The epiphytic lichen flora of *Platanus orientalis* stands in Greece

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Abstract


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The epiphytic lichen flora of 37 stands of Platanus orientalis L. (plane) on the Greek mainland from Makedonia in the north to Peloponnisos in the south and in the W half of Kriti has been investigated. It is shown that a rich flora, including several members of the Collemataceae (12 taxa of Collema and 16 taxa of Leptogium), Gyalectaceae, Opegraphaceae and Pannariaceae, is more or less restricted to areas with high precipitation or sites with a humid mesoclimatic, while under drier conditions P. orientalis supports mainly taxa of the families Lecanoraceae, Physciaceae and Teloschistaceae. However, elements of both species groups are present in most of the stands. Such a species combination may lend support to the S European Lobaria-Anaptychia nodum of the Lobarion proposed by Rose (1988). Riparian plane forests are discussed in relation to conservation of biodiversity. Among the 152 lichen taxa encountered, 13 taxa are new to Greece, viz.: Arthonia aff. stellaris, Bacidia absistens, Collema fragrans, C. ligericum, Lecidella laureri, Lemmopsis ct. pelodes, Lepraria ct. imposibilis, Leptogium aragonii, L. microphyloides, L. pulvinatum var. quercicola, Opegrapha rufescens, Phaeophyscia chloantha and Rinodina anomala. A further ten taxa are new to the Greek mainland.

Additional key words: azonal vegetation, conservation, Lobarion, plane, riparian forests, Xanthorion

Introduction

The lichen flora of Greece is at present insufficiently known (Abbott 2009; Christensen & Svane 2009), and even less is known about its lichen vegetation. Neither the lichen flora nor the lichen vegetation of the zonal vegetation types in Greece, such as the lichen communities of the major forest types, is known to any satisfactory degree. When it comes to azonal vegetation types or special biotopes within the zonal vegetation units, knowledge of the lichen flora and vegetation is virtually unknown.

Azonal riparian forests constitute a special environment different from the surrounding zonal vegetation. Higher humidity is a common feature and in many cases reduced human influence due to difficult topography results in the presence of large old trees. As a consequence the epiphytic flora of riparian forests often deviates substantially from that of the surrounding forests.

Though often small in area, riparian forests of Platanus orientalis L. (plane) constitute a characteristic and important element in the Greek landscape. The plane forests occur naturally from the lowlands to the mountains (Mayer 1984: 529). The distribution of larger riparian forest complexes in Greece, including P. orientalis stands, was mapped by Bohn & al. (2003: vol. 1, map 20). The vascular plant flora and vegetation of riparian P. orientalis forests in Greece have been studied by Gradstein & Smittenberg (1977), Bergmeier (1990) and Moeschhauser & Papp (1994), who also studied the bryophytes of this habitat. Schuler (2000) briefly mentioned the soil conditions and the ground flora of a riparian Platanus forest in N Greece and Bohn & al.
(2003) give a general picture of the floristic composition of E Mediterranean riparian plane forests. Outside their natural habitat plane trees are widely planted to provide shade. Based on herbarium specimens the occurrence of *Platanus orientalis* in Greece was mapped by Strid & Tan (2002: map 1333).

*Platanus orientalis* is distributed from the Balkan Peninsula to the W Himalayas (Strid & Tan 2002). The European distribution is mapped by Horvat & al. (1974: fig. 66). Although widespread in Greece, it first appears in pollen records as late as c. 3000 BP, together with *Castanea* and *Juglans* (Willis 1992).

The lichen flora of *Platanus orientalis* has been little studied. This may be due to the loose scaly bark of trunks and branches of young trees, which make a poor substrate for epiphytes. However, old trees develop a rough and stable bark on the trunks, which provide a suitable habitat for many bryophytes and lichens (Fig. 5). Due to the overall moss cover of the trunks resulting from the humid environment on the island of Evvia, Krause & Clement (1962) considered *P. orientalis* as a less important phorophyte for lichens. They included only seven species from *Platanus* in their species list from Evvia: *Collema nigrescens*, *Crocynia membranacea* (Dicks.) Zahlbr., *Leptogium lichenoides*, *Lobaria pulmonaria*, *Nephroma lusitanicum* Schäer. (= *N. laevigatum*), *Peltigera degenii* Gyeln. and *P. praetextata*. Christensen (1994b) studied the lichen flora of plane trees at two Greek localities with different humidity. In the locality with a more dry town environment, among the nine taxa found, species of *Lecanoraceae* and *Teloschistaceae* dominated while in the more humid locality in a ravine a large number of cyanophilic lichens were encountered among the 20 species collected. No taxa were in common. These finds motivated the study of a larger number of localities in order to provide an overview of the variation in species composition of different environments. The present study documents the epiphytic lichen flora of 37 stands of *P. orientalis* on the Greek mainland and on the island of Kriti, the majority being riparian plane forests.

### Material and methods

Material for this paper was collected during trips to Greece in 1989 (Christensen 1994b), 1994, 1997, 2002, 2006, 2009 and 2011. The sampling procedure was as follows: at each site all species were collected from a single tree from the base to c. 2 m in height. From the closest neighbouring tree all new species from the same section of the tree were collected. More trees in the close surroundings were examined until no further species were found. More distant trees were examined only if they had niches that were not already studied or if they grew under different conditions (higher up the bank, more shaded, etc.). Thus, the time spent on each site was dependant on the diversity of the biotope. The specimens are deposited in the Botanical Museum of Copenhagen (C) and in the private herbarium of the author. A minor part of the material is deposited in the Botanical Museum in Berlin-Dahlem (B) and a few specimens are deposited elsewhere (BG).

In the list of taxa the specimens are referred to by their collection numbers. Specimens co-occurring in the herbarium packets of numbered specimens are referred to by the numbers (placed in brackets) of the specimens with which they occur. All co-occurrences are listed, since the number of co-occurrences for the smaller species to a certain extent reflects their abundance on the different localities. Unless otherwise stated the specimens grew directly on the bark on the middle part of the trunks of plane trees. With few exceptions the nomenclature is in accordance with Abbott (2009). When other synonyms are used on the labels these are mentioned in the list of taxa. Based on Abbott (2009), Christensen & Svane (2009) and Christensen & Alstrup (2013), *** denotes taxa new to Greece, ** denotes taxa new to the Greek mainland, and * denotes taxa new to one or more provinces of Greece (i.e. the traditional geographic regions, of which Makedonia, Ipiros, Thessalia, Sterea Ellas, Peloponnisos and Kriti are covered in this paper).


The 37 localities below are arranged geographically from NE to SW on the Greek mainland and from W to E on Kriti (Fig. 1). The latitudes and longitudes given are map readings. Vascular plant taxa in the habitat descriptions are listed in descending order of abundance.

### List of localities

#### Makedonia

1. Nomos and eparchia Kavalas, Mt Pangeon, E slope, Ikosinissis monastery, 40°59’N, 24°06’E, c. 350 m. – On trunk of a single free-standing *Platanus* tree in a grazed area near the monastery, N slope, inclination 15°. Substrate limestone. – 16 Sep 1997.

2. Nomos Kavalas, along coastal road, c. 2 km E of Loutra Eleftheron village, 40°45’N, 24°06’E, c. 20 m. – On *Platanus* trees c. 1 m d.b.h. (diameter at breast height)

3. Nomos Thessalonikis, along coastal road, c. 1 km NE of Asprovalta, 40°44’N, 23°44’E, c. 2 m. – Old *Platanus* trees 1 – 1.25 m d.b.h. on S-facing littoral, used as picnic site (tables and benches between the trees). Substrate quartzite. – 17 Sep 1997.

4. Nomos Chalkidikis, E coast, just S of Olympias village, 40°35’N, 23°47’E, c. 50 m. – NNE-running, summer-dry river bed, inclination c. 8°, with a highly modified riparian plane forest. A small group of scattered trees surrounded by open grazing land is the only remnant of a former riparian plane forest. On *Platanus* trees c. 1 m d.b.h. Substrate quartzite. Dirt road along riverside. Much sheep dung and road dust. – 17 Sep 1997.

5. Nomos and eparchia Pierias, Mt Kato Olympos, E slope, E of Pori village, just W of Agia Paraskevi church, 39°57’N, 22°36’E, 340 m. – SSW-sloping ravine with rivulet riparian *Platanus* forest. Substrate limestone. Ground cover of *Equisetum*, *Pteridium aquilinum* (L.) Kuhn and *Rubus*. On trunks of *Platanus* trees 1 – 1.5 m d.b.h. on W-facing slope, inclination 10°. – 27 Jul 1994. – See the phytosociological description of the riparian *Platanus* forests of this mountain by Bergmeier (1990) and the habitat photograph in Bohn & al. (2003: Bild 146).

6. Nomos and eparchia Grevenon, Grevena-Kalambaka road, at the tributary to the Aliakmon river, which constitutes the border between the nomi Grevenon and Trikalon, c. 5 km S of Anixis village, 39°54’N, 21°35’E, c. 550 m. – Riparian *Platanus* forest lining the banks of a very broad, almost level, summer-dry shingle bed of the NE-running river. Substrate acidic shingle. Sheep-grazed, but only a little dung in proximity of the sampled trees. *Quercus ct. frainetto* Ten. woodland around the river. On *Platanus* trees c. 1 m d.b.h. at the N bank. – 18 Sep 1997.

7. Nomos Ioanninon, eparchia Konitsas, N Pindos, W-facing valley of Aoös river, at the old Konitsa bridge, 40°04’N, 20°48’E, 475 m. – Substrate limestone. Riparian *Platanus* forest with uniform, relatively old trees, used as a recreational site, on N-facing slope, inclination 40°. On trunks of *Platanus* trees 0.5 – 1 m d.b.h. at margin of river bed. – 25 Jul 1994.


10. Nomos Thesprotias, c. 16 km E of Igoumenitsa town, c. 2 km E of Neráída village, Thiamis (Kalamos) river valley between the old and new bridges from the Igoumenitsa-Ioannina road to the villages of Kokkinia and Kiparisos, 39°34’N, 20°28’E, 25 m. – Riparian mixed *Platanus* forest with *Alnus glutinosa* (L.) Gaertn., *Populus tremula* L. and *Salix* sp. on level river bed on NW-facing bank. Ground flora includes *Rubus fruticosus* s.l., *Dactylis glomerata* L., *Smilax*, *Hedera helix* L., *Cy-

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Fig. 1. The geographical distribution of the 37 localities.
clamen cf. hederifolium Aiton, Orobanche sp. Substrate limestone. On trunks of tall and slender Platanus trees 20–40 cm d.b.h. – 20 Sep 2002.

11. Nomos Thessprotias, c. 18 km E of Parga town, just E of Gliki village, valley of Acheron river, 39°21’N, 20°37’E, 25 m. – Riparian Platanus forest in E–W-running river gorge with steep to almost vertical rock walls and mountain slopes. Substrate limestone conglomerate. On trunks of Platanus trees 0.4–1.5 m d.b.h. on S-facing river-bank, on level ground to 20° slope. – 18 Sep 2002.

12. Nomos Prevezas, c. 27 km WNW of Arta town, c. 10 km NNW of Louros village, between the villages Ano Kotsanopolu and Ano Rachii, 39°15’N, 20°41’E, 225 m. – Riparian Platanus forest on NE slope, inclination 10° in river bed. Substrate quartzite. On trunks of Platanus trees 1.5–1.75 m d.b.h. – 21 Sep 2002.

**Thessalia**

13. Nomos Larisas, eparchia Tirnavou, Pinios river, vale of Tembi, between Tembi village and the Agia Paraskevi cave church, 39°51’N, 22°33’E, 25 m. – E–W-running ravine with riparian Platanus forest. A highly modified natural stand where human constructions (buildings, car parks etc.) have reduced humidity considerably. Used as a picnic site. Substrate limestone? On trunks of Platanus trees 0.5–1 m d.b.h. on N-facing slope, outside the church on N bank. – 26 Jul 1994 and 22 Sep 1997.

14. Nomos Larisas, eparchia Agias, E coast, Stomion village, mouth of Pinios river, 39°51’N, 22°45’E, 1.5 m. – Platanus orientalis–Alnus glutinosa summer-dry swamp located within the village. The crown-cover is rather dense, leaving the trunks rather dark. Ground flora includes Polygonum persicaria L., Juncus effusus L., Mentha aquatica L., Lycopus europaeus L., Carex. On trunks of Platanus trees 0.8–1 m d.b.h. – 24 Sep 1997.

15. Nomos Larisas, eparchia Agias, E coast, just W of Paliouria village, 39°47’N, 22°50’E, 25 m. – Riparian Platanus forest along NE-running, summer-dry river with c. 8° slopes, surrounded by arable land. Dirt road alongside the river. Substrate arkose (a coarse-grained sandstone containing feldspar). Ground flora includes Cyclamen hederifolium, Hedera helix, Arbutus unedo, Ruscus aculeatus L., Pteridium aquilinum, Gallium. On trunks of Platanus trees 0.3–1.5 m d.b.h. – 24 Sep 1997.

16. Nomos Trikalon, eparchia Ano Kotsanopoulo and Ano Rachi, 39°48’N, 21°33’E, c. 300 m. – Riparian Platanus forest in a rather narrow and steep river bed, inclination 40° to level (bottom). The crowns of the plane trees heavily shade the trunks, which are also shaded by dense growth of Rubus fruticosus s.l. and Clematis vitalba L. Substrate acidic unconsolidated conglomerate. On Platanus trees 0.5–1 m d.b.h. on W slope of river. – 18 Sep 1997.

17. Nomos and eparchia Trikalon, S Pindos, valley of Acheleous river, at bridge to the mountain village Gardikio, 39°33’E, 21°18’E, c. 700 m. – This humid riparian Platanus forest on S slope, inclination 30° to level (in river bed), with a permanent water-bearing river is natural except for a road above the slope of the river bed. Substrate quartzite. On Platanus trees 0.4–1.5 m d.b.h. Ground flora of Rubus fruticosus s.l., Hedera helix, Cyclamen hederifolium, Helleborus, Primula, Geranium. On trunk of Platanus orientalis. – 21 Sep 1997.

18. Nomos and eparchia Trikalon, S Pindos, valley of Acheleous river, c. 5.5 km W of Agios Nikolados village, 10.5 km NW of Mt Avgo, SW slope of Mt 1930 m (no name on map), in N-facing bend in road, 39°32’N, 21°20’E, c. 800 m. – Riparian Platanus forest remnant consisting of a few plane trees in S-sloping ravine with summer-dry rivulet, inclination 20°. A house is under construction in the remainder of the ravine. Substrate quartzite. On trunks of Platanus trees 0.5–1 m d.b.h. Ground flora sparse, dominated by Rubus fruticosus s.l. – 21 Sep 1997.


**Sterea Ellas**

20. Nomos Fthiotidas, c. 17 km W of Lamia town, N slope of Mt Iti, E outskirts of Ipati town, 38°52’N, 22°15’E, 380 m. – Riparian Platanus forest in a small ravine, with small waterfall on NW slope, inclination 55°. Used for recreational purposes, and due to its proximity of the town, heavily influenced by trampling, etc. Substrate crystalline acidic rock (probably metamorphic sandstone). On trunks of Platanus trees 0.6–1.25 m d.b.h. – 1 Aug 1994.

21. Nomos and eparchia Evritanias, c. 11 km SSW of Karpenisi town, just S of Mikron Chorion village, Karpenissiotis river, 38°51’N, 21°44’E, 590 m. – Situated in a narrow valley, this natural riparian Platanus forest borders a S-running river. A short stretch of dirt road alongside the river (old road?) functions as a lay-by. Substrate arkose. Ground flora includes Rubus fruticosus s.l., Dactylis glomerata, Equisetum telmateia Ehrl., Convolvulus cantabrica L., Teucrium flavum subsp. helleicum

**Peloponnisos**


25. Nomos Arkadias, c. 27 km E of Nafplio town, near Neochori village, 37°32’N, 23°09’E, 225 m. – Riparian *Platanus* forest along rivulet with stagnant water in deep, narrow ravine on S slope, inclination 35°, surrounded by dry agricultural land. Undergrowth of *Nerium oleander*, *Ficus carica* L. and *Rubus*. No ground flora. On trunks of *Platanus* trees c. 75 cm d.b.h. – 30 Sep 2006.

26. Nomos Arkadias, c. 18 km WSW of the coastal town Leonidi, Kosmas village, 37°06’N, 22°44’E, 1125 m. – On large old *Platanus* trees c. 1.8 m d.b.h. with heavily shaded trunks in the central square of a mountain village. – 26 Sep 2006. – Fig. 2.

27. Nomos Chania, W coast, c. 9 km SW of Kissamos town, about half way between the villages Platanos and Sfinari, 35°27’N, 23°35’E, 300 m. – Riparian *Platanus* forest in a S-facing ravine with stream in a bend in the road. Undergrowth of *Nerium oleander*. Picnic site. Substrate quartzite. On trunks of *Platanus* trees 50–75 cm d.b.h. – 29 Apr 2009. – Fig. 3 & 4.

28. Nomos Chania, c. 15 km S of Kissamos town, few km W of Louchi village, at the side road to the south, 35°22’N, 23°37’E, 500 m. – Riparian *Platanus* forest in a S-facing ravine with stream in a bend in the road. Undergrowth of *Nerium oleander*. Picnic site. Substrate quartzite. On trunks of *Platanus* trees 50–75 cm d.b.h. – 29 Apr 2009.

29. Nomos Chania, c. 5.5 km NE of Paleochora town, E outskirts of Azogieres village, 35°16’N, 23°43’E, 400 m. – Riparian *Platanus* forest in ravine on SE slope. Undergrowth of *Nerium oleander*. On trunks of *Platanus* trees c. 40 cm d.b.h. – 30 Apr 2009.

**Kriti**

27. Nomos Chania, W coast, c. 9 km SW of Kissamos town, about half way between the villages Platanos and Sfinari, 35°27’N, 23°35’E, 300 m. – Riparian *Platanus* forest in a S-facing ravine with stream in a bend in the road. Undergrowth of *Nerium oleander*. Picnic site. Substrate quartzite. On trunks of *Platanus* trees 50–75 cm d.b.h. – 29 Apr 2009.

Fig. 2. Plane trees in the square of the mountain village Kosmas (loc. 26) in SE Peloponnisos. The dark patches of the tree trunks are due to *Collema furfuraceum* and *Lep-togium pulvinatum* var. *quercicola* in particular. Also present are *L. microphylloides* and *L. teretiusculum*.
30. Nomos Chanion, c. 26 km SW of Chania town, just S of Agia Irini village, Agia Irini Gorge, 35°19'N, 23°50'E, 575–550 m. – Riparian *Platanus* forest in NW–SE-running gorge, inclination 10° to SE. Substrate limestone. On trunks of *Platanus* trees 0.4–1 m d.b.h. – 27 Apr 2009.


32. Nomos Chanion, c. 17 km SW of Chania town, just W of Langos village, 35°25'N, 23°54'E, 250 m. – Riparian *Platanus* forest along an E–W-running river valley with orchards (*Olea europaea*, *Castanea sativa*, *Citrus*) in the valley bottom and on the lower slopes. Substrate quartzite. On trunks of *Platanus* trees c. 40 cm d.b.h. – 27 Apr 2009.

33. Nomos Rethymnus, c. 19 km SW of Rethymno town, c. 3 km N of Myriokefala village, at the junction of the side road to Maroulou village with the Episkopi-Asi Gonia road, E bank of Mafselas river, 35°16'N, 24°18'E, 275 m. – Riparian *Platanus* forest along water-bearing river. Undergrowth of *Nerium oleander*, *Smilax aspera* L., *Quercus coccifera*. Ground flora with *Arisarum vulgare* Targ. Tozz., *Dracunculus vulgaris* Schott, *Cyclamen creticum* Hildebr. On *Platanus* trees 40–75 cm d.b.h. – 1 Apr 2011.

34. Nomos Rethymnus, c. 19 km S of Rethymno town, just N of Kourtaliotiko Ravine, at the side road to Frati village, 35°12'N, 24°28'E, 275 m. – Single exposed, probably planted, *Platanus* above the riparian *Platanus* forest in the valley bottom. On *Platanus* tree c. 75 cm d.b.h. – 3 Apr 2011.

35. Nomos Rethymnus, N foothills of Mt Psiloritis, c. 7 km SW of Perama town, c. 2 km NE of Arkadi monastery, at Agia Paraskevi chapel, 35°19'N, 24°39'E, 380 m. – Riparian *Platanus* forest on N-facing slope, inclination 20°, with phrygana/maquis. Substrate limestone. On *Platanus* trees c. 50 cm d.b.h. – 5 Apr 2011.

36. Nomos Rethymnus, N foothills of Mt Psiloritis, c. 2 km ESE of Perama town, c. 1 km W of Agios Silas church, 35°21'N, 24°43'E, 75 m. – Level valley bottom with dried-out river bed. Riparian *Platanus* forest in area with small fields and orchards. Substrate limestone. On *Platanus* trees c. 30 cm d.b.h. – 5 Apr 2011.

37. Nomos Irakliou, c. 17 km NNW of Iraklio town, in the river valley between Fodele village and Agios Pan-
deleïmon monastery, 35°22’N, 24°58’E, 75 m. – SE-sloping river valley with riparian Platanus forest. River bed dry. On Platanus trees 1–1.75 m d.b.h. – 6 Apr 2011. – Fig. 5.

Results

List of taxa

Lichens

*Agonimia tristicula* (Nyl.) Zahlbr. – (2) (11686); (8) 10731; (11) (12629, 12631, 12632, 12636), 12641, (12643, 12646, 12647, 12654); (12) (12698, 12699); (15) 12050, 12051; (16) 11759; (19) (11847, 11851, 11863, 11867), 11872, 11873; (20) 11035, 11037a, (11038a); (23) (12125, 12127), 12138. – The specimens were all sterile, hence distinguished from *A. octospora* Coppens & P. James by the colour and shape of the squamules (James 1981). New to Ipiros, Makedonia and Thessalia.

*Anaptychia ciliaris* (L.) Körb. ex A. Massal. – On bark and among mosses. (10) 12678; (21) (12083), 12101, 12106; (24) 5735, 5749.


*Arthonia radiata* (Pers.) Ach. – (10) (12664), 12665.

***Arthonia aff. stellaris* Krempl. – (15) 12061a det. B. J. Coppens. – This species occurs in “temperate Europe in oceanic or montane areas” (Smith & al. 2009). In Italy it is extremely rare in Toscana and Lazio (Nimis & Martellos 2008). In the Balkans it is known from Slovenia (Suppan & al. 2000).

***Bacidia absistens* (Nyl.) Arnold – (10) (12661, 12667) det. E. Llop; (11) 12048 det. E. Llop. – In Italy it is extremely rare to very rare along the Tyrrenian coastal provinces and in Sicily (Nimis & Martellos 2008). In the Balkans it is known from Slovenia (Suppan & al. 2000; Mayrhofer 2006).

*Bacidia arceutina* (Ach.) Arnold – (10) (12658), 12661, (12662, 12663, 12667) all conf. or det. E. Llop; (15) (12061) det. S. Ekman & E. Llop.

**Bacidia circumspecta** (Nyl. ex Vain.) Malme – (2) 11685a, 11691, 11694 all det. or conf. S. Ekman & E. Llop; (29) 14242. – Known from the islands of Naxos, Kriti and Rodos (Abbott 2009).

**Bacidia fraxinea** Lönnr. – (4) 11708; (11) (12643); (15) 12060; (16) (11755); (21) 12104a. All det. E. Llop. – Known from Kriti (Abbott 2009).

*Bacidia parthalassica* Llop & Gómez-Bolea – (11) 12645a, 12646, 12649; (14) 12038; (15) 12062. All det. E. Llop. – New to Ipiros and Thessalia.

*Bacidia rubella* (Hoffm.) A. Massal. – On bark and mosses on bases and middle parts of trunks. (4) 11704, (11706), 11715 all conf. S. Ekman & Llop; (10) (12661), 12679 conf. E. Llop; (12) 12712, 12715 conf. E. Llop; (15) 12065 conf. E. Llop; (16) 11751, 11753; (19) (11848) conf. E. Llop; (21) (12088); (22) 12114 conf. S. Ekman & E. Llop.

*Bacidia subincompta* (Nyl.) Arnold – (10) (12667) conf. E. Llop; (17) 11903 conf. S. Ekman: (37) 14514. – New to Ipiros.

*Bacidia thyrennica* Llop – (10) (12667) det. E. Llop; (11) 12646 det. E. Llop; (14) 12038 det. E. Llop; (15) 12060, 12062 both det. E. Llop. (31) 14167. (35) 14494, 14496, 14497, 14498, 14499. – The specimens determined by E. Llop were reported by Llop & al. (2007).


*Caloplaca cerinella* (Nyl.) Flagey – (7) 10838; (12) (12701).

*Caloplaca cerina* (Huds.) Th. Fr. – (4) 11709; (20) 11034.

*Caloplaca ferruginea* (Huds.) Th. Fr. – (10) 12673; (11) 12631, 12636, 12640.

Fig. 5. An old plane tree of an open riparian forest in a summer-dry rivulet (loc. 37). The non-scaly bark of the trunk was covered in dirt from the spring flood. Only three species of lichen were found on this the easternmost locality studied on Kriti, viz.: *Bacidia subincompta*, *Collema auriforme* and *Leptogium tenuissimum*. 

...
Caloplaca flavorubescens (Huds.) J. R. Laundon – (1) (11662), 11674; (2) (11686), 11695; (7) (10839), 10846; (8) (10709), 10732; (10) 12664, (12667); (12) (12701); (19) (11880); (24) (3734), 5738; (28) (14212). (30) 14175, 14180; (33) 14463; (34) 14469; (35) (14494, 14495, 14496, 14499); (36) (14504). – In agreement with Abbott (2009) I find that the two varieties, var. flavorubescens and var. quercina Giralt, Nimis & Poelt, are not always easy to separate. The species is therefore treated here in the broad sense.

Caloplaca haematites (Chaub. ex St.-Amans) Zwickl – (1) (11668, 11669, 11677, 11681); (24) (5738).

Caloplaca pyracea (Ach.) Th. Fr. – (1) (11662, 11668, 11669, 11674, 11677), 11682, (11683); (2) 11687; (12) (12703); (13) 10854.

Caloplaca servitiana (Hue) H. Magn. – (1) (11662, 11668, 11669, 11674, 11677), 11682, (11683); (2) 11687; (12) (12703); (13) 10854.

Collema auriforme (Arnold) Hoffm. – On bark and mosses on bases as well as middle parts of trunks. (8) 10714, 10715, 10723, 10729; (11) (12653); (12) 12692a, 12697, (12698, 12699, 12703); (18) 11895, 11898, 11899; (19) 11854, 11870, 11871; (22) (12115), 12120; (23) (12125, 12132); (24) 5739 det. G. Degelius, 5746; (28) 14210; (29) 14236, 14241; (30) 14176, 14201, 14202; (33) 14460, 14462; (37) 14513. – At loc. 8 the specimens from the base were covered in clay, indicating inundation during the spring flood.

Collema conglomeratum Hoffm. – (6) 11723, 11724, 11725, 11732; (29) 14243, 14244.

Collema fasciculare (L.) F. H. Wigg. – (21) 12087. – Otálora & Wedin (2013) showed that C. fasciculare belongs to Arctomitaceae and made the combination Arctomia fascicularis (L.) Otálora & Wedin. However, as the genus Arctomia is heterogeneous (Otálora & Wedin 2013) and new combinations are likely to take place in the future, I prefer to keep the established name until the taxonomy is settled.

Collema flaccidum (Ach.) Ach. – On Homalothecium sericeum and other mosses on bases as well as middle parts of trunks. (7) 10843; (8) 10734; (12) 12692b, 12698, (12697, 12712); (17) 11905, 11909; (19) (11863); (20) 11046; (22) (12117, 12120), 12121, 12122 (fertile); (24) 5733 conf. G. Degelius, 5750; (29) 14239.

***Collema fragrans (Sm.) Ach. emend. Degel. – (27) 14137; (30) 14185. – In the Balkans known from Slovenia (Suppan & al. 2000), Bosnia & Herzegovina (Bilovitz & Mayrhofer 2011) and Bulgaria (Mayrhofer & al. 2005).

Collema furfuraceum (Arnold) Du Rietz – On bark and mosses on banks. (8) 10712, 10716; (10) 12675; (11) 12627, 12639; (12) (12697), 12714; (19) 11881; (20) 11037; (21) 12095, (12100); (26) (13681), 13683, 13684, 13685, 13686.

***Collema ligerinum (Homalothecium) (Hy.) Harm. – (8) 10737; (23) 12126, 12128a, 12129a, 12132, 12133a; (27) 14128, 14140, 14142. – In the Balkans known from Slovenia (Suppan & al. 2000), Bosnia & Herzegovina (Bilovitz & Mayrhofer 2011) and Bulgaria (Mayrhofer & al. 2005).

Collema multipunctatum Degel. – (2) (11686), 11694a, (11697); (16) 11748; (21) (12094); (30) 14189; (31) 14161, 14166, (14167, 14168, 14170), 14172.

Collema nigrescens (Huds.) DC. – (1) 11660, 11665, 11671, 11672, 11673, 11681; (7) 10840; (10) 12687; (11) 12653; (12) 12694, 12698a, (12701); (21) (12083 cf., 12094); (23) 12137; (25) 13722; (28) 14120; (33) 14459. – The specimens 12687, 12694 and 12698a puzzled me for some time. They have a typical nigrescens-type thallus, with prominent ridges and pustules. The isidia are, however, squamiform. This combination of characters could not be keyed out using Degelius (1954). The only taxon with a ridged and pustulate thallus in combination with squamiform isidia seems to be C. hueanum var. squamosum Degel., but the ridges are not as fine as described and illustrated by Degelius (1974) and the pustules are more prominent. Comparison with specimens of this taxon at UPS collected and determined by G. Degelius (South Africa, Cape Prov.,
Collema occultatum Bagl. – (8) (10709), 10710, (10717), 10718.

Collema subflaccidum Degel. – On bark and moss on trunks. (6) 11726, 11735; (7) 10837; (8) 10717, 10728, 10730; (10) (12666); (11) 12640; (12) 12695, 12699, 12710; (17) (11918); (19) (11847, 11850), 11859, 11862, 11863; (21) (12093, 12103).

Collema subnigrum Degel. – On bases and middle parts of trunks. (1) 11663; (8) 10735, 10736; (10) 12657, 12659, 12671, 12674; (11) 12650, 12652; (15) (12055), 12666; (17) 11910; (19) 11864; (21) (12091); (23) 12141; (24) 5744, 5745, 5747; (28) 14203, 14213; (31) 14162, 14169.

Diplotomma alboatrum (Hoffm.) Flot. – (34) (14470). – This is a variable species (Smith & al. 2009). The species concept of Clauzade & Roux (1985, as Buellia alboatra (Hoffm.) Th. Fr.) is adopted here.

Fuscopannaria mediterranea (Tav.) P. M. Jørg. (= Pan- naria mediterranea Tav.) (Jørgensen 1994b) – (6) 11740; (10) 12662, 12670; (17) 11918; (21) (12084a), 12093 both cf.; (24) 5732.

Fuscopannaria olivacea (P. M. Jørg.) P. M. Jørg. (= Pannaria olivacea P. M. Jørg.) (Jørgensen 1994b) – (17) 11917; (21) 12086, 12090; (24) 5740, 5742 conf. P. M. Jørgensen.

*Gyalecta derivata* (Nyl.) H. Olivier – (2) 11687a conf. A. Vezda. – New to Makedonia.

*Gyalecta truncigena* (Ach.) Hepp – (5) 10887 “Gyalecta truncigena ad var. liguriensis Vezda vergens (sp. citriforment)” (A. Vezda on label), (10888): (11) 12630 spores muriform, 18–21 × 10–12 μm; (15) 12059, “Gyalecta truncigena var. truncigena. Sp. crebre muraldivisae, 20–22 × 10–12 μm” (A. Vezda on label); (27) 14129, 14133, 14141. – New to Ipiros and Thessalia.

**Haematoma ochroleucum var. porphyrium** (Pers.) J. R. Laudon – On trunks and limbs. (10) (12674); (12) 12711. – Known from Santorini (Abbott 2009).

Hyperphyscia adglutinata (Flörike) H. Mayrhofer & Poelt – (4) (11716), 11720; (11) (12631, 12633), 12634, (12637, 12641); (12) (12701, 12709); (13) 10850, 10851, 10852, 11922; (14) 12036, (12037, 12041, 12042), 12043, 12044, (12046).

*Lecanora biformis* A. Massal. – (8) 10709; (22) 12115; (24) (5736). – This specimen was erroneously reported as Vestergrenopsis isidata (Degel.) E. Dahl by Christensen (1994b). On the Iberian Peninsula *K. biformis* occurs in warm and humid sites, mainly in the west, but in continental parts it occurs in deep valleys and ravines (Burgaz & Martinez 2001), i.e. under similar conditions as the present study. – New to Ipiros and Sterea Ellas.

Lecanaria clyrtella (Ach.) Th. Fr. – (12) 12701; (24) (5738).

*Lecanaria clyrtellina* (Nyl.) Sandst. – On bases and middle parts of trunks. (19) 11869, 11869a. – New to Thessalia.

Lecanaria naegelii (Hepp) Diederich & Van den Boom – (1) (11662, 11668), 11669, (11674, 11681, 11682); (2) (11686a); (5) 10886b, 10887, 10889, 10897; (7) 10838, 10839; (10) 12667, 12668 conf. E. Llop; (13) 10853; (14) (12041); (15) (12053); (16) (11753); (19) 11885a; (29) 14216a.

Lecanora chlorotera Nyl. subsp. chlorotera f. chlorotera – (1) (11668, 11669, 11683); (2) 11686; (5) 10886a, (10883), 10885, 10887, 10847; (9) 5811; (15) (12061), 12067; (19) 11874, (11881); (25) 13717; (30) 14179, 14179; (32) (14154a); (34) 14468; (35) 14495, (14456); (36) 14506.

Lecanora chlorotera subsp. chlorotera f. crassula (H. Magn.) Poelt – (36) 14505.

Lecanora dispersa (Pers.) Sommerf. – (1) (11662), 11675a, 11677, 11669, 11674, 11681, 11683; (7) (10839); (18) 11891; (28) (14213).

Lecanora hagenii (Ach.) Ach. – (5) 10866a; (8) (10709), 10732; (9) 5810; (12) (12708); (16) (11755); (19) (11867); (20) (11034); (26) 13677; (30) 14181, (14196). – See note under L. persimilis.

Lecanora horiza (Ach.) Linds. – (4) (11713); (7) 10847; (10) 12669; (19) 11882; (21) (12101); (25) 13718; (30) 14186; (34) 14467; (35) (14494, 14497, 14499); (36) 14507.

Lecanora meridionalis H. Magn. – (19) (11881).

Lecanora persimilis (Th. Fr.) Nyl. – (7) (10846); (9) 5804a. – Among the specimens originally determined as *Lecanora hagenii* mainly by use of Clauzade & Roux (1985), re-examination using the revision by Šliwa (2007) resulted in these records of a species recently reported as new to the Greek mainland (Christensen & Svarne 2009).

Lecanora rugosella Zahlbr. – (1) (11677); (10) 12660, (12667), 12668, (12669); (19) (11880); (30) (14181), 14183; (32) (14153); (35) (14499).

Lecanora sambuci (Pers.) Nyl. – (1) (11668, 11670).

Lecanora sp. – (5) 10892. – Thallus very thin, ecoricate, grey with yellowish white convex soralia, which become confluent, developing a thick, farinose thallus. Traces of usnic acid and zeorin by hptlc. Apothecia with pale discs and sorediate thallus margin, which
Christensen: The epiphytic lichen flora of Platanus orientalis stands in Greece is not raised above the disc. The brown colour and the granules of the epithecium disappear in KOH. Ascospores ellipsoid, colourless, non- septate, c. 10 × 5 μm. This specimen probably belongs to an undescribed taxon close to L. leukertiana Zedda (Zedda 2000), L. compallens Herk & Aptroot, L. sorediomarginata Rodrigues, Terrón & Elix (Rodrigues & al. 2011) or L. strobilina (Spreng.) Kieff. However, the chemistry of L. sorediomarginata differs, the thallus margin of L. strobilina is not sorediate and L. compallens has so far not been found with apothecia. Leccanora leukertiana has been transferred to Lepraria: Lepraria leukertiana (Zadda) L. Saag. The specimen is under study by T. Tønsberg.

Cf. Lecanora sp., det. T. Tønsberg – (4) 11717 with pigmented external soredia and zeorin (by tlc); (5) 10858 with unknown substance in rf 5-6; (12) 12089 with usnic acid and zeorin (by tlc); (19) on mosses on trunk 11866 with usnic acid and zeorin (by tlc); (20) (11034), 11039 with grey spot in rf 5-6 (above zeorin); (30) 14188. – These are all crustose sorediate specimens in need of further study.

Lecidella achristerota (Nyl.) Hertel – (1) (11662, 11673); (2) 11693; (4) 11705; (5) 10863, (19892); (19) (11885a); (24) (5745).

Lecidella elaeochroma (Ach.) M. Choisy – (5) 10861; (7) 10832, 10844, (10847); (11) (12638); (15) (12067); (19) (11848); (25) (13714), 13716; (30) (14175), 14178, (14180, 14181), 14184, 14187, 14196; (32) 14153, (14154, 14155); (35) (14499); (36) 14504.

Lecidella euphoreoa (Flörke) Hertel – (1) (11668, 11674, 11677, 11681); (5) 10870; (7) (10838, 19839, 10841); (10) (12669); (15) 12068; (17) 11912; (19) (11876), 11879, (11880); (20) 11045; (24) (5734); (33) 14461; (35) (14495).

***Lecidella laureraei (Hepp) Körb. – (5) 10864. – In the Balkans known from Slovenia (Suppan & al. 2000, Mayrhofer 2006), Bosnia & Herzegovina (Bilovitz & Mayrhofer 2011), Montenegro (Knežević & Mayrhofer 2009) and Bulgaria (Mayrhofer & al. 2005).

***Lemnopsis cf. pelodes (Stein) T. L. Ellis – (31) 14159a, 14165 both det. P. M. Jørgensen. – No material for comparison was found in the lichen herbarium of Copenhagen University (C). Using the key of Ellis (1981) the specimens key out as L. pedes. (orange discs of apothecia and spores c. 18 × 9 μm). Morphological and anatomical characters are in accordance with this species, but the substrate is unusual, hence the “cf.” (Jørgensen in litt.). Lemnopsis affine G. Samp., known only from the type locality in Portugal, has smaller spores (11–12.5 × 4.5–5.5 μm) and convex apothecial discs (Ellis 1981). The habitat of L. pedes is non-calcareous sandy clay (Ellis 1981). However, in riparian forests in Greece the trunks of plane trees are often coated in clay and silt for a considerable height. This was also the case at the present locality on a bedrock of quartzite. The species was hitherto known from Sweden, Finland, Poland and Lithuania (Ellis 1981; Jørgensen 1988, 2007; Jørgensen & Motiejūnaitė 2005), and Montenegro (Knežević & Mayrhofer 2009). According to Linda in Arcadia (pers. comm.) it also occurs in Norway, the Netherlands and Belgium. The present find together with that from Montenegro indicate that the species is far more widespread than the previous finds from N Europe suggest.


Lepraria eburnea J. R. Laundon – On bark and moss on trunks, (18) 11893, 11901 both conf. T. Tønsberg.

***Lepraria cf. impossibilis* Sipman – (20) 11041, 11042 both with stictic acid complex by hptlc, both det. T. Tønsberg. These specimens, tentatively referred to *L. impossibilis*, known from Asia and tropical America (Kukwa & Sohrabi 2008), are in need of further study.

Lepraria lobificans Nyl. – (5) on moss and bark on trunk, 10889; (15) on bark and moss on trunk, 12056. Both conf. T. Tønsberg.

**Lepraria vouauxii** (Hue) R. C. Harris – (22) on moss on trunk, 12109 det. T. Tønsberg. – Known from the Aegean island of Ikaria (Abbott 2009).

Leproplaca xantholyta (Nyl.) Harm. – On moss and on Opegrapha varia Pers. on trunk. (12) 12690; (20) 11043.

***Leptogium aragonii* Otálora – On soil-infused (due to flooding) moss on base of trunk. (8) 10721. – The species is widespread in Europe, where it grows on pleurocarpous mosses on the basal parts of tree trunks (Otálora & al. 2008).

Leptogium brebissonii Mont. – (10) 12676, 12677, 12683, 12685. – The report (as *L. ruginosum* (Dufour ex Schaer.) Nyl.) from Mt Taigetos by Degelius (1956) is based on a specimen of *L. coralloideum* (Meyen & Flot.) Vain. (Jørgensen 1994a), as noted by Abbott (2009).

**Leptogium cyanescens** (Rabenh.) Körb. – (11) 12636, 12651. – Known from the islands of Evvia and Naxos (Abbott 2009).

*Leptogium furfuraceum* (Harm.) Sierk – On *Lepraria s. lat. on Homalothecium sericeum* on trunk. (28) 14207. – New to Kriti.

Leptogium gelatinosum (With.) J. R. Laundon – (28) 14206, (14210), 14211.

*Leptogium intermedium* (Arnold) Arnold – (22) 12117; (28) 14210. – New to Sterea Ellas and Kriti.

Leptogium lichenoides (L.) Zadda – *On Homalothecium sericeum, Hypnnum cupressiforme, Leucochloridium sordidum* and among other mosses on bases and middle parts of trunks (6) 11728, (11740), (11738, 11740), 11742; (15) 12057; (16) 11756; (17) (11911), 11916; (18) 11888, 11890; (19) 11857; (22) (12113), 12124.
Leptogium microphylloides Nyl. – (26) (13678), 13679 conf. M. G. Otálora; (28) 14204, 14205, 14208; (29) 14240, 14244a; (31) 14163. – The specimens referred to without specimen citation by Abbott (2009) are from Kosmas, Peloponnisos (loc. 26). The specimen reported as L. microphylloides Nyl. by Christensen (1994b) belongs to L. microphylloides auct. (see below); hence, the species is here formally reported as new to Greece. It seems that the species is mainly known from W, C and S France (Claudade & Roux 1985), though its distribution is unclear as it is uncertain whether literature records refer to L. microphylloides Nyl. or L. microphylloides auct.

Leptogium pulvinatum (Hoffm.) Otálora var. auct. non Nyl. – (2) (11736) middle parts of trunks. Leucodon sciuroides are covered in clay and silt, and on tum –

Leptogium microphylloides

Leptogium pulvinatum

Leptogium quercicola

Leptogium subaridum P. M. Jørg. & Goward – (11) (12650), 12650a, 12651, 12652, 12654; (24) (5735); (27) (14137), 14138, (14140), 14142, 14144; (30) 14173, 14192; (32) (14158). – The specimen from loc. 24 was published as L. lichenoides by Christensen (1994b). Re-examination of the specimen showed it to be L. subaridum (Jørgensen & Goward 1994), described from North America and recently found in Europe (Aragón & al. 2004). This isidiate species grows on moss-covered ground in relatively dry conditions in forests of Pinus ponderosa P. Lawson & C. Lawson and Pseudotsuga menziesii (Mirb.) Franco in North America. In Europe it seems to be mainly epiphytic on broad-leaved trees in semi-arid to humid conditions (Aragón & al. 2004). Leptogium subaridum is reported from the Ionian island of Kerkyra (Corfu) (Aragón & al. 2004) and from Kriti (Christensen & Svane 2007). – New to Ipiros.

Leptogium subtilis (Schrad.) Torsss. – (2) (11697), 11698, 11699; (6) 11743; (8) 10726, 10727; (10) (12664); (11) 12629, 12630, 12631, 12632, 12633, 12634, 12635, 12636, 12639a, 12640, 12641, 12647; (12) 12698, 12703, 12706, 12708; (15) 12604; (16) 11745, 11754, (11756, 11757, 11758), 11758a; (17) 11905a, 11918; (19) (11847), 11850, 11851, 11859, 11860, 11862, 11863, 11869; (20) (11038a); (21) (12083); (23) 12127, 12133, 12136; (25) 13724, 13725, (29) (14237); (31) 14171. – Jørgensen (1994a) stated that this species “usually grows on rotting wood or debris”, whereas Aragón & Otálora (2004) stated that it grows on old trees “in well-preserved forests with humid and shaded conditions at altitudes of 750 to 1300 m”. The latter is more in accordance with the conditions found in the riparian Platanus forests of Greece. Known from the Ionian island of Kerkyra (Corfu) (Christensen & al. 1997) and from Kriti (Grube & al. 2001). – New to Ipiros, Makedonia, Steerea Ellas and Peloponnisos.

Leptogium tenuissimum (Dicks.) Körb. – On silt-impreanted moss cushions on lower parts of trunks. (31) 14164; (32) 14157, 14158; (37) 14512.

Leptogium teretisculus (Wallr.) Arnold – (2) (11686, 11687), 11688, (11693, 11694, 11695), 11696, 11697, (11698), 11700; (4) 11703, 11708, 11714, (11719); (6) (11731, 11735, 11741); (8) 10709, (10717, 10727, 10733); (10) (12675, 12681, 12682); (11) 12625, 12630, 12636, 12637, 12638, 12639, 12640, 12641, 12647, 12650, 12651, 12653); (12) (12698, 12699, 12701, 12703, 12706); (14) 12046; (15) (12051), 12055, (12066); (16) (11746, 11754, 11755, 11756), 11757, 11758, (11759); (17) 11908, 11920a; (19) (11851, 11859, 11860, 11862, 11863); (20) (11035), 11036, 11037b, 11038a; (21) (12083, 12091), 12092, (12093, 12094), 12096, 12105, (12108); (23) 12125,
Table 1. Number of hygrophytic species per locality in relation to the potential vegetation/vegetation zones of Greece. The number of species is shown as the range and (in brackets) the average.

<table>
<thead>
<tr>
<th>Vegetation zone</th>
<th>Potential vegetation</th>
<th>Localities</th>
<th>Hygrophytic species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermomediterranean</td>
<td>Maenian (Ceratonia silqua L., Olea europaea L., Pistacia lentiscus L.)</td>
<td>23, 25–37</td>
<td>0–9 (3.9)</td>
</tr>
<tr>
<td>Mesomediterranean</td>
<td>Sclerophyllous forests (Quercus cocifera L.)</td>
<td>2, 3, 4, 9–15, 17, 18, 20</td>
<td>0–18 (7.7)</td>
</tr>
<tr>
<td>Supramediterranean</td>
<td>Deciduous forests (Quercus cerris L., F. quercifolia Ten.)</td>
<td>1, 5–8, 16, 19</td>
<td>4–17 (7.8)</td>
</tr>
<tr>
<td>Montane Mediterranean</td>
<td>Montane forests (Abies borisii-regis Matt., Fagus sylvatica L., Pinus nigra J. F. Arnold)</td>
<td>21, 22, 24, 26</td>
<td>5–23 (12.3)</td>
</tr>
</tbody>
</table>

(12127), (12128), (12130), (12132), (12133), (12134), (12136), (5734, 5736, 5738), 5741 conf. P. M. Jorgensen; (25) 13714, 13715, 13723, (13725); (26) (13679); (27) 14128, 14138, 14140, 14141, 14142, 14144; (28) 14214, (29) 14236, 14237, 14242, 14243; (30) 14174, (14176), 14190, 14191, 14193, 14199; (31) 14168; (32) 14458; (34) 14468a.

**Opegrapha rufescens** (Schma.) O. Blanco & al. – (1) 11883; (21) 12084y. **Opegrapha ochrocheila** (Nyl.) Sandler Berlin & Arup. – (5) 10859.

**Melanella glabra** (Schma.) O. Blanco & al. – (1) 11683; (21) 12084y. **Melanella glabratula** (Lamy) Sandler Berlin & Arup. – (5) 10859.

**Melanohalea exasperatula** (Nyl.) O. Blanco & al. – (1) 11679; (19) 11875, (11876).

**Micarea prasina** Fr. – (19) 11867, 11868; (21) (12093) sterile.

**Myccocadium sublime** (Pers.) Szatala s. lat. – (16) 11749 det. L. Tibell.

**Nephroma laevigatum** Acht. – Among mosses on trunks. (21) 12082, 12108; (22) 12111; (24) 5748.

**Normandina pulchella** (Borrer) Nyl. – (11) 12642, 12643, 12651, 12654. – Known from the Ionian island of Kefallonia (Mucina & al. 2000) and from Kriti (Grube & al. 2001).

**Opegrapha atra** Pers. – (5) 10886 conf. Egea & Torrente.

**Opegrapha culmigena** Lib. (= O. varia var. herbarum (Mont.) Källsten) – (15) 12054. – Known from the islands of Kerkýra (Corfu) and Naxos (Abbott 2009).

**Opegrapha ochrocheila** Nyl. – (5) 10882, 10883, 10884, 10885, 10888 all det. or conf. Egea & Torrente. – A doubtful record exists for the Aegean island of Amorgos (Abbott 2009).

**Opegrapha rufescens** Pers. – (5) 10882, 19883 both det. Egea & Torrente. (19885, 10886, 10891 all three conf. Egea & Torrente); (14) 12049. – In the Balkans known from Slovenia (Suppan & al. 2000), Bosnia & Herzegovina (Bilovit & Mayrhofer 2011) and Montenegro (Knežević & Mayrhofer 2009).
Physconia enteroxantha

Physconia distorta

Physcia venusta

Porina aenea

Physcia stellaris

Physcia tenella

Physciona distorta

Physconia aipolia

Physcia aipolia

Physcia bizziana

Physcia bizziana var. leptophylla Vězda

Physcia leptalea (Ach.) DC. – (1) (11669); (21) 12094, 12099, (1204).

Physcia stellaris (L.) Nyl. – (13) 10849; (27) 1430, 14135.

Physcia tenella (Scop.) DC. – (4) (11715); (11) 12649; (14) 12040; (21) 12080, 12093.

Physciona distorta (With.) J. R. Laundon – On Leucodon sciuroides and other mosses on trunks. (1) 11664; (12) 12699; (19) 11846, (11859); (21) 12084, (12084a, 12085); (22) 12119; (26) 13675, 13680.

Physciona enteroroxantha (Nyl.) Poelt – On moss on trunks. (5) 10880, 10881.

Physciona grisea (Lam.) Poelt – (4) 11710; (6) 11739; (16) (11756).

Physciona perisidiosa (Erichsen) Moberg – (1) 11670; (6) 11738; (19) (11847) det. R. Moberg, 11856; (21) 12088, 12099.

Physciona servitii (Nadv.) Poelt – (11) 12652; (19) 11878; (31) 14171; (32) 14156.

Physciona venusta (Ach.) Poelt – (19) 11855; (24) 5737; (28) 14217; (30) 14198; (32) 14156.

Porina aenea (Wallr.) Zahlbr. – (4) 11712; (5) (10883), 10884, (10885); (10) 12658, (12660), 12663, (12664, 12665, 12667, 12668); (14) 12048; (15) 12053; (17) 11913; (23) 12130 cf., thallus grey.

**Porina chlorotica (Ach.) Müll. Arg. – (15) 12058; (18) 11889. – Known from the Ionian island of Kerkya (Corfu) (Abbott 2009).

*Punctelia subrudecta* (Nyl.) Krog – (11) 12644. – New to Ipiros.

Ramatina pollinaria (Westr.) Ach. – (10) 12684.

Ramatina sp. – (30) 14196a, juvenile specimen.

***Rinodina anomala* (Zahlbr.) H. Mayrhofer & Giralt – (2) 11686a conf. H. Mayrhofer. – In Europe it is previously known from Portugal, Spain, S France and Dalmatia (Croatia) (Clauzade & Roux 1985). Poelt (1969) mentioned a Portuguese specimen with brown hypothecium as deviating from the description by Zahlbruckner (1914, as *Buella anomala* Zahlbr.), where it is stated to be colourless. The present specimen has colourless hypothecium and concurs with the description given by Giralt (2001), who characterized the species as rather oceanic. In Italy it is rare in Puglia and very rare in Sardinia (Nimis & Martello 2008). Its general distribution is in Mediterranean-Macaronesian. The specimens from Dalmatia and Greece may represent the E fringe of its area.

Rinodina colobina (Ach.) Th. Fr. – (1) 11683; (24) (5736) both det. H. Mayrhofer; (28) (14212), 14213.

Rinodina exigua (Ach.) Gray – (9) 5809a.

Rinodina plana H. Magn. – (30) 14195.

Rinodina pyrina (Ach.) Arnold – (1) 11662, 11668, (11677) all det. or conf. H. Mayrhofer.

Sclerophora sp. – (5) 10888 det. L. Tibell.

Stauromela emphalarioides (Anzi) P. M. Jørg. & Henssen – (7) 10833, 10836; (10) 12672; (17) 11915; (21) 12087a, 12102; (22) (12115); (24) 5743; (25) 13720.

Xanthoria parietina (L.) Th. Fr. – (1) 11677, on *Phaeophyscia* sp. 11677; (4) 11716; (6) 11737; (8) 10733; (9) 5807, 5808; (10) 12656, 12667, 12668, 12669; (11) 12664; (12) 12700; (13) (12041); (16) 11755, 11759; (21) 12092, 12093, 12094, 12097, 12099, 12100, 12101, 12107; (27) 14134; (28) 14216, 14218; (30) 14197a; (32) 14150, 14154a), 14155; (34) 14471.

**Bryophytes**

In a number of cases the dominant bryophytes were collected. They were also present together with a large number of the collected lichen specimens.

*Homalothecium sericeum* (Hedw.) Schimp. – (4) (11703); (6) 11728, 11744; (12) 12692; (16) 11746, 11751, 11756; (17) (11911), 11914, 11921; (18) 11891; (19) 11853, 11865, 11872; (21) 12096; (22) 12112, 12116, 12123; (28) 14207a.

*Hypnum cupressiforme* Hedw. – (15) 12052; (17) 11916, 11920; (18) 11895; (21) 12083, 12108.


*Leucodon sciuroides* (Hedw.) Schwägr. – (2) (11688); (4) 11707; (6) (11731), 11733; (8) 10711; (12) 12691; (16) 11746; (17) 11902, (11916, 11920); (18) (11887, 11898); (19) 11845, 11850, 11854, 11863, 11871, 11872, 11873); (21) 12083, 12084, 12108.

*Pterogonium gracile* (Hedw.) Sm. – (12) 12693.
Discussion

Species composition in relation to environment

From the relatively high number of localities that include lay-bys, picnic sites, etc. it may seem as if this collector has an inclination towards the comfortable. However, where rivulets with riparian plane forests intercept roads, amenities providing resting place and drinking water are often provided (Fig. 3 & 4). Also, in general, the narrow, bending mountain roads with steep slopes next to roadways and an abundance of blind bends, along with a rather fatalistic attitude of many Greek drivers, in many cases made parking less than appealing. A lot of promising sites were therefore left unstudied.

Being conducted as a purely floristic study, no attempt to quantify the abundance of the species at the localities was undertaken. However, the abundance of the taxa on the different localities is to some degree reflected in the number of co-occurrences enumerated in the species list, at least with regard to the minor species. Particularly abundant at many localities are Leptogium subtile and L. terebiansculum. To a lesser extent this applies to Agonimia tristicula, Caloplaca flavorubescens, C. pyracea, Leptogium lichenoides, L. pulvinatum var. quercicola and Physcia adscendens.

The encountered lichens can be grouped as (1) hygrophytic species, including Lobaria species, (2) Xanthorion and other species of nutrient-rich environments and (3) other lichens that do not belong to either of the above categories (Fig. 6). Ecological information for Fig. 6 was extracted from Nimis (1993) and Puntillo (1996). Some species have, according to these authors, a clear hygrophilous bias in the C Mediterranean area (Italy), though they generally have wider ecological amplitudes or even opposing ecological niches. That lichen species may inhabit different ecological niches in different climatic zones was documented by Poelt (1987). However, the similar geography of Greece and Italy – both being mountainous north-south-oriented peninsulas in the NC Mediterranean area – gives reason to believe that the ecological statements of Nimis (1993) and Puntillo (1996) can be applied more or less directly in a Greek context.

Climate and vegetation zones

In general, the climatic conditions of the E Mediterranean riparian plane forests are those of warm summers with a prolonged dry spell, mild winters and frequent precipitation during autumn, winter and spring (Bohn & al. 2003). However, being an azonal vegetation type ranging through more vegetation zones (Horvat & al. 1974), the climatic conditions vary with altitude: the cooler environment of higher altitudes creates a more humid environment than similar precipitation does at a lower altitude.

When relating the localities to the potential vegetation of their respective areas (Quézel & Barbero 1985), there appears to be a direct relationship between the vegetation zones and the number of hygrophytic species (Table 1).

Stand parameters

A large number of parameters both within the stand and in the immediate surroundings influence the composition of the epiphytic lichen flora, and human influence in varying degrees is present at all sites. No standardized method to quantify these parameters was used. The following is based on observations in the field. The sites modified or altered by humans are mainly found in the lowland and at lower elevations of the E part of the mainland, while at higher elevations on the steeper slopes on the W side of the Pindos Range the surrounding vegetation of the localities is more natural. This gradient in naturalness is, however, paralleled by an increase in precipitation. These two factors are likely to affect the lichen flora in concert. Natural or near-natural riparian plane forests (loc. 2, 5, 6, 7, 8, 10, 11, 12, 15, 16, 17, 19, 20, 21 & 24) generally have a higher number of species and a higher percentage of hygrophytic species than degraded, modified or artificial sites (Fig. 6). Especially the natural riparian forests of the high-precipitation area on the W slope of the mountains of Ipiros (loc. 10, 11 & 12) have high hygrophytic percentages. Two sites in sheltered river valleys in the C part of the Pindos Range (loc. 19 & 21) have the highest species numbers and a large hygrophytic element. Isolated small pockets of riparian plane forests, though low in number of species, may harbour Lobaria and other hygrophytic species together with less demanding species. For example, loc. 22 has Bacidium rubella, Collema auriforme, C. flaccidum, Koerberia biforminis, Lepraria vouauxii, Leptogium intermedium, L. lichenoides, L. pulvinatum var. pulvinatum, L. pulvinatum var. quercicola, Lobaria pulmonaria, Nephroma laevigatum, Pettigera praetextata, Physconia distorta and Staurolemma omphalarioides. Chance colonization and/or random extinction may have influenced the species composition of such localities.

Highly modified stands may be low in species and have only few or no hygrophytic species (e.g. loc. 13). Other modified sites, e.g. by surrounding farmland, may harbour a high percentage of hygrophytic species despite a low number of species (e.g. loc. 33 & 37). At loc. 18 the presence of Lobaria pulmonaria may indicate a former richer flora of this degraded riparian forest in a small, isolated ravine. Random extinction may account for its present species composition (Caloplaca pyracea, Collema auriforme, Lecanora dispersa, Lepraria eburnea, Leptogium lichenoides, L. pulvinatum var. pulvinatum, Lobaria pulmonaria and Porina chlorotica).

Plane trees in artificial environments (loc. 1, 3, 9 & 26) generally have a low number of species and few hygrophytic species in particular due to reduced humidity compared to natural riparian stands. The high percentage of hygrophytic species at loc. 26 is due to the humid environment of this mountain village at 1125 m altitude (Fig. 2). Nutrient-enrichment may, however, result in a high number of Xanthorion species (loc. 1, a single tree outside a monastery).
Localities with picnic sites and other recreational activities (loc. 1, 3, 9, 10, 16, 20 & 21) generally have above average numbers of Xanthorion and other nitrophytic species or at least a bias towards such species. Nearby dirt roads and intensive grazing by herds of sheep and goats may also promote establishment of nutrient-favoured species.

In many cases (e.g. loc. 8, 31, 32 & 37) trunks of riparian plane trees were covered high up by clay and silt deposited by the spring flood (Fig. 5). The height of the flood could often be estimated by the debris caught in the branches of the crowns. This mineral-enrichment of the trunks may be responsible for the presence of some epigeic species, viz.: Lemnopsis pelodes and Leptogium tenuissimum.

The number of hygrophytic species appears to be negatively associated with two parameters: (1) sites where the trees are either planted and/or are found outside the natural biotopes of Platanus orientalis (loc. 1, 3 & 9) or (2) strongly modified to nearly natural habitats at low altitudes of the driest parts of Greece (loc. 4, 13 & 25). In natural habitats at low altitudes within the dry-climate types, the highest number of hygrophytic species is found on shaded sites where the crown cover is more or less closed (loc. 15 & 23). In natural habitats at high altitudes the highest number of hygrophytic species were found at sites along rivers and rivulets that are water-bearing during the whole year (loc. 8, 17, 19, 21 & 24), while at sites with summer-dry streams, fewer hygrophytic species were encountered (loc. 5, 6, 16, 18 & 22). In the high-precipitation area W of the Pindos Range, natural or near-natural plane forests along permanent streams harbour a high percentage of hygrophytic species (loc. 10 & 11).

Allowing for some deviations from the general pattern, which can be ascribed to local conditions, on Kriti an E-W gradient in species richness and number of hygrophytic species is found with the highest values in the west, in nomos Chanion (loc. 27–32), decreasing to the east in nomi Rethymnis and Irakliou (loc. 33–37). This is most likely caused by the gradient in precipitation along the island, though different land-use practices may contribute (more arable land to the east). The number of species per locality is generally lower on Kriti than on the mainland, especially in the easternmost localities (Fig. 6).

Although many variables influence the species composition of the investigated localities, it may be concluded that the general climate and the potential natural vegetation/vegetation zones govern the general pattern of the epiphytic flora, while the stand parameters and the conditions of the immediate surroundings, notably the topography-influenced local climatic conditions and the present vegetation surrounding the plane stands, may modify the overall pattern to a considerable extent.

### Communities

Based on a study of a large number of mainly NW European sites, Rose (1988) concluded that the Lobarion community originally hosted members of the genera Collema, Leptogium, Nephroma and other genera with cyanobacterial photobionts. Lobarion communities in-
cluding this contingent are today restricted to the oceanic coastal part of W Europe, some mountain areas of C Europe and to montane areas of the Mediterranean area (France, Italy) (Rose 1988).

The Lobaria communities in S Europe, the Lobaria-Anaptychia nodum (nom. prov., Rose 1988), including species of Collema, Leptogium, Physcia and Physcina, and the Bryophytes Leptodon smithii, Leucodon sciuroides and Pterigynandrum filiforme Hedw., as well as Xanthoria parietina, thus accommodate taxa of the Lobaria s.str. and Xanthorion communities. Rose (1988) gave only a very short description of this community and presented a short list of species (Rose 1988: Table 1). No-one has reported on this community since. It is therefore unclear which species are faithful and how many of the species of the above mentioned genera are to be included in the Lobaria-Anaptychia community. Varying with the ecological and historical conditions of the sites, the epiphytic communities (including the few collected mosses) found on Platanus orientalis in this study seem to represent more or less well-developed examples of this Lobaria-Anaptychia community. However, the floristic approach of this study can not solve this topic: sociological studies are needed. In Fig. 6, the distribution of Xanthorion species and hygrophytic species (sensu Nimis 1993) at the 37 localities is presented. Both of these groups include species of the Lobaria-Anaptychia community (Rose 1988).

The presence of Xanthorion species within the Lobaria community under Mediterranean conditions may not only be due to nutrient enrichment, as dust deposition alone has been known to stimulate development of communities dominated by species of Xanthoria and Physcia (Loppi & Pirontsos 2000).

The most common Lobaria species (in the narrow sense of Nimis 1993) were Catinaria atropurpurea, Fuscopannaria mediterranea, Lobaria pulmonaria and Nephroma laevigatum (only 3–5 localities each). Among the hygrophytic species (sensu Nimis 1993, which include Lobaria species in the broader sense of Rose 1988), Leptogium subtile and L. teretiusculum were by far the most common (16 and 24 localities, respectively), followed by Agonimia tristicula, Collema auriforme, C. flaccidum, C. furfuraceum, C. nigrescens, C. subflaccidum and C. subnigrescens (8–13 localities each). Xanthorion species were most frequently represented by Caloplaca pyracea, Lecania naegeli, Physcia adscendens and Xanthoria parietina (11–17 localities each). Among other nitrophytic species, the most frequent were Lecanora hagenii and Lecidella euphoria (9 and 11 localities, respectively).

Conservation

Lichen species are not evenly distributed in the landscape. Particular circumstances induce a higher number of species than average, or result in a high number of more demanding and therefore rarer species (hotspots – Peterson & McCune 2003). In forest types dominated by a single or a few tree species, other tree species that constitute only a minor element in the stand structure may contribute significantly to the total biodiversity of the epiphytic lichens. In Swedish forests of Picea abies (L.) H. Karst., for example, Esseen (1981) found Lobaria species on trees of Salix caprea L. and Populus tremula L., but not, or only infrequently and in small amounts, on Betula, Picea, Pinus and Sorbus. Comparable results were obtained from Finnish mixed forests by Kuusinen (1996b), who also found a higher species richness and more host-specific species on Salix caprea than on the dominant forest tree, Picea abies. In Finland in Populus tremula pockets on boggy ground within stands of Picea abies, cyanobacterial lichens occurred exclusively or more frequently in old-growth plots (Kuusinen 1996a). Habitats such as trees on lake sides or riparian forests often harbour a number of hygrophytic, often cyanophilic lichens. A survey of Danish Lobaria localities showed that in Fagus forests trees with Lobaria pulmonaria were almost exclusively found on N-facing slopes, in forest bogs, along rivulets and in other more humid places (Christensen & Sochting 1996). In the drier parts of the British Isles, Lobaria communities are found in similar places (James & al. 1977). In the NW United States, hotspots of hardwood, though richer in species, were shown to be similar in species composition to the surrounding communities. In contrast, riparian hotspots were unique in species composition, including a high number of cyanophilic lichens (Peterson & McCune 2003). McCune & al. (2002) studied macrolichen species richness of streams in the NW United States and found that species listed as rare or threatened were more concentrated along streams than macrolichens in general, especially along the larger streams. There was also a tendency for cyanolichens to increase with stand age. These few examples underline the importance of azonal vegetation types for increasing biodiversity in a given area.

Conservation of lichen-rich epiphytic habitats in Europe has mainly focused on old-growth forests and habitat continuity (e.g. Rose 1992). This is rightly important for the conservation of lichens, as indeed it is for the conservation of many other organisms. Although they often support a rich and interesting lichen flora, riparian habitats have so far attracted limited attention (McCune & al. 2002; Peterson & McCune 2003; present study).

In general, riparian plane forests in Greece are important in maintaining a high diversity of lichens on a landscape scale. The lichen flora of the plane trees in riparian forests in the mountainous areas of Greece would appear to be unique on a European scale. It is, therefore, important, both on a European level and on a national Greek level, to preserve this special habitat. It not only harbours as many as 13 species not found in other biotopes in Greece, it also harbours an array of cyanophilic and other hygrophytic species that, though they each are not exclu-
sive to *Platanus*, compose an epiphytic vegetation unique to riparian plane forests.

In planning a protection programme for the riparian plane forests it is important to preserve not only those sites with the richest flora. Riparian forest within different zonal vegetation types should be represented, as should examples of riparian forest along both water-bearing and summer-dry streams. Greek authorities are strongly recommended to initiate measures for the protection and proper management of representative riparian plane forests in order to preserve this unique habitat and its special epiphytic flora. It is not only important in a Greek context, but is also of high conservation value on a European scale.

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