

Lichens from the Çangal Mountains (Sinop, Turkey)

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Abstract — 98 infrageneric lichen taxa are reported from 30 sampling stations in the Çangal Mountains, SW of Sinop in Turkey. Seven species are new to Turkey: *Aspicilia grisea*, *Caloplaca obscurella*, *Cliostomum corrugatum*, *Evernia illyrica*, *Melanelia subargentiifera*, *Micarea sylvicola* and *Porpidia glaucophaea*. 96 species are new to the province of Sinop.

flora / chorology / Çangal Mountains / Turkey

Résumé — 98 taxons infragénériques ont été récoltés de 30 localités des Monts Çangal, au sud-ouest de Sinop en Turquie. Sept espèces étaient jusqu'alors inconnues en Turquie : *Aspicilia grisea*, *Caloplaca obscurella*, *Cliostomum corrugatum*, *Evernia illyrica*, *Melanelia subargentiifera*, *Micarea sylvicola* et *Porpidia glaucophaea* ; et 96 sont nouvelles pour la province de Sinop.

flore / chorologie / Monts Çangal / Turquie

INTRODUCTION

Although several detailed studies on the lichen flora of Turkish provinces have recently been published (e.g. Çiçek & Özdemir Türk, 1998; John & Nimis 1998; Karabulut & Özdemir Türk, 1998; Yazıcı, 1999), knowledge of the lichen flora in some regions is still lacking (John, 1990, 1996). Hitherto only five species have been published for the province of Sinop: *Lobaria pulmonaria* and *Peltigera praetextata* (Czeczuga *et al.*, 1999), *Placidium squamulosum* (Breuss, 1998), *Toninia opuntioides* and *T. sedifolia* (Timdal, 1991). The present study in a semi-natural area contributes to our knowledge of the chorology of lichens in Turkey and, as environmental and ecological indicators, help to characterise the habitats covered within the study area.

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MATERIAL AND METHODS

Lichens were collected from 30 localities in the Çangal Mountains in 1993 and 1994. The lichen samples are stored in the herbarium of ANK (Ankara University, Botany Department, Ankara).

STUDY AREA

The survey area is located in the central Küre Mountains in northern Anatolia between 41° 41' 48" to 41° 44' 36" N and 34° 39' 11" to 34° 44' 49" E. The collecting stations are presented in Table 1 and their distribution is shown in

Tab. 1. Collecting sites.

<i>Localities</i>	<i>Altitude (m)</i>	<i>Date of Collection</i>
1. Suluçayır	1,300	10.IX.1993
2. Çangal Forest Exploitation	1,150	14.IX.1993
3. The north-west of Geyik Harmanı	1,300	15.IX.1993
4. Suluçayır	1,300	15.IX.1993
5. Çangal Forest Exploitation	1,050	16.IX.1993
6. Çangal Forest Exploitation	1,100	16.IX.1993
7. Karadere	1,100	16.IX.1993
8. Çangal Forest Exploitation	1,150	18.IX.1993
9. Pazaryeri hill	1,200	09.VIII.1994
10. Pazaryeri hill	1,250	09.VIII.1994
11. Hilltop of Pazaryeri hill	1,405	09.VIII.1994
12. Pazaryeri hill, Taşlıburun hill	1,405	09.VIII.1994
13. Çangal Forest Exploitation	950	09.VIII.1994
14. Hillside of Ortaalan hill	1,450	09.VIII.1994
15. Hillside of Ortaalan hill, Geyik Harmanı	1,200	09.VIII.1994
16. North-west Geyik Harmanı	1,300	09.VIII.1994
17. Northern slopes of Çangal Mountain	1,400	10.VIII.1994
18. Northern slopes of Çangal Mountain	1,450	10.VIII.1994
19. Western slopes of Çangal Mountain	1,400	10.VIII.1994
20. Çangal Boğazı	1,150	10.VIII.1994
21. Karaca Girişi, Pazaryeri hill	1,250	10.VIII.1994
22. Hillside of Çangal Mountain	1,250	10.VIII.1994
23. Kurt Kuyusu, Küçük Yanık	1,100	11.VIII.1994
24. Kurt Kuyusu, Küçük Yanık	1,150	11.VIII.1994
25. Kurt Kuyusu, Çukurçay	1,100	11.VIII.1994
26. Kurt Kuyusu, Çukurçay	1,150	11.VIII.1994
27. Kurt Kuyusu, Çangal ayrımı	1,200	11.VIII.1994
28. Çangal Forest Exploitation on place	1,000	12.VIII.1994
29. Hillside of Ortaalan hill	1,350	12.VIII.1994
30. Kurt Kuyusu, Çukurçay	1,200	13.VIII.1994

Figure 2. The specimens cited refer to square A5 according to the grid system of the "Flora of Turkey" (Davis 1965). Following the "Flora Europaea" 50 km × 50 km UTM grid system (John 1992, 1996), the specimens found refer to square 36TXM2.

The research area represents Mesozoic units, mainly composed of Upper Cretaceous, Lower Cretaceous and Jurassic formations, consisting of 6 main groups: Gürsökü, Yemişliçay, Kapanboğazı, Çağlayan, İnaltı and Akgöl. The Gürsökü formation is Upper Cretaceous in age and mainly crops out around Dilmen and Gürsökü; marl, shale, sandstone and limestone form its lithology. The Yemişliçay formation belongs to the Upper Cretaceous (Meastrihitian) and is observed around Yemişliçay, Karadağ, Sülümce Hill, Dodurga and Karakoyun; it is mainly interlayered with sandstone, shale, marl, tuff and agglomerate. The Kapanboğazı formation is Upper Cretaceous (Santonian-Campanian) and crops out around Çokran Yayla, Bürnük and Erikli Sulusökü; it is red to claret in colour and is composed of biomicrite and lime mudstone. The Çağlayan formation is Lower Cretaceous and forms a zone between Türkeli and Durağan; it is composed of sandstone, sandy limestone interlayered, shale and marl. The İnaltı formation belongs to Upper Jurassic – Lower Cretaceous and crops out near İnaltı village; it is grey-white, blue-black and pinkish in colour and composed of limestone. The Akgöl formation crops out around Çangal Dağı, Kayadibi and Bürnük village; it is composed of Layers of sandstone, quartzite, claystone, shale, marl and micritic limestone.

The study area occurs where Eurasia and Anatolian plates collided and compressed, forming anticline and synclines in east – west directions, particularly the Çangal Dağı anticline and the Gürsökü syncline.

The study area has a mixed forest formation of *Abies nordmanniana* (Stev.) Spach subsp. *bornmuelleriana* (Mattf.) Coode et Cullen and *Fagus orientalis* Lipsky. These pine and deciduous forests prevail on the Çangal Mountains, Pazaryeri Hill, Ortaalan Hill and Çangal Forest. *A. nordmanniana* subsp. *bornmuelleriana* and *Pinus sylvestris* L. formations are situated on the west of Pazaryeri Hill and on a small area in the southeast of Çangal Forest.

The climatic data were collected from the nearest meteorological station (Ayancık) and classified according to Emberger (1955) precipitation-temperature coefficient (Q_2) and aridity indices. According to these indices [$Q_2 = 136.2$; $S = 5.8$ (PE/ME); $m = 2.1$ °C], Ayancık has a rainy-cold Mediterranean climate from a bioclimatical respect (Akman, 1990) (Fig. 1).

RESULTS

The taxa are listed in alphabetical order, followed by localities and substrates. The nomenclature follows Hafellner & Türk (2001) and author names are according to Brummitt & Powell (1992). *Abies nordmanniana* subsp. *bornmuelleriana*, *Fagus orientalis* and *Pinus sylvestris* are denoted by on *Abies*, on *Fagus* and on *Pinus* respectively in the list. Lichen taxa new to Turkey are indicated by #, those new to the province by *.

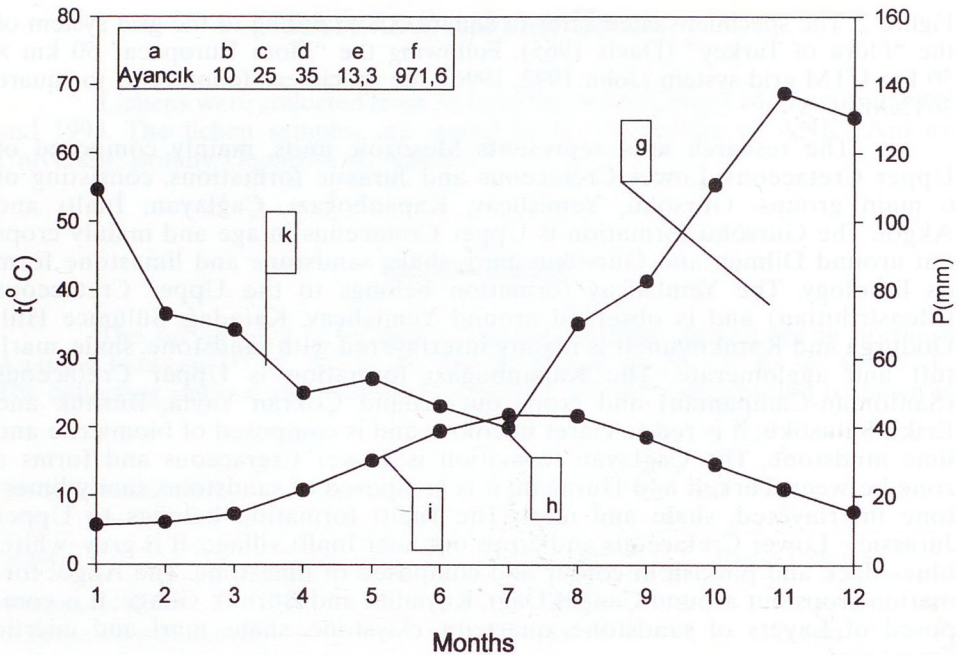


Fig. 1. Climatic diagram of Ayancık. a: Locality; b: Altitude (m); c: Estimation period (Temperature); d: Estimation period (Precipitation); e: Annual mean temperature (°C); f: Annual mean precipitation (mm); g: Rainy period; h: Drought period; i: Monthly mean temperature (°C); k: Monthly mean precipitation (mm).

The species

- **Alectoria sarmentosa* (Ach.) Ach., Loc. 4, 12: on Abies.
- **Amandinea punctata* (Hoffm.) Coppins & Scheid., Loc. 24: on Abies.
- ***Aspicilia grisea* Arnold, Loc. 18: on siliceous rocks.
- **Baeomyces rufus* (Huds.) Rebert., Loc. 15: on siliceous rocks, Loc. 5: on soil.
- **Biatora helvola* Körb. ex Hellb., Loc. 24: on Abies.
- **Bryoria capillaris* (Ach.) Brodo & D. Hawksw., Loc. 4, 12, 20, 24: on Abies, Loc. 4: on Pinus.
- **Bryoria fuscens* (Gyeln.) Brodo & D. Hawksw., Loc. 4, 14, 20, 24: on Abies.
- **Bryoria nadvornikiana* (Gyeln.) Brodo & D. Hawksw., Loc. 4: on Abies.
- **Buellia griseovirens* (Turner & Borrer ex Sm.) Almb., Loc. 10, 12, 24: on Abies.
- **Calicium salicinum* Pers., Loc. 9: on Abies.
- **Caloplaca ferruginea* (Huds.) Th. Fr., Loc. 24: on Abies.
- **Caloplaca furfuracea* H. Magn., Loc. 24: on Abies.
- **Caloplaca herbidella* (Hue) H. Magn., Loc. 24: on Abies.
- ***Caloplaca obscurella* (Körb.) Th. Fr., Loc. 24: on Abies.
- **Candelariella vitellina* (Hoffm.) Müll. Arg., Loc. 18: on siliceous rocks.
- **Candelariella xanthostigma* (Ach.) Lettau, Loc. 6: on Fagus.
- **Chrysothrix candelaris* (L.) J.R. Laundon, Loc. 5, 9, 24: on Abies.
- **Cladonia cenotea* (Ach.) Schaer., Loc. 17: on detritus over siliceous rocks.
- **Cladonia coniocraea* (Flörke) Spreng., Loc. 15: on Abies, Loc. 14, 23: on decaying wood, Loc. 17: on siliceous rocks, Loc. 1: on soil.
- **Cladonia fimbriata* (L.) Fr., Loc. 5: on decaying wood, Loc. 5, 17: on siliceous rocks, Loc. 5: on soil.
- **Cladonia furcata* (Huds.) Schrad., Loc. 2, 4, 5, 7, 13: on siliceous rocks and soil.

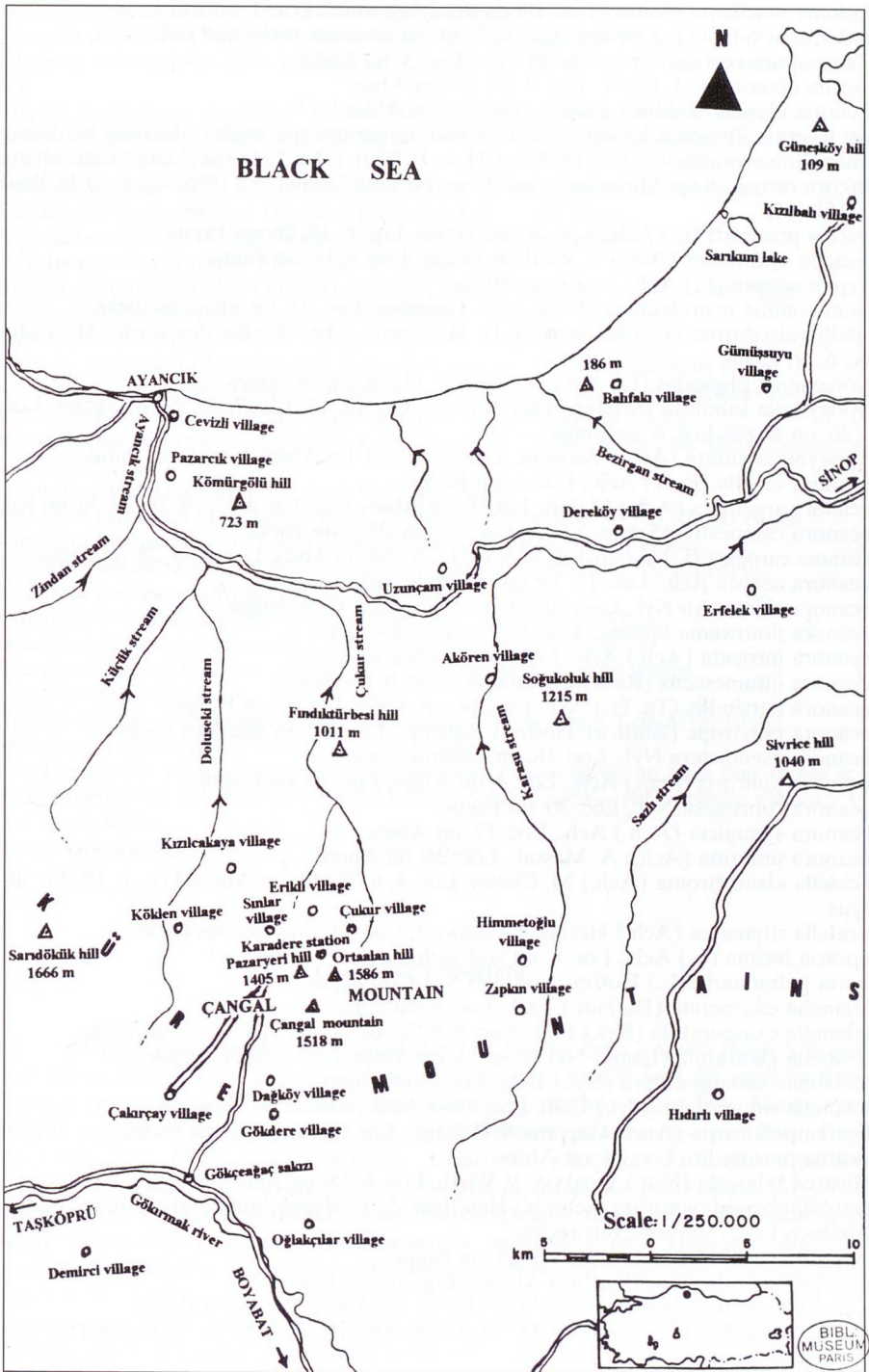


Fig. 2. Map of the study area.

- **Cladonia macilentata* Hoffm., Loc. 19: on decaying wood, Loc. 1: on soil.
 **Cladonia pyxidata* (L.) Hoffm., Loc. 6, 7, 18: on siliceous rocks and soil.
 #**Cliostomum corrugatum* (Ach.: Fr.) Fr., Loc. 5: on Abies.
 **Evernia divaricata* (L.) Ach., Loc. 4, 20, 24: on Abies.
 #**Evernia illyrica* (Zahlbr.) Zahlbr., Loc. 24: on Abies.
 Note: *Evernia illyrica* is known also from two herbarium specimens: "Kazdağ bei Edremit Buchen-Tannenwaldzone, 17.6.1955, leg. H. et E. Walter, Nr. 1516 (M)" and "Kızılçahamam Çankoru ormanı Kapı Mirandağ, auf Abies bornmülleriana, 3.5.1955, leg. E. et H. Walter, Nr. 1151 (M)".
 **Evernia prunastri* (L.) Ach., Loc. 20: on Abies, Loc. 6, 18, 26: on Fagus.
 **Fuscidea cyathoides* (Ach.) V. Wirth & Vězda, Loc. 6, 13: on Fagus.
 **Graphis scripta* (L.) Ach., Loc. 6: on Fagus.
 **Haematomma ochroleucum* (Neck.) J.R. Laundon, Loc. 21: on siliceous rocks.
 **Hafellia disciformis* (Fr.) Marbach & H. Mayrhofer, Syn.: *Buellia disciformis* (Fr.) Mudd, Loc. 6: on Fagus.
 **Hypogymnia physodes* (L.) Nyl., Loc. 4, 5, 6, 11, 18, 24: on Abies.
 **Hypogymnia tubulosa* (Schaer.) Hav., Loc. 4, 5, 6, 10, 11, 12, 17, 20, 24: on Abies, Loc. 6, 13, 26: on Fagus, Loc. 6: on Pinus.
 **Hypogymnia vittata* (Ach.) Parrique, Loc. 10, 17, 24: on Abies, Loc. 4: on Pinus.
 **Lecanora albella* (Pers.) Ach., Loc. 6: on Fagus.
 **Lecanora argentata* (Ach.) Malme, Loc. 10: on Abies, Loc. 3, 6, 9, 13, 19, 28, 29, 30: on Fagus.
 **Lecanora campestris* (Schaer.) Hue, Loc. 18: on siliceous rocks.
 **Lecanora carpinea* (L.) Vainio, Loc. 4, 6, 10, 17, 20, 24: on Abies, Loc. 6, 13, 28: on Fagus.
 **Lecanora cenisia* Ach., Loc. 17, 18: on siliceous rocks.
 **Lecanora chlorotera* Nyl., Loc. 20, 24: on Abies, Loc. 6: on Fagus.
 **Lecanora flotowiana* Spreng., Loc. 18: on siliceous rocks.
 **Lecanora intricata* (Ach.) Ach., Loc. 18: on siliceous rocks.
 **Lecanora intumescens* (Rebent.) Rabenh., Loc. 6: on Abies.
 **Lecanora persimilis* (Th. Fr.) Nyl., Loc. 24: on Abies, Loc. 5: on Fagus.
 **Lecanora polytropa* (Ehrh. ex Hoffm.) Rabenh., Loc. 18: on siliceous rocks.
 **Lecanora pseudistera* Nyl., Loc. 18: on siliceous rocks.
 **Lecanora pulcaris* (Pers.) Ach., Loc. 4. on Abies, Loc. 28: on Fagus.
 **Lecanora subrugosa* Nyl., Loc. 30: on Fagus.
 **Lecanora symmicta* (Ach.) Ach., Loc. 17: on Abies.
 **Lecanora umbrina* (Ach.) A. Massal., Loc. 24: on Abies.
 **Lecidella elaeochroma* (Ach.) M. Choisy, Loc. 4, 6, 20, 24. on Abies, Loc. 6, 19, 28, 30: on Fagus.
 **Lecidella stigmatea* (Ach.) Hertel & Leuckert, Loc. 21: on siliceous rocks.
 **Lepraria incana* (L.) Ach., Loc. 6: on soil with mosses.
Lobaria pulmonaria (L.) Hoffm., Loc. 3, 6, 9, 19: on Fagus.
 **Melanelia exasperata* (De Not.) Essl., Loc. 6: on Abies.
 **Melanelia exasperatula* (Nyl.) Essl., Loc. 4, 6, 24: on Abies, Loc. 6, 24: on Fagus.
 **Melanelia glabratula* (Lamy) Nyl., Loc. 24: on Abies, Loc. 6, 8: on Fagus.
 #**Melanelia subargentifera* (Nyl.) Essl., Loc. 9: on Fagus.
 **Melanelia subaurifera* (Nyl.) Essl., Loc. 4: on Abies, Loc. 6: on Fagus.
 **Micarea peliocarpa* (Anzi) Coppins & R. Sant., Loc. 23: on siliceous rocks.
 **Micarea prasina* Fr., Loc. 24: on Abies.
 #**Micarea sylvicola* (Flot.) Vězda & V. Wirth, Loc. 6, 15: on siliceous rocks.
 **Myxobilimbia sabuletorum* (Schreb.) Hafellner, Syn.: *Mycobilimbia sabuletorum* (Schreb.) Hafellner, Loc. 7: on siliceous rocks.
 **Nephroma parile* (Ach.) Ach., Loc. 25. on Fagus
 **Ochrolechia androgyna* (Hoffm.) Arnold, Loc. 16: on Fagus.
 **Ochrolechia szatalaensis* Verseghy, Loc. 10, 12: on Abies, Loc. 6: on Fagus.
 **Parmelia saxatilis* (L.) Ach., Loc. 11, 18, 24: on Abies, Loc. 6, 8, 16: on Fagus, Loc. 18, 21: on siliceous rocks.
 **Parmelia sulcata* Taylor, Loc. 6, 9, 24: on Abies, Loc. 6, 8, 18, 26: on Fagus.
 **Parmelina quercina* (Willd.) Hale, Loc. 6: on Abies.

- **Peltigera degenii* Gyeln., Loc. 24: on decaying wood.
 **Peltigera didactyla* (With.) J.R. Laundon, Loc. 7: on siliceous rocks.
 **Peltigera polydactylon* (Neck.) Hoffm., Loc. 19: on *Fagus*, Loc. 6: on siliceous rocks and soil.
Peltigera praetextata (Sommerf.) Zopf, Loc. 5, 27: on siliceous rocks and soil.
 **Pertusaria albescens* (Huds.) M. Choisy & Werner, Loc. 10, 24: on *Abies*, Loc. 18: on *Fagus*, Loc. 18: on siliceous rocks.
 **Pertusaria amara* (Ach.) Nyl., Loc. 9, 10, 24: on *Abies*, Loc. 16, 22: on *Fagus*.
 * *Pertusaria hemisphaerica* (Flörke) Erichsen, Loc. 5: on *Abies*.
 **Pertusaria pertusa* (Weigel) Tuck., Loc. 9, 13, 16, 28: on *Fagus*.
 **Phlyctis argena* (Spreng.) Flot., Loc. 9, 12: on *Abies*.
 **Physcia semipinnata* (J.F. Gmelin) Moberg, Loc. 24: on *Abies*, Loc. 13. on *Fagus*.
 **Physcia tenella* (Scop.) DC., Loc. 13: on *Fagus*.
 **Platismatia glauca* (L.) W.L. Culb. & C.F. Culb., Loc. 18: on *Abies*.
 **Porpidia crustulata* (Ach.) Hertel & Knoph, Loc. 6, 15, 23: on siliceous rocks.
 #**Porpidia glaucophaea* (Körb.) Hertel & Knoph, Loc. 6, 15, 23: on siliceous rocks.
 **Protoparmelia badia* (Hoffm.) Hafellner, Loc. 18: on siliceous rocks.
 **Pseudevernia furfuracea* (L.) Zopf, Loc. 4, 9, 12, 20, 24: on *Abies*, Loc. 26: on *Fagus*, Loc. 4, 6, 17: on *Pinus*.
 **Pyrenula nitida* (Weigel) Ach., Loc. 9, 13: on *Fagus*.
 **Ramalina farinacea* (L.) Ach., Loc. 9, 13, 20: on *Abies*, Loc. 13, 18, 26: on *Fagus*.
 **Ramalina fastigiata* (Pers.) Ach., Loc. 20: on *Abies*, Loc. 18. on *Fagus*.
 **Ramalina obtusata* (Arnold) Bitter, Loc. 13, 20: on *Abies*, Loc. 18. on *Fagus*.
 **Ramalina pollinaria* (Westr.) Ach., Loc. 24. on *Abies*.
 **Ramalina subfarinacea* (Nyl. ex Crombie) Nyl., Loc. 24: on *Abies*.
 **Rhizocarpon geographicum* (L.) DC., Loc. 17: on siliceous rocks.
 **Rinodina exigua* (Ach.) Gray, Loc. 10, 24: on *Abies*, Loc. 6: on *Fagus*.
 **Rinodina oleae* Bagl., Loc. 24: on *Abies*.
 **Scoliciosporum umbrinum* (Ach.) Arnold, Loc. 24: on *Abies*, Loc. 6: on *Fagus*.
 **Tephromela atra* (Huds.) Hafellner, Loc. 6: *Abies*.
 Note: The species usually grows on siliceous rocks, observations on bark rare rather scarce.
 **Tuckermannopsis chlorophylla* (Willd.) Hale, Syn.: *Cetraria chlorophylla* (Willd.) Vain., Loc. 9: on *Abies*.
 **Usnea articulata* (L.) Hoffm., Loc. 24: on *Abies*.

DISCUSSION

The present paper lists all of the 101 lichen taxa known from Sinop province. However this list is far from being complete, but it will fill gaps in the distribution maps of Turkish lichens and stimulate further recording. Many species are only recorded for the second time from Turkey: *Alectoria sarmentosa*, *Bryoria nadvornikiana*, *Buellia griseovirens*, *Cladonia cenotea*, *Fuscidea cyathoides*, *Lecanora intricata*, *L. pseudistera*, *L. symmicta*, *Micarea peliocarpa*, *M. prasina*, *Peltigera degenii* and *Rinodina oleae*; other species in the list represent a third record: *Baeomyces rufus*, *Haematomma ochroleucum*, *Hafellia disciformis*, *Lecanora persimilis*, *Myxobilimbia sabuletorum*, *Ochrolechia androgyna* and *Peltigera didactyla*. For some species the known distribution is extended to the northern and eastern part of Turkey, e.g. *Haematomma ochroleucum*, *Pertusaria hemisphaerica*, *Rinodina oleae* and *Scoliciosporum umbrinum*.

Most lichen species are more or less acidophytic, being recorded from acid bark of *Abies nordmanniana* and siliceous rock surfaces. The lack of nitro-

philous species like *Phaeophyscia* spp. or *Xanthoria* spp. (Wirth 1991) on subneutrophic bark of *Fagus orientalis* indicate a natural habitat without any influence of nitrogen from agriculture or air pollution.

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