4, 59, on the mosses, soil  
*Cladonia chlorophaea* (Flörke ex Sommerf.) Spreng., Locality 2, on soil  
 \**Cladonia coniocraea* (Flörke) Spreng., Locality 4, 27 on decayed bark of *Quercus* sp, mosses  
 \**Cladonia convoluta* (Lam.) Cout., Locality 59, on soil  
 \**Cladonia fimbriata* (L.) Fr., Locality 1, 2, 4, 7, 8, 10, 12, 58, on soil, decayed bark of *Quercus* sp, of *Pinus* sp  
 \**Cladonia foliacea* (Huds.) Willd., Locality 4, 53, 54, 56, 65, on the mosses  
 \**Cladonia furcata* (Huds.) Schrad., Locality 15, 30, 39, 42, 61, on soil  
 #\**Cladonia humilis* var. *bourgeanica* A.W. Archer, Locality 2, on soil  
 \**Cladonia ochrochlora* Flörke, Locality 7, on soil  
 \**Cladonia portentosa* (Dufour) Coem., Locality 59, on the mosses  
 \**Cladonia pyxidata* (L.) Hoffm var. *pyxidata*, Locality 1, 6, 13, 14, 16, 17, on soil  
 \**Cladonia pseudopityrea* Vain, Locality 4, on soil, Locality 59, on the mosses  
 \**Cladonia ramulosa* (With.) J.R. Laundon, Locality 2, 15, on soil, mosses  
 \**Cladonia rangiformis* Hoffm., Locality 1, 2, 7, 10, 11, 12, 13, 15, 17, 23, on soil  
 \**Cladonia subrangiformis* L. Scriba ex Sandst., Locality 15, on soil  
 \**Cladonia subcervicornis* (Vain.) Kernst., Locality 59, on the mosses  
 \**Cladonia subulata* (L.) Weber ex F.H. Wigg., Locality 2, 7, 12, 59, on soil, decayed bark of *Quercus* sp, mosses  
 \**Clauzadea monticola* (Ach.) Hafellner & Bellem., Locality 8, on calcareous rock  
 \**Collema auriforme* (With.) Coppins & J.R. Laundon, Locality 16, 17, on the mosses  
 \**Collema crispum* (L.) Weber ex F.H. Wigg., Locality 3, on soil  
*Collema flaccidum* (Ach.) Ach., Locality 18, 19, 22, on *Quercus* sp  
 \**Collema subflaccidum* Degel. Locality 22, on *Quercus* sp  
 \**Dermatocarpon miniatum* (L.) W. Mann, Locality 67, 68, 69, on calcareous rock  
 \**Dermatocarpon luridum* (Dill. ex With.) J.R. Laundon, Locality 51, 69, on watery calcareous rock  
 \**Diploschistes muscorum* (Scop.) R. Sant., Locality 28, 31, on *Quercus* sp.  
 \**Diploschistes ocellatus* (Vill.) Norman, Locality 59, on calcareous rock  
 \**Diploschistes scruposus* (Schreb.) Norman, Locality 59, on siliceous rock,  
 \**Diplotomma alboatrum* (Hoffm.) Flot., Locality 3, on calcareous rock  
 \**Diplotomma epipolium* (Ach.) Arnold, Locality 40, on calcareous rock

- #\**Enterographa elaborata* (Lyell ex Leight.) Coppins & P. James, Locality 52, on *Carpinus* sp
- \**Enterographa hutchinsiae* (Leight.) A. Massal., Locality 52, on *Carpinus* sp.
- \**Evernia prunastri* (L.) Ach, Locality 7, 8, 9, 11, 12, 22, 27, 31, 58, 59, 64, 66, 72, 75, 79, 80, on *Quercus* sp, *Fagus orientalis*, *Pinus sylvestris*
- \**Farnoldia jurana* (Schaer.) Hertel, Locality 51, on siliceous rock
- Flavoparmelia caperata* (L.)Hale, Locality 7, 8, 9, 15, 22, 36, 47, 58, 72,77, 79, on *Quercus* sp, mosses, calcareous rock, *Carpinus* sp, *Pinus sylvestris*
- \**Fulgensia fulgens* (Sw.) Elenkin, Locality 42, on soil
- \**Graphis elegans* (Borrer ex Sm.) Ach., Locality 4, on *Fagus orientalis*
- \**Graphis scripta* (L.) Ach., Locality 1, 4, 7, 8, 15, 31, 45, 52, 71, 76, 78, on *Fagus orientalis*, *Populus* sp, *Quercus* sp
- \**Gyalecta truncigena* (Ach.) Hepp, Locality 1, on *Fraxinus excelsior*
- \**Hypogymnia physodes* (L.) Nyl. Locality 8, 12, 15, 22, 58, 68, 70, 75, 76, on *Quercus* sp, *Fagus orientalis*, *Pinus* sp
- \**Hypogymnia tubulosa* (Schaer.) Hav., Locality 9, 22, 58, on *Pinus* sp, *Quercus* sp.
- \**Immersaria athrocarpa* (Ach.) Rambold & Pietschm., Locality 44, on siliceous rock
- \**Lecania cyrtella* (Ach.) Th. Fr. Locality 52, on *Carpinus* sp
- \**Lecania naegelii* (Hepp) Diederich & Van den Boom, Locality 7, 10, 31, 73, 74, on *Quercus* sp
- \**Lecanora argentata* (Ach.) Malme, Locality 1, 22, 45, 75, on *Fagus orientalis*, *Quercus* sp
- \**Lecanora bolcana* (Pollich) Poelt, Locality 69, 80, on siliceous rock
- \**Lecanora campestris* (Schaer.) Hue, Locality 3, 67, on calcareous rock
- Lecanora carpinea* (L.) Vain., Locality 9, 10, 22, 31, 45, 49, on *Quercus* sp, *Carpinus* sp
- \**Lecanora chlarotera* Nyl., Locality 8, *Populus* sp., Locality 43, 44, on *Quercus* sp
- \**Lecanora crenulata* (Dicks.) Hook., Locality 3, on calcareous rock
- \**Lecanora dispersa* (Pers.) Röhl., Locality 3, 8, 77, on calcareous rock
- \**Lecanora gangaleoides* Nyl., Locality 8, 10, 78, on siliceous rock
- \**Lecanora garovaglii* Körb.) Zahlbr., Locality 41, siliceous rock
- \**Lecanora glabrata* (Ach.) Malme, Locality 45, on *Carpinus* sp
- \**Lecanora intricata* (Ach.) Ach., Locality 37, on siliceous rock
- \**Lecanora intumescens* (Rebent.) Rabenh., Locality 31, on *Carpinus* sp
- \**Lecanora rupicola* (L.) Zahlbr., Locality 43, on siliceous rock
- \**Lecanora strobilina* (Spreng.) Kieff., Locality 10, 31, 58, on *Quercus* sp
- \**Lecanora subcarnea* (Lilj.) Ach., Locality 48, on siliceous rock
- \**Lecanora subcarpinea* Szatala, Locality 15, 31, on *Carpinus* sp
- \**Lecanora subrugosa* Nyl., Locality 7, 22, 45, on *Quercus* sp, *Carpinus* sp
- \**Lecidea auriculata* Th. Fr., Locality 46, on siliceous rock
- \**Lecidea fuscoatra* (L.) Ach., Locality 52, 59, on soft limestone
- \**Lecidea lapicida* (Ach.) Ach., Locality 33, on siliceous rock
- \**Lecidea lapicida* var. *pantherina* (DC.) Ach. Locality 32, on siliceous rock
- \**Lecidea plana* J. Lahm, Locality 80, on siliceous rock
- Lecidella carpathica* Körb., Locality 3, on calcareous rock
- \**Lecidella euphorea* (Flörke) Hertel, Locality 15, 31, 45, 58, on *Quercus* sp, *Carpinus* sp, *Pinus* sp
- Lecidella elaeochroma* (Ach.) M.Choisy, Locality 1, 7, 10, 22, 46, 47, 58, 63, 66, on *Quercus* sp, *Carpinus* sp

- \**Lecidella stigmatea* (Ach.) Hertel & Leuckert, Locality 53, on calcareous rock
- \**Lepraria incana* (L.) Ach., Locality 7, 22, 48, 49, 52, on *Quercus* sp, *Carpinus* sp, *Ulmus minor*, siliceous rock
- \**Leptogium lichenoides* (L.) Zahlbr., Locality 3, on the mosses
- +\**Lichenocodium erodens* M.S. Christ. & D. Hawksw., Locality 22, on *Lecanora carpineae*
- Lobaria scrobiculata* (Scop.) P. Gaertn., Locality 22, 31, 64, on *Quercus* sp
- Lobaria pulmonaria* (L.) Hoffm., Locality 22, 70, on *Quercus* sp
- \**Lobaria virens* (With.) J.R. Laundon, Locality 7, on the mosses
- \**Lobothallia radiosa* (Hoffm.) Hafelner, Locality 59, on calcareous rock
- \**Melanelixia fuliginosa* (Fr ex Duby) O. Blanco et al., Locality 45, 71, on *Quercus* sp
- \**Melanelixia subargentifera* (Nyl.) O. Blanco et al., Locality 1, 7, 15, on *Quercus* sp, *Populus* sp
- \**Melanelixia subaurifera* (Nyl.) O. Blanco et al., Locality 1, 12, 15, 58, 59, on *Pyrus* sp, *Prunus* sp, *Populus* sp, *Carpinus* sp, *Quercus* sp
- \**Melanohalea exasperata* (De Not.) O. Blanco et al., Locality 27, 50, 58, on decayed bark of *Quercus* sp.
- \**Melanohalea exasperatula* (Nyl.) O. Blanco et al., Locality 58, 72, on *Quercus* sp.
- \**Nephroma laevigatum* Ach., Locality 22, 60, 64, on *Quercus* sp, mosses, *Quercus* sp
- \**Nephroma parile* (Ach.) Ach., Locality 22, 31, 63, 73, 74, on the mosses
- \**Nephroma tangeriense* (Maheu & A. Gillet) Zahlbr., Locality 22, on *Quercus* sp
- Opegrapha atra* Pers., Locality 1, on *Fagus orientalis*
- #\**Opegrapha culmigena* Lib., Locality 10, 31, on *Carpinus* sp.
- \**Opegrapha varia* Pers. Locality 1, 7, on *Carpinus* sp, *Quercus* sp
- \**Opegrapha rufescens* Pers., Locality 31, on *Quercus* sp
- \**Parmelia saxatilis* (L.) Ach., Locality 36, on siliceous rock
- \**Parmelia sulcata* Taylor, Locality 1, 7, 9, 12, 22, 26, 27, 31, 32, 36, 37, 45, 59, 62, 63, 64, 66, 70, 74, 77, 78, on *Quercus* sp, *Prunus* sp, *Fraxinus* sp, *Carpinus* sp, *Alnus* sp
- Parmelina quercina* (Willd.) Vain., Locality 12, 27, on decayed bark of *Quercus* sp
- \**Parmotrema perlatum* (Huds.) M. Choisy, Locality 5, 7, 10, 12, 15, 20, 21, 22, 24, 27, 29, 59, 63, 64, 65, 68, on *Quercus* sp, *Carpinus* sp, *Populus* sp, *Fraxinus* sp, *Pinus* sp
- \**Peltigera canina* (L.) Willd., Locality 22, on soil
- \**Peltigera horizontalis* (Huds.) Baumg., Locality 22, 31, on the mosses, soil
- \**Peltigera malacea* (Ach.) Funck, Locality 29, on soil
- \**Peltigera membranacea* (Ach.) Nyl., Locality 31, on the mosses
- \**Peltigera neckeri* Hepp, Locality 20, on the mosses
- \**Peltigera polydactylon* (Neck.) Hoffm. Locality 38, on the mosses
- \**Peltigera praetextata* (Flörke ex Sommerf.) Vain., Locality 22, 15, 27, 31, 56, 57, 64, on soil, *Quercus* sp, mosses
- Peltigera rufescens* (Weiss) Humb., Locality 22, on soil
- \**Peltula euploca* (Ach.) Poelt, Locality 39, on calcareous rock
- \**Pertusaria albescens* (Huds.) M. Choisy & Werner, Locality 9, 22, 31, 63, on *Quercus* sp, *Carpinus* sp
- \**Pertusaria amara* (Ach.) Nyl. var. *amara*, Locality 5, 7, 22, on *Quercus* sp, *Fraxinus excelsior*
- \**Pertusaria corallina* (L.) Arnold, Locality 8, on siliceous rock

- \**Pertusaria flavida* (DC.) J.R.Laundon, Locality 12, on *Pinus* sp  
 \**Pertusaria hemisphaerica* (Flörke) Erichsen, Locality 15, 22, on *Quercus* sp,  
*Quercus* sp  
 \**Pertusaria hymenea* (Ach.) Schaer., Locality 8, 10, on *Carpinus* sp  
 \**Pertusaria leioplaca* DC., Locality 31, 52, 61, on *Fagus orientalis*  
 \**Pertusaria pertusa* (Weigel) Tuck. Locality, 7, 12, 27, 31, on *Quercus* sp, *Fagus orientalis*  
 \**Pertusaria pustulata* (Ach.) Duby, Locality 8, on decayed bark of *Quercus* sp  
 \**Phaeographis inusta* (Ach.) Müll. Arg., Locality 52, on *Carpinus* sp  
 \**Phaeophyscia ciliata* (Hoffm.) Moberg, Locality 7, 22, on *Quercus* sp, *Carpinus* sp.  
 \**Phaeophyscia nigricans* (Flörke) Moberg, Locality 27, on *Quercus* sp.  
 \**Phaeophyscia orbicularis* (Neck.) Moberg, Locality 7, 54, 55, on *Quercus* sp  
 \**Phaeophyscia sciastra* (Ach.) Moberg, Locality 35, on calcareous rock  
 \**Phlyctis agelaea* Ach.) Flot., Locality 5, 27, on *Fagus orientalis*  
 \**Phlyctis argena* (Spreng.) Flot. , Locality 8, on *Quercus* sp  
*Physcia adscendens* (Th. Fr.) H. Olivier, Locality 1, 7, 15, 27, 6, 19, 23, 25, 28, 34, 46, on *Carpinus* sp, limestone, *Quercus* sp, *Pinus sylvestris*, decayed bark of *Quercus* sp, *Robinia pseudoacacia*  
 \**Physcia aipolia* (Ehrh. ex Humb.) Fűrnr., Locality 27, 64, 66, on *Quercus* sp  
 \**Physcia caesia* (Hoffm.) Fűrnr., Locality 59, 51 on calcareous rock  
 \**Physcia dubia* (Hoffm.) Lettau, Locality 34, on siliceous rock  
 \**Physcia semipinnata* (J.F. Gmel.) Moberg, Locality 53, 27, on branch of *Quercus* sp  
 \**Physcia stellaris* (L.) Nyl., Locality 7, on *Populus* sp  
 \**Physcia tenella* (Scop.) DC., Locality 58, on *Carpinus* sp  
 \**Physconia distorta* (With.) J.R.Laundon, Locality 10, 12, 27, 28, 31, 64, on *Quercus* sp  
 \**Physconia enteroxantha* Nyl.) Poelt Locality 10, 29, on *Quercus* sp  
 \**Physconia grisea* (Lam.) Poelt Locality 30, 47, on *Quercus* sp, *Prunus armeniaca*  
 \**Placopyrenium bucekii* (Nadv. et Servit ) Breuss, Locality 69, on siliceous rock  
 \**Platismatia glauca* (L.) W.L. Culb. & C.F. Culb., Locality 22, on *Quercus* sp  
 \**Porpidia crustulata* (Ach.) Hertel & Knoph, Locality 7, on siliceous rock  
 \**Porpidia cinereoatra* (Ach.) Hertel & Knoph, Locality 4, 9, on siliceou rock  
 \**Porpidia macrocarpa* (DC.) Hertel & A.J. Schwab, Locality 1, 4, 9, 10, 26, on soft limestone  
 \**Porpidia platycarpoides* (Bagl.) Hertel, Locality 7, on siliceous rock  
 \**Protoblastenia incrustans* (DC.) J. Steiner, Locality 8, 26, on limestone  
 \**Protoblastenia rupestris* (Scop.) J. Steiner, Locality 8, 25, calcareous rock  
 \**Protoparmeliopsis muralis* (Schreb.) M.Choisy, Locality 3, 23, 24, 25, on calcareous rock  
 \**Pseudevernia furfuracea* (L.) Zopf var. *furfuracea*, Locality 8, 12, 22, 33, 35, 58, 60, 62, 64, 71, 73, on *Quercus* sp, *Fagus orientalis*, *Pinus sylvestris*  
 \**Pseudevernia furfuracea* (L.) Zopf var. *ceratea* Ach.) D. Hawksw., Locality 12, on *Pinus sylvestris*  
 #\**Psorula rufonigra* (Tuck.) Gotth. Schneid. Locality 54, on the mosses  
 \**Punctelia subrudecta* (Nyl.) Krog, Locality 10, on *Quercus* sp  
 \**Pyrenula nitida* (Weigel) Ach., Locality 4, 7, 41, 42, 52, on *Fagus orientalis*  
 \**Ramalina calicaris* (L.) Fr., Locality 22, on *Quercus* sp  
 \**Ramalina canariensis* J. Steiner, Locality 22, on *Quercus* sp

- \**Ramalina farinacea* (L.) Ach., Locality 1, 20, 22, 27, 64, on *Quercus* sp  
 \**Ramalina fastigiata* (Pers.) Ach., Locality 22, 27, 64, 69, on *Quercus* sp, *Prunus* sp  
 \**Ramalina fraxinea* (L.) Ach., Locality 22, 27, 31, on *Quercus* sp  
 \**Ramalina pollinaria* (Westr.) Ach., Locality 22, on *Quercus* sp  
 \**Ramalina subgeniculata* Nyl., Locality 21, 22, 27, on *Quercus* sp  
 \**Rhizocarpon distinctum* Th. Fr., Locality 3, on siliceous rock  
 \**Rhizocarpon geminatum* Körb., Locality 3, on siliceous rock  
 \**Rhizocarpon geographicum* (L.) DC., Locality 37, 59, on siliceous rock.  
 \**Rhizocarpon subgeminatum* Eitner, Locality 3, on siliceous rock  
 \**Rhizocarpon umbilicatum* (Ramond) Flagey, Locality 3, on calcareous rock  
 \**Rhizocarpon viridiarum* (Wulfen) Körb., Locality 61, on siliceous rock  
 \**Rinodina lecanorina* (A. Massal.) A. Massal., Locality 79, on calcareous rock  
 \**Sarcogyne regularis* Körb., Locality 8, on calcareous rock  
 #\**Strigula ziziphi* (A. Massal.) Cl. Roux & Sérus., Locality 1, on *Carpinus* sp  
 \**Tephromela atra* (Huds.) Hafellner, Locality 32, 33, 60, on siliceous rock  
*Thelotrema lepadinum* (Ach.) Ach., Locality 52, on *Carpinus* sp  
 \**Toninia candida* (Weber) Th. Fr., Locality 35, 62, on soil  
 \**Toninia opuntioides* (Vill.) Timdal, Locality 55, on soil  
 \**Toninia sedifolia* (Scop.) Timdal, Locality 50, 56, 65, on soil  
 \**Toninia taurica* (Szatala) Oksner, Locality 57, on soil  
 \**Trapelia coarctata* (Turner ex Sm.) M. Choisy, Locality 7, 10, 52, on siliceous rock  
 \**Trapelia involuta* (Taylor) Hertel, Locality 34, 59, on siliceous rock.  
*Xanthoparmelia conspersa* (Ehrh. ex Ach.) Hale, Locality 21, 24, 51, 59, on siliceous rock  
 \**Xanthoparmelia pulla* (Ach.) O. Blanco et al., Locality 58, 59, on siliceous rock  
 \**Xanthoparmelia stenophylla* (Ach.) Ahti & D. Hawksw., Locality 9, 40, 59, on calcareous rock  
 \**Xanthoria candelaria* (L.) Th. Fr., Locality 10, on *Morus* sp  
 \**Xanthoria elegans* (Link) Th. Fr., Locality 8, 30, on calcareous rock  
 \**Xanthoria parietina* (L.) Th. Fr., Locality 6, 7, 18, 19, 27, 39, 40, 41, 48, 57, 63, 64, 66, 67, 69, 76, on *Quercus* sp, *Pyrus* sp, siliceous rock  
 \**Xanthoria polycarpa* (Hoffm.) Rieber, Locality 51, on *Quercus* sp.  
 \**Usnea diplotypus* Vain., Locality 69, on *Malus* sp  
 \**Usnea filipendula* Stirt., Locality 69, on *Malus* sp  
 \**Usnea florida* (L.) Weber ex F.H. Wigg., Locality 69, on *Prunus* sp  
 \**Usnea hirta* (L.) Weber ex F.H. Wigg., Locality 59, on *Pinus* sp  
 \**Usnea lapponica* Vain, Locality 51, on *Pyrus* sp  
 \**Usnea substerilis* Motyka, Locality 59, on *Pinus* sp  
 \**Usnea fulvoreaegens* (Räsänen) Räsänen, Locality 22, on *Quercus* sp  
 \**Verrucaria calciseda* DC., Locality 8, on limestone  
 \**Verrucaria muralis* Ach., Locality 8, 10, 38, on calcareous rock  
 \**Verucaria nigrescens* Pers., Locality 8, 52, on calcareous rock

## Discussion

*Arthonia pinastri*, *Aspicilia inornata*, *Cladonia humilis* var. *bourgeanica*, *Opegrapha culmigena*, *Psorula rufonigra* and *Strigula ziziphi* are new

records for Turkey and 205 lichen species and one lichenicolous fungus (*Lichenocmium erodens*) are new records for Zonguldak.

Crustose species were seen in a total of 65 localities and are very common in locality 1, 3, 7, 8, 10, 22, 31, 52 and 59 especially in the north near the coastal areas of the Black Sea. Generally in these areas those lichen taxa prefer to grow mostly on deciduous trees and from time to time on rocks. In addition 12 crustose lichen taxa were found only in locality 52. *Lecanora*, *Caloplaca* and *Pertusaria* are the most common crustose lichen genera. Among them *Lecanora* is the most common one (found in 24 localities). This genus grows both on rocks and deciduous habitats in the most part of study area. Genus *Caloplaca* was generally found on the rocks next to the streams in north of the study area.

The most common foliose genera are *Peltigera*, *Melanelia* sensu lato, *Parmelia*, *Physcia*, *Phaeophyscia* and *Xanthoria*. As expected so many *Peltigera* species were never defined in the forests, especially in north parts because of high rainfall, washing of the soil and deficiency of light. But in some areas, Sipahiler, Esenlik, Elmacı, Üçköy, Köro\_lu, it is characteristic that *Peltigera* grows on mosses and soil in mostly *Quercus* in well-lit forests inner parts of the study area despite using of excessive coal.

Fruticose lichen taxa defined in a total of 33 localities and of these, 9 are near to the Black Sea and inner areas. Most of the fruticose species are *Cladonia* spp (21 taxa). The others are *Ramalina* and *Usnea*. Members of *Cladonia* grow on mosses, soil and base of the trees. So they were found in well lit underforest and at the beginning of the forests. But *Ramalina* spp. were seen to grow only on *Quercus* in well lit forests especially in Sipahiler village, Hacıali turning and Kızılcapınar village. However, *Usnea* spp. were found on *Pyrus*, *Malus* and *Prunus* on roadsides towards the south of the study area in Düzpelit village and Armutlu district.

#### Acknowledgements

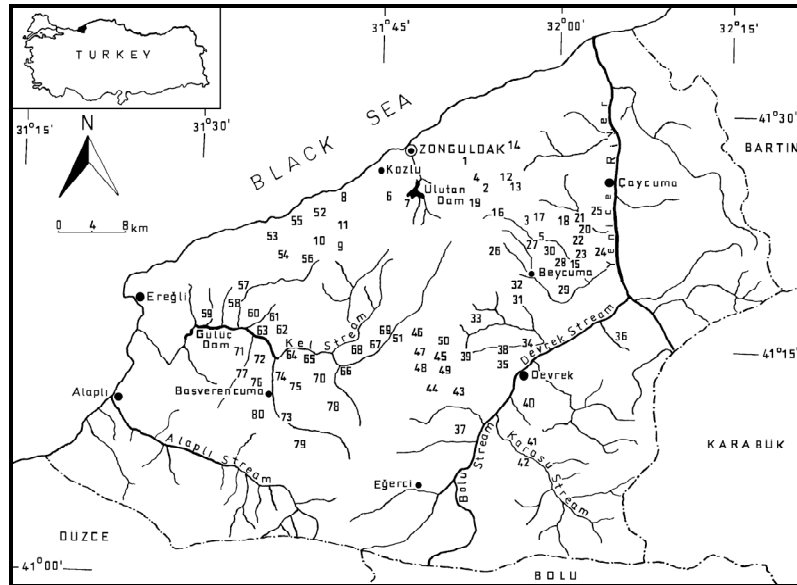
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**Figure 1.** Map of the collecting sites and numbers

**Table 1.** The number of the stations and sites collected samples.

No	Localities	Altitudes	Coordinates
1	Center; Kirat, roadside and in forest	160 m	41°11'45" N, 31° 51'20" E
2	Center; 10 km to Zonguldak, main roadside ( ifalıs district)	70 m	41°25'15" N, 31° 54'30" E
3	Beycuma turning	90 m	41°23'15" N, 31° 58'10" E
4	Center; 7 km to Zonguldak, Hayatköy, mainroad side	80 m	41°26'05" N, 31° 53'45" E
5	Center; 20 km to Zonguldak, mainroad side	90 m	41°22'10" N, 31° 59'10" E
6	Center; Kozlu village, roadside	100 m	41°24'45" N, 31° 46'10" E
7	Center; Forest of Ulutan dam	150 m	41°24'30" N, 31° 47'20" E
8	Center; Esenköy, roadside and forests	100 m	41°24'50" N, 31° 42'50" E
9	Center; Saka village	200 m	41°21'25" N, 31° 42'50" E
10	Center; Gücek village	250 m	41°21'40" N, 31° 41'30" E
11	Center; Üzüngüney	200 m	41°22'50" N, 31° 42'45" E
12	Center; Köro_lu village	250 m	41°26'05" N, 31° 56'15" E
13	Center; Sapça village	250 m	41°25'10" N, 31° 56'50" E
14	Center; Ayıcı village	275 m	41°28'10" N, 31° 56'30" E
15	Center; Çayköy, Milli Egemenlik Park forests	100 m	41°20'25" N, 31° 01'50" E
16	Center; Himmeto_lu village	100 m	41°23'50" N, 31° 55'30" E
17	Center; Osmanlı village	175 m	41°23'30" N, 31° 59'00" E
18	Zonguldak: Center; Da_üstü village	200 m	41°23'20" N, 32° 00'45" E
19	Center; Tasmacı village	200 m	41°24'30" N, 31° 53'45" E
20	Çaycuma; Esenlik village	200 m	41°22'45" N, 32° 02'40" E
21	Çaycuma; Ye_ilyurt village	200 m	41°23'30" N, 32° 02'25" E
22	Çaycuma; Sipahiler village	200 m	41°22'05" N, 32° 02'15" E
23	Çaycuma; Kalaycio_lu village	150 m	41° 21'10" N, 32° 02'30" E
24	Çaycuma; Kayba_ı village	150 m	41° 21'20" N, 32° 04'00" E
25	Çaycuma; Aliköy	200 m	41° 24'05" N, 32° 03'45" E
26	Beycuma; Karadere village	300 m	41° 21'20" N, 31° 55'30" E
27	Beycuma; Haciali turning	400 m	41° 21'40" N, 31° 58'35" E
28	Beycuma; Eceler village	275 m	41° 20'35" N, 32° 00'30" E
29	Beycuma; Kaleo_lu village	350 m	41° 18'50" N, 32° 01'00" E
30	Beycuma; Çukurören village	400 m	41° 21'20" N, 31° 59'55" E
31	Devrek; Karacaören village	500 m	41° 18'10" N, 31° 57'40" E
32	Devrek; Bölücek vilage	500 m	41° 19'00" N, 31° 57'30" E
33	Devrek; Velibeyler village	500 m	41° 16'50" N, 31° 54'00" E
34	Devrek; Dedeo_lu village	450m	41° 15'20" N, 31° 58'20" E
35	Devrek; Nizamlar village	450 m	41° 14'00" N, 31° 56'30" E
36	Devrek; Osmanbeyler village	450 m	41° 15'55" N, 32° 06'20" E
37	Devrek; Sofular village	600 m	41° 10'00" N, 31° 52'55" E
38	Devrek; Yılancağuz village	450 m	41° 14'30" N, 31° 56'30" E
39	Devrek; Mumcuo_lu village	450 m	41° 14'40" N, 31° 53'05" E
40	Devrek; Pınarözü village	500 m	41° 11'55" N, 31° 58'55" E

**Table 1.** The number of the stations and sites collected samples.

No	Localities	Altitudes	Coordinates
41	Devrek; Ataköy village	600 m	41° 09'20" N, 31° 59'05" E
42	Devrek; Gürbüzler village	650 m	41° 07'55" N, 31° 58'25" E
43	Devrek; Ye_ilyurt village	600 m	41° 12'20" N, 31° 52'35" E
44	Devrek; Tellio_lu village	650 m	41° 12'30" N, 31° 50'05" E
45	Ere_li; Babada_geçidi	750 m	41° 14'40" N, 31° 50'55" E
46	Ere_li; Aydın village	500 m	41° 15'50" N, 31° 48'50" E
47	Ere_li; Yazıören village	550 m	41° 14'50" N, 31° 48'55" E
48	Ere_li; Yukarı hocalar district	550 m	41°13'50" N, 31° 49'05" E
49	Ere_li; Sakallar village	550 m	41°13'45" N, 31° 51'10" E
50	Ere_li; Vakıf village	540 m	41°11'55" N, 31° 58'55" E
51	Ere_li; Armutlucuma district (7 km to Devrek)	500 m	41°15'25" N, 31° 47'10" E
52	Ere_li; on previously built Ere_li road, İhksu district, roadside	100 m	41°23'20" N, 31° 40'35" E
53	Ere_li; Ballıca village	400 m	41°21'55" N, 31° 36'20" E
54	Ere_li; Sücüllü village	375 m	41°20'35" N, 31° 37'25" E
55	Ere_li; Tepegören village	400 m	41°22'50" N, 31° 38'40" E
56	Ere_li; Elmacı	350 m	41°20'25" N, 31° 39'45" E
57	Ere_li; Üçköy	450 m	41°18'30" N, 31° 33'55" E
58	Ere_li; Deliler district	650 m	41°17'05" N, 31° 33'25" E
59	Ere_li; Ören village, 150 m to mainroad	650 m	41°16'45" N, 31° 30'55" E
60	Ere_li; Aydınlar village	450 m	41°16'45" N, 31° 35'00" E
61	Ere_li; Süleymanbeyler village	500 m	41°16'30" N, 31° 36'50" E
62	Ere_li; Yazıcılar village	450 m	41°15'40" N, 31° 37'35" E
63	Ere_li; Suba_ı village	400 m	41°15'35" N, 31° 35'50" E
64	Ere_li; Kızılcapınar village	450 m	41°14'20" N, 31° 38'25" E
65	Ere_li; Ramazanlı village, roadside	475 m	41°14'00" N, 31° 40'00" E
66	Ere_li; Güne_li village, roadside	500 m	41°13'05" N, 31° 43'05" E
67	Ere_li; Hasbeyler village	475 m	41°15'00" N, 31° 45'00" E
68	Ere_li; Ortaköy	450 m	41°14'30" N, 31° 43'30" E
69	Ere_li; Düzpelit village, roadside	500 m	41°15'45" N, 31° 45'45" E
70	Ere_li; Külah village	500 m	41°12'50" N, 31° 41'00" E
71	Ere_li; Yunuslu village	475 m	41°14'25" N, 31° 33'45" E
72	Ere_li; Çi_demli villlage	475 m	41°14'00" N, 31° 35'45" E
73	Ba_verencuma; Ormanlı district	450 m	41°10'15" N, 31° 37'55" E
74	Ba_verencuma; Ortacı village	450 m	41°12'55" N, 31° 37'35" E
75	Ba_verencuma; Hasankahyalar	475 m	41°12'20" N, 31° 39'00" E
76	Ba_verencuma; Ye_ilköy	475 m	41°12'30" N, 31° 35'15" E
77	Ba_verencuma; Sofular	500 m	41°13'00" N, 31° 39'55" E
78	Ba_verencuma; Velida_village	475 m	41°11'05" N, 31° 42'25" E
79	Ba_verencuma; Akköy	500 m	41°08'30" N, 31° 39'30" E
80	Ba_verencuma; Ba_ören village	500 m	41°10'25" N, 31° 35'30" E