Turkish Journal of Botany

Volume 29 | Number 6 Article 2

1-1-2005

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Turk J Bot
29 (2005) 417-423

Research Article

Lichens of Giresun District Giresun Province, Turkey

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Received: 27.12.2004
Accepted: 06.10.2005

Abstract: One hundred and six lichen taxa are reported from the city of Giresun and Giresun Island, Turkey. One of these, *Phaeographis dendritica* (Ach.) Müll.Arg., is new to Turkey.

Key Words: lichens, flora, biodiversity, Giresun, Turkey.

Giresun İli Merkez İlçesinin Likenleri

Özet: Bu çalışmada Giresun ili ve Giresun adasından 106 liken taksonu tespit edilmiştir. *Phaeographis dendritica* (Ach.) Müll.Arg. Türkiye için yenidir.

Anahtar Sözcükler: likenler, flora, biyoçeşitlilik, Giresun, Türkiye.

Introduction

The difference between the western and the eastern part of the lichen vegetation of the Black Sea region is well recognised (Öztürk & Güvenç 2003; John & Breuss 2004), but there is a lack of detailed information on the exact limitations of the vegetation types and characteristic habitats. The present paper helps to define the characteristic structures along the Black Sea coast, especially at the border between the Central Black Sea sub-region and the Eastern Black Sea sub-region (Erol, 1983). Only one species (*Xanthoria parietina* (L.) Th.Fr.) was published from the particular study area (Küçük, 1990) previously. The lichen flora of the whole province, actually represented by only 42 species, is poorly known (John & Breuss, 2004).

Description of Study Area

The study area (c. 30 km^2) covers the city of Giresun and Giresun Island, about 2 km NE of the city. The city is situated between 40º 53´ and 40º 57´ N and 38º 19´ and 38º 28´ E. Giresun Island is located at 40º 55´ N and 38º 26´ E.

According to data from the Giresun meteorological station for 1990-2004, the oceanic climate prevails in the study area. Its annual average precipitation is 1420.6 mm and its annual average temperature is 13.7 ºC (Figure 1).

The city of Giresun has a relatively rough land surface and the elevation changes from 0 to 230 m, with recent holocene in the valleys and along the western part of the littoral and uniform upper cretaceous volcanic facies dominating the rest of the study area (Erentöz, 1962). Gedikkaya Hill, 3 km SE of the city centre, is the highest point in the study area (230 m). The second highest place in the study area is Giresun Castle (140 m).

Most of the study area is covered by agricultural plantations, particularly *Corylus maxima* Miller (55%), which provides a suitable ecological habitat for corticolous lichen species. The predominant rocks of the study area are siliceous.

Materials and Methods

The lichen specimens were collected between 2000 and 2004 from 7 areas of the city:

1. top of Gedikkaya hill and around
2. slopes of Gedikkaya hill
3. top of Giresun castle and around
4. slopes of Giresun castle

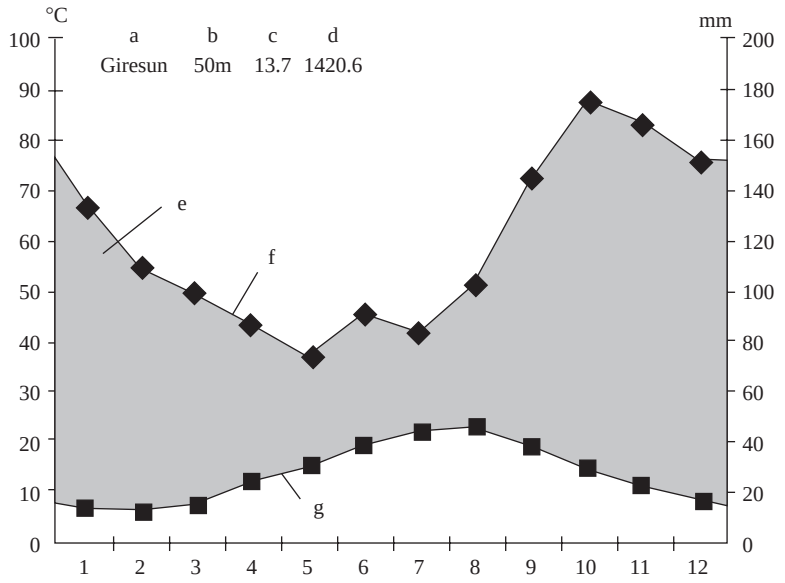

Figure 1. Climatic diagram of Giresun district. a: Locality; b: Altitude (m); c: Average annual temperature (°C); d: Average annual precipitation (mm); e: Humid period; f: Precipitation (mm); g: Temperature (°C).

5. city centre

6. sea shore to the north of the city

7. Giresun Island

The lichen samples are stored in the herbarium of Giresun Faculty of Sciences and Arts, Karadeniz Technical University, Giresun. The nomenclature follows a more or less modern concept, e.g., *Protoparmeliopsis muralis* (Schreb.) M.Choisy is accepted for *Lecanora muralis* (Schreb.) Rabenh. (Hafellner & Türk, 2001; Santesson et al., 2004), segregation of *Parmelia* s.l. and recently proposed nomenclatural changes like *Parmotrema perlatum* (Huds.) M.Choisy replacing *Parmotrema chinense* auct. (Hawksworth 2004) and the integration of *Neofuscelia* in *Xanthoparmelia* (Blanco et al., 2004).

Results

Loc. 1

Gedikkaya hill; at the top of the hill (230 m), and near the top (220-225 m), the following lichen species were found on siliceous rocks, partly overgrown with mosses:

Caloplaca crenularia (With.) J.R.Laundon

C. holocarpa (Ach.) A.E.Wade

Candelariella vitellina (Hoffm.) Müll.Arg.

Cladonia coniocraea (Flörke) Spreng.

C. furcata (Huds.) Schrad.

C. pocillum (Ach.) Grognot

C. rangiformis Hoffm.

C. squamosa (Scop.) Hoffm.

C. unicalis (L.) F.H.Wigg.

Diploschistes scruposus (Schreb.) Norman

Flavoparmelia caperata (L.) Hale

Lecanora gangaleoides Nyl.

Parmelia saxatilis (L.) Ach.

P. sulcata Taylor

Peltigera collina (Ach.) Schrad.

P. didactyla (With.) J.R.Laundon

P. horizontalis (Huds.) Baumg.

P. polydactylon (Neck.) Hoffm.

P. praetextata (Sommerf.) Zopf

P. rufescens (Weiss) Humb.

Pertusaria lactea (L.) Arnold

Protoparmeliopsis muralis (Schreb.) M.Choisy

Punctelia subrudecta (Nyl.) Krog

Ramalina pollinaria (Westr.) Ach.

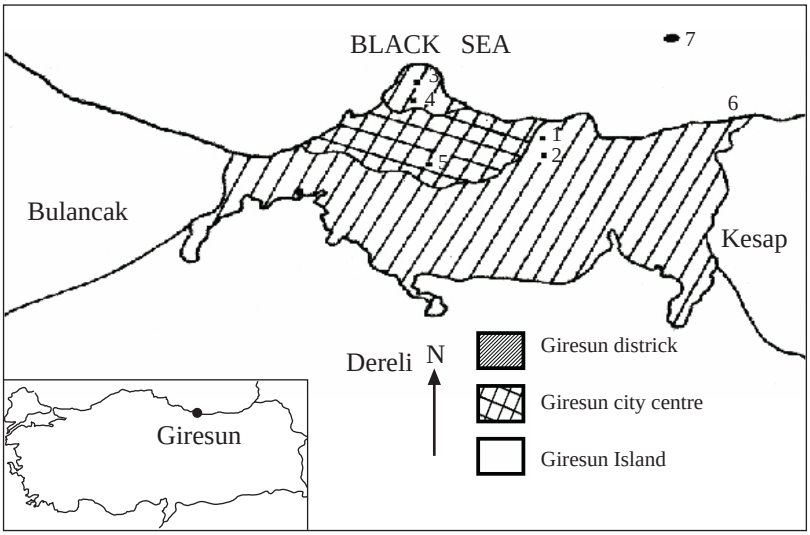

Figure 2. Map of the study area.

Roccella phycopsis Ach.

Xanthoparmelia conspersa (Ach.) Hale

X. somloensis (Gyeln.) Hale

Xanthoria calcicola Oxner

One species on *Berberis vulgaris*:

Parmotrema perlatum (Huds.) M.Choisy

Loc. 2

Along the slopes of Gedikkaya hill (140-195 m), siliceous rocks and mosses and different trees were examined:

on *Erica arborea*:

Hypogymnia physodes (L.) Nyl.

Pseudevernia furfuracea (L.) Zopf

on *Berberis vulgaris:*

Melanelia subaurifera (Nyl.) Essl.

Pyrenula nitida (Weigel) Ach.

on *Ulmus glabra:*

Xanthoria parietina (L.) Th.Fr.

on siliceous rocks, mosses and soil:

Caloplaca flavovirescens (Wulfen) DT. & Sarnth.

Cladonia pyxdidata (L.) Hoffm.

Dermatocarpon miniatum (L.) Mann

Leptogium gelatinosum (With.) J.R.Laundon

Lichinella nigritella (Lettau) Moreno & Egea

Melanelia subaurifera (Nyl.) Essl.

Peltigera didactyla (With.) J.R.Laundon

P. polydactylon (Neck.) Hoffm.

Ramalina pollinaria (Westr.) Ach.

Rinodina teichophila (Nyl.) Arnold

Xanthoparmelia conspersa (Ach.) Hale

on *Pyrus* sp.:

Phaeophyscia orbicularis (Neck.) Moberg

Loc. 3

Around the top and at the top of Giresun Castle (120-140 m), siliceous rocks and the mortar of the monument were investigated, as well as some trees around the restaurant area.

on mortar:

Caloplaca decipiens (Arnold) Blomb. & Forss.

C. dolomiticola (Hue) Zahlbr.

C. flavescens (Huds.) J.R.Laundon

C. lithophila H.Magn.

C. saxicola (Hoffm.) Nordin

C. teicholyta (Ach.) J.Steiner

Candelariella aurella (Hoffm.) Zahlbr.

Lecanora albescens (Hoffm) Branth & Rostr.

L. campestris (Schaer.) Hue

L. dispersa (Pers.) Sommerf.

Protoblastenia rupestris (Scop.) J.Steiner

Verrucaria nigrescens Pers.

on siliceous rocks:

Acarospora fuscata (Nyl.) Arnold

Amandinea punctata (Hoffm.) Coppins & Scheid.

Aspicilia cinerea (L.) Körb.

Caloplaca velana (A.Massal.) Du Rietz

Candelariella coralliza (Nyl.) H.Magn.

C. vitellina (Hoffm.) Müll.Arg.

Catillaria chalybaea (Borrer) A.Massal.

Cladonia subrangiformis Sandst.

C. pyxdidata (L.) Hoffm.

Dermatocarpon miniatum (L.) Mann

Endocarpon adscendens (Anzi) Müll.Arg.

Flavoparmelia caperata (L.) Hale

Lecanora gangaleoides Nyl.

Lecidella carpathica Körb.

L. stigmatea (Ach.) Hertel & Leuckert

Leptogium gelatinosum (With.) J.R.Laundon

Lobothallia radiosa (Hoffm.) Hafellner

Parmelia sulcata Taylor

Parmelina tiliaceae (Hoffm.) Ach.

Peltigera rufescens (Weiss) Humb.

Pertusaria aspergilla (Ach.) J.R.Laundon

Physcia dubia (Hoffm.) Lettau

Placocarpus schaereri (Fr.) Breuss

Protoparmeliopsis muralis (Schreb.) M.Choisy

Punctelia subrudecta (Nyl.) Krog

Rhizocarpon geographicum (L.) DC.

Rinodina oxydata (A.Massal.) A.Massal.

Tephromela atra (Huds.) Hafellner

Xanthoparmelia conspersa (Ehrh. ex Ach.) Hale

X. loxodes (Nyl.) O.Blanco, A.Crespo, Elix, D.Hawksw. & Lumbsch.

X. somloensis (Gyeln.) Hale

X. verruculifera (Nyl.) O.Blanco, A.Crespo, Elix, D.Hawksw. & Lumbsch.

Xanthoria calcicola Oxner

on *Acer* sp.:

Arthonia radiata (Pers.) Ach.

Hyperphyscia adglutinata (Flörke) H.Mayrhofer

Lecanora pulicaris (Pers.) Ach.

Lecidella elaeochroma (Ach.) M.Choisy

Phaeophyscia orbicularis (Neck.) Moberg

Xanthoria parietina (L.) Th.Fr.

Loc. 4

Along the slopes of the castle hill (40–115 m), siliceous rocks and calcareous substrata were studied.

on siliceous rocks:

Aspicilia caesiocinerea (Malbr.) Arnold

A. cinerea (L.) Körb.

Buellia spuria (Schaer.) Anzi

Caloplaca irrubescens (Arnold) Zahlbr.

Cladonia coniocraea (Flörke) Spreng.

C. fimbriata (L.) Fr.

C. furcata (Huds.) Schrad.

C. glauca Flörke

C. pyxdidata (L.) Hoffm.

C. rangiformis Hoffm.

Collema subnigrescens Degel.

Diploschistes scruposus (Schreb.) Norm.

Lecanora gangaleoides Nyl.

Parmelia sulcata Taylor

Parmelina tiliacea (Harm.) Hale

Peltigera malacea (Ach.) Funck

Pertusaria aspergilla (Ach.) J.R.Laundon

Physcia dubia (Hoffm.) Lettau

P. tribacia (Ach.) Nyl.

Punctelia subrudecta (Nyl.) Krog

Neofuscelia pulla (Ach.) Essl.

Xanthoparmelia tinctina (Maheu & A.Gillet) Hale

on calcareous substrate:

Lecanora crenulata Hook.

Sarcogyne regularis Körb.

Loc. 5

In the city centre (near the Giresun Education Faculty, Bus Station, Ali Rıza Erkan Park and Giresun State Hospital), 10-140 m, mortar, siliceous rocks and different trees were investigated.

on mortar:

Caloplaca decipiens (Arnold) Blomb. & Forss.

Caloplaca flavovirescens (Wulfen) DT. & Sarnth.

C. irrubescens (Arnold) Zahlbr.

Candelariella aurella (Hoffm.) Zahlbr.

on siliceous rocks:

Candelariella vitellina (Hoff.) Müll.Arg.

Cladonia fimbriata (L.) Fr.

C. furcata (Huds.) Schrad.

C. pyxidata (L.) Hoffm.

C. rangiformis Hoffm.

Parmelia sulcata Taylor

Physcia dubia (Hoffm.) Lettau

P. tribacia (Ach.) Nyl.

Protoparmeliopsis muralis (Schreb.) M.Choisy

Xanthoparmelia conspersa (Ehrh. ex Ach.) Hale

X. tinctina (Maheu & A.Gillet) Hale

on *Corylus maxima:*

Arthonia cinnabarina (DC.) Wallr.

Caloplaca holocarpa (Ach.) Wade

Flavoparmelia caperata (L.) Hale

Graphis scripta (L.) Ach.

Hypogymnia physodes (L.) Nyl.

Lecanora argentata (Ach.) Malme

L. chlarotera Nyl.

Melanelia subaurifera (Nyl.) Essl.

Opegrapha varia Pers.

Parmelia sulcata Taylor

Parmotrema arnoldii (Du Rietz) Hale

Pertusaria pertusa (Weigel) Tuck.

Phaeographis dentritica (Ach.) Mull.Arg., (Kınalıoğlu 40).

Phaeophyscia orbicularis (Neck.) Moberg

Physcia adscendens (Fr.) H.Olivier

P. aipolia (Humb.) Hampe

P. leptalea (Ach.) DC.

P. stellaris (L.) Nyl.

Ramalina farinaceae (L.) Ach.

Xanthoria parietina (L.) Th.Fr.

on *Laurocerasus officinalis*:

Lecidella elaeochroma (Ach.) M.Choisy

on *Malus* sp.

Physcia aipolia (Humb.) Hampe

on *Prunus* sp.:

Lecidella elaeochroma (Ach.) M.Choisy

on *Populus* sp:

Hypotrachyna revoluta (Flörke) Hale

Lecanora argentata (Ach.) Malme

Melanelia subaurifera (Nyl.) Essl.
Physcia adscendens (Fr.) H.Olivier
Punctelia subrudecta (Nyl.) Krog
Xanthoria parietina (L.) Th.Fr.

on *Salix* sp.:
Physcia adscendens (Fr.) H.Olivier
Xanthoria parietina (L.) Th.Fr.

on *Robinia pseudacacia*:
Xanthoria parietina (L.) Th.Fr.

Loc. 6
Sea shore N of the city:
Aspicilia caesiocinerea (Malbr.) Arnold
Caloplaca flavovirescens (Wulfen) DT. & Sarnth.
Candelariella vitellina (Hoffm.) Müll.Arg.
Collema furfuraceum (Arnold) Du Rietz
Diploschistes caesioplumbeus (Nyl.) Vain.
Melanelia stygia (L.) Essl.
Peltula euploca (Ach.) Poelt
Xanthoparmelia conspersa (Ehrh. ex Ach.) Hale
Xanthoria calcicola Oxner

on calcareous rock:
Sarcogyne regularis Körb.

Loc. 7
Giresun Island, on siliceous rocks:
Caloplaca aractina (Fr.) Häyrén
C. chlorina (Flot.) H.Olivier
C. crenularia (With.) J.R.Laundon
C. irrubescens (Arnold) Zahlbr.
Pannaria conoplea (Ach.) Bory
on calcareous rocks:
Caloplaca dolomiticola (Hue) Zahlbr.

Figure 3. *Phaeographis dentritica* (Ach.) Müll. Arg., Habitus 25 mm.

C. flavescens (Huds.) J.R.Laundon

C. teicholyta (Ach.) J.Steiner

Dermatocarpon miniatum (L.) Mann

Protoparmeliopsis muralis (Schreb.) M.Choisy

Roccella phycopsis Ach.

Xanthoria calcicola Oxner

Discussion

No differences in the floristic elements were found in the study area depending on altitude. *Roccella phycopsis*, a species of coastal rocks, grows at 230 m altitude near the top of Gedikkaya hill. More surprisingly, the alpine species *Melanelia stygia* was found growing near the seashore. The high precipitation and compensatory effect of the sea is reflected by a high percentage of normally epiphytic species, like *Flavoparmelia caperata, Parmelia saxatilis, Parmelia sulcata, Parmelina tiliacea* and *Punctelia subrudecta* covering rocks on Gedikkaya hill and at Giresun castle.

The climate diagram of Giresun resembles those of Rize and Zonguldak more than those of neighbouring Trabzon and Samsun. Consequently, the lichen flora has affinities to the eastern and western Black Sea coast vegetation.

Phaeographis dentritica is the only oceanic species in this study, included in category 1 of the continental figure of the indicator values given by Wirth (2001). The oceanic species (category 2) in the study area are *Arthonia cinnabarina, Cladonia glauca, Hypotrachyna revoluta, Pannaria conoplea, Parmotrema perlatum* and *Parmotrema arnoldii* (Wirth, 1995, 2001).

The genus *Phaeographis* appears to be linked to the western part of the Black Sea region. Those species with a more eastern main distribution within northern Turkey are *Arthonia cinnabarina, Hypotrachyna revoluta,* and *Parmotrema arnoldii*. Most of the rest of the species according to our current knowledge do not vary in their distribution and are more or less widespread, some with a preference for the Aegean region.

Air pollution as almost no influence on the lichen flora. A high dominance of *Xanthoria parietina* and other nitrophileous species (*Phaeophyscia orbicularis, Physcia adscendens*) in the study area is caused by the oceanic climate and saltwater and not, contrary to the inland areas, by hypereutrophication (Verein Deutscher Ingenieure, 2004).

Acknowledgements

The author gratefully acknowledges the identification of *Arthonia cinnabarina, Peltula euploca* and *Phaeographis dentritica* by Harrie Sipman, Berlin, and Volker John, Bad Dürkheim, for providing data from a short field trip to Giresun castle in 2004 and for valuable contributions to the text as well as for checking most of the lichen samples.

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