Lichens from thickets of Buxus, Carpinus and Juniperus on Mt Vourinos, Makedhonia, North Central Greece

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Lichens from thickets of *Buxus, Carpinus* and *Juniperus* on Mt Vourinos, Makedhonia, North Central Greece

Abstract

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76 taxa of mainly epiphytic and epigeous lichens are reported from Mt Vourinos in Makedhonia, Greece. 12 taxa are new to Greece, viz. *Buellia erubescens, B. insignis, Caloplaca cerina* var. *muscorum, C. necator, Cladonia merochlorophaea* var. *novochlorophaea, Lecanora leptyrodes, Parmelia subargentifera, Physcia dubia, Ramalina fraxinea* var. *calicariformis, Rinodina conradi, R. septentrionalis* and *Scoliciosporum umbrinum* var. *corticola.* Seven additional taxa are new to the Greek mainland, viz. *Aspicilia cheresina* var. *justii, Caloplaca conglomerata, Candelariella reflexa, Cladonia symphycarpa, Parmelia pulla* var. *pokornyi, P. tinctina* and *Pertusaria rhodiensis*. Ecological aspects are briefly discussed.

Introduction

Greece, with its varied topography and geology as well as great variation in climatic conditions, has a large number of biotopes and vascular plants, including woody species. It therefore harbours also a rich lichen flora and a high number of different epiphytic and epilithic lichen communities; the epigeous lichen vegetation is, in contrast, less developed due to the heavy grazing pressure in most areas. The relatively high number of papers dealing with Greek lichens (Christensen 1989) still gives only a glimpse of this richness, and the only synoptic papers, viz. Steiner (1898) and Szatala (in Rechinger 1943), are outdated. The *Fagus, Pinus* and *Abies* forests in the Greek mountains host lichen species and lichen communities that are threatened, if not extinct, in large parts of Central Europe (Sérusiaux 1989). Protection of these habitats has thus also European significance, since they may serve as potential centres for a re-expansion of the lichen vegetation when conditions in Central Europe ameliorate. For many parts of the Mediterranean area, lichen checklists have been made or are in preparation (Nimis 1998). The lack of a comprehensive up-to-date overview of the Greek lichen flora is a considerable draw-back in floristic studies. The present paper is therefore intended as a further contribution towards a thorough checklist of the Greek lichen flora.

Material and methods

The lichen material studied was collected by the author in the years 1989 and 1991. The numbers given are the author's collection numbers. The epiphytic vegetation of twigs often consists of numerous small specimens of various taxa growing closely intermingled. In consequence, it was not possible to prepare separate samples for each taxon. Some therefore have no separate collection number and are referred to with the bracketed collection number of the numbered specimen with which it is joined. The specimens are deposited in the Botanical Museum of Copenhagen (C), in the Berlin herbarium (B) and in the author's private herbarium.

Taxa new to Greece are marked with a double asterisk (**), taxa new to the Greek mainland with a single asterisk (*). The nomenclature follows Nimis (1993). Whenever possible, geographical names are quoted in accordance with The Times Atlas of the World 1990.

Mt Vourinos

Mt Vourinos is situated in SW Makedhonia, N Central Greece, between the towns of Grevena and Kozani, WNW of Mt Olimbos. Mt Vourinos (with an elevation of 1866 m according to Babalonas 1989 and of 1621 m according to the Ethniki Statistiki Ypiresia tis Ellados' Nomos map no. 26 of 1963 with corrections 1972 and 1983) is an almost crescent-shaped range running nearly 30 km NW to S. The maximum width of the range is in the northern part and almost 8 km. Serpentine is the bedrock in most of the range (Babalonas 1989), which is one of the larger serpentine outcrops in Greece (Brooks 1987: fig. 14.12). In the southern part ultrabasic dunite and peridotite (Babalonas 1988) and above the village of Metamorphosis on the eastern slope (locality III of this paper) hard limestone occur.

Mt Vourinos is situated at the border between the mesomediterranean and submediterranean climate, which in Greece generally is above 1800 m (UNESCO-FAO 1963). The former is characterised by 40-75 physiologically dry days during the dry season, the latter has less than 40 such days (UNESCO-FAO 1963). The climate of Mt Vourinos is submediterranean-continental with only moderate summer drought, the precipitation of the town of Kozani in the lowland north of Mt Vourinos is 710 mm annually (Babalonas 1988).

A map of the area and a list of the vascular plant flora of Mt Vourinos was published by Babalonas (1989). The vegetation on the S and W slopes consists of scattered thickets of *Juniperus oxycedrus* L. and *Buxus sempervirens* L. in a dry grass-herb vegetation, while the N and E slopes are covered with dense, heavily browsed thickets of *Carpinus orientalis* Mill. These vegetation types belong to the supramediterranean zone characterized by deciduous oaks (Quezel & Barbero 1985). The vegetation of the southern part of Mt Vourinos between 600 and 1100 m consists of *Buxus* shrubs and scattered stands of *Quercus frainetto* (Babalonas 1988).

Juniperus oxycedrus belongs to the shrub layer of *Quercus frainetto* forests (Babalonas 1988) and the *Juniperus* thickets are considered as remnants of degraded *Quercus* forests. The human influence on the vegetation of the mountain has been severe and probably long-lasting. Judged by the scattered *Quercus* trees on the S and W slopes and the scattered old *Abies* on the N slope, *Quercus* forests or mixed forests with *Quercus* must have been the natural vegetation there, whereas the N slope was possibly covered with *Abies* or *Abies-Fagus* forests.

The whole mountain is heavily grazed by sheep and goats and the *Carpinus* growth appears as a brush wood both due to browsing and to the fact that the bushes are cut back to feed the animals with twigs out of their reach. Most of the *Carpinus* plants are between 0.5 and 3 m, the *Juniperus* and *Buxus* shrubs about 1.5 m high. While the *Carpinus* brush wood is very dense, the *Juniperus* and *Buxus* thickets have large open areas between the shrubs or between clumps of shrubs. These areas are either serpentine outcrops or very dry soil with drought and grazing resistant vascular plants (cf. Babalonas 1989).

The sampling sites

The lichens were collected at three sites on the main part of Mt Vourinos N of the village of Chromio:

I: Nomos (province) and eparchia (municipality) Grevenon. W slope S of the main summit (Drisinikos). Grass heath with serpentine outcrops and scattered *Buxus sempervirens, Quercus* and *Juniperus oxycedrus* shrubs on S and E exposed slopes and on the summit area of a minor ridge. Alt. 1250-1325 m. Date 28.4.1989.

II: Nomos and eparchia Grevenon. W slope of the summit Drisinikos, above the village Exarchos. Grass heath on SW slope with serpentine outcrops and scattered shrubs and thickets of *Buxus sempervirens* and *Juniperus oxycedrus* with some *Quercus* shrubs. Alt. 875-925 m. Date 14.9.1991.

III: Nomos and eparchia Kozanis. N slope, above the village Metamorphosis. Thicket of *Carpinus orientalis* and *Juniperus oxycedrus* with some *Quercus* shrubs. Limestone. Alt. 900 m. Date 19.9.1991.

List of lichens

The following list is reasonably complete for the epiphytic and epigeous lichens, while the saxicolous lichens were paid only minor attention in the field.

41, 44 and 28 lichen taxa were recorded from locality I, II and III, respectively.

If not stated otherwise, the specimens of locality III were collected from bark of bitten twigs and dead branch ends of heavily browsed *Carpinus* bushes.

Anaptychia ciliaris (L.) Körb.
I: On the bark of branches of dead *Juniperus, 5996, 6011, 6015* (with apothecia); on the bark of twigs and stems of dead *Juniperus (6008).* – No. *6011* has a smooth, brown upper cortex and only the lobes in the lowermost part of the tufted thallus are felted. This is perhaps a symptom of stress due to this very exposed situation on the summit area.
II: On a dead *Buxus* stem, *9060*.
III: (9287, 9293).

****Aspicilia cheresina*** var. ***justii*** (Servít) Clauz. & Roux
II: On SE facing vertical side of rock outcrop, *9041*.

The variety *granulifera* (Steiner) Szatala has been recorded from Mt Olimbos (Szatala 1959) and the variety *justii* (Servít) Clauz. & Roux only from the Aegean (Sipman & Raus 1999). The variety *justii* is thus new to the Greek mainland. *A. cheresina,* which is usually found on calcareous substrata and parasitises *Aspicilia calcarea* in the juvenile stage, was here growing partly on *Aspicilia* sp. and *Acarospora* sp., partly directly on the serpentine rock.

Buellia alboatra (Hoffm.) Th. Fr.
II: On the bark of *Buxus* branches *(9013, 9015)*.

*****Buellia*** cf. ***erubescens*** Arnold
II: On the bark of a *Juniperus* stem (*9021*). – The spores (18-23 × 7-12 µm) are a little too large and the hymenium (100-120 µm) too high in comparison with the measurements published by e.g. Schauer (1965), Poelt (1969), Clauzade & Roux (1985) and Purvis & al. (1992) for *B. erubescenes.* The K+ red reaction of the verrucose-areolate thallus is, however, indicative of this taxon. Alternatively, the specimen may be a chemically aberrant form of *B. zahlbruckneri* Steiner; Nimis (1993), however, suggests that the two taxa might be conspecific.

*****Buellia insignis*** (Naeg.) Th. Fr.
I: On the bark of a twig of dead *Juniperus (5990)*.

Buellia triphragmia (Nyl.) Arnold
Syn.: *B. lauricassiae* auct. europ., non (Fée) Müll. Arg. (cf. Nimis 1993).
II: On the bark of a *Juniperus* stem, *9043;* on wood of dead *Juniperus* twig *(9053)*.

Buellia zahlbruckneri Steiner
I: On the bark of a twig of dead *Juniperus (5989).*

Caloplaca cerina (Ehrh.) Th. Fr.
II: On the bark of a stem of dead *Juniperus (9029).*

*****Caloplaca cerina*** var. ***muscorum*** (Massal.) Jatta
I: On moss and litter on the ground *(5988a).*

****Caloplaca conglomerata*** (Bagl.) Jatta
II: On *Aspicilia* cf. *cheresina* on the SE facing vertical side of a serpentine rock outcrop, *9041a.*

Caloplaca ferruginea (Huds.) Th. Fr.
I: On the bark of twigs of dead *Juniperus, 5982, 6012.*
II: On the bark of branches and dead twigs of *Buxus, 9013, 9037;* on the bark of a *Juniperus* stem *(9021, 9043).*
III: *(9289, 9293, 9298).*

Calopaca flavorubescens (Huds.) Laundon
III: *(9285, 9288, 9289, 9293, 9296, 9298).*

Caloplaca haematites (Chaub.) Zwackh
II: On the bark of twigs and branches of *Buxus, 9017, 9034.*
III: *(9298).*

*****Caloplaca necator*** Clauz. & Roux
II: On *Aspicilia* sp. on SW slanting serpentine rock, *9039.*

Caloplaca pyracea (Ach.) Th. Fr.
I: On the bark of a twig of dead *Juniperus (5990).*
II: On the bark of trunks of living and dead *Juniperus* bushes *(9022), 9028.*
III: (*9287*).

****Candelariella reflexa*** (Nyl.) Lettau
II: On the bark of a dead *Buxus* twig *(9064);* on the bark of the lower side of a slanting *Juniperus* stem, *9055.*

Previously recorded from Santorini (Sipman & Raus 1995).

Candelariella vitellina (Hoffm.) Müll. Arg.
I: On the bark of twigs of dead *Juniperus (5982, 5989, 5990, 5991, 6012).*
II: On the bark of branches and of dead twigs of *Buxus, 9024, (9064);* on wood and bark of living and dead *Juniperus* bushes *(9022), 9030, (9029).*
III: *(9288, 9289, 9291, 9292, 9293, 9298).*

Candelariella xanthostigma (Ach.) Lettau
II: On the bark of a *Buxus* branch *(9033);* on the bark of a stem of dead *Juniperus, 9063.*

Cetraria aculeata (Schreb.) Fr.
I: On soil, *5985.*

A rare lichen in Greece: two previous collections are known from the Greek mainland (Kärnefelt 1986).

Cladonia convoluta (Lam.) Anders
II: On soil and litter, partly under *Buxus* shrub, *9014*.
III: On soil and litter, *9301*.
For the authorship of this name see Burgaz & Ahti (1992).

Cladonia foliacea (Huds.) Willd.
I: On moss and litter on the ground, *5983*.

Cladonia macilenta Hoffm.
I: On soil under trunk of dead *Juniperus, 6006* (K+ & P+ yellow).

*****Cladonia merochlorophaea*** var. ***novochlorophaea*** Sipman
I: On soil rich in organic matter, *5984*. – Homosekikaic, sekikaic and fumarprotocetraric acids by tlc.

Cladonia pocillum (Ach.) O.-J. Rich.
III: On moss and litter on limestone outcrop, *9302, 9304* (both det. S. Stenroos).

Cladonia pyxidata (L.) Hoffm.
II: On soil, *9052*.

Cladonia rangiformis Hoffm.
I: On soil and litter, *5986*.
II: On soil and litter, partly under *Buxus* shrub, *9038*.
III: On soil and litter, *9305*.

****Cladonia symphycarpa*** (Ach.) Fr.
I: On soil, *6005*.
II: On shallow soil on serpentine outcrop, *9047*.
Though normally found on calcareous ground (Nimis 1993) it is here reported from serpentine soils. Previously recorded from Evvia (Krause & Klement 1962).

Dermatocarpon miniatum var. ***complicatum*** (Lightf.) Th. Fr.
II: On serpentine outcrop, *9045, 9061*.

Evernia prunastri (L.) Ach.
III: *9310*.

Hypogymnia tubulosa (Schaer.) Hav.
III: *9311*.

Lecanora carpinea (L.) Vainio
II: On the bark of a *Buxus* branch, *9091a*.

Lecanora hagenii (Ach.) Ach.
I: On the bark of twigs of dead *Juniperus, 5989, 5990, 5991*.

*****Lecanora leptyrodes*** (Nyl.) Degel.
II: On a *Juniperus* stem *(9022)*.
III: *9289, 9290*.
Distinguished from *L. carpinea* by the P+ yellow reaction only, the two taxa are likely to be conspecific (Ibáñez & Burgaz 1998); however, until the taxonomy is clarified, both should be maintained as separat species.

Lecanora meridionalis H. Magn.
Syn.: *L. chlarotera* subsp. *meridionalis* (H. Magn.) Clauz. & Roux
I: On wood and bark of twigs and branches of dead *Juniperus, 5992, 5997* (det. O. Vitikainen), *5998, 6004*.
II: On the bark of branches and of dead twigs of *Buxus, 9015, 9031, 9064*; on the wood of a dead *Juniperus* twig, *9053;* on the bark of *Juniperus* stem (*9043*).

Lecanora mughicola Nyl.
I: On the wood of dead *Juniperus* (*6000*, conf. H. Vänskä)

Lecanora rugosella Zahlbr.
Syn.: *L. chlarotera* subsp. *chlarotera* f. *rugosella* (Zahlbr.) Poelt
II: On the bark of branches and twigs of *Buxus, 9015, 9019, 9020, 9032*; on bark of *Juniperus* stem (*9021, 9022*).
III: *9284, 9286*.

Lecanora varia (Hoffm.) Ach.
I: On the wood of stems and branches of dead *Juniperus, 5993, 6000* (conf. H. Vänskä), *6001, 6009*.

Lecidella achristotera (Nyl.) Hertel & Leuckert
I: On the bark of twigs of dead *Juniperus* (*5991*).
II: On the bark of dead twigs of *Buxus (9064);* on the bark of the stem of living and dead *Juniperus* bushes *(9022, 9029)*.
III: *9292* (hymenium with inspersion in the basal one third only, thallus C-).

I have the same experience as Sipman & Raus (1999) that the inspersion of the hymenium in *Lecidella achristotera/elaeochroma* is highly variable and probably of no taxonomic value. However, I find it better to retain the two taxa separated, awaiting a taxonomic revision of the group, as literature records are more easily united than split at a later stage.

Lecidella carpathica Körb. var. ***carpathica***
I: On pebbles *(5994)*.

Lecidella elaeochroma (Ach.) Choisy var. ***elaeochroma***
I: On wood and bark of twigs of dead *Juniperus (5982, 5992, 5997, 5998, 6007)*.
II: On the bark of dead branches of living and dead *Buxus* bushes *(9035, 9042), 9050*.
III: *9288*.

Lecidella euphorea (Flörke) Hertel
I: On wood and bark of twigs of dead *Juniperus (5997, 6012)*.
II: On the bark of branch of *Buxus (9017);* on the bark of a stem of *Juniperus (9021);* on the wood of a dead twig of *Juniperus (9053)*.
III: *(9284)*.

Lepraria lobificans Nyl.
II: On soil in rock crevice, *9054*; tlc: atranorin, zeorin, stictic acid and constictic acid.

Lepraria sp.
III: Seen, not collected.

Megaspora verrucosa var. ***mutabilis*** (Ach.) Nimis & Roux
Syn.: *Aspicilia mutabilis* (Ach.) Körb.

I: On the bark of a branch of dead *Juniperus (5998)*.
III: *9285, 9287*.

The species seems to be known from deciduous trees only (Clauzade & Roux 1985, Nimis 1993).

Ochrolechia alboflavescens (Wulfen) Zahlbr.
I: On the wood of a twig of dead *Juniperus, 6004a* (sterile, det. I. Brodo; tlc: variolaric acid, protolichesterinic acid, and lichesterinic acid, det. I. Brodo).

Ochrolechia szatalaensis Vers.
I: On the wood of a branch and the bark of a stem of dead *Juniperus, 6003* (thallus C-, thalline margin of apothecia C+ yellowish, disc C+ orange. Conf. I. Brodo: "thallus unusual thick" (in litt.). Tlc: variolaric acid, murolic acid, and neodihydromurolic acid, det. I. Brodo), *6010* (Thallus C+ yellow, thalline margin C+ yellow, and disc C+ yellow).

Parmelia acetabulum (Neck.) Duby
I: On the bark of stems of dead *Juniperus, 6008*.
II: On the bark of stems and dead branches of *Buxus, 9042, 9049, 9056*.
III: *9283*.

Parmelia glabratula (Lamy) Nyl. var. ***glabratula***
III: *9300a*.

Parmelia pastillifera (Harm.) Schub. & Klem.
I: On the bark of a branch of dead *Juniperus, 5999*.
II: On the bark of the trunk of *Juniperus (9021)*.

****Parmelia pulla*** var. ***pokornyi*** (Körb.) Türk & Poelt, ined. (fide Scholz 1995)
I: On soil, pebbles and rock, *5994*.

The variety *pokornyi* is known from Kriti (Kleinig 1966).

Parmelia somloensis Gyeln.
Syn.: *P. taractica* auct. europ., non Krempelh.
I: On moss and litter on the ground; loosely attached to soil and *Cladonia foliacea (5983)*. – Lobes more or less linear. Medulla K+ yellow, turning red. The substrate indicates *Parmelia sublaevis* Cout. (= *P. taractica* f. *hypoclista* (Nyl.) Clauz. & Roux according to Poelt & Vězda (1981) and Clauzade & Roux (1985), but this taxon seems to be more broad-lobed (Hale 1990) than the present specimen. The chemical reactions (Krog 1978 as *P. taractica* Krempelh.) as well as the morphology of the lobes (Hale 1990) indicate *Parmelia somloensis*.

*****Parmelia subargentifera*** Nyl.
III: *9300*.

Parmelia sulcata Th. Tayl.
III: *9312*.

Parmelia tiliacea (Hoffm.) Ach.
II: On the bark of stems of living and dead *Juniperus* bushes, *9026, 9044;* on serpentine outcrop, *9059*.

****Parmelia tinctina*** Mah. & Gill.
II: On serpentine outcrop, *9062*.

Peltigera rufescens (Weis) Humb.
I: On soil and litter, *6016* (with regeneration lobuli, conf. O. Vitikainen).
III: On mosses and litter, *9303*.

Pertusaria albescens (Huds.) Choisy & Werner
I: On dead *Juniperus, 5995*.

****Pertusaria rhodiensis*** Erichs.
I: On the wood of a branch of dead *Juniperus* (*6010*, thallus C-, K+ yellow).
Hitherto known only from the type locality on Rhodos and from a single gathering in S Italy (Nimis 1993).

Physcia adscendens (Fr.) H. Oliv.
II: On the bark of branches and stems of living and of dead *Juniperus* busches*, 9022, 9023, 9025*.
III: *9299*.

Physcia biziana (Massal.) Zahlbr.
II: On the bark of a *Buxus* branch, *9016*.

*****Physcia dubia*** (Hoffm.) Lettau
II: On SE facing vertical rock outcrop, *9040* with apothecia.
Reported in the Mediterranean region from Italy (Nimis 1993) and Cyprus (Litterski & Mayrhofer 1998).

Physcia semipinnata (J. F. Gmel.) Moberg
I: On the bark of a twig of dead *Juniperus, 6007* (det. R. Moberg). – Seemingly attacked by *Xanthoria parietina*, producing apothecia. The specimen is badly developed with only few cilia, possibly a stress-reaction caused by the harsh environment of the summit area (cf. the note under *Anaptychia ciliaris*).
III: *9291, 9293, 9294, 9295, 9298, 9306, 9307*.

Physcia stellaris (L.) Nyl.
I: On the bark of a branch of dead *Juniperus, 6002* (conf. R. Moberg).
II: On the bark of a branch of dead *Juniperus, 9027*.

Physcia tenella (Scop.) DC.
II: On the bark of twigs and branches of dead and living *Buxus* bushes, *(9022), 9036*, *(9042, 9064);* on bark of a *Juniperus* stem *(9021)*.

Porpidia cinereoatra (Ach.) Hertel & Knoph
II: On serpentine rock outcrop, *9046*.

Pseudevernia furfuracea var. ***ceratea*** (Ach.) D. Hawksw.
I: On the wood of twigs and branches of dead *Juniperus, 5987, 6014*.
II: On the bark of a dead *Buxus* branch, *9058;* on the bark of a *Juniperus* twig*, 9051*.

Pseudevernia furfuracea (L.) Zopf var. ***furfuracea***
I: On the bark of a branch of dead *Juniperus, 6013*.
II: On the bark of a branch of *Juniperus, 9066;* on the bark of a *Juniperus* stem *(9043)*.

Psora decipiens (Hedw.) Hoffm.
I: On soil, *5988* (with apoth.).

Ramalina farinacea (L.) Ach.
III: *9308*.

*****Ramalina fraxinea*** var. ***calicariformis*** (Nyl.) Hue
III: *9309*.
The variety *calicariformis* is new to Greece.

*****Rinodina conradi*** Körb.
I: On moss and litter on the ground, *5988a*.

*****Rinodina septentrionalis*** H. Magn. s. lat.
I: On the bark of a twig of dead *Juniperus (6012)* det. H. Mayrhofer.
III: (*9298*) det. H. Mayrhofer.
Known from the Italian Alps (Nimis 1993) and from Cyprus (Litterski & Mayrhofer 1998).

Rinodina pyrina (Ach.) Arnold
I: On the bark of twigs of dead *Juniperus (5989, 5991)*.
II: On the bark of trunks of living and dead *Juniperus* bushes*, 9021*, *(9022)*, *9023a*. – No. *9021* and *9023a* conf. H. Mayrhofer.

*****Scoliciosporum umbrinum*** var. ***corticola*** (Anzi) Clauz. & Roux
II: On the bark of a *Buxus* branch, *9033*.
The variety *corticola* is new to Greece.

Tephromela atra (Huds.) Hafellner ex Kalb
I: On the wood of the trunk of dead *Juniperus (6000)*.
II: On the bark of a *Buxus* branch *(9032);* on the wood of a dead *Juniperus* twig *(9053)*.

Toninia cinereovirens (Schaer.) Massal.
II: On shallow soil on serpentine rock outcrop, *9048*.
Only two previous records are known from Greece, one from Attika (Szatala 1940) and one from Kriti (Timdal 1991).

Xanthoria parietina (L.) Th. Fr.
I: On the bark of branches and twigs of *Juniperus* (*5998*).
II: On the bark of branches and dead twigs of *Buxus, 9018, 9035, (9064);* on the bark of a stem of dead *Juniperus, 9029*.
III: *9296, 9297.*

Discussion

Of the 76 lichens reported in this study 12 taxa or 16 % have apparently not been recorded from Greece before. Such a high figure and similar figures from other recently published works, e.g. Sipman & Raus (1999), substantiate that the Greek lichen flora is still incompletely known and that many more unrecorded taxa are likely to be found.

A number of epigeous and epilithic lichens normally confined to more or less calcareous substrata were found here on serpentine or serpentine derived soils, viz. *Aspicilia cheresina* var. *justii*, *Cladonia convoluta, C. symphycarpa, Dermatocarpon miniatum* var. *complicatum, Peltigera rufescens, Physcia dubia* and *Psora decipiens*. To a lesser extent this applies to *Cladonia rangiformis*, which shifts from calcareous to siliceous substrate in the southern part of its range, and to *Lecidella carpathica* var. *carpathica,* which makes this change in the northern part of its

range (data from Nimis 1993). Though the lichen flora of serpentine and limestone is normally different (James & al. 1977), calciphilous lichens growing on the moderately basic serpentine or soils derive from it have been observed elsewhere, e.g. in Cornwall (Gilbert & James 1987).

The soil-inhabiting lichens (17 taxa, 12 in locality I, 7 in locality II and 3 in locality III) include all *Cetraria* and *Cladonia* species as well as *Caloplaca cerina* var. *muscorum, Lepraria lobificans, Parmelia pulla* var. *porkornyi, P. somloensis, Peltigera rufescens, Psora decipiens, Rinodina conradi* and *Toninia cinereovirens*. Their low number in the *Carpinus orientalis* thicket (locality III) is probably a result of the almost total absence of soil on this limestone slope. In this thicket, the lichens were found in places where litter accumulates, i.e. in crevices and depressions of difficult access for browsing animals. On the two serpentine sites soils are better developed on the rocky slopes. The epigeous lichens generally find shelter below the branches close to the ground of the *Juniperus oxycedrus* and *Buxus sempervirens* shrubs, they were never found in the open. This is likely a result of the browsing herds of sheep and goats. The fact that the highest number of epigeous lichens was found in locality I, may be due to the lower grazing pressure in this place at a higher altitude and further distance from the villages as well as to the more rugged terrain. An altitude-dependant increase in precipitation and fog frequency (the latter experienced during field work on 28 June) may also be important.

The epiphytic flora of all three localities has a relatively high number of taxa belonging to the families *Candelariaceae* (represented by the genus *Candelariella*), *Physciaceae (Anaptychia, Buellia, Physcia* and *Rinodina)* and *Teloschistaceae (Caloplaca* and *Xanthoria).* The recorded members of these families as well as others, e.g. *Lecanora rugosella* and *Lecidella elaeochroma*, belong to the Xanthorion parietinae alliance and are indicative of nutrient-enriched substrates, in the sampling sites caused by flocks of sheep and goats and the dry summer climate, which support dust formation. However, a number of species of the genera *Buellia* and *Rinodina*, as well as e.g. *Lecanora mughicola, L. varia* and *Ochrolechia alboflavescens*, are characteristic of more nutrient-poor conditions, growing on lignum or acid bark. In the sampling sites they were generally found on exposed wood of *Juniperus* stems. The smooth surface of the wood is likely to accumulate less dust and nutrients than the bark. Thus two ecologically different assemblies of lichens, at least in regard to nutrient requirements, are harboured within the relatively limited space of single *Juniperus* bushes. This may explain the higher number of taxa on *Juniperus* (38) than on *Buxus* (20) or *Carpinus* (25) where exposed wood was missing.

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References

Babalonas, D. 1988: Zur Kenntnis der Flora und Vegetation auf Serpentinstandorten Nordgriechenlands. II. Serpentinvegetation auf submontanen Stufen. – Bot. Jahrb. Syst. **110:** 145-156.

— 1989: Beitrag zur Flora des serpentinischen Vourinos-Gebirge (Nordgriechenland). – Willdenowia **18:** 387-398.

Brooks, R. R. 1987: Serpentine and its vegetation. A multidisciplinary approach. – London & Sydney.

Burgaz, A. R. & Ahti, T. 1992: Contribution to the study of the genera *Cladina* and *Cladonia* in Spain I. – Nova Hedwigia **55:** 37-53.

Christensen, S. N. 1989: The lichen flora on *Ulmus* in a North Greek mountain village with an introduction to the literature on Greek lichens. – Graphis Scripta **2:** 107-113.

Clauzade, G. & Roux, C. 1985: Likenoj de okcidenta Europo. Ilustrita determinlibro. – Bull.

Soc. Bot. Centre-Ouest, Nouv. Ser., Numéro Spécial **7-1985.**
Gilbert, O. L. & James, P. W. 1987: Field meeting on the Lizard Peninsula, Cornwall. – Lichenologist **19:** 319-334.
Hale, M. E. 1990: A synopsis of the lichen genus *Xanthoparmelia* (Vainio) Hale *(Ascomycotina, Parmeliaceae).* – Smithsonian Contr. Bot. **74.**
Ibáñez, I. & Burgaz, A. R. 1998: Epiphytic species of the *Lecanora subfusca* group *(Lecanoraceae)* in Spain. – Nova Hedwigia **67:** 45-58.
James, P. W., Hawksworth, D. L. & Rose, F. 1977: Lichen communities in the British Isles: A preliminary conspectus. – Pp. 295-413 in: Seaward, M. R. D. (ed.), Lichen ecology. – London, etc.
Kärnefelt, I. 1986: The genera *Bryocaulon, Coelocaulon* and *Cornicularia* and formerly associated taxa. – Opera Bot. **86.**
Kleinig, H. 1966: Beitrag zur Kenntnis der Flechtenflora von Kreta. – Nova Hedwigia **11:** 513-526
Krause, W. & Klement, O. 1962: Zur Kenntnis der Flora und Vegetation auf Serpentinstandorten des Balkans 5. Flechten und Flechtengesellschaften auf Nord-Euböa (Griechenland). – Nova Hedwigia **4:** 182-262.
Krog, H. 1978: On *Parmelia protomatrae (Xanthoparmelia),* an overlooked lichen species in Europe. – Norweg. J. Bot. **25:** 51-54.
Litterski, B. & Mayrhofer, H. 1998: Catalogue of lichenized and lichenicolous fungi of Cyprus. – Studia Geobot. **16:** 57-70.
Nimis, P. L. 1993: The lichens of Italy. An annotated catalogue. – Mus. Regionale Sci. Nat. Torino, Monogr. **12.**
— 1998: The MED-checklist of Mediterranean lichens: report from the OPTIMA Commission for Lichens. – OPTIMA Newslett. **33:** 17-20.
Poelt, J. 1969: Bestimmungsschlüssel europäischer Flechten. – Lehre [reprint Vaduz 1974].
— & Vězda, A. 1981: Bestimmungsschlüssel europäischer Flechten. Ergänzungsheft II. – Vaduz.
Purvis, O. W., Coppins, B. J., Hawksworth, D. L., James, P. W. & Moore, D. M. 1992: The lichen flora of Great Britain and Ireland. – London.
Quézel, P. & Barbero, M. 1985: Carte de la végétation potentielle de la Région Méditerranéenne. Feuille n° 1: Méditerranée Orientale. – Paris.
Rechinger, K. H. 1943: Flora Aegaea, Flora der Inseln und Halbinseln des ägäischen Meeres. – Denkschr. Akad. Wiss. Wien, Math.-Naturwiss. Kl. **105(1).**
Schauer, T. 1965: Die holz- und rindenbewohnenden Arten der Flechtengattung *Buellia* s. str. im Nordalpenraum. – Mitt. Bot. Staatssamml. München **5:** 609-626.
Scholz, P. 1995: New or interesting records of lichens and lichenicolous fungi from Germany. – Pp. 387-394 in: Knoph, J.-G., Schrüfer, K. & Sipman, H. J. M. (ed.): Studies in lichenology with emphasis on chemotaxonomy, geography and phytochemistry, Festschrift Ch. Leuckert. – Bibl. Lichenol. **57.**
Sérusiaux, E. 1989: Liste rouge des macrolichens dans la Communauté Europeénne. – Liege.
Sipman, H. J. M. & Raus, T. 1995: Lichen observations from Santorini (Greece). – Pp. 409-428 in: Knoph, J.-G., Schrüfer, K. & Sipman, H. J. M. (ed.), Studies in lichenology with emphasis on chemotaxonomy, geography and phytochemistry, Festschrift Ch. Leuckert. – Bibl. Lichenol. **57.**
— & Raus, T. 1999: A lichenological comparison of the Paros and Santorini island groups (Aegean, Greece), with annotated checklist. – Willdenowia **29:** 239-297.
Steiner, J. 1898: Prodromus einer Flechtenflora des griechischen Festlandes. – Sitzungsber. Kaiserl. Akad. Wiss. Math.-Naturwiss. Kl. **107:** 103-189.
Szatala, Ö. 1940: Adatok a Balkánfélsziget és Kis-Ázsia zuzmóflórájának ismeretéhez. Contributions à la connaissance de la flore lichénologique de la péninsule des Balkans et de l'Asie

Mineure. – Borbásia **2:** 33-50.
— 1959: Contributions à la connaissance des lichens de la Grèce II. Mont Olympe. – Ann. Hist.-Nat. Mus. Natl. Hung **51:** 121-144.
Timdal, E. 1991: A monograph of the genus *Toninia (Lecideaceae, Ascomycetes).* – Opera Bot. **110.**
UNESCO-FAO 1963: Bioclimatic map of the Mediterranean zone. – Arid Zone Res. **21:** 1-58.

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