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## Lichens of *Cupressus sempervirens* on the Aegean islands of Kriti and Kos, Greece

### Abstract

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72 epiphytic taxa are reported from *Cupressus sempervirens* stands of the islands of Kriti and Kos. Including previously published taxa, the known flora of epiphytic lichens of Greek *Cupressus* stands comprises 93 taxa. Two taxa, *Bacidia parathalassica* and *B. thurrenica* are new to Greece, 21 taxa are new to Kos and 4 taxa are new to Kriti.

Key words: Mediterranean cypress, epiphytic lichens, lichen diversity, Cos, Crete, Mediterranean region.

### Introduction

A relatively high number of papers deal with the Greek lichen flora (see Christensen 1989). In recent years papers mainly authored or co-authored by S. N. Christensen, S. Pirintsos or H. J. M. Sipman have contributed further to the knowledge of the Greek lichen flora. Lately, the checklist of Kriti (Grube & al. 2001) seems to have stimulated publication of floristic work on the island (Spribille & al. 2006, Christensen & Svane 2007).

The high percentage of new records in recent papers underlines the incompleteness of the present knowledge. However, knowledge of the composition of the lichen flora and vegetation of particular substrates and habitats is even scantier (Spribille & al. 2006). The present paper is a small contribution to improve this situation.

*Cupressus sempervirens* is a chiefly E Mediterranean tree, which forms woodlands, mainly on limestone. Elsewhere in the Mediterranean it occurs naturally in coastal S Anatolia, Cyprus, Lebanon and the Cyrenaica. It also occurs in the Elburz area and in mountains of S Iran (Christensen 1997). Outside its natural area it is widely planted as an ornamental tree in churchyards and waysides. The investigated stands on Kriti and Kos thus represent together with those in the Cyrenaica the westernmost natural occurrences of *C. sempervirens*. A list of epiphytic lichens of this tree has not previously been published, neither from Greece, nor from elsewhere.

### Material and methods

The specimens were collected on living *Cupressus sempervirens* trees. All specimens were collected by the present author; his collecting numbers are given in italics. For some specimens no separate vouchers were made: they co-occur with the specimens cited. The specimens are deposited at the Botanical Museum of Copenhagen (C) with minor sets in Berlin-Dahlem (B) and in the author's private herbarium.

Epiphytic taxa of *Cupressus sempervirens* published by Sipman & Raus (2002) or Spribille & al. (2006) and not found in this study are included in order to give as comprehensive a list as possible. Epiphytes on other phorophytes in *Cupressus* woodlands are not included.

The distribution of the taxa on the islands were checked using Grube & al. (2001), Spribille & al. (2006) and Christensen & Svane (2007) for Kriti and Sipman & Raus (2002) for Kos.

The lichens collected come from the following localities:

Kriti, Nomos Chanion, Lefka Ori Mts

1. About 6 km WNW of the village of Omalos, about 1½ km N of the village of Agia Irini, *Cupressus sempervirens-Quercus coccifera* woodland with scattered *Pinus brutia* on NNW slope; bedrock: limestone; 975-1050 m, 10.4.1986. This is the same as locality 4 of Christensen & Svane (2007).
2. About 24 km SSW of the town of Chania, about 3 km S of the village of Omalos, just N of Xyloskalo; degraded *Cupressus sempervirens-Quercus coccifera* woodland on SW slope; bedrock; limestone; 1200-1360 m, 3.4.1986. This is the same as locality 6 of Christensen & Svane (2007).

Kos

3. Between Asklepion and Platanos, *Cupressus sempervirens* avenue along asphalt paved road, 24.4.1988.
4. N slope of Mt Dikeos, just E of the village Ziá, *Cupressus sempervirens* woodland on N facing limestone slope, 300 m, 26.4.1988.
5. N slope of Mt Dikeos, above the village Ziá, open *Cupressus sempervirens-Pinus brutia* woodland with undervegetation of *Quercus coccifera* and *Cistus salvifolius* on N facing limestone slope, 340 m, date 26.4.1988.
6. N slope of Mt Dikeos, above the village Ziá, along the path to the summit, dense stand of tall *Cupressus sempervirens* trees along unpaved dirt road on W slope; bedrock: limestone; 460 m, 27.4.1988.
7. N slope of Mt Dikeos, above the village Ziá, along the path to the summit; open *Cupressus sempervirens* woodland on N slope; bedrock: sandstone; 580 m, 27.4.1988.

### List of lichens from Kriti and Kos epiphytic on *Cupressus sempervirens*

The following list includes two taxa, preceded by two asterisks (\*\*), that are new to Greece, four taxa, preceded by a plus sign (+), new to Kriti and 21 taxa, preceded by an asterisk (\*), new to Kos.

The numbers in brackets refer to the collecting localities given in the section "Material and methods".

*Anaptychia ciliaris* (L.) Körb. – (1) on trunk, 3276; (2) on trunk, 2950, 2972, 2973, on bark of twigs, with *Pseudevernia furfuracea* 2977, on decorticated wood of twigs, with *Pertusaria albescens* 2968.

\*\**Bacidia parathalassica* Llop & Gómez-Bolea – (6) on trunks, 4897a, with *Physcia adscendens* 4900, 4903; (7) on trunks, 4920, on thin branches, 4926, with *B. thyrrenica* 4922. – All det. E. Llop.

\*\**Bacidia thyrrenica* Llop ad int. – (6) on a trunk, with *Physcia adscendens* 4900; (7) on a thin branch, 4916a, 4917a, 4922, on cones, with *Lecanora horiza* 4913. – All det. E. Llop.

*Buellia chloroleuca* Körb. – Kriti (Spribille & al. 2006).

- Buellia griseovirens* (Turner & Borrer) Almb. – (2) on decorticated wood, 2945a.
- Caloplaca cerina* (Hedw.) Th. Fr. – (2) on trunks, 2947, 2952; (3) on trunks, 4770a, 4772, 4774a; (5) on trunks, 4840; (6) on a trunk, with *Catillaria chalybeia* 4897.
- \**Caloplaca flavorubescens* var. *quercina* (Flagey) Giralt & al. – (1) on bark of twigs, 3273; (2) on bark of twigs and cones, with *Caloplaca haematites* 2974, with *Lecidella euphoria* 2931, 2975, with *Physcia leptalea* 2976; (4) on a twig, 4826; (6) on trunks, with *Lecanora argentata* 4905, on cones, with *Rinodina pyrina* 4902; (7) on a thin branch, with *Lecanora argentata* 4917, with *Bacidia rosella* 4917a, 4926, on a twig, with *Lecanora meridionalis* 4916, with *Physcia leptalea* 4930, on cones, with *Lecanora horiza* 4913, with *Catillaria chalybeia* 4915. – See Christensen & Svane (2007).
- \**Caloplaca furfuracea* H. Magn. – (1) on a trunk and on decorticated wood, 3265a, 3269, 3270, 3271a, with *Pertusaria albescens* var. *corallina* 3264, with *Ochrolechia turneri* 3266, with *Ochrolechia pallescens* 3267, with *Pertusaria coccodes* var. *coccodes* 3272. – No. 3271a conf. U. Söchting. This species differs from *C. herbidella* in the non-corticate, K- “isidia”.
- \**Caloplaca haematites* (St.-Amans) Zwackh – (1) on decorticated wood of a trunk (with *Caloplaca furfuracea* 3270, with *Rinodina* sp. 3270a, on bark of twigs, with *Diplotomma alboatrum* 3257, with *Caloplaca flavorubescens* 3273; (2) on bark of twigs and on cones, 2974; (4) on a twig, with *Caloplaca flavorubescens* 4826; (5) on trunks, with *Xanthoria parietina* 4832, on bark on dead twig, with *Lecanora chlarotera* 4833; (6) on a trunk, 4899b, on shaded twigs, with *Diplotomma alboatrum* 4909; (7) on cones, with *Lecanora horiza* 4913, with *Catillaria chalybeia* 4915.
- Caloplaca herbidella* (Hue) H. Magn. – Kriti (Spribille & al. 2006).
- Caloplaca obscurella* (Körb.) Th. Fr. – Kos (Sipman & Raus 2002).
- Caloplaca pyracea* (Ach.) Th. Fr. – (4) on a twig, with *Caloplaca flavorubescens* 4826; (5) on trunks, with *Rinodina pyrina* 4839, with *Caloplaca cerina* 4840, with *Catillaria chalybeia* 4850, on bark on dead twig, with *Lecanora chlarotera* 4833; (6) on trunks, 4899a, 4899 conf. U. Söchting, on cones, with *Rinodina pyrina* 4902, on shaded twigs, with *Diplotomma alboatrum* 4909; (7) on cones, with *Lecanora horiza* 4913.
- Candelariella faginea* Nimis & al. – Kriti (Spribille & al. 2006).
- Candelariella reflexa* (Nyl.) Lettau – Kriti (Spribille & al. 2006).
- Candelariella vitellina* (Hoffm.) Müll. Arg. – (1) on a trunk, with *Pyrrhospora quercea* 3252; (2) on a trunk, 2935.
- Candelariella xanthostigma* (Ach.) Lettau – (1) on a trunk, 3262, on bark of twigs, 3261; (6) on a trunk, with *Catillaria chalybeia* 4897.
- Candelariella* sp. 1 – Kriti (Spribille & al. 2006).
- Catillaria chalybeia* (Borrer) A. Massal. – (5) on trunks, 4844, 4834a, 4850; (6) on trunk, 4897. (7) on cones, 4915.
- Catillaria chalybeia* var. *chloropoliza* (Nyl.) H. Kilius – Kos (Sipman & Raus 2002).
- \**Catillaria nigroclavata* (Nyl.) Schuler – (6) on trunks, with *Physcia adscendens* 4900, with *Bacidia rosella* 4903.
- Catnaria atropurpurea* (Schaerer) Vězda & Poelt – Kriti (Spribille & al. 2006).
- \**Cladonia chlorophaea* (Sommerf.) Spreng. – (2) on trunk, with *Lethariella intricata* 2953; (5) on the base of a trunk, 4845 (squamules only).
- +*Cladonia* cf. *grayi* Sandst. – (2) on the base of a trunk, 2954. – Cups relatively narrow, granulose sorediate, primary squamules esorediate. C-, K-. Two tlc-runs gave inconclusive results. Using the key of Ahti (1977), the specimen is best referred to *C. grayi*.
- Collema furfuraceum* (Arnold) Du Rietz – Kriti (Spribille & al. 2006).
- Collema multipunctatum* Degel. – Kriti (Spribille & al. 2006).
- Diplotomma alboatrum* (Hoffm.) Flotow – (1) on twigs, 3257; (6) on a trunk, with *Ramalina canarinsis* 4898, on shaded twigs, 4909.
- Fuscopannaria olivacea* (P. M. Jørg.) P. M. Jørg. – (1) on bark and decorticated wood, 3251, 3274, both conf. P. M. Jørgensen.

- +*Hypocenomyce caradocensis* (Nyl.) P. James & Gotth. Schneid. – (2) on decorticated wood, 2941 det. V. Alstrup.
- Lecania cyrtellina* (Nyl.) Sandst. – Kriti (Spribille & al. 2006).
- Lecania naegelii* (Hepp) Diederich & Van den Boom – (6) on a trunk, 4897b det. E. Llop, 4908a; (7) on cones, with *Lecanora horiza* 4913 det. E. Llop.
- \**Lecanora argentata* (Ach.) Malme – (5) on trunks, 4841, 4848; (6) on a trunk, 4905; (7) on a thin branch, 4917, on cones, with *Lecanora horiza* 4913, with *Catillaria chalybeia* 4915.
- Lecanora chlarotera* Nyl. – (1) on bark and wood of twigs and cones, with *Pertusaria albescens* 3268; (2) on a trunk, 2934, on decorticated wood of twigs, with *Pertusaria albescens* 2968.
- \**Lecanora chlarotera* subsp. *chlarotera* f. *crassula* (H. Magn.) Poelt – (5) on bark on a dead twig, 4833.
- Lecanora dispersa* (Pers.) Sommerf. – (3) on a trunk, 4773.
- \**Lecanora hagenii* (Ach.) Ach. – (2) on twigs, with *Lecidella euphoria* 2931; (4) on a twig, with *Caloplaca flavorubescens* 4826.
- Lecanora horiza* (Ach.) Linds. – (4) on a twig, with *Caloplaca flavorubescens* 4826; (5) on a trunk, with *Rinodina pyrina* 4839, on bark on dead twig, with *Lecanora chlarotera* 4833; (6) on trunks, with *Caloplaca pyracea* 4899, with *Physcia adscendens* 4900, with *Physcia biziana* 4908; (7) on a trunk, 4927, on twigs, 4912a, on cones, 4913.
- Lecanora leuckertiana* Zedda – Kos (Sipman & Raus 2002).
- \**Lecanora meridionalis* H. Magn. – (5) on a trunk, 4831; (7) on a trunk, 4921, on a twig, 4916.
- \**Lecanora rugosella* Zahlbr. – (2) on decorticated wood of a trunk, 2937; (5) on a trunk, 4830; (6) on trunks, with *Caloplaca pyracea* 4899, with *Physcia adscendens* 4899a; (7) on twigs, with *Lecanora horiza* 4912a.
- Lecanora saligna* (Schrad.) Zahlbr. – Kriti (Spribille & al. 2006).
- \**Lecanora umbrina* (Ach.) A. Massal. – (6) on a trunk, with *Caloplaca pyracea* 4899.
- Lecanora varia* (Hoffm.) Ach. – (2) on decorticated wood, 2919, 2941a.
- Lecidea* cf. *erythrophaea* Sommerf. – Kos (Sipman & Raus 2002).
- Lecidella achristotera* (Nyl.) H. Hertel & Leuckert – (2) on bark of twigs, with *Caloplaca cerina* 2952, with *Physcia leptalea* 2976.
- Lecidella elaeochroma* (Ach.) M. Choisy – (1) on decorticated wood, 3271; (2) on decorticated wood of a dead branch, with *Ochrolechia alboflavescens* 2943, on bark of twigs, with *Pseudovernia furfuracea* 2977; (5) on a trunk, 4849; (7) on a thin branch, with *Bacidia rosella* 4922, on cones, with *Catillaria chalybeia* 4915.
- \**Lecidella euphorea* (Flörke) Hertel – (1) on bark and wood of twigs and cones, with *Diplo-tomma alboatrum* 3257, with *Pertusaria albescens* 3268, with *Caloplaca flavorubescens* 3273; (2) on trunks, 2927, 2934a, on decorticated wood of a trunk, 2937a, 2939, on bark of twigs and cones, 2931, 2975; (4) on a twig, *Caloplaca flavorubescens* 4826; (5) on trunks, with *Lecanora rugosella* 4830, with *Lecanora meridionalis* 4831, on bark on dead twig, with *Lecanora chlarotera* 4833; (7) on a twig, with *Physcia leptalea* 4930, on cones, with *Lecanora horiza* 4913.
- Leptogium gelatinosum* (With.) J. R. Laundon – (2) on mosses on trunks, 2917, 2918, 2959, 2962.
- Leptogium teretiusculum* (Wallr.) Arnold – Kriti (Spribille & al. 2006).
- Lethariella intricata* (Moris) Krog – (2) on trunks, 2953, 2967.
- Megaspora verrucosa* var. *mutabilis* (Ach.) Nimis & C. Roux – (2) on trunks, 2923, 2924.
- \**Mycocalicium* cf. *minutellum* (Ach.) Nád. – (5) on decorticated wood of a broken limb, 4853.
- Ochrolechia alboflavescens* (Wulfen) Zahlbr. – (2) on decorticated wood of a dead branch, 2943.
- Ochrolechia balcanica* Versegly – Kriti (Spribille & al. 2006).
- +*Ochrolechia microstictoides* Räsänen – (2) on decorticated wood, 2945.
- Ochrolechia pallescens* (L.) A. Massal. – (1) on trunks, 3255, 3267; (2) on trunks, 2971.
- Ochrolechia turneri* (Sm. & Sowerby) Hasselrot – (1) on a trunk, 3266. – New to Nomos Chania, Kriti.

- Parmelia saxatilis* (L.) Ach. – (1) on a trunk, 3275; (2) on decorticated wood on trunks, 2942, 2960. – Kos (Sipman & Raus 2002).
- Parmelina pastillifera* (Harm.) Hale – (1) on decorticated wood on a trunk, 3254.
- Parmelina tiliacea* (Hoffm.) Hale – (2) on a trunk, 2920.
- \**Pertusaria albescens* (Huds.) Choisy & Werner – (1) on trunks, 3252a, 3256, 3265, on bark and wood of twigs and cones, 3260, 3268; (2) on trunks, 2930, 2946, on decorticated wood of twigs, 2968; (7) on a trunk, 4925.
- Pertusaria albescens* var. *corallina* (Zahlbr.) J. R. Laundon – (1) on trunks, 3264, 3285, on bark on thin branches and twigs, 3258, 3263; (2) on trunks, 2944, 2948, 2963, 2964, 2969. – This taxon dominated the epiphytic vegetation on trunks of *C. sempervirens* at loc. 2.
- Pertusaria coccodes* (Ach.) Nyl. var. *coccodes* – (1) on a trunk, 3272; (2) on a trunk, with *Pertusaria pertusa* var. *meridionalis* 2921.
- Pertusaria pertusa* auct. – Kriti (Spribille & al. 2006).
- Pertusaria pertusa* var. *meridionalis* Zahlbr. – (2) on a trunk, 2921.
- Pertusaria rhodiensis* Erichs. – (5) on a trunk, 4834 (K- or faintly yellow); (7) on a trunk, 4919 (K+ reddish). – The taxonomy of *P. rhodiensis* and related species needs urgent revision. Sipman & Raus (2002) and Spribille & al. (2006) discuss the species. – Kriti (Spribille & al. 2006).
- Phaeophyscia orbicularis* (Neck.) Moberg – Kos (Sipman & Raus 2002).
- \**Phlyctis argena* (Spreng.) Flotow – (7) on a trunk, 4929. – Kriti (Spribille & al. 2006).
- Physcia adscendens* (Fr.) H. Olivier – (5) on a trunk, 4829; (6) on trunks, 4899a, 4900, on cones, with *Rinodina pyrina* 4902. – Kriti (Spribille & al. 2006).
- Physcia biziana* (A. Massal.) Zahlbr. – (6) on a trunk, 4908.
- Physcia biziana* var. *leptophylla* Vězda – Kriti (Spribille & al. 2006).
- Physcia leptalea* (Ach.) DC. – (2) on a trunk, 2936, on bark of twigs, 2976; (5) on a trunk, 4828; (6) on trunks, 4901, 4906; (7) on a trunk, 4918, on a twig, 4930, on cones, with *Lecanora horiza* 4913.
- Physcia tenella* (Scop.) DC. – (2) on a trunk, 2951; (6) on a trunk, with *Catillaria chalybeia* 4897.
- Physconia distorta* (With.) J. R. Laundon – Kriti (Spribille & al. 2006).
- \**Physconia grisea* (Lam.) Poelt – (3) on a trunk, 4770.
- Physconia subpulverulenta* (Szatala) Poelt – (1) on a trunk, 3277.
- Physconia venusta* (Ach.) Poelt – (1) on a trunk, 3284; (2) on bark, 2932, on decorticated wood on a trunk, 2958, 2961, 2965.
- Platismatia glauca* (L.) W. L. Culb. & C. F. Culb. – (2) on a trunk, 2955.
- Pleurosticta acetabulum* (Neck.) Elix & Lumbsch – (1) on decorticated wood on a trunk, 3278, 3286; (2) on trunks, 2922, 2940.
- Pseudevernia furfuracea* (L.) Zopf var. *furfuracea* – (2) on a trunk, 2933, on bark of twigs, 2977.
- +*Pyrrhospora querneae* (Dicks.) Körb. – (1) on a trunk, 3252. – Distinguished from *Lecanora expallens* by its UV+ orange fluorescence.
- Ramalina canariensis* J. Steiner – (6) on a trunk, 4898, on shaded twigs, with *Diplotomma alboatrum* 4909; (7) on a twig, 4924.
- \**Ramalina farinacea* var. *reagens* de Lesd. – (7) on twigs, 4928.
- Ramalina fraxinea* (L.) Ach. – Kos (Sipman & Raus 2002).
- Ramalina pollinaria* (Westr.) Ach. – (2) on a trunk, 2966. – Reported from Kriti by Rondon (1969).
- \**Ramalina subgeniculata* Nyl. – (7) on twigs and cones, 4912, 4914.
- Rinodina oleae* Bagl. – (4) on a twig, with *Caloplaca flavorubescens* 4826 det. H. Mayrhofer.
- Rinodina plana* H. Magn. – Kriti (Spribille & al. 2006).
- \**Rinodina pyrina* (Ach.) Arnold – (5) on a trunk, 4839 det. H. Mayrhofer; (6) on a trunk, with *Physcia leptalea* 4901 det. H. Mayrhofer, on cones, 4902.
- \**Rinodina septentrionalis* Malme – (5) on a trunk, 4831a conf. H. Mayrhofer.
- \**Rinodina sophodes* (Ach.) A. Massal. – (3) on a trunk, 4774.

*Rinodina* spp. – (1) on a trunk, 3270a; (2) on a trunk, with *Pertusaria albescens* var. *corallina* 2944, with *Caloplaca cerina* 2952; (5) on bark on dead twig, with *Lecanora chlarotera* 4833. – All det. H. Mayrhofer.

*Tephromela atra* (Huds.) Hafellner – (2) on decorticated wood of a trunk, 2938; (7) on a twig, with *Physcia leptalea* 4930, on cones, *Lecanora horiza* 4913.

*Xanthoria parietina* (L.) Th. Fr. – (1) on a trunk, 3283; (3) on a trunk, 4771 a very shaded and dust affected specimen with rugose central part of the thallus, reminiscent of *X. calcicola* Oxner; (5) on a trunk, 4832; (6) on trunks, 4904, 4907, on shaded twigs, with *Diplotomma alboatrum* 4909; (7) on trunks, with *Lecanora meridionalis* 4921, with *Lecanora horiza* 4927, on twigs, with *Lecanora meridionalis* 4916, with *Ramalina canariensis* 4924, with *Physcia leptalea* 4930, on a thin branch, with *Lecanora argentata* 4917, with *Bacidia rosella* 4926, on cones, with *Lecanora horiza* 4913, with *Catillaria chalybeia* 4915.

### Discussion

The higher mountains of Kriti and the larger E Aegean islands are the natural habitat of *Cupressus sempervirens* in Greece. According to Walter & Lieth (1960) the whole of the island of Kos belongs to the climate group VI<sub>2</sub>, while the mountainous areas of Kriti belong to climate group IV<sub>4</sub>. No climate data exist from Kos, but it is safe to expect the precipitation to be lower than that of Kriti on account of the different position of the two islands in relation to westerly humid winds. Deduced from Hager (1985), the precipitation of the investigated localities of Kriti is 1400 (loc. 1) to >1800 (loc. 2) mm/y. Despite the high precipitation of the localities of Kriti, a marked hygrophytic element is not present in the flora. On Kos, however, the number of *Ramalina* species may indicate some level of humidity, probably due to fog formation.

In Table 1 the taxa are arranged in accordance with their occurrences in the seven localities studied. Where possible, the taxa are tentatively referred to phytosociological units, mainly by use of James & al. (1977) and Wirth (1980), keeping in mind that communities described from northern or western Europe may not be directly applicable to Kriti and Kos. Species may occur in more than one units and some species referred to either *Physcietum ascendentis*, a community of nutrient rich substrates, or to *Lecanoretum subfuscae*, a community of relatively nutrient rich substrates, may as well have been referred to the other unit, e.g., *Lecidella elaeochroma*. The two newly described *Bacidia* species are referred to *Physcietum ascendentis* on account of the accompanying species (see species list).

With the exception of loc. 3 on Kos, which was an avenue, all investigated *Cupressus* stands on the two islands are natural woodlands. However, none of the stands is unaffected by human influence. Selective cutting occurred in earlier times. Presently, to different degrees, they all are affected by raised nutrient levels from flocks of sheep and goats and other human activities. The nutrient status is reflected in the presence of the following species, which occur on half or more of the localities: *Caloplaca cerina*, *C. flavorubescens*, *C. haematites*, *C. pyracea*, *Lecanora horiza*, *L. rugosella*, *Lecidella elaeochroma*, *L. euphorea*, *Physcia leptalea* and *Xanthoria parietina*.

The two Cretan localities were rather open mixed woodlands of *Cupressus sempervirens* and *Quercus coccifera*. They harbour mainly a mixture of *Pseudevernetium furfuraceum* and *Physcietum adscendentis* with a minor quantum of species belonging to the *Lecanoretum subfuscae*. Finally few xylicolous lichens of the *Lecanorion varia* were present. The vegetation of the trunks of *Cupressus* trees at loc. 2 was dominated by *Pertusaria albescens* var. *corallina*. This taxon was also abundant at loc. 1. *Pertusaria albescens* var. *corallina* is a species of nutrient enriched bark (*Xanthorion*) (Wirth 1980). It was, however, not found on *C. sempervirens* on Kos despite the relatively high percentage of nutrient-demanding species found on the localities of this island.

*Pseudevernetium furfuracea* is a common community (alliance) of many coniferous trees. In the present study it was only found in *Cupressus* woodlands of Kriti, and only in an impoverished form, including the following species: *Lethariella intricata*, *Ochrolechia alboflavescens*,

Table 1. The list of lichen taxa reported, their phytosociological affinities and their distribution; localities 1+2 = Kriti, 3-7 = Kos. Phytosociological units: Ls = Lecanoretum subfuscae, Lv = Lecanorion variae, Pa = Physcietum ascendens, Pf = Pseudevernetium furfuraceae, Rf = Ramalinetum fastigiatae.

Locality	1	2	3	4	5	6	7
<i>Fuscopannaria olivacea</i>	x						
<i>Caloplaca furfuracea</i>	x						
<i>Ochrolechia turneri</i>	x						
<i>Parmelina pastillifera</i>	x						
<i>Physconia subpulverulenta</i>	x						
<i>Pyrrhospora quiernea</i>	x						
<i>Anaptychia ciliaris</i>	x						
<i>Candelariella vitellina</i>	x						
<i>Lecanora chlorotera</i>	x						
<i>Ochrolechia pallascens</i>	x						
<i>Parmelia saxatilis</i>	x						
<i>Pertusaria albescens corallina</i>	x						
<i>Pertusaria coccodes</i>	x						
<i>Physconia venusta</i>	x						
<i>Pleurosticta acetabulum</i>	x						
<i>Buellia griseovirens</i>	x						
<i>Cladonia grayi</i>	x						
<i>Hypocenomyce caradocensis</i>	x						
<i>Lecanora varia</i>	x						
<i>Lecidella achrilotera</i>	x						
<i>Leptogium gelatinosum</i>	x						
<i>Lethariella intricata</i>	x						
<i>Megaspora verrucosa mutabilis</i>	x						
<i>Ochrolechia alboflavescens</i>	x						
<i>Ochrolechia microstictoides</i>	x						
<i>Pertusaria pertusa meridionalis</i>	x						
<i>Platismatia glauca</i>	x						
<i>Pseudevernia.furf.furfuracea</i>	x						
<i>Parmelina tiliacea</i>	x						
<i>Ramalina pollinaria</i>	x						
<i>Cladonia chlorophaea</i>	x						
<i>Tephromela atra</i>	x						
<i>Caloplaca cerina</i>	x						
<i>Xanthoria parietina</i>	x						
<i>Caloplaca flavorubescens</i>	x						
<i>Caloplaca haematites</i>		x					
<i>Candelariella xanthostigma</i>		x					
<i>Diplotomma alboartrum</i>		x					
<i>Lecanora hagenii</i>		x					
<i>Pertusaria albescens</i>		x					
<i>Physcia tenella</i>		x					
<i>Physcia leptalea</i>		x					
<i>Lecidella elaeochroma</i>		x					
<i>Lecidella euphorea</i>		x					
<i>Lecanora rugosella</i>		x					
<i>Lecanora dispersa</i>		x					
<i>Physconia grisea</i>		x					
<i>Rimodina sophodes</i>		x					
<i>Rimodina oleae</i>		x					
<i>Caloplaca pyraea</i>		x					
<i>Lecanora horiza</i>		x					
<i>Catillaria chalybeia</i>		x					
<i>Lecanora argentata</i>		x					
<i>Physcia adscendens</i>		x					
<i>Rimodina pyrina</i>		x					
<i>Catillaria nigroclavata</i>		x					
<i>Lecanora umbrina</i>		x					
<i>Physcia biziana</i>		x					
<i>Rimodina septentrionalis</i>		x					
<i>Mycocalicium minutellum</i>		x					
<i>Lecanora chl. chl. crassula</i>		x					
<i>Lecanora meridionalis</i>		x					
<i>Pertusaria rhodiensis</i>		x					
<i>Bacidia parathalassica</i>		x					
<i>Bacidia thyrrenica</i>		x					
<i>Lecania naegeli</i>		x					
<i>Ramalina canariensis</i>		x					
<i>Ramalina farinacea reagens</i>		x					
<i>Ramalina subgeniculata</i>		x					
<i>Phlyctis argena</i>		x					

*O. microstictoides*, *Parmelia saxatilis*, *Platismatia glauca* and *Pseudevernia furfuracea*. This is perhaps a result of competition from species favoured by nutrients and calcareous dust.

The natural woodland localities of Kos (loc. 4-7) were located at different altitudes on the north slope of a single mountain. The lower altitude of the localities at Kos compared to those of Kriti (300-580 m vs. 975-1360 m) results in a higher level of human activity, including animal husbandry. This again results in a higher nutrient level, which is reflected in the species composition: lack of *Pseudevernia* and other elements of nutrient poor conditions (Table 1). At loc. 7, the woodland was more open than at the lower localities (4-6). The presence here of higher abundance and more species of the genus *Ramalina* may be the result of the more open environment in combination with the higher altitude (fog, precipitation?).

The *Cupressus* avenue (loc. 3) harboured only a few species. They are all characteristic of nutrient enriched substrates: *Caloplaca cerina*, *Lecanora dispersa*, *Physconia grisea*, *Rinodina sophodes* and *Xanthoria parietina*.

In all 72 epiphytic taxa were collected on *Cupressus sempervirens* on the two islands. Excluding *Rinodina* spp., this paper reports 45 epiphytic taxa from Kriti and 40 from Kos. 30 epiphytic taxa occurring on Kriti were not found on Kos, while 25 epiphytic taxa found on Kos were not found on Kriti (Table 1). Disregarding genera with only one species encountered, it is notable that the genera *Ochrolechia* and *Parmelina* were only found on the island of Kriti, while *Bacidia* and *Catillaria* were only found on Kos. The genera *Ramalina* and *Rinodina* are represented with more species on the island of Kos than on Kriti, while the opposite was the case for *Pertusaria*. Sipman & al. (2005) ascribe similar differences in the epiphytic lichen flora on the two Aegean islands of Naxos and Icaria to restrictions in dispersal and chance colonisation. However, the differences in species composition on *C. sempervirens* on the isles of Kriti and Kos may well reflect the preliminary status of the floristic work on the islands.

The high percentage of taxa reported new to Kriti and Kos in particular underlines the present insufficient state of knowledge of the lichen flora of these islands. Further studies are obviously needed. Based on a purely floristic work, attempts to explain the difference in composition of the floras of the localities can only be speculative. Ecological investigations are, therefore, in great need to provide a better understanding of the impact of environment on the vegetation of the Mediterranean biotopes.

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### References

- Ahti, T. 1977: *Cladonia* Wigg., nom. cons. subgen. *Cladonia*. – Pp. 51-84 in: Poelt, J. & Vězda, A. (ed.), Bestimmungsschlüssel europäischer Flechten. Ergänzungsheft I. – Vaduz.
- Christensen, K. I. 1997: *Cupressus* L. – Pp. 9-10 in: Strid, A. & Tan, K. (ed.), *Flora hellenica* **1**. – Königstein.
- 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.
- & Svane, S. 2007: Contribution to the knowledge of the lichen flora of Crete (Kriti), Greece. – *Willdenowia* **37**: 587-593. [[CrossRef](#)]
- Grube, M., Lindblom, L. & Mayrhofer, H. 2001: Contributions to the lichen flora of Crete: a compilation of references and some new records. – *Stud. Geobot.* **20**: 41-59.
- Hager, J. 1985: Pflanzenökologische Untersuchungen in den subalpinen Dornpolsterfluren Kretas. – *Diss. Bot.* **89**.
- 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.

- Sipman, H. & Raus, Th. 2002: An inventory of the lichen flora of Kalimnos and parts of Kos (Dodecanisos, Greece). – *Willdenowia* **32**: 351-392.
- , — & Scharlau, A. 2005: Some lichens have incomplete distribution ranges in the Aegean (Greece). – *Folia Cryptog. Estonica* **41**: 97-104.
- Spribile, T., Schultz, M., Breuss, O. & Bergmeier, E. 2006: Notes on the lichens and lichencolourous fungi of western Crete (Greece). – *Herzogia* **19**: 125-148.
- Walter, H. & Lieth, H. 1960: *Klimadiagramm-Weltatlas*. – Jena.
- Wirth, V. 1980: *Flechtenflora*. – Stuttgart.

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