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Lichens from olive groves on the Ionian island Corfu (Kerkyra), Greece

Abstract

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Sixty-seven lichens and allied taxa are reported from olive trees *(Olea europaea)* and soil in olive groves on the island of Corfu, Greece. One species, *Mycocalicium albonigrum* (Nyl.) Tibell, is new to Europe and five species are new to Greece, viz.: *Arthonia impolita* (Ehrh.) Borr., *Lecanora rubicunda* Bagl., *Opegrapha niveoatra* (Borr.) Laundon, *Physcia biziana* (Massal.) Zahlbr., and *P. clementei* (Sm.) Maas Geest. Twenty-three taxa are new to Corfu. The epiphytic lichens of the olive trees are grouped according to habitat preferences and are briefly discussed in relation to published lichen communities. The chorology of the flora is likewise briefly touched.

Introduction

A relatively large number of papers deal with Greek lichens (Christensen 1989). Most of these, however, only enumerate scattered, casual collections, often by non-lichenologists.

Previously, lichens and lichenicolous fungi from Corfu were collected by F. J. A. N. von Unger (herb. W) in 1860, published by Hepp (in Unger 1862) with 26 lichens; by Mazziari (herb. W) before 1857, published by Körber (1868) with 25 taxa; by C. Eggerth sen. (herb. B) in 1885, published by Arnold (1887) with 140 taxa and Eggerth jun. (1887) with one taxon; by P. Sydow (herb. B) in 1886, published by Arnold (1887); by K. Rechinger (herb. W) in 1912, published by Keissler (in Rechinger 1914) with two lichen parasites and Steiner (in Rechinger 1915) with 121 taxa; by Th. Just (herb. W) in 1929, published by Servít (1935) with 28 taxa; and by J. Poelt (herb. GZU) in 1970, unpublished.

It appears that it was the Germans and Austrians who late in the last century and in the beginning of this century were botanically active on the island, as was the case in most parts of Greece, with regard to cryptogams as well as phanerogams. The British and the French, though having historical affinity to the island (Pratt 1978), seem not to have contributed much to its botanical exploration.

Considering the vast distribution of the olive *(Olea europaea)* in the Mediterranean region there are surprisingly few papers dealing with the lichen flora specifically of this tree. Barros (1941) dealt with the epiphytes of *Olea* in Portugal. She describes a much

more oceanic situation than that of Corfu, with, for example, species of *Nephroma, Sticta, Lobaria, Leptogium, Collema, Pannaria,* and *Parmeliella.* Tomaselli (1949) studied the distribution of the lichens on olive trees around Montpellier. The species composition is that of a Xanthorion community. Reichert & Galun (1958) give floristic notes from olives in Israel and the occupied West Bank reporting a number of taxa collected under different ecological conditions.

A handful more include records from olive trees. Nimis et al. (1990a) recorded the lichen flora of olives in an air pollution study in NW Italy. The flora consisted mainly of "acidophytic, non-nitrophytic and relatively aerohygrophytic lichens". The taxa reported from Istria (Croatia) by Christensen (1988) represent a Xanthorion community. Bartoli et al. (1991) studied epiphytic lichens in southern Calabria, including five *Olea*-stands. Few species on *Olea* are mentioned by Klement (1969) from the dry Aeolian Islands (Italy), and Seaward (1983) reports species from *Olea* in the Malaga Province (Spain).

Arnold (1887), in a floristic paper, reports a number of lichens from olive groves on the island of Corfu (see the discussion).

This paper deals with the lichen flora of olive trees on the Ionian island, Corfu, mainly from one grove at Gouvia.

Topography, climate and vegetation

The island of Corfu (Kerkyra) is the northernmost of the Ionian islands, separated from the Albanian coast by a narrow sound (Fig. 1). The size of the island is about 60 (N.-S.) times 30 (E.-W.) km. The highest peak, Mt Pantokrator, 914 m, dominates the northeastern part of the island. Two smaller mountains, Mt Aghii Deka, 576 m, and Mt Aghios Mattheos, 463 m, are situated in the central part of the island. The major part of the island is hilly (below 400 m) or flat lowland. Geologically the island consists of Tertiary marl and sandstone, only the highest points being limestone and flysch-marl (Rechinger in Karsten & Schenck 1914).

The climate diagram of Corfu town is shown in Fig. 2. The climate is relatively humid with an annual precipitation of 1172 mm, most of which falls from autum to spring. In mid-summer there is a dry spell of 3 to 4 months. Mean temperatures range from 11-12° C in winter to 26-27° C in summer, with an annual average of 17.7° C. Frost occurs occasionally from November to March. The village Gouvia, a little north of Corfu town, has similar climatic conditions.

The potential natural vegetation (see e.g. Dierssen 1990: 115) of the island, in the S.W. part, consists of thermomediterranean shrubs and thickets dominated by *Ceratonia siliqua, Pistacia lentiscus, Myrtus communis,* and *Olea europaea* subsp. *silvestris,* and in the rest of the island of mesomediterranean forests, mainly of *Quercus* (Quezel & Barbero 1985). However, the vegetation of the island is greatly influenced by man. The lowland is dominated by intensive agriculture, while the hilly country and the lower part of the mountains are covered by extensive cultivated olive groves. The higher parts of the mountains are dominated by seminatural vegetation such as maquis and phrygana. Although the wild olive is part of the natural vegetation on the S.W. part of the island of Corfu (Quezel & Barbero 1985), extensive olive groves were, however, planted specifically to supply Venice with adequate amounts of olive oil, especially after the conquest of Crete by the Turks in 1669.

As to the pH of olive the literature statements are somewhat conflicting.

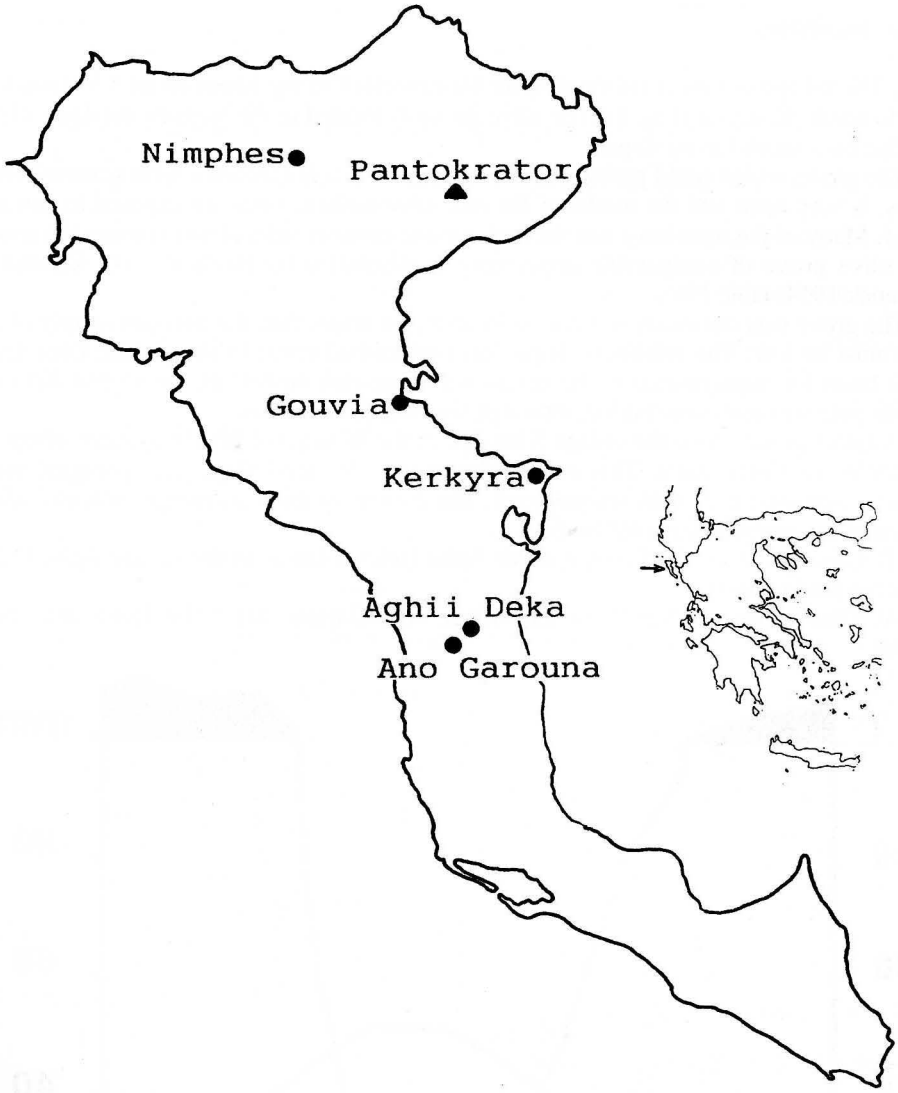

Fig. 1. Sketch map of the island of Corfu. The villages Aghii Deka (loc. III), Ano Garuna (loc. IV), Gouvia (loc. I), and Nimphes (loc. II) as well as Kerkyra (Corfu town) and the summit of Mt Pantokrator are indicated.

The bark of olive is on the one hand said to be acidic (Nimis et al. 1990a) and Barkman (1958: 108) regards pH values of 5.8-6.2 as being elevated by dust impregnation. On the other hand Barkman (1958: 154) also states that *Olea* has neutral bark.

The localities

I. The village of Gouvia is situated on the east coast of the island about 8 km north of Corfu town (Kerkyra) (Fig. 1). The olive grove is located at the western outskirts of the village on a south-facing slope.

The grove, which could perhaps be best described as a dry meadow with scattered olive trees, is very open and the trunks of the old, often hollow, trees are exposed to sun and wind. Many of the trees have lost the bark on one or more sides, thus exposing the wood. An olive grove of comparable appearance is illustrated by Rechinger (in Karsten & Schenck 1914: table 19a).

The grove was obviously not grazed by sheep or goats, thus the nitrogen supply of the site must be low. The relatively dense and undisturbed cover of the ground flora gives little basis for impregnation of the trunks with lime-rich dust. Only the nearby dirt road might give a minor contribution, although this was not obvious.

II. Olive grove above the village Nimphes, at the W slope of Mt Pantokrator, about 17 km N.W. of Corfu town. This grove, placed on a terraced slope, has younger, more slender-stemmed trees with smooth bark. The crowns of the trees merge, thus excluding much of the sunlight from the trunks.

III. Olive grove on the E. slope of Mt Aghii Deka, 2 km S. of the village Aghii Deka, near the road to Stavros.

IV. Olive grove 100 m N. of the village Ano Garuna, Mt Aghii Deka, alt. about 475m.

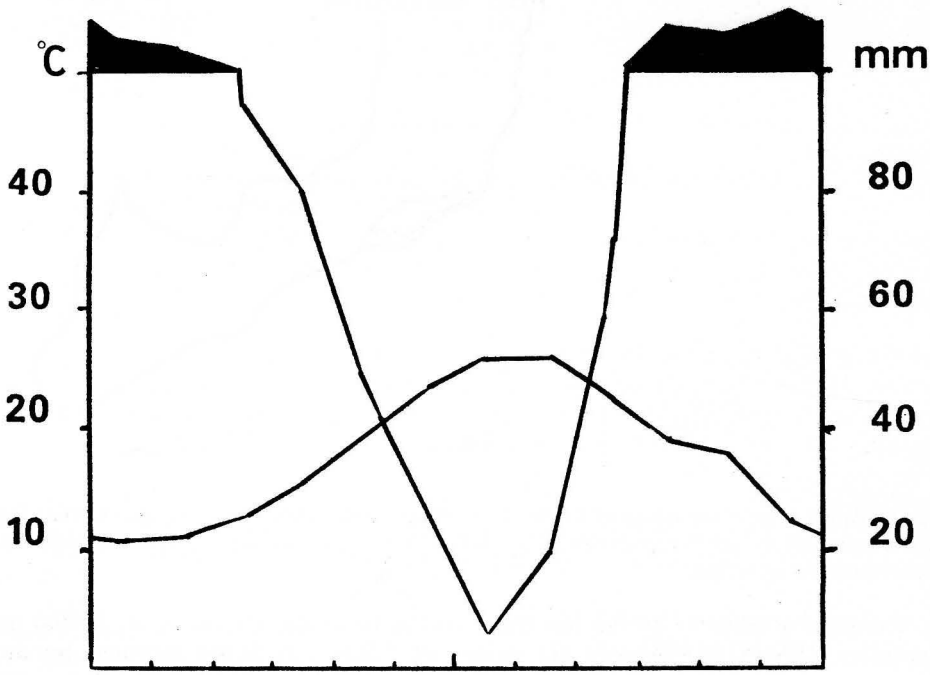

Fig. 2. Climate diagram for Corfu town, following Walter & Lieth (1960).

Materials and Methods

The lichens were collected in May-June 1983. Five to ten trees were sampled floristically at each of the localities I and II. At localities III and IV the sampling was only supplementary. For each specimen collected the position on the trees was noted.

The specimens of *Cladonia* were analysed by thin-layer chromatography (TLC) following standard procedures (Christensen 1987). Only solvent A was used. The identifications of *Collema* were kindly revised by G. Degelius, of *Mycocalicium* and *Sphinctrina* by L. Tibell, and of *Opegraphaceae* by J. M. Egea and P. Torrente. For revision of selected specimens thanks are due to T. Ahti *(Ochrolechia)*, I. Brodo *(Lecanora)*, P. M. Jørgensen *(Leptogium)*, and R. Moberg *(Physcia)*. The material is deposited in the Botanical Museum of Copenhagen (C) and in the author's private herbarium.

Results

The species

Ecological notes are included only in special cases as they appear in Tables 1 & 2. Unnumbered notations refer to taxa that co-occur in the packets of specifically collected, and thus numbered, specimens. Taxa not included in the literature dealing with Corfu (see Introduction) or in monographs (e.g. Degelius 1954, Jørgensen 1978) are considered as new to the island, and those not mentioned in Christensen (1989) and literature cited therein or in Christensen et al. (1991) and in Diamantopoulos et al. (1992) are considered as new to Greece.

Acrocordia gemmata (Ach.) Massal.
Gouvia, *1370, 1528.*
New to Corfu. Known from the mainland of Greece (Harmand & Maire 1909).

Arthonia impolita (Ehrh.) Borr.
Gouvia, *1345.*
New to Greece.

Arthonia melanophthalma Duf.
Gouvia, *1376, 1389, 1558.* Spores 4-5 septate, as also noted by Arnold (1887: 155 and Fig. 3 plate 3). Redinger (1937) states that the spores are 3-5 septate, whereas according to Clauzade & Roux (1985) they are only 3-septate.

Buellia sp.
Gouvia, *1386a.* No visible thallus present. Spores brown, two-celled, 15-18 x 6-7 µm. Apothecia produce a wine-red solution in KOH. Perhaps an unlichenized saprophyte.

Caloplaca ferruginea (Huds.) Th. Fr.
Nimphes, *1452, 1453, 1462.*

Caloplaca pollinii (Massal.) Jatta
Gouvia, *1541.*

Caloplaca sp. aff. ***turkuensis*** (Vain.) Zahlbr.
Gouvia, *1350*. The investigation of this probably new species is still in progress.

Cladonia chlorophaea (Flörke ex Sommerf.) Sprengel s. str.
Nimphes, *1451, 1465*, both contain fumarprotocetraric acid (by TLC).
New to Corfu. Known from the Ionian island Kefalonia (Servít 1935), the mainland of Greece (Harmand & Maire 1909, Szatala 1940, 1941, 1959, Geissler 1977), Evvia (Krause & Klement 1962) and the Aegean Islands (Szatala in Rechinger 1943a).

Cladonia convoluta (Lam.) Anders
Gouvia, *1524*.

Cladonia firma (Nyl.) Nyl.
Gouvia, *1525*.
New to Corfu. Known from Evvia (Krause & Klement 1962) and Attica (Christensen et al. 1991).

Cladonia furcata (Huds.) Schrad. subsp. ***furcata***
Gouvia, *1633*, TLC: fumarprotocetraric acid.

Cladonia pocillum (Ach.) Grognot
Gouvia, *1521*, TLC: fumarprotocetraric acid.

Cladonia pyxidata (L.) Hoffm.
Gouvia, *1354, 1532*, both with fumarprotocetraric acid (TLC).

Cladonia rangiformis Hoffm. var. ***rangiformis*** s. str.
Gouvia, *1522*, TLC: atranorin, rangiformic acid and an unknown yellow spot in R_f 6; *1556*, TLC: atranorin, rangiformic acid and an unknown yellow spot in R_f 6; Nimphes, *1450*, with apothecia, TLC: atranorin and rangiformic acid.

Collema furfuraceum (Arnold) Du Rietz
Gouvia, *1533*. Nimphés, 1464.

Collema multipunctatum Degel.
Gouvia, *1561*. Aghii Deka, *1596*.
New to Corfu. Known from Peloponnisos (Degelius 1956).

Collema nigrescens (Huds.) DC.
Gouvia, *1566*, sterile, isidiate.

Collema subnigrescens Degel.
Aghii Deka, *1595*. Nimphes, *1464a*.
New to Corfu. Known from Peloponnisos (Degelius 1956), Evvia (Krause & Klement 1962), and Crete (Kleinig 1966).

Diploschistes muscorum (Scop.) R. Sant.
Nimphes, *1451b* on *Cladonia chlorophaea*.

Lecanactis lyncea (Sm.) Fr.
Gouvia, *1342, 1347, 1360, 1383.*

Lecanora chlarotera Nyl.
Gouvia, *1371a, 1377, 1537a. Lecanora chlarotera* is here circumscribed in a broad sense, viz.: including all taxa with a KOH-dissolvable granular epihymenium with the exception of subsp. *meridionalis* only (cf. Poelt & Vezda 1981, Clauzade & Roux 1985).
New to Corfu. Known from the mainland of Greece (Räsänen 1944, Willmanns 1959, Willmanns & Phitos 1960, Christensen 1989, Zaharopoulou & Arianoutsou 1991, Diamantopoulos et al. 1992, Pirintsos et al. 1993), Peloponnisos (Rondon 1970), Evvia (Krause & Klement 1962), and Crete (Kleinig 1966).

Lecanora expallens Ach.
Gouvia, *1341* with apoth., *1539.*
New to Corfu. The species was recently reported new to Greece (Christensen 1994).

Lecanora rubicunda Bagl.
Gouvia, *1369, 1375, 1380* (conf. I. Brodo), *1537* ("Apothecia unusual in being more or less pruinose", I. Brodo on label), *1562.*
New to Greece.

Lecanora saligna (Schrad.) Zahlbr.
Gouvia, *1559.*
New to Corfu. Known from Mt Olympus (Szatala 1959) and Thessaloniki (Pirintsos et al. 1993).

Lecanora sienae B. de Lesd.
Gouvia, *1348* (conf. I. Brodo), *1549, 1626, 1627* ("*Lecanora laevis* Poelt s. str. Cortex very distinct; but close to *L. horiza* in having a thick algal layer", Brodo on label). The circumscription of this taxon used here is in accordance with the European floras (Poelt & Vezda 1981, Clauzade & Roux 1985).
New to Corfu. Known from Peloponnisos (Rondon 1970) and Crete (Rondon 1969).

Lecanora symmicta Ach. var. ***symmictera*** (Nyl.) Zahlbr.
Gouvia, *1343, 1365.*

Lecidella achristotera (Nyl.) Hertel & Leuckert
Gouvia, *1363, 1371, 1553, 1554, 1557, 1631.*
New to Corfu. Known from the mainland of Greece (Christensen 1994).

Lecidella elaeochroma (Ach.) Choisy var. ***elaeochroma***
Gouvia, *1367, 1540, 1623, 1625.* Nimphes.

Lecidella euphorea (Flörke) Hertel
Gouvia, *1357.*
New to Corfu. Known from the Greek mainland (Steiner 1919).

Lepraria sp. 1
Gouvia, *1361,* on bark in holes in the trunk. Without marginal lobes: TLC: atranorin and

fumarprotocetraric acid.

Lepraria sp. 2
Gouvia, *1563, 1564,* both on bark on the underside of the inclining trunk of a large-crowned olive. Both without marginal lobes; TLC: atranorin, divaricatic acid, fumarprotocetraric acid, and an unknown purple substance in R_f 7.

None of the three *Lepraria* specimens have a chemical content that is in agreement with the any of the known north-western European species (Laundon 1992). Whether they represent chemical races of known species or they represent new taxa is an open question.

Leptogium lichenoides (L.) Zahlbr.
Gouvia, *1356.*
New to Corfu. Known from the Greek mainland (Szatala 1941, 1959).

Leptogium sinuatum (Huds.) Massal.
Gouvia, *1352,* conf. P. M. Jørgensen.
New to Corfu. Known from the Aegean Island Ikaros (Szatala in Rechinger 1943a).

Mycocalicium albonigrum (Nyl.) Tibell
Gouvia, *1340, 1560* det. L. Tibell.
Mycocalicium albonigrum is here reported for the first time from Europe (cf. Tibell 1982). It is a non-lichenized warm-temperate to tropical species with a wide distribution, previously known from N. and S. America and Australasia (Tibell 1990).

Normandina pulchella (Borr.) Nyl.
Nimphes, on *Collema furfuraceum 1464.*
New to Corfu. Known from the Ionian Island Kefalonia (Servít 1935). The European distribution of this taxon has recently been mapped by Tretiach & Nimis (1989).

Ochrolechia subviridis (Høeg) Erichs.
Gouvia, *1628.*
New to Corfu. Known from the Greek mainland (Szatala 1941), Evvia (Krause & Klement 1962), and Crete (Szatala in Rechinger 1943b).

Ochrolechia turneri (Sm.) Hasselr.
Gouvia, *1351, 1353, 1359, 1531* all det. or confirmed by T. Ahti. All the specimens have C+ yellow soralia. The cortex is C+ yellow in nos. *1351* and *1531,* while it is negative in the others. According to Hanko et al. (1985) *O. turneri* has a negative reaction of the thalline tissues with C and KC while Purvis et al. (1992) give yellow reactions with these spot tests.
New to Corfu. Known from the Greek mainland (Räsänen 1944 as *Pertusaria leprarioides* Erichs.).

Opegrapha celtidicola (Jatta) Jatta
Gouvia, *1344, 1362, 1526,* det. P. Torrente & J. M. Egea. According to Clauzade & Roux (1985) *O. celtidicola* normally grows on bark and not on decorticated wood as the present specimens. Torrente & Egea (1989), however, state that it grows on both bark and wood, and reduce *O. xylographoides* Steiner (in Rechinger 1915), originally described from *Olea* wood collected on Corfu, to synonomy.

Opegrapha niveoatra (Borr.) Laundon
Gouvia, *1349* conf. Egea & Torrente.
New to Greece.

Pannaria cf. ***olivacea*** P. M. Jørg.
Nimphes, *1465a*. A sterile and fragmentary specimen.

Parmelia caperata (L.) Ach.
Gouvia, *1374, 1384, 1535*. Nimphes, *1454, 1458*.

Parmelia glabratula (Lamy) Nyl. subsp. ***glabratula***
Nimphes, *1463*.
New to Corfu. Known from the Greek mainland (Christensen 1989, Diamantopoulos et al. 1992, Pirintsos et al. 1993).

Parmelia perlata (Huds.) Ach.
Gouvia, *1534, 1546*.

Parmelia quercina (Willd.) Vainio
Nimphes, *1459*.
New to Corfu. Known from Thessaloniki (Diamantopoulos et al. 1992, Pirintsos et al. 1993).

Parmelia tiliacea (Hoffm.) Ach.
Gouvia, *1527*. Ano Garuna, *1416*. Nimphes, *1461*.

Pertusaria amara (Ach.) Nyl.
Gouvia, *1358, 1368, 1545, 1565*.

Pertusaria heterochroa (Müll. Arg.) Erichs.
Gouvia, *1624, 1629*. According to Poelt (1969) the thallus of this taxon should be "fast immer unterrindig". Clauzade & Roux (1985) state it to be thin, sometimes endocorticate. The present specimens have clearly yellow thalli, *1629* being much thinner than *1624*, perhaps due to the substratum of no. *1629* being decorticated wood. The radially striated spore wall and the two-spored asci agree with the present taxon.

Pertusaria hymenea (Ach.) Schaerer
Gouvia, *1366, 1382, 1538*. The specimens are habitually very similar to those of the previous taxon, but the asci are eight-spored. No. *1366* has much thinner thallus than nos. *1382* and *1538*, perhaps due to the different substrates, wood of the first mentioned vs. bark of the two latter.

Pertusaria lecanorodes Erichs.
Gouvia, *1355, 1379, 1381, 1630*. *Pertusaria lecanorodes* is often included in *P. hymenea* (Hanko 1983, Clauzade & Roux 1985). The descriptions of the chemical reactions of *P. lecanorodes* and *P. hymenea* given by Poelt (1969), Clauzade & Roux (1985), and Hanko (1983) are not in agreement. That of Poelt (1969) seems to fit the present material best, hence, specimens with pale discs and C- cortex are here refered to *P. hymenea*, whereas

those with dark discs and C+ orange cortex are referred to *P. lecanorodes.*
New to Corfu. Known from the Greek mainland (Szatala 1941), Crete (Szatala in Rechinger 1943b, Kleinig 1966), and the Aegean Islands (Szatala in Rechinger 1943a).

Pertusaria leucostoma (Bernh.) Massal. em. Erichs.
Gouvia, with *Sphinctrina turbinata 1548.* Nimphes.
Reported from Corfu by Hanko (1983) and also known from Rhodes (Szatala in Rechinger 1943a).

Pertusaria pertusa (Weig.) Tuck. var. ***meridionalis*** Zahlbr.
Gouvia, *1456.*
New to Corfu. Known from Mt Olympus (Szatala 1959), Athos peninsula (Szatala 1941), Crete (Szatala in Rechinger 1943a and in Rechinger 1943b, Zahlbruckner 1906), and Rhodos (Szatala in Rechinger 1943a).

Pertusaria sp.
Gouvia, *1378, 1388.* Thallus yellowish, smooth, fruits not constricted at the base, with one apothecium, perithecia-like. Disc pale. Asci 2-spored. Spores ca. 130 x 45 µm with a zoned wall 8-9 µm thick. Thallus reactions: cortex K+ yellow, C+ orange, KC+ orange, P- ; medulla P-.

From the present material, it appears that the genus *Pertusaria,* or at least the Mediterranean representatives, are in need of revision.

Physcia biziana (Massal.) Zahlbr.
Gouvia, *1529.*
New to Greece.

Physcia clementei (Sm.) Maas Geest.
Gouvia, *1372,* conf. R. Moberg.
New to Greece. In the Mediterranean area the species is locally frequent in old olive groves (Serusiaux 1989).

Physcia semipinnata (Gmelin) Moberg
Gouvia, *1385, 1530, 1542.*

Physcia stellaris (L.) Nyl.
Nimphes, *1460.*

Physconia venusta (Ach.) Poelt subsp. ***venusta***
Ano Garuna, *1415.*
New to Corfu. Known from the Greek mainland (Szatala 1941, Diannelidis 1955, Geissler 1977), Crete (Szatala in Rechinger 1943b), and the Aegean islands (Szatala in Rechinger 1943a).

Pyrenula chlorospila (Nyl.) Arnold
Gouvia, *1536.*

Ramalina canariensis Steiner
Gouvia, *1373, 1543, 1547a, 1551, 1621*. Nimphes, *1455a* (no soralia present).

Ramalina farinacea (L.) Ach.
Gouvia, *1547*.

Ramalina fastigiata (Pers.) Ach.
Nimphes, *1454a, 1455, 1457*.

Ramalina lacera (With.) Laundon
(syn.: *R. duriaei* (De Not.) Bagl.)
Gouvia, *1543a, 1547b*. This species often occurs intermingled with other species of *Ramalina*, as can be seen from the collection numbers.
New to Corfu. Known from Evvia (Krause & Klement 1962).

Schismatomma decolorans (Turn. & Borr.) Clauz. & Vezda
Gouvia, *1371b* fertile, conf. Egea and Torrente.
The species was recently published from Corfu by Tehler (1993). It is not known from other places in Greece.

Sphinctrina turbinata (Pers. ex Fr.) de Not.
Gouvia, *1548* growing on *Pertusaria leucostoma* and on *P. hymenea 1382*. It occurs here in a supposed Mediterranean form, with the characteristic K+ reaction of the excipulum, but with the habitus as in *S. leucopoda* Nyl. (Löfgren & Tibell 1979, Tibell in litt.).
New to Corfu. In Greece the species is previously known from Rhodes (Löfgren & Tibell 1979). It requires a well-lit and not too dry a habitat and seems to be favoured by a slightly oceanic climate (Löfgren & Tibell 1979).

Toninia sedifolia (Scop.) Timdal
(syn.: *T. caeruleonigricans* (Light.) Th. Fr.)
Nimphes, *1451a*.

Xanthoria parietina (L.) Th. Fr.
Gouvia, *1544, 1552*.

Taxon ignotus
Gouvia, *1346, 1364*. On wood of trunk of *Olea*. Thallus sterile, continuous, thin to hypoxylic, whitish, K+ red, C-, P+ yellowish red. Soralia at first discrete and somewhat raised, delimited by a collar of thallus and wood fibres, later confluent, eroded to the level of the thallus, whitish to greenish white to dark greyish green, chemical reactions as in the cortex. Alga: *Trentepohlia*.

Species groups

The lichens collected at the olive grove at Gouvia are presented in Table 1 and those of the remaining localities in Table 2.

Table 1. Lichen species collected in the olive grove at Gouvia arranged according to their habitats: 1, on the ground. 2, on the bark at the basal part of the trunks of olive trees. 3, on the bark of rough-barked trunks. 4, on decorticated wood of trunks. 5, on the bark of young smooth-barked trunks. 6, on the bark of branches in crowns. 7, on bark of twigs.

Species	1	2	3	4	5	6	7
Cladonia convoluta	+	.	.	.	.	.	.
C. firma	+	.	.	.	.	.	.
C. furcata subsp. *furcata*	+	.	.	.	.	.	.
C. rangiformis v. *rangiformis*	+	.	.	.	.	.	.
C. pocillum	+	.	.	.	.	.	.
C. pyxidata	.	+	.	.	.	.	.
Collema furfuraceum	.	+	.	.	.	.	.
Lecidella euphorea	.	+	.	.	.	.	.
Leptogium lichenoides	.	+	.	.	.	.	.
L. sinuatum	.	+	.	.	.	.	.
Ochrolechia turneri	.	+	.	.	.	.	.
Physcia biziana	.	+	.	.	.	.	.
Parmelia perlata	.	+	.	.	+	.	.
Physcia semipinnata	.	+	.	.	+	.	.
Pertusaria amara	.	+	+	+	+	.	.
P. lecanorodes	.	+	+	+	+	.	.
Lecanora sienae	.	+	+	+	+	.	.
Lecanactis lyncea	.	.	+	+	.	.	.
Pertusaria hymenea	.	.	+	+	+	.	.
Lecidella achristotera	.	.	+	+	+	+	+
Acrocordia gemmata	.	.	+	.	.	.	.
Collema multipunctatum	.	.	+	.	.	.	.
C. nigrescens	.	.	+	.	.	.	.
Lepraria sp. 1	.	.	+	.	.	.	.
Lepraria sp. 2	.	.	+	.	.	.	.
Ochrolechia subviridis	.	.	+	.	.	.	.
Parmelia tiliacea	.	.	+	.	.	.	.
Pertusaria pertusa v. *meridionalis*	.	.	+	.	.	.	.
Sphinctrina turbinata	.	.	+	.	+	.	.
Lecanora rubicunda	.	.	+	.	+	+	.
Parmelia caperata	.	.	+	.	+	+	.
Lecanora chlarotera	.	.	.	+	+	+	.
L. expallens	.	.	.	+	+	.	.
Lecidella elaeochroma	.	.	.	+	+	.	.
Arthonia impolita	.	.	.	+	.	.	.
Buellia sp.	.	.	.	+	.	.	.
Caloplaca sp. aff. *turkuensis*	.	.	.	+	.	.	.
Lecanora saligna	.	.	.	+	.	.	.
L. symmicta v. *symmictera*	.	.	.	+	.	.	.
Mycocalicium albonigrum	.	.	.	+	.	.	.
Opegrapha celtidicola	.	.	.	+	.	.	.
O. niveoatra	.	.	.	+	.	.	.
Pertusaria heterochroa	.	.	.	+	.	.	.
Caloplaca pollinii	.	.	.	.	+	.	.
Pertusaria leucostoma	.	.	.	.	+	.	.
Pyrenula chlorospila	.	.	.	.	+	.	.

Species	1	2	3	4	5	6	7
Ramalina farinacea	.	.	.	.	+	.	.
R. lacera	.	.	.	.	+	.	.
R. canariensis	.	.	.	.	+	+	+
Arthonia melanophthalma	.	.	.	.	+	+	.
Pertusaria sp.	.	.	.	.	+	+	.
Xanthoria parietina	.	.	.	.	+	.	+
Physcia clementei	.	.	.	.	.	+	.
Schismatomma decolorans	.	.	.	.	.	+	.

From Table 1 some ecological species groups can be extracted:

1. Terrestial lichens *(Cladonia convoluta* to *C. pocillum).*
2. Lichens confined to the base of trees *(Cladonia pyxidata* to *Physcia biziana).*
3. Lichens confined to trunks with rough bark *(Acrocordia gemmata* to *Parmelia tiliacea).*
4. Lichens confined to the decorticated wood of tree trunks *(Arthonia impolita* to *Pertusaria heterochroa);* among these *Lecanactis lyncea* and *Mycocalicium albonigrum* had the largest cover from about one fifth to one third of the decorticated parts of the trunks. *Lecanora expallens* had a cover of about 5 %.
5. Lichens growing on smooth bark *(Caloplaca pollinii* to *Xanthoria parietina).*
6. Lichens confined to branches in the crown *(Physcia clementei* and *Schismatomma decolorans).*
7. Lichens of the trunks regardless of height and bark characteristics *(Lecanora sienae* and *Pertusaria hymenea).*
8. The remaining lichens (notably *Lecidella achristotera*) seem to be less specific in their choice of habitat.

Chorology

The chorology of the collected lichens is summarized in Table 3. *Ochrolechia turneri* is not included in Table 3 as in most floras it is not separated from *O. microstictoides* Räs. and statements of its range, therefore, are unreliable. *Lecanora expallens* and *L. saligna* have Southern Central Europe (smed) as their southern limit (Wirth 1980).

It seems that their range must be extended into the Mediterranean zone (as in Table 3). *Lecidella achristotera* probably has the same range as *L. elaeochroma*, but the distributional range stated by Nimis et al. (1990b) is used here (s'mieur-med?).

Twelve taxa are strictly Mediterranean (including Macaronesian), viz.: *Arthonia melanophthalma, Caloplaca pollinii, Collema multipunctatum, Lecanora rubicunda, Opegrapha celtidicola, Pertusaria heterochroa, P. lecanorodes, P. pertusa* var. *meridionalis, Physconia venusta, Pyrenula chlorospila, Ramalina canariensis,* and *R. lacera.* Many of these are bound to suboceanic conditions.

Discussion

In the species list a number of specimens are determined to genus only. Apart from what it might tell about the present author, it may well be indicative of the presence in this relatively little studied part of Europe of a lichen flora rich in undescribed taxa or in known taxa with broader variation than hitherto described in the current floras, e.g. Clauzade & Roux (1985).

Table 2. Lichens from olive groves. O = on trunk of *Olea;* b = on basal part of trunk of *Olea;* l = on limestone terrace wall in the grove.

	Localities		
Species	Nimphes	Aghii Deka	Ano Garuna
Caloplaca ferruginea	O		
Cladonia chlorophaea	b, l		
C. rangiformis	l		
Collema furfuraceum	O		
C. multipunctatum		O	
C. subnigrescens	O	O	
Diploschistes muscorum	l		
Lecidella elaeochroma	O		
Normandina pulchella	O		
Pannaria cf. *olivacea*	b		
Parmelia caperata	O		
P. glabratula	O		
P. quercina	O		
P. tiliacea	O		O
Pertusaria leucostoma	O		
P. pertusa v. *meridionalis*	O		
Physcia stellaris	O		
Physconia venusta			O
Ramalina cf. *canariensis*	O		
R. fastigiata	O		
Toninia sedifolia	l		

Species groups

The species assemblages of wood and old bark (3 & 4, Table 1) seem to be related to Arthonietum impolitae Almb., a community confined to dry, well-lit deciduous trees, often with acid bark, and quickly drying decorticated wood (Barkman 1958, James et al. 1977, Nimis & Schiavon 1986), or perhaps to Lecanactidetum premneae James, Hawksworth & Rose (1977), which colonizes bark surfaces that have become dry and brittle with age with reduced water-holding capacity, but a relatively high pH. Nimis & Schiavon (1986) found a comparable species assemblage on old, isolated specimens of *Quercus cerris* on the Tyrrhenian coast, though this species has very acid bark.

The lichen assemblages of young smooth-barked trunks and branches in the crown base may represent some kind of Ramalinetum, which is characteristic of somewhat well-lit and well-ventilated sites. From Table 1 it appears that a large number of the lichens growing on the smooth-barked trunks (5) are less specific in their ecological demands, as they also occur on rough bark (3) and exposed wood (4), and to a lesser extent on the basal parts of the trunks (2).

Decorticated wood (4) and old rough bark (3) have also a relatively high number of species in common.

The lichens of the basal part of the trunks (2) are probably the most humidity-demanding species. They constitute a relatively distinct group, having a large part of its members in common with the smooth bark (5, Table 1).

The lichens on the ground (1) are separated as a distinct group, having no species in common with the epiphytic groups.

The lichens collected at the olive grove at Nimphes (Table 2) grew in a much more shaded, more humid and less wind-exposed situation. The flora was reminiscent of that of

smooth-barked trunks and branches of the olive trees at Gouvia, although some more humidity-demanding species *(Pannaria olivacea, Normandina pulchella)* are indicative of the more hygric conditions of this site.

Table 3. Chorology (zonal amplitude) of the lichens found in the olive grove at Gouvia. Abbreviations according to Wirth (1980): Arkt = Arctic; atl = atlantic; Bor = boreal; Med = Mediterranean; Mieur = central European; oz = oceanic; S'bor = south boreal; Smed = Submediterranean; S'mieur = south central European.

	Range						
Arkt	+						
Bor	+	+					
S'bor	+	+	+				
Mieur	+	+	+	+			
S'mieur	+	+	+	+	+		
Smed	+	+	+	+	+	+	
Med	+	+	+	+	+	+	+
Number of taxa	4	17	8	12	4	2	12
Percentage of total	7	29	14	20	7	3	20
Number of atl - oz	0	3	3	12	1	0	1
Percentage of atl-oz in the chorological group	0	18	38	100	25	0	8

Other studies

Arnold (1887) reported 50 taxa from olive trees on Corfu and 11 taxa from the ground in the groves, most of which are also reported in the present study. His specimens were collected in five different localities by two collectors (Eggert and Sydow, respectively). A direct comparison between the species list of Arnold (1887) and the present is, therefore, not possible. For example, he reported the suboceanic species *Diploicia canescens* and the Mediterranean-maritime *Dirina ceratoniae,* neither of which were found in the present study. Such differences may just be related to different ecological conditions at the sampling sites, rather than to factors like increased air pollution or change in management practices during the passed 100 years. The lichen flora reported by Arnold (1887) from the southern outskirts of Corfu town to Canoni has, however, great overall similarity with that of Gouvia. Also the lichen flora on *Olea* in western Calabria (Italy) studied by Bartoli et al. (1991) is very similar to the present one. No other studies of epiphytes on *Olea* have given comparable results. They all cover different ecological conditions.

Chorology

While, from a Central European viewpoint, it is meaningful to discuss the chorology of a flora within the range Arctic to Mediterranean (Wirth 1980), it is perhaps less so when viewed from the southern outskirts of Europe.

From Table 3 it seems that all the taxa have distributions ranging from the Mediterranean region with various extensions to the north. The distributional picture is, however, biased by the sources used (Wirth 1980, supplemented by Ahti 1977, Löfgren & Tibell 1979, Nimis & Poelt 1987, Nimis et al. 1990b, Poelt 1969, Tibell 1990, and Torrente & Egea 1989), which take only (Western) Europe into account. The lack of comprehensive floras from the areas south and east of this area may obscure the real distributional patterns of some of the treated taxa. With the limitations of this unidirectional approach in mind, the chorology is briefly discussed.

Table 3 gives the relative abundance of the different distributional ranges of the lichen flora of Gouvia. The main groups being those with a distribution from the boreal zone, the southern boreal zone, and the Central European zone, respectively, to the Mediterranean zone, and the pure Mediterranean group. While the reason for the low number of taxa that range from the Mediterranean to the Arctic is relatively obvious, it is more difficult to explain why there are so few taxa with a South Central European and Submediterranean to Mediterranean range, respectively.

35 % of the taxa found at Gouvia have atlantic to oceanic distribution in Europe. In comparison, 15.2 % to 22.7 % of the flora on *Olea* at different sites in Calabria (Bartoli et al. 1991) have a subatlantic distribution. Considering the mean annual precipitation of the area of about 1450 mm, the relatively low values from Calabria are not easily explained. The relatively high value of Corfu may be due to the high annual precipitation (1172 mm) caused by the westerly seaborne winds to which Corfu is subject.

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