Notes on the lichens and lichenicolous fungi of western Crete (Greece)

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Abstract: SPRIBILLE, T., SCHULTZ, M., BREUSS, O. & BERGMEIER, E. 2006. Notes on the lichens and lichenicolous fungi of western Crete (Greece). – Herzogia **19**: 125–148.

We report a total of 248 species of lichens and lichenicolous fungi from recent floristic work in western Crete. A total of 103 taxa are reported from the island for the first time; at least 16 taxa are new to Greece. Two species, *Peccania teretiuscula* and *Verrucaria werneri*, are new to Europe and both are reported for only the second time since their description. Lichens that disperse by asexual reproductive structures (soredia, isidia) constitute only a small proportion of the flora and most species with this dispersal strategy are relatively infrequent. Some possible reasons for this as well as general patterns in the epiphytic lichen flora are discussed.

Zusammenfassung: SPRIBILLE, T., SCHULTZ, M., BREUSS, O. & BERGMEIER, E. 2006. Beitrag zur Kenntnis der Flechten und lichenicolen Pilze West-Kretas (Griechenland). – Herzogia **19**: 125–148.

In diesem Beitrag berichten wir über Nachweise von 248 Arten von Flechten und lichenicolen Pilzen von West-Kreta. 103 Taxa sind Erstnachweise für Kreta, davon werden auch mindestens 16 erstmals für Griechenland angegeben. *Peccania teretiuscula* und *Verrucaria werneri* sind neu für Europa und waren bisher nur von der Typuslokalität bekannt. Flechten, die sich mittels asexueller Reproduktionseinheiten (Soredien, Isidien) ausbreiten, machen nur einen kleinen Teil der Flechtenflora Kretas aus, und die meisten dieser Arten sind recht selten. Mögliche Gründe dafür sowie allgemeine Muster der epiphytischen Flechtenflora werden diskutiert.

Key words: Ascomycetes, biodiversity, cyanolichens, conservation, epiphytes, floristics, island biogeography, Mediterranean, reproductive strategy, sorediate lichens.

Introduction

One hundred years after the first publication on the lichens of Crete (ZAHLBRUCKNER 1906), the exploration of the lichen flora of Crete remains to a certain extent in a phase of initial reconnaissance. Compared to its well studied island counterparts in the western Mediterranean, the island has seen the publication in the last century of comparatively few floristic surveys. Relatively little ecological work has been done, notwithstanding a few important, pioneering works in which broad groupings of Cretan lichen habitats were outlined for the first time (RONDON 1969, PAPP et al. 1998). Even so, it is difficult to characterize the ecological behaviour and geographical and zonal distribution of most lichen species on Crete for want of data; and such work, in turn, is impeded by the absence of any kind of regional flora for the eastern Mediterranean.

Much of what we know today about the lichens of Crete can be traced back to a handful of publications. ZAHLBRUCKNER (1906) provided a list of 86 lichens collected on the island by J. Dörfler and R. Sturany in 1904. This was followed by a floristic 'Reisebericht' based on collections of A. Ginzberger in April 1914 and prepared by J. Steiner (STEINER 1917). Within

the framework of the 'Flora Aegaea', the Hungarian lichenologist Ödön Szatala provided a catalogue of lichens of the Aegean, in which the Cretan portion was based largely on existing collections of Dörfler, Sturany and Ginzberger (SZATALA 1943a). In a second contribution, SZATALA (1943b) listed lichens collected by Karl Heinz Rechinger in 1942 during the German occupation. Many of these early specimens are in W or WU. The sum total of lichen species known up to this point from Crete was about 240 (KLEINIG 1966). In 1964, a student excursion from the University of Heidelberg added 80 new species to the flora and provided occasion for a consolidated checklist of Cretan lichens (KLEINIG 1966). Further additions to the flora were reported by RONDON (1969) and PAPP et al. (1998), as well as in a series of monographic taxonomic treatments (e.g., TIMDAL 1991). The inventory of new species was ultimately summarized in a second checklist of Cretan lichens, including 68 additional previously unreported taxa, by GRUBE et al. (2001).

In the framework of another botanical excursion, this time from the University of Göttingen in May, 2004, the first author had the opportunity to collect lichens in a wide variety of habitats at 32 different localities across western Crete. The collecting effort was not systematic, and because of time limitations complete inventories were not possible at every site. Epiphytic species received most of the emphasis, although species from all substrates were included in the general survey. In all, c. 940 specimens were collected along an altitudinal gradient ranging from sea level to over 1500 m in the western half of the island. Further lichen collections were made by the second author during a visit to Crete in spring of 2005. Lichens were collected along the trail to the Kamares Gorge (south slope of the Ida Mountains) as well as on coastal cliffs close to Matala in the Messara Bay.

The aim of the present article is twofold. First, we would like to provide a contribution to the lichen flora of Greece and the eastern Mediterranean by documenting the species found in the course of our surveys, including numerous new records. Second, we wish to begin to lay the groundwork for creating ecological and distributional profiles for the species of the Cretan lichen flora by annotating each record with notes on substrate and occurrence. The need to do this even for species already known from Crete is evident. Many, perhaps even most, of the known species are based only on single records specifying only localities, often in the broadest terms. The lack of ecological or distributional data has up to now represented a considerable hurdle to more detailed studies, and we hope that the present annotated list will help lay the groundwork for more detailed systematic and ecological studies of the Cretan lichen flora.

Materials and Methods

We visited a total of 34 different sites across western and central Crete (Table 1). The selection of localities reflected an attempt to capture a broad array of habitats ranging from arid coastlines, phrygana and macchia to *Platanus* ravines, *Castanea* groves and native *Quercus* woodlands on limestone, siliceous phyllite/quartzite bedrock and Neogene sediments from sea level to about 1700 m. The large diversity of habitats at various elevations allowed us to collect epiphytes from a total of 17 different phorophyte species. Although an attempt was made to capture as many different substrates as possible, collecting was generally biased towards epiphytes.

Over 1000 specimens were collected. Identification of the material followed standard light microscopic methods. Thin layer chromatography was carried out on about 150 specimens following the methods described by CULBERSON (1972) and CULBERSON & JOHNSON (1982).

Table 1: Lichen collecting localities.

	Date	Locality	Elev. (m)	Coordinates
1	05 May 2004	Vicinity of Knossos SE of Iraklio	90–120	35°18'N/25°10'E
2	05 May 2004	Near Ano Archanes, base of Youchtas Mountain	500	35°13'N/25°09'E
3	06 May 2004	Akrotiri Peninsula, Stavros	Sea level	35°36'N/24°06'E
4	07 May 2004	Village of Imbros	900	35°15.5'N/24°09.5'E
5	07 May 2004	Along footpath between village of Imbros and upper entrance to Imbros Gorge	750	35°15'N/24°10'E
6	07 May 2004	Imbros Gorge	400–700	35°14'N/24°09.5'E
7	08 May 2004	Akrotiri Peninsula, vicinity of Moni Gouvernetou and Moni Katholiko	100–250	35°35.5'N/24°08'E
8	09 May 2004	Omalos Plain, Spilion Tsanis (Tsani Cave)	1050	35°21.5'N/23°54'E
9	09 May 2004	Southern edge of Omalos plain near road junction	1100	35°19.5'N/23°54.5'E
10	09 May 2004	Levka Ori, trail S of Omalos from Xiloskalo towards Gingilos	1200–1700	35°18'–19'N/ 23°54'–54.5'E
11	10 May 2004	Fassas Valley, 1 km SW of Langos, in *Platanus*-dominated moist ravine	220	35°25'N/23°53'E
12	10 May 2004	Fassas Valley, 2 km SW of Langos	310	35°24'13"N/23°52'26"E
13	10 May 2004	Fassas Valley, between Langos and Nea Roumata	330	35°24'01"N/23°52'27"E
14	10 May 2004	Levka Ori, just W of Agii Theodori, c. 3 km SW of Omalos, between mountains Mavri Kimite and Tourli	1050–1100	35°20'N/23°51'–52'E
15	11 May 2004	Between Topolia and Koutsamatados, around entrance to Cave of Agia Sofia	300	35°25'N/23°41'E
16	11 May 2004	Elos	500	35°22'N/23°38'E
17	11 May 2004	C. 1 km east of Elafonisi	0–5	35°17'N/23°32'E
18	13 May 2004	Akrotiri Peninsula, below Moni Gouverneto	200–250	35°35.5'N/24°08'E
19	14 May 2004	Kastellos, 1.5 km W of Armeni	370	35°19'N/24°26'E
20	14 May 2004	Between Armeni and Kare	413	35°17'32"N/24°28'56"E
21	14 May 2004	Near Prassies	400	35°19'N/24°31.5'E
22	15 May 2004	SW of Psiloritis Mountains, Skholi Asomatou (Asomaton Agricultural School)	350	35°15'N/24°39'E
23	15 May 2004	Between Asomaton and Genna	350–400	35°15'N/24°38.5'–39'E
24	16 May 2004	1.5 km W of Meronas on the road to Gerakari	700	35°13'30"N/24°36'E
25	16,19 May 2004	Between Gerakari and Spili: Gious Kambos Plateau	750–800	35°13'N/24°33.5'E
26	16 May 2004	Mouth of Megalou Potamos on sea, below Preveli Monastery	0–5	35°09'–10'N/24°28.5'E
27	17 May 2004	Limni Votomou, above Ano Zaros, in phrygana facing town	510	35°09'N/24°54.5'E
28	17 May 2004	Psiloritis Mtns., Rouvas Gorge, above town of Ano Zaros	700	35°09'N/24°54'E
29	17 May 2004	On plateau above Rouvas Gorge, near the chapel of Agios Ioannis	900–1000	35°09'N/24°54'E
30	18 May 2004	Messara Plain, ruins of Gortis	180	35°04'N/24°56'E
31	18 May 2004	Near Festos, excavation of Agia Triada	70–100	35°04'N/24°47'E
32	18 May 2004	West of Pitsidia: Kommos Beach, 100–200 m from sea	5–10	35°01'N/24°45'E
33	30 Apr 2005	Southern Ida Mountains, trail to Kamares Gorge (M. Schultz collections)	950–1000	c. 35°09.5'N/24°49.5'E
34	27 Apr and 02 May 2005	Matala SW of Messara Plain, rocky slopes, coastal cliffs on trail to and at Red Beach (M. Schultz collections)	5–100	c. 34°59.25'N/24°45.0'E

M. Schultz reviewed almost all of the Lichinaceae and Collemataceae and O. Breuß revised the pyrenocarps. Unless otherwise indicated, specimens are deposited in B, with some duplicates in GOET, BG (including most *Bacidias*) and W; M. Schultz' collections are deposited in HBG. A few additional records were generously contributed by Stefan Abrahamczyk, Tassilo Feuerer, Helmut Mayrhofer and Viktoria Wagner and are deposited as indicated. Vascular plant nomenclature follows JAHN & SCHÖNFELDER (1995). *Quercus macrolepis* refers to *Quercus ithaburensis* subsp. *macrolepis*.

Results and Discussion

A total of 248 species, 1 subspecies and 4 varieties were recorded in 94 genera. Of these, 103 taxa do not appear to have been previously reported from Crete. The species reported here bring the total number of lichens known for Crete to 524 lichen taxa and 16 non-lichenized, lichenicolous fungi, up from the previously reported figures of 427 and 13, respectively (GRUBE et al. 2001) following the subtraction of three species reported in the latter (see below).

At least three species reported by GRUBE et al. (2001) should be excluded: *Caloplaca calcicola* var. *rechingeri* Servít ('*Caloplaca rechingeri* Servít'; cf. KLEINIG 1966) is a synonym of *C. cretensis* (Zahlbr.) Wunder and *Caloplaca rhinodinoides* J.Steiner is a synonym of *Caloplaca variabilis* var. *variabilis* (WUNDER 1974). *Fuscopannaria leucosticta* is accepted by GRUBE et al. (2001) based on the reports of ZAHLBRUCKNER (1906) and SZATALA (1943b), but the supporting specimens in both cases have been referred to *Fuscopannaria olivacea* (JØRGENSEN 1978). It is possible that other species currently accepted for the flora of Crete should be excluded, but determining where this is the case will require re-examination of original material.

Patterns in the epiphytic lichen flora

GRUBE et al. (2001) state that strong degradation of the vegetation limits the abundance of epiphytic lichens on Crete. While we have not conducted a systematic survey of Cretan epiphytic lichen vegetation, our observations suggest that this assumption should be revisited with scrutiny of the types of disturbance and disturbed habitats involved. Lichen communities occurring on trunks of *Olea europaea* and alley trees in villages are indeed likely to have been strongly impacted by the widespread liming of trunks. Overgrazed low-growing stands of hedge-trimmed *Quercus coccifera* are usually rather poor in epiphytic lichen species. However, whether this is due to overgrazing or the fact that such stands often occur on very dry, dusty sites is not immediately evident. We found richly developed epiphytic lichen communities on both trunks and branches in heavily grazed woodlands; ultimately even overgrazed stands offer colonizable bark on the trunks and branch bases behind the protective outer layer of heavily armed branch tips. It is in fact conceivable that grazing in some cases may provide additional enrichment and niche development through nutrient input. Lobarion-like communities, which in Crete can be recognized by the presence of *Fuscopannaria olivacea* and a suite of crustose species, are found in both grazed and ungrazed *Quercus* woodlands but always occur in stands with large, presumably old trees.

Data are not yet sufficient to map epiphytic lichen vegetation, but some broad patterns are becoming evident. Lichen vegetation reflecting more humid conditions occurs at mid-montane elevations and extends downslope on the north side of Crete into the area of Neogene sediments. Typical species that represent this formation are *Collema furfuraceum*, *Fuscopannaria*

olivacea, *Pertusaria hymenea* and *Staurolemma omphalarioides*. *Ramalina-Evernia*-dominated lichen vegetation is characteristic of some montane forests of the Psiloritis Mountains in areas where cloud banks hang for protracted periods of time; these are also the only areas on Crete in which species of *Lobaria* are known to occur.

One group of species definitely affected by the human impact of the island are the lignicoles. Only nine species were found exclusively on lignum in the present survey: *Buellia chloroleuca*, *Calicium glaucellum*, *C. salicinum*, *Mycocalicium subtile*, *Lecanora saligna*, *Lecanora* aff. *hypoptoides*, *Platismatia glauca*, *Rinodina excrescens* and *Scoliciosporum umbrinum*. The first four species are found almost exclusively on lignum also in mainland regions. All are known for Crete from only one or two records, reflecting the scarcity of dead wood that is so evident when surveying lichens in Cretan woodlands.

One of the more important areas for rare species identified during the present survey is the Fassas Valley, an area of humid, low elevation *Platanus orientalis*-dominated ravines southwest of Chania below the village of Nea Roumata. This and adjacent valleys differ from much of the rest of the Cretan landscape in that they are underlain by siliceous rock, mainly phyllite and quartzite. These areas are accordingly less water-permeable and maintain numerous perennial watercourses. Several relicts of the Tertiary vascular flora are known from this area, including the bay tree *Laurus nobilis*, the fern *Woodwardia radicans* and the regionally endemic *Lathyrus neurolobus* (JAHN & SCHÖNFELDER 1995). The following lichens have been found on Crete so far only in this area: *Bacidia arceutina*, *Bacidina phacodes*, *Fuscopannaria* aff. *atlantica*, *Hyperphyscia adglutinata*, *Lempholemma* sp. 1, *Lepraria lobificans*, *Micarea bauschiana*, *Opegrapha atra* and *Opegrapha ochrocincta*. All but the *Lepraria* and *Micarea* are corticolous epiphytes. Further work on the lichen flora of the *Platanus* ravines is badly needed in light of continued threats to ravine habitats from encroaching settlements, forest clearing for orange plantations, and road construction.

Table 2: Proportion of reproductive strategies represented in the Cretan lichen flora.

	Number of taxa	Per cent of total flora
Sexual reproduction	448	85.5
With soredia	46	8.8
With isidia or fragmenting thallus	30	5.7
Total with vegetative propagules	76	14.5
Total number of taxa	524	100

Low proportion of species with vegetative propagules

An examination of the proportions of species with different reproductive strategies shows that the vast majority of species reproduce sexually by spores (Table 2). Species with asexual reproductive structures (soredia, isidia and fragmenting thalli) constitute only 14.5 % of the total Cretan lichen flora (Table 2). Comparable proportions have been reported by SIPMAN & RAUS (1999) from the Aegean islands of Paros (14 %) and Santorini (18 %). It is difficult to meaningfully compare these statistics with data from mainland areas owing to the differences in size and relief of study areas and the differing degree to which lichen floras have been studied. That said, however, it is interesting to note that the percentage of lichen species with vegetative reproductive structures is higher in a mainland area of Spain (22 %) in a study reported by SIPMAN et al. (2005) and consistently higher in every administrative region of Italy in the

ITALIC database of MARTELLOS & NIMIS (2001): for example, 26.2 % for Emilia Romagna, a mainland region, 22.6 % for Sicily and 22.4 % for Sardinia, the largest and second largest islands in the Mediterranean, respectively, and 20.7 % for the whole of Italy.

The reasons for the low number of asexually reproducing species and the rarity of others are likely to be complex. JAHNS (1984) points out that lichens with soredia-like structures are formed under humid conditions and are at a disadvantage in dry climates owing to the low water storage capacity of soredia. Theoretically, isidia-bearing species should be at an advantage under these circumstances due to their greater water storage capacity, but they are in turn more strongly dispersal-limited. It might thus be tempting to assume that the relatively low number of lichens with vegetative reproductive strategy on Crete is attributable to a drier climate. However, there is evidence to suggest that climate may not be responsible for this phenomenon. First, many parts of Crete, especially in the western mountains, are in fact very humid, with annual precipitation of up to 1500 mm (2000 mm in summit areas), notwithstanding the characteristically Mediterranean summer moisture deficit. Secondly, several prominent asexually reproducing lichen species are absent on Crete and present either on adjacent islands or on the mainland. A good example of this is *Hypogymnia physodes*, which grows not only in corresponding habitats on the Greek mainland but also on the Aegean islands of Paros, Naxos and Ikaria (SIPMAN & RAUS 1999, SIPMAN et al. 2005). Given the well-developed epiphytic lichen communities in the Cretan mountains, it seems likely that *H. physodes* would be able to grow on Crete were its diaspores able to colonize the appropriate substrates. Thirdly, a similarly irregular distribution of asexually reproducing lichen species between islands has been reported by SIPMAN et al. (2005) from Ikaria and Naxos, two medium-sized islands in the central Aegean, with several of the common species present on one island and absent on the other. In tandem with these observations, SIPMAN et al. (2005) also report isolated occurrences of the isidiate foliose lichen *Pseudevernia furfuracea* on the island of Ikaria, where the two main chemotypes, var. *furfuracea* ('var. *olivetorina*') and var. *ceratea*, occur isolated on two different mountains. A similar incongruence can be observed on Crete, where *P. furfuracea* var. *furfuracea* is known from only a single locality, whereas var. *ceratea* is found in both the Levka Ori and Ida mountain ranges. The two varieties exhibit largely sympatric distributions in mainland areas (CULBERSON et al. 1977).

Another possible explanation is that asexually reproducing lichens do not disperse over long distances as effectively as sexually reproducing species. This would contradict a widely held assumption that at least sorediate species disperse as well or more effectively than sexual species (e.g., BOWLER & RUNDEL 1975). This assumption has been at least in part based on the observation that in sexual-asexual species pairs, the asexually reproducing species tend to have wider distributional ranges (BOWLER & RUNDEL 1975). Relatively little work has been conducted on dispersal strategies in lichens, although there is evidence, e.g., in calicioid fungi that species with small spores are more effective long distance dispersers than species with comparatively large spores (TIBELL 1994). Following the same general logic, spores should be more effective long distance dispersal propagules than soredia, which tend to be considerably larger. The spotty distribution of asexually reproducing species on Crete and other Aegean islands in any case appears to be consistent with a pattern of irregular colonization of island habitats. Island biogeographical factors – including area, isolation and dispersal strategies – are well studied for other groups of organisms but are still virtually unexplored in lichenology. As more floristic work is completed on Crete and other Aegean islands, this part of the world may prove to be a productive outdoor laboratory for the study of insular effects on lichen floras.

Endemism in the Cretan lichen flora

Whatever island effects can be detected for the Cretan lichen flora do not appear to be reflected, at least at present, in a high number of endemic species. Relatively few new taxa have been described from Crete, mainly by ZAHLBRUCKNER (1906) and STEINER (1917), and of these, all but one have fallen into synonomy or been shown to be more widespread. This leaves only two lichen species, *Thelidium creticum* (STEINER 1917) and the more recently described *Toninia cretica* (TIMDAL 1991) that are known to occur only on Crete. *Toninia cretica* is found in calcareous rock fissures and is known only from four localities in the western and central part of the island (TIMDAL 1991). *Thelidium creticum* is known only from the type collection from limestone at Knossos (STEINER 1917). Three more taxa will likely be added when *Acarospora* sp. 1, *Candelariella* sp. 1 and *Lempholemma* sp. 1, apparently undescribed species discovered in the present survey, are formally described. However, the endemic status of lichens described in the past from Crete or other Mediterranean islands has tended to be short-lived as they are discovered in other hitherto little-explored areas. In light of this cycle of description and discovery, it is probable that the proportion of endemics in the flora will at any rate remain low. The near absence of endemic lichens stands in vivid contrast to the vascular flora, in which over 10 % of the 1800 vascular taxa are endemic to Crete and adjacent islands (JAHN & SCHÖNFELDER 1995).

Lichens recorded from western Crete

The following list documents the species found. An asterisk (*) indicates a species new for Crete. It is difficult in many cases to assess whether a species is known from Greece as there is no recent checklist of Greek lichens (see also SIPMAN & RAUS 2002). However, where it is apparent that a taxon has not been previously reported for Greece, this is indicated by a double asterisk (**). The numbers in parentheses refer to collecting localities (see Table 1); collection numbers are those of the first author unless otherwise indicated; ‘sub’ indicates that a specimen is filed under the given name in the herbarium.

***Acarospora** sp. 1 – Parasitic on *Diploschistes diacapsis* in moist, open phrygana, 800 m. (25): 13542, 13543, 13761.

This species belongs to the subgenus *Xanthothallia* H. Magn., the members of which are characterized by the presence of rhizocarpic acid in the cortex. *A.* sp. 1 possesses rhizocarpic acid in both the cortex and medulla and an unknown xanthone in the medulla. The only other species in the genus known to have rhizocarpic acid also in the medulla is *Acarospora chrysocardia* Poelt & Steiner, but that species has larger ascospores (POELT & STEINER 1971) and, significantly, lacks xanthones (LEUCKERT & BUSCHARDT 1978). A detailed description of the new species is in preparation (Spribille, ined.).

Acrocordia gemmata (Ach.) A.Massal. – On *Castanea sativa* and *Quercus macrolepis* bark, 330–500 m. (16): 13392 (sub *Physconia distorta*); (19): 13451.

Agonimia opuntiella (Buschardt & Poelt) Vězda – On bark of *Quercus macrolepis*, 370 m. (19): 13443 (ver. C. Roux).

Anaptychia ciliaris (L.) Körb. – A montane species found between 750–1300 m. Epiphytic on branches of *Acer sempervirens*, *Cupressus sempervirens*, *Pinus brutia*, *Pyrus spinosa*, *Quercus coccifera*, *Zelkova abelicea*. (4): 12853; (8): 13023, 13029; (9): 13070; (10): 13187, 13201, 13206; (14): 13311, 13374; (29): 13629, 13636, 13649, 13665; (33): Schultz 09426.

***Anema decipiens** (A.Massal.) Forssell – On steep limestone boulders and overhangs close to sea level. (34): Schultz 09465d, 09468b (with *Thyrea confusa*, *Thelochroa montinii* and *Lichinella iodopulchra* s.l.).

Squamules are usually greyish pruinose. Fairly widespread in southern Europe.

Arthonia** aff. ***calcicola Nyl. – On vertical limestone canyon walls and on exposed limestone boulders, 0–700 m. (6): 12970 (sub *Caloplaca xantholyta*); (17): 13408; (34): Schultz 09453a.

Spribille 12970 and 13408 are remarkable in possessing a very short hymenium 40–55 µm tall, much shorter than described for *Arthonia calcicola*. The material otherwise broadly agrees with *A. calcicola* in possessing protococcoid algae in an immersed thallus and a bluish-green epithecium.

Arthopyrenia punctiformis A.Massal. – On *Ceratonia siliqua* bark at sea level. (26): 13591.

Aspicilia caesiocinerea (Nyl. ex Malbr.) Arnold – On rock in phrygana, 750 m. (5): 12908 (sub *Lobothallia radiosa*).

Aspicilia calcarea (L.) Mudd – On large exposed limestone boulders, c. 1000 m. (33): Schultz 09421.

****Aspicilia cheresina*** (Müll.Arg.) Hue var. ***justii*** (Servít) Clauzade & Cl.Roux – Parasitic on *Aspicilia* cf. *caesiocinerea* on limestone, 1050 m. (8): 13056, 13058. TLC (13058): norstictic, connorstictic, stictic and constictic acids.
Only the var. *microspora* (Arnold) Clauzade & Cl.Roux, which contains only norstictic acid, was previously reported from Crete (GRUBE et al. 2001).

Aspicilia coronata (A.Massal.) de Lesd. – On large exposed limestone boulders. (34): Schultz 09417b (with *Verrucaria marmorea*, *Bagliettoa parmigera*).
Thallus ± entirely endolithic, apothecia whitish or blackish, colour and reaction of the epihymenium separate the species from similar species of *Hymenelia* or *Ionaspis*.

Aspicilia cupreoglauca de Lesd. – On siliceous rock of shepherd's hut, 800 m. (25): 13765.

Aspicilia farinosa (Flörke) Arnold – On large exposed limestone boulders, 1000 m. (33): Schultz 09418a (with *Rinodina immersa*).

****Bacidia arceutina*** (Ach.) Arnold – On *Laurus nobilis* bark in humid *Platanus orientalis* ravine; 310 m. (12): 13292 (BG, det. S. Ekman).

****Bacidia circumspecta*** (Vain.) Malme – On *Quercus macrolepis* bark, 370 m. (19): 13465 (BG, det. S. Ekman).

****Bacidia rubella*** (Hoffm.) A.Massal. – On *Quercus pubescens* bark, 700 m. (24): 13527 (BG, ver. S. Ekman).

Bacidia thyrrenica Llop ined. – On *Quercus coccifera* branches, c. 1000 m. (29): 13624 (B), 13633, 13667, 13676 (BG, ver. S. Ekman).
B. thyrrenica includes material traditionally assigned to *B. rosella* (Pers.) De Not. (S. Ekman, pers. comm.).

****Bacidina phacode***s (Körb.) Vězda – On bark of *Phillyrea latifolia* and *Platanus orientalis*, 220–330 m. (11): 13274; (13): 13298, 13304 (both BG, ver. S. Ekman).

Bagliettoa parmigera (J.Steiner) Vězda & Poelt – On large exposed limestone boulders, c. 1000 m. (33): Schultz 09417c (with *Verrucaria marmorea*, *Aspicilia coronata*).

****Biatoridium monasteriense*** Körb. – On bark of *Quercus macrolepis*, 370 m. (19): 13450.

Bilimbia lobulata (Sommerf.) Hafellner & Coppins – On calcareous soil over rock, 1050 m. (8): 13065.

*****Botryolepraria lesdainii*** (Hue) Canals et al. – On deeply shaded limestone rock faces, cave entrances, and bare mineral soil below *Cupressus* in deep shade, 300–700 m. (6): 12988; (15): 13384; (28): 13618 (all specimens BG, ver. T. Tønsberg). TLC: lesdainin (major), two unidentified terpenoids (trace).

*****Buellia chloroleuca*** Körb. – On wood of *Cupressus sempervirens* snag, c. 1400 m. (10): 13224. TLC: xanthone.
Previously known in the Mediterranean from Spain and Italy (GIRALT et al. 2000), otherwise central Europe and Scandinavia. New to the eastern Mediterranean.

****Buellia griseovirens*** (Turner & Borrer ex Sm.) Almb. – On *Pinus brutia* bark, 1000–1400 m. (10): 13194; (14): 13305 (sub *Pertusaria pertusa*), 13338. TLC: atranorin, norstictic acid.

Buellia subdisciformis (Leight.) Vain. – On exposed calciferous sandstone boulders near sea level. (34): Schultz 09404b (with *Lecanora prominens*, *Caloplaca erythrocarpa*).

****Calicium glaucellum*** Ach. – On dead wood of *Castanea sativa*, E of Koutsamatados, 280–400 m, 35°24'14.0"N/23°41'13.9"E, 12.06.2005, leg. S. Abrahamczyk s.n. (GOET, det. T. Spribille).

Calicium salicinum Pers. – On snag in moist ravine, c. 900 m. (29): 13732.

****Caloplaca aquensis*** Houmeau & Cl.Roux – On calcareous conglomerate and exposed limestone near sea level on the southern coast of Crete. (32): 13757 (det. C. Roux); (34): Schultz 09456.

Caloplaca aurantia (Pers.) Hellb. – On calcareous rock; sea level to about 700 m. (6): 12973, 12984; (7): 13002, 13003; (17): 13406, 13418; (31): 13755; (34): Schultz 09450b (with *Verrucaria nigrescens*).

Caloplaca biatorina (A.Massal.) J.Steiner – On exposed limestone boulders, c. 1000 m. (33): Schultz 09405.

Caloplaca cerina (Hedw.) Th.Fr. – On phrygana shrubs and trunks and branches of *Acer sempervirens*, *Ceratonia siliqua*, *Pyrus spinosa*, *Quercus coccifera* and planted *Pinus halepensis*, near sea level to c. 1700 m. (1): 12831; (2): 12833; (7): S.R. Gradstein s.n. (GOET); (10): 13124, 13127, 13128, 13203; (26): 13593; (29): 13678, 13724.; (33): Schultz 09422, 09449.

Caloplaca chalybaea (Fr.) Müll.Arg. – On large exposed limestone boulders, c. 1000 m. (33): Schultz 09420.

Caloplaca citrina (Hoffm.) Th.Fr. – On highly enriched bird rock in front of goat stable also used as a pigeon roost, c. 200 m. (18): 13441.

Caloplaca crenularia (With.) J.R.Laundon s.l. – On siliceous rocks, 220–900 m. (5): 12907; (11): 13245; (24): 13537; (25): 13559.

****Caloplaca crenulatella*** (Nyl.) H.Olivier – On concrete retaining wall in shade, 350 m. (22): 13490.

Caloplaca erythrocarpa (Pers.) Zwackh – On siliceous rocks in montane phrygana, 800–1000 m. (25): 13557, 13569, 13758, 13766; (33): Schultz 09403, 09404c (with *Lecanora prominens*, *Buellia subdisciformis*).

Caloplaca flavescens (Huds.) J.R.Laundon – Mainly on limestone rock walls, c. 500–1000 m. (6): 12976; (8): 13034 (sub *Lobothallia radiosa*), 13054; (28): 13599.

Caloplaca flavorubescens (Huds.) J.R.Laundon subsp. ***flavorubescens*** – On twigs of *Quercus coccifera* and *Rhamnus lycioides* subsp. *oleoides*, 1000 m. (29): 13695, 13727.

Caloplaca haematites (St.-Amans) Zwackh – On trunks and branches of *Acer sempervirens*, *Cupressus sempervirens*, *Juglans regia*, *Olea europaea* and *Pyrus spinosa*, sea level to c. 1700 m. (7): V. Wagner s. n. (GOET); (8): 13028; (10): 13141, 13216, 13219; (14): 13368; (23): 13502, 13503; (29): 13725.
Cretan material has smaller ascospores than described for *C. haematites* but is clearly distinguishable from *C. cerina* on account of the disc colour and well-developed grey thallus.

Caloplaca herbidella (Hue) H.Magn. – On bark of *Castanea sativa*, *Cupressus sempervirens* and *Pinus brutia*, 500–900 m. (14): 13327, 13360, 13370; (16): 13400; N of Agia Irini, 35°20'45.9"N/ 23°49'27.8"E, 800 m, 08.06.2005, leg. S. Abrahamczyk s. n. (GOET).
A montane species, on Crete perhaps limited to the Levka Ori; previously known only from Omalos (GRUBE et al. 2001).

Caloplaca inconnexa (Nyl.) Zahlbr. – Mainly on *Aspicilia* species over siliceous rock and persisting in part on lichen-free rock, also on *Aspicilia* over limestone, 800 – c. 1500 m. (8): 13050; (10): 13093; (25): 13759.

****Caloplaca marmorata*** (Bagl.) Jatta – On limestone, 1000 m. (8): 13039, 13052, 13061.
Other Greek reports are from Euboea (NAVARRO-ROSINÉS & HLADUN 1996), and several other Aegean islands (SIPMAN & RAUS 1999, 2002, as cf.).

****Caloplaca navasiana*** Nav.-Ros. & Cl.Roux – On calcareous rocks in the littoral zone. (17): 13409 (ver. C. Roux).
Previously known from mainland Greece, Cyprus (LITTERSKI & MAYRHOFER 1998), and the western Mediterranean (NAVARRO-ROSINÉS & ROUX 1995).

****Caloplaca obscurella*** (Körb.) Th.Fr. – On *Quercus macrolepis* trunk, 370 m. (19): 13464 (det. H. Sipman).

****Caloplaca polycarpa*** (A.Massal.) Zahlbr. – Parasitic on *Bagliettoa* on partly shaded calcareous rock, c. 200 m. (7): 13001.

Caloplaca variabilis (Pers.) Müll.Arg. s.l. – Found on three distinctly different substrates: **1)** on siliceous rock, 800–1500 m: (10): 13107; (25): 13554; **2)** on calcareous rock, 500–1050 m: (2): 12841; (8): 13035, 13049; (30): 13739; (34): Schultz 09457b; **3)** on fine twigs of *Quercus coccifera*, 1000 m: (29): 13700 (! H. Sipman).

We interpret the species here to include forms that approach *C. circumalbata* (Delile) Wunder. Material from siliceous rock has larger ascospores on average (13–18 × 5.5–8.5 µm) than specimens from calcareous rock (11–14.5 × 5.0–8.5 µm), but the former does not appear to correspond to *C. diphyodes* (Nyl.) Jatta nor to any other taxonomic delineations in WUNDER (1974). The specimen from *Quercus* twigs has ascospores 10.5–12.5 × 4.8–7.0 µm and appears to be the first report of a member of this group as a true epiphyte; the site where it occurred did not appear to be particularly influenced by dust, and in fact included many typical Lobarion species.

Caloplaca xantholyta (Nyl.) Jatta – On limestone rock wall, c. 600 m. (6): 12970.

Candelariella aurella (Hoffm.) Zahlbr. – On bases of phrygana shrubs and on limestone, 500–1050 m. (2): 12837; (8): 13064.

****Candelariella faginea*** Nimis, Poelt & Puntillo – On bark of *Acer sempervirens* and *Berberis cretica*, also on wood of *Cupressus* snag, 1000–1500 m. (8): 13027; (9): 13067; (10): 13129, 13143.

One of the specimens (13067) resembles the closely related *C. xanthostigma* in having small thallus granules c. 0.1 mm diam., but agrees with *C. faginea* in possessing asci with variable ascospore numbers in one and the same apothecium.

*****Candelariella plumbea*** Poelt & Vězda – On siliceous rock, 900 m. (25): 13563, 13565.

Described from Austria (POELT & VĚZDA 1976) and subsequently reported only from the former Yugoslavia and northern Italy.

****Candelariella reflexa*** (Nyl.) Lettau – On *Cupressus sempervirens* bark in shaded gorge, c. 400 m. (6): 12955.

*****Candelariella*** sp. 1 – On bark of *Cupressus sempervirens* branches, c. 1200 m. (10): 13154, 13205.

Ascospores perfectly round, 4–5 µm in diameter, variably 8, 16 or 24 per ascus; apothecia strongly convex, <0.5 mm diam.; thallus consisting of small granules to 0.1 mm diam. This appears to be the first species of *Candelariella* with sphaerical ascospores. We hesitate to describe it until we have seen more specimens, as the material is quite scanty.

Candelariella vitellina (Hoffm.) Müll.Arg. – On siliceous rock, c. 800 m. (25): 13556.

****Catapyrenium psoromoides*** (Borrer) R.Sant. – On bark of *Quercus macrolepis*, 370 m. (19): 13469.

Catillaria chalybeia (Borrer) A.Massal. var. ***chalybeia*** – On siliceous and calcareous rock, wood and *Platanus* bark, 220–1000 m. (5): 12909 (sub *Tephromela atra*); (11): 13245 (sub *Caloplaca crenularia*); (13): 13286-B; (29): 13735.

Catillaria chalybeia var. ***chloropoliza*** (Nyl.) H.Kilias – On siliceous rock of shepherd's hut in open fields, 800 m. (25): 13555, 13558.

Catillaria nigroclavata (Nyl.) Schuler – On *Olea europaea* branches and on fencepost in village, 220–1000 m. (4): 12860 (sub *Lecidella elaeochroma*); (11): 13262; (20): 13480 (sub *Pertusaria leioplaca*); (33): Schultz 09424a, 09432a (with *Lecidella elaeochroma*).

Spribille 13480 is a form in which most apothecia contain asci with 8 ascospores/ascus, but some have 16 ascospores per ascus and the ascospores are 4.8–5.5 × 1.8–2.0 µm. This appears to represent a transition in the polysporous state between *Catillaria nigroclavata* and the recently described *Catillaria praedicta* Tretiach & Hafellner (TRETIACH & HAFELLNER 1998). Interestingly, the specimen appears to be at least facultatively lichenicolous on *Pertusaria leioplaca*.

****Catinaria atropurpurea*** (Schaer.) Vězda & Poelt – On *Cupressus sempervirens* bark, 900 m. (14): 13354.

****Cladonia cervicornis*** (Ach.) Flot. subsp. ***cervicornis*** – On soil beneath shrubs in phrygana; c. 200 m. (18): 13425.

PAPP et al. (1998) reported the similar *C. cervicornis* subsp. *verticillata* from near Chania, but that subspecies has better developed podetia and less dominant squamules.

Cladonia convoluta (Lam.) Anders – On soil in phrygana, c. 100–300 m. (5): 12878; (18): 13426, 13438.

Cladonia foliacea (Huds.) Willd. – On soil in phrygana, c. 100–500 m. (2): 12844; (7): 12991.

Cladonia furcata (Huds.) Schrad. subsp. ***furcata*** – On soil in phrygana, 200–800 m. (18): 13429; (25): 13574, 13583, 13585.

Cladonia furcata subsp. ***subrangiformis*** (Sandst.) Abbayes – On soil in phrygana, 220–800 m. (5): 12880, 12887; (11): 13252; (25): 13584.

****Cladonia humilis*** (With.) J.R.Laundon – On bare soil bank in shade, 700 m: (24): 13540; also on moss on trunk of *Phillyrea latifolia*, 1000 m: (29): 13712. TLC: atranorin, fumarprotocetraric acid.

Cladonia pocillum (Ach.) Grognot – On moss cushions on rock outcrop, sea level to c. 750 m. (5): 12869, 12870; (34): Schultz 09459.

Cladonia pyxidata (L.) Hoffm. – On soil in phrygana and road cuts, and in moss on canyon walls, rarely epiphytic on *Platanus orientalis* and *Quercus macrolepis* in humid localities; 180–800 m. (2): 12845; (5): 12868, 12871, 12877; (11): 13254; (13): 13293; (18): 13430; (23): 13491; (24): 13513; (25): 13581; (30): 13740.

Clauzadea immersa (Weber) Hafellner & Bellem. – On limestone rocks in phrygana and canyon walls, 500–700 m. (5): 12884; (6): 12969.

Clauzadea metzleri (Körb.) D.Hawksw. – On limestone outcrops and rock walls, 90–500 m. (1): 12830 (det. C. Roux); (6): 12963; (7): 13006.

****Collema coccophorum*** Tuck. – On calcareous soil crust, c. 1000 m. (33): Schultz 09416.
A species common worldwide in dry regions.

****Collema conglomeratum*** Hoffm. var. ***conglomeratum*** – On bark of *Quercus*, c. 1000 m. (33): Schultz 09425b, 09438a.
Similar to *Collema ligerinum* in growth form and substrate but well separated by the constantly 2-celled, fusiform ascospores.

Collema crispum (Huds.) Weber ex F.H.Wigg. var. ***crispum*** – On calcareous soil crusts, 90–1000 m. (1): 12827; (33): Schultz 09414.

Collema crispum var. ***metzleri*** (Arnold) Degel. – On soil in phrygana and on lime pebbles, 180–510 m. (18): 13436; (27): 13594. (30): 13737.

Collema cristatum (L.) Weber ex F.H. Wigg. – On soil, pebbles, rock walls and moss over rock, 180–1700 m. (5): 12886; (6): 12974; (7): 13009, (10): 13089. (25): 13575; (30): 13738; (33): Schultz 09413.

Collema flaccidum (Ach.) Ach. – On *Platanus orientalis* bark, 330 m. (13): 13290.

****Collema fragile*** Tayl. – On dry limestone rocks near seashore. (17): 13420.
Otherwise known in Greece from Corfu (DEGELIUS 1954).

Collema furfuraceum (Arnold) Du Rietz – On *Castanea sativa*, *Cupressus sempervirens*, *Quercus ilex* and *Quercus macrolepis*, 370–700 m. (6): 12989; (16): 13402; (19): 13448, 13459 (mixed with *Collema nigrescens*); (24): 13507, 13529 (with *C. nigrescens*); (33): Schultz 09441a, 09445b.
The species is characterized by broad, distinctly ridged and pustulate lobes with cylindrical to coralloid isidia. Apothecia are occasionally formed.

****Collema*** cf. ***latzelii*** Zahlbr. – On limestone rock faces, c. 700 m. (28): 13601, 13614-B.

Collema multipunctatum Degel. – On bark of *Cupressus sempervirens* and *Quercus* spp., 500–800 m. (6): 12954 (sub *Leptogium teretiusculum*); (24): 13512; in *Quercus*-Hain, Bezirk Rethimnon, Kloster Arcadi östlich Karoussi südöstlich Rethimnon, 3.10.1982, T. Feuerer & N. Höhne 12671, det. M. Schultz (HBG).

Collema nigrescens (Huds.) DC. – On bark of *Quercus pubescens*, 370–1000 m. (19): 13459; (24): 13522, 13529; (33): Schultz 09430a (with *Pleurosticta acetabulum*), 09445a.
Although this species is not uncommon, it was apparently overlooked in early studies, and reported as new to Crete only recently by GRUBE et al. (2001) from Arcadi Monastery.

****Collema subflaccidum*** Degel. – On trunk of *Quercus ilex*, c. 1000 m. (33): Schultz 09441c.
The species is separated from *Collema furfuraceum* by the lack of distinct ridges and pustules on

the broadly rounded lobes as well as the presence of very fine granulose isidia. Also known from Cephalonia, Greece (DEGELIUS 1954, as *C. subfurvum*) and Cyprus (LITTERSKI & MAYRHOFER 1998).

***Collema tenax** (Sw.) Ach. em. Degel. – On soil and sand-filled rock clefts and occasionally spreading onto calcareous rock, at all sampled elevations. (6): 12957; (8): 13040; (10): 13090 (cf.); (17): 13420; (21): 13485; (25): 13573; (28): 13611; (33): Schultz 09411; (34): Schultz 09407, 09467.

Collema undulatum Flot. – On limestone, 1500–1800 m; (10): 13098; Kalk, Bezirk Heraklion, Ida-Gebirge, am Aufstieg von der Analipsis-Kapelle zum Koussakas, 1800 m, 24.9.1982, T. Feuerer & N. Höhne 12603, det. M. Schultz (HBG).
Known from Italy, Romania and Syria (DEGELIUS 1954) and the report by KLEINIG (1966) from the island of Dia.

Degelia plumbea (Lightf.) P.M.Jørg. & P.James – Epiphytic on trunks of *Castanea sativa*, *Phillyrea latifolia* and *Quercus coccifera*, 500–1000 m; (16): 13387; (29): 13659, 13660, 13716; N of Agia Irini, 35°20'45.9"N/23°49'27.8"E, 800 m, 08.06.2005, leg. S. Abrahamczyk s.n. (GOET).
Both the 'Mediterranean' and typical forms of the species are present in our material (P.M. Jørgensen, pers. comm.). *Degelia plumbea* always occurs in the Cretan equivalent of 'Lobarion' communities, typically associated with *Bacidia* spp., *Fuscopannaria olivacea*, *Nephroma laevigatum* and *Physconia distorta* but usually lacking *Lobaria* species.

Dermatocarpon miniatum (L.) W.Mann – On vernally seepy rock, 1050–1500 m. (8): 13044, 13059; (10): 13087, 13096.

Diploschistes diacapsis (Ach.) Lumbsch – On soil in phrygana, sea level to c. 800 m. (6): 12959; (7): 12993; (18): 13424; (25): 13579, 13580; (34): Schultz 09460.

Diploschistes muscorum (Scop.) R.Sant. – On soil and plant detritus in phrygana, 750 m. (5): 12879.

Diploschistes ocellatus (Vill.) Norman – Over calcareous walls of ruins, 180 m. (30): 13747.

Diplotomma alboatrum (Hoffm.) Flot. – On bases of phrygana shrubs and bark of *Acer sempervirens*, c. 500 m. (2): 12839; (6): 12930.

Diplotomma chlorophaeum (Hepp ex Leight.) Szatala – On siliceous rock, 900 m. (25): 13559 (sub *Caloplaca crenularia*), also 13765, as cf. (sub *Aspicilia cupreoglauca*).

Diplotomma epipolium (Ach.) Arnold – On siliceous rock of shepherd's hut, c. 800 m. (25): 13562.

Dirina massiliensis Durieu & Mont. f. ***massiliensis*** – On N-facing limestone cliff close to sea, c. 100 m. (7): 13016.

Endocarpon adsurgens Vain. – On moss over vernally moist limestone rock outcrop, 1050 m. (8): 13060. The squamules are appressed, not ascending, suggesting *E. pusillum*, but the ascospores are colourless and relatively small (25–32 × 12–13 µm).

Evernia prunastri (L.) Ach. – On trunks of *Pinus brutia* and branches of *Quercus coccifera*, 900–1000 m. (14): 13329; (29): 13655, 13662.

Fulgensia fulgida (Nyl.) Szatala – Terricolous in phrygana and on soil in archaeological excavation, 180–200 m. (18): 13423; (30): 13741.

Fulgensia schistidii (Anzi) Poelt – On *Schistidium* over rock, 1500 m. (10): 13099.

Fulgensia subbracteata (Nyl.) Poelt – On calcareous soil crust, c. 1000 m. (33): Schultz 09410; (34): Schultz 09458.

****Fuscopannaria*** aff. ***atlantica*** P.M.Jørg. – On bark of *Platanus orientalis* trunks, 310 m. (12): 13282 (det. P. M. Jørgensen).
This recently described species (JØRGENSEN 2005) is otherwise known only from western Europe, east to Italy. Fertile material is needed to be sure of the identification.

Fuscopannaria mediterranea (Tav.) P.M.Jørg. – On bark of *Platanus orientalis* and *Quercus pubescens*, 330–560 m. (12): 13281; (23): 13496 (B, BG).

Fuscopannaria olivacea (P.M.Jørg.) P.M.Jørg. – On trunks of *Castanea sativa*, *Cupressus sempervirens*,

Phillyrea latifolia, *Platanus orientalis*, *Quercus coccifera*, *Q. macrolepis* and *Q. pubescens*, 330–1000 m. The most common epiphytic *Fuscopannaria* on Crete. (13): 13284; (14): 13349, 13350, 13356; (16): 13386; (19): 13442, 13444, 13445; (23): 13495; (24): 13519; (29): 13644, 13658, 13714 (BG), 13715; (33): Schultz 09423.

There appears to be some variability in the degree of pointedness of the perispore, with some individuals from locality (29) exhibiting at times more or less pointed perispores while others are neatly rounded.

***Heppia solorinoides** (Nyl.) Nyl. – On calcareous soil crusts, c. 1000 m. (33): Schultz 09409.

Easily recognized by the whitish squamules with deeply cracked surface.

***Hyperphyscia adglutinata** (Flörke) H.Mayrhofer & Poelt – On bark of *Olea europaea* trunk, 220 m. (11): 13260.

***Lecania cyrtellina** (Nyl.) Sandst. – On knot in bark of *Cupressus sempervirens*, c. 1400 m. (10): 13221.

***Lecania erysibe** (Ach.) Mudd – On calcareous rock, 400 m. (21): 13486.

***Lecania naegelii** (Hepp) Diederich & P.Boom – On *Quercus coccifera* branch, 1000 m. (29): 13688.

***Lecania spadicea** (Flot.) Zahlbr. – On limestone rocks at or near sea level, locally abundant. (17): 13412; (34): Schultz 09452.

***Lecania sylvestris** (Arnold) Arnold – On limestone rock, c. 500 m. (6): 12967 (sub *Solenopsora olivacea*).

***Lecanora albescens** (Hoffm.) Branth & Rostrup – On siliceous rock, 750–1400 m. (5): 12896 (sub *Verrucaria nigrescens*); (10): 13077, 13079 (sub *Lecidella anomaloides*).

Lecanora campestris** (Schaer.) Hue var. ***campestris – On siliceous rock under dense macchia, 220 m. (11): 13244 (det. C. Roux).

***Lecanora carpinea** (L.) Vain. – On *Acer sempervirens* and *Pyrus spinosa*, 1000–1500 m. (10): 13134, 13135; (29): 13719 (sub *L. chlarotera*).

***Lecanora chlarotera** Nyl. – On trunks and branches of trees and shrubs, the most common epiphytic *Lecanora* species on Crete, sea level to 1700 m. (2): 12836; (4): 12848; (5): 12919, 12929, 12943, 12938, 12952; (9): 13068; (10): 13130, 13136, 13145, 13146, 13197, 13213; (11): 13256; (14): 13313, 13320, 13339, 13364, 13376; (19): 13467; (20): 13484; (23): 13500; (24): 13530, 13531; (26): 13590; (29): 13690, 13719; (33): Schultz 09429.

***Lecanora** cf. ***crenulata** Hook. – On limestone rocks in phrygana, 750 m. (5): 12890.

Our material has ascospores 8.2–10.0 × 3.8–6.5 µm, agreeing with the dimensions provided by HAWKSWORTH & DALBY (1992) but these dimensions are clearly smaller than those provided by CLAUZADE & ROUX (1985).

***Lecanora dispersa** (Pers.) Sommerf. – On exposed limestone, 750–1050 m. (5): 12889; (8): 13063 (sub *Verrucaria nigrescens*).

***Lecanora** aff. ***hypoptoides** (Nyl.) Nyl. – On bare wood of fence post, c. 900 m. (4): 12859 (sub *Lecanora saligna*).

Characterized by lead gray to brownish-tinged apothecia 0.1–0.3 mm diam. with retreating margin, epihymenium with bluish green, K– or K+ intensifying, HNO_3+ mauve pigment, simple, narrowly ellipsoid ascospores, and *Lecanora*-type ascus. Our material has small ascospores 7.0–7.8 × 2.0–3.0 µm.

***Lecanora leuckertiana** Zedda – On limestone rock faces, c. 500–800 m. (6): 12964, 12965, 12985; c. 1 km S Imbros an der Straße nach Hora Sfakion, O-exponierte Kalkschrofen über dem Eingang zur Imbros Schlucht, c. 800 m; 35°15'N/24°10'E, 13.05.1997, H. Mayrhofer 13939 & R. Ertl (GZU, det. L. Zedda). TLC (12964, 12965, 12985): usnic and isousnic acid, zeorin.

Known in Greece from the Aegean islands of Paros (ZEDDA 2000), Kalimnos and Kos (SIPMAN & RAUS 2002), and Ikaria (SIPMAN et al. 2005) and probably widespread.

***Lecanora muralis** (Schreb.) Rabenh. s.l. – On siliceous rocks, 1400 m. (10): 13144. TLC: usnic acid, zeorin.

Members of this species complex are more common on Crete than indicated here and were not systematically sampled in this survey.

Lecanora polytropa (Hoffm.) Rabenh. – In crevices of limestone rock wall, 1700 m. (10): 13092.
The specimen does not appear to differ morphologically from typical *L. polytropa*, which is otherwise considered a strict acidophile.

****Lecanora prominens*** Clauzade & Vězda – On exposed calcareous sandstone near sea level. (34): Schultz 09404a.

Lecanora pruinosa Chaub. – On exposed limestone, sea level to 1000 m. (6): 12970 (sub *Caloplaca xantholyta*); (8): 13036; (34): Schultz 09454 (sub *Solenopsora olivacea*). TLC (13036): xanthones.

Lecanora rugosella Zahlbr. – On trunks of *Acer sempervirens* and *Platanus orientalis*, 330–1000 m. (13): 13297; (29): 13623.

Lecanora rupicola (L.) Zahlbr. subsp. ***sulphurata*** (Ach.) Leuckert & Poelt – On siliceous rock, 800 m. (25): 13549, 13772.

****Lecanora saligna*** (Schrad.) Zahlbr. – On wood of *Cupressus* snag and village fencepost, 900–1400 m. (4): 12857, 12859; (10): 13232. TLC (12859): isousnic acid.

****Lecanora symmicta*** s.l. – Three chemical races were found: **1)** with usnic acid and zeorin: On bark of *Olea europaea*, on phyllite rock faces, also on limestone, 110–1050 m. (8): 13041; (11): 13266; (20): 13481, 13483; Deres, 35°27'50"N/23°50'09"E, 117 m, 17.06.2005, leg. S. Abrahamczyk s. n. (GOET); **2)** with usnic acid only: On moss over rock and over bark of *Quercus ilex* and directly on bark of *Q. macrolepis*, 370 – c. 500 m. (6): 12918, 12941; (19): 13471-B; and **3)** with usnic acid and unidentified xanthone in Rf class 7 [A, B, C]: on bark of *Pinus brutia*, 900 m. (14): 13308.
We found only the leprose, sterile form. SIPMAN & RAUS (2002) refer material with usnic acid and zeorin to *L. expallens*, but that species contains thiophanic acid as a major constituent (TØNSBERG 1992). Pending a revision of this group, we prefer to refer the collections to *L. symmicta*, which contains usnic acid and zeorin (ZEDDA 2000).

Lecidella anomaloides (A.Massal.) Hertel & H.Kilias – On siliceous rock, c. 1300 m: (10): 13079; calcareous rock, 1050 m: (8): 13057, 13058.
This species is normally associated with siliceous rock, but the material seems typical.

Lecidella carpathica Körb. – On siliceous rock, c. 1500 m. (10): 13073.

Lecidella elaeochroma (Ach.) M.Choisy – One of the most common epiphytic lichen species on Crete, on nearly all tree species, also on bare wood, 330–1700 m. (4): 12850, 12855; (5): 12864; (6): 12928, 12944, 12950; (8): 13142; (10): 13117, 13120, 13207, 13218, 13223; (13): 13296; (14): 13316, 13362; (16): 13397; (19): 13473; (29): 13626, 13681, 13687; (33): Schultz 09431, 09432b.
Material from *Acer sempervirens* at high elevations (13117, 13120) may conform to the var. *flavicans* (Ach.) Hertel. The chemical variation in this species on Crete would be worth detailed study.

Lecidella euphorea (Flörke) Hertel – On *Platanus orientalis* bark and *Cupressus sempervirens* wood, 220–1400 m. (10): 13195; (11): 13257.

****Lempholemma*** sp. 1 – On *Platanus orientalis* bark in moist ravines, c. 300–330 m. (12): 13279, 13286.
The material is richly fertile but cannot be assigned to any presently accepted European species; the epiphytic habitat is also unusual.

****Lepraria lobificans*** Nyl. – On shaded vertical rock faces in humid *Platanus orientalis* ravine, 220 m. (11): 13267, 13271 (both BG). TLC: atranorin, stictic acid and satellites, zeorin, unidentified cf. anthraquinones.

Lepraria nivalis J.R.Laundon – On moss over siliceous and calcareous rock faces and on branch of *Phillyrea latifolia*, 220 – c. 700 m. (6): 12966 (BG); (11): 13264 (BG), 13273. TLC: atranorin, protocetraric acid (major).

Leprocaulon microscopicum (Vill.) Gams – On siliceous rock, trunks of *Castanea sativa*, 220–800 m. (11): 13247; (16): 13398 (BG); N of Agia Irini, 35°20'45.9"N/23°49'27.8"E, 08.06.2005, leg. S. Abrahamczyk s.n. (GOET). TLC (13247): usnic acid, zeorin.

Leptogium biatorinum (Nyl.) Leight. – On limestone rock walls, c. 700 m; (6): 12977.

Leptogium gelatinosum (With.) J.R.Laundon – In moss cushions over canyon walls and cliffs, and epiphytic in moss mats on branches of *Phillyrea latifolia* and *Quercus coccifera*, 220–1500 m. (10): 13080, 13081, 13238; (11): 13269; (28): 13606; (29): 13698, 13706.

****Leptogium palmatum*** (Huds.) Mont. [syn. *L. corniculatum* (Hoffm.) Minks, see JØRGENSEN & NASH 2004] – Terricolous in phrygana and in moss cushions on canyon walls, c. 700–900 m. (25): 13774; (28): 13605.

Leptogium schraderi (Bernh.) Nyl. – On calcareous soil crust among mosses near sea level. (34): Schultz 09464.

Leptogium subtile (Schrad.) Torss. – On *Olea europaea* bark, 410 m. (20): 13482.

****Leptogium tenuissimum*** (Dicks.) Körb. – On soil and in crevices, 700–900 m. (25): 13570; (28): 13613; on trunk of *Quercus ilex*, (33): Schultz 09443b, 09444.

****Leptogium teretiusculum*** (Wallr.) Arnold – Epiphytic on *Cupressus sempervirens* and *Quercus macrolepis*, also saxicolous once on siliceous rock in dense macchia; 220–700 m. (6): 12954; (11): 13246; (19): 13462. (24): 13507 (sub *Collema furfuraceum*).

Lethariella intricata (Moris) Krog – On bark and wood of *Cupressus sempervirens*, c. 1400 m. (10): 13198, 13200, 13209, 13229.
This conspicuous species is known on Crete only from the greater vicinity of the mountain Gingilos, above the Samaria Gorge south of the Omalos Plateau. The nearest known localities are apparently in northern Greece (Spribille, unpubl.).

****Lichinella iodopulchra*** (Croz.) P.Moreno & Egea s.l. – On steep limestone boulders and overhangs near sea level. (34): Schultz 09401, 09468a (with *Anema decipiens*).
Thallus often greyish pruinose, squamulose-lobate to lobate, lobes usually with revolute margin, fruiting bodies hidden in swollen lobe margin.

****Lichinella sinaica*** (Galun & Marton) P.Moreno & Egea – On steep limestone boulder near sea level. (34): Schultz 09406.
Smaller than previous species, squamules predominantly erect, peltate, ± cylindrical to flattened, fruiting bodies hidden in tips of the squamules, usually epruinose. Described from Sinai Peninsula and later reported from southeastern Spain, Yemen and the U.S.A.

****Lobaria amplissima*** (Scop.) Forssell – On branches of *Acer sempervirens* and *Quercus coccifera*, 1000 m. (29): 13620, 13639 (B, CONN).
The extremely reduced, completely dendriscocauloid specimens conform to the traditional concept of the morphospecies referred to as *Dendriscocaulon umhausense* (Auersw.) Degel. However, molecular analysis of 13639 within the context of a wider revision of this group (B. Goffinet, Storrs, Connecticut, unpubl. data, 2004) confirms that this taxon agrees with the dendriscocauloid, blue-green phototype of *L. amplissima*. Green foliose phototype *L. amplissima* is known in Greece from the Aegean island of Ikaria (SIPMAN et al. 2005) and mainland localities in Epirus, NW Greece (Spribille, unpubl.). Reports of *Dendriscocaulon umhausense* from elsewhere in the Mediterranean should also be revisited as to whether they may also represent only the purely dendriscocauloid form of *L. amplissima*.

****Lobaria scrobiculata*** (Scop.) DC. – On *Quercus coccifera* branch in thick mats of the moss *Leucodon sciuroides*, 1000 m. (29): 13631.

Lobothallia radiosa (Hoffm.) Hafellner – On exposed limestone and siliceous rock, c. 750–1500 m. Three chemical races were found: **1)** lacking lichen substances (on siliceous rock and limestone, [10]: 13084, 13102); **2)** with norstictic acid and unknown substance (on limestone, [8]: 13034); and **3)** with stictic and norstictic acid, satellites and unknown substance (on limestone, [5]: 12908).

Megaspora verrucosa (Ach.) Hafellner & V.Wirth – On *Cupressus sempervirens* bark and moss over bark, 1000–1400 m. (10): 13212, 13214; (33): Schultz 09433.

Melanelia exasperata (De Not.) Essl. – On branches of *Acer sempervirens*, *Pyrus spinosa*, *Quercus coccifera* in montane localities, 1000–1400 m. (8): 13025; (10): 13111, 13186; (29): 13641, 13674, 13689, 13721.

Melanelia glabra (Schaer.) Essl. – On trunk of *Quercus ilex*, c. 1000 m. (33): Schultz 09448.

Micarea bauschiana (Körb.) V.Wirth & Vězda – On shaded, crumbling phyllite rock outcrop along brook, 220 m. (11): 13263 (det. B. J. Coppins).

Micarea micrococca (Körb.) Gams ex Coppins – On bark of *Castanea sativa*, 500 m. (16): 13390 (sub *Placynthiella icmalea*; det. B. J. Coppins).

Micarea misella (Nyl.) Hedl. – On stalks of shrubs in dry phrygana, 250 m. (18): 13427 (det. B.J. Coppins).

Mycobilimbia lurida (Ach.) Hafellner & Türk – On soil in siliceous rock crevices, 900–1500 m. (10): 13085; (25): 13586.

Mycocalicium subtile (Pers.) Szatala – On dead *Castanea* wood, E of Koutsamatados, 280–400 m, 35°24'14.0"N/23°41'13.9"E, 12.06.2005, leg. S. Abrahamczyk s.n. (GOET, det. T. Spribille).

Neofuscelia attica (Leuckert et al.) Essl. – On siliceous rock of small shepherd's hut and in open, moist phrygana; 900 m. (25): 13567, 13775. TLC: norstictic acid (major), cf. alectoronic acid (minor), connorstictic acid (minor) and unidentified fatty acid (minor).

Nephroma laevigatum Ach. – On trunks of *Castanea sativa* and *Phillyrea latifolia*, 500–1000 m. (16): 13385; (29): 13707; N of Agia Irini, 35°20'45.9"N/23°49'27.8"E, 800 m, 08.06.2005, leg. S. Abrahamczyk s.n. (GOET).
KLEINIG (1966) also reports this species from the Omalos Plateau and Levka Ori above Thymia. It appears to be infrequent at montane elevations.

Ochrolechia balcanica Verseghy – Epiphytic on bark of *Acer sempervirens*, *Castanea sativa*, *Cupressus sempervirens*, *Pyrus spinosa* and *Quercus coccifera*, also on lignum of *Cupressus* snag; 500–1500 m. (6): 12926; (10): 13119, 13138, 13234; (14): 13359, 13375; (16): 13393; (29): 13627, 13632, 13684; (33): Schultz 09428, 09437.

Ochrolechia dalmatica (Erichs.) Boqueras (syn. *Pertusaria dalmatica* Erichs.) – On bark of *Acer sempervirens*, *Castanea sativa*, *Pinus brutia* and *Quercus pubescens*; 500–1100 m. (14): 13325; (16): 13391; (24): 13521; (29): 13628. TLC (all specimens): gyrophoric acid (major), ± atranorin (minor, possibly a contaminant), ± low–running xanthones (minor).
Characterized by a thick, continuous verrucose thallus with a prominently zoned silvery white prothallus, C– cortex and medulla and defined to confluent, ± flat soralia with C+ pink-red soredia.

Ochrolechia pallescens (L.) A.Massal. – On bark at base of *Pinus brutia*, 900 m. (14): 13310. TLC (thallus and apothecium): gyrophoric acid (major), atranorin (minor), xanthone (minor).

Opegrapha atra Pers. – On bark of *Platanus orientalis* in shaded, humid stream bottoms, 220–300 m. (11): 13258; Aïr Kirgianis, 35°25'43.9"N/23°40'45.3"E, 300 m, 18.05.2005, leg. S. Abrahamczyk & E. Bergmeier s.n. (GOET).

Opegrapha ochrocincta Werner – On *Platanus orientalis* bark, 220 m. (11): 13285 (ver. C. Roux).

Opegrapha rupestris Pers. – On vertical limestone rock face in shaded gorge, c. 500 m. (6): 12983.
In addition to the typical form, we found a form with strongly clustered lirellae similar to *O. conferta* Anzi but with slightly narrower ascospores: on concrete pavement, 100 m, (31): 13755 (sub *Caloplaca aurantia*).

Opegrapha varia Pers. – On woody stalks of old *Hedera helix* and on *Quercus macrolepis* and *Q. pubescens* trunks, 370–700 m. (6): 12917; (19): 13453; (24): 13523.

Parmelia saxatilis (L.) Ach. – On bark of *Pinus brutia* and *Cupressus sempervirens* and on wood of *C. sempervirens* snags and scars, 900–1100 m. (10): 13190, 13211, 13227; (14): 13326.

Parmelina pastillifera (Harm.) Hale – On bark of *Acer sempervirens*, *Pyrus spinosa* and *Zelkova abelicea*, c. 500–1500 m. (6): 12935; (8): 13031; (9): 13071; (10): 13109, 13125; (14): 13328 (sub *Parmelina tiliacea*); (29): 13717.

Parmelina tiliacea (Hoffm.) Hale – On bark of *Castanea sativa*, *Phillyrea latifolia*, *Pinus brutia*, *Quercus coccifera* and *Q. macrolepis*, 370–1000 m. (14): 13328; (16): 13405; (19): 13466; (24): 13509; (29): 13685, 13710; (33): Schultz 09446.

This species appears to occupy more humid habitats on average than *P. pastillifera*, often in areas with 'Lobarion' communities.

Peccania cerebriformis Henssen & Büdel – On limestone rock walls, c. 700 m. (28): 13614-B.
A distinct species with peltate, brain-like folded lobules or squamules. Described from Lanzarote and later reported from southeastern Spain, Kuwait and Oman. This is the first record from the eastern Mediterranean.

Peccania teretiuscula (Flagey) Henssen – On calcareous rock near seashore and in phrygana, 0–750 m. (5): 12894; (7): 13011; (17): 13415.
This species was described from Algeria by FLAGEY (1895) and until now had been reported only from the type collection. Further recent collections of this species along with a detailed description will be provided in a separate publication (SCHULTZ & VAN DEN BOOM 2006). New to Europe.

Peltigera canina (L.) Willd. – On soil in phrygana and over a terrace retaining wall, 750 m. (5): 12873, 12902.

Peltigera polydactylon (Neck.) Hoffm. – Terricolous in calcareous phrygana and over phyllite rock ledges in forest, once epiphytic on tree bases and lower tree trunks of *Quercus pubescens*, 750–800 m. (5): 12872; (24): 13505, 13535.

Pertusaria albescens (Huds.) M.Choisy & Werner – Montane, on bark of *Acer sempervirens*, *Cupressus sempervirens*, *Phillyrea latifolia*, *Pinus brutia*, *Quercus coccifera* and *Q. pubescens*, also on wood of *Cupressus* snag, 700–1700 m. (10): 13208, 13215; (14): 13306, 13343, 13365; (24): 13528; (29): 13622, 13646, 13679, 13709; (33): Schultz 09435. TLC: fatty acids.
In addition, we have seen several soft-isidiate specimens conforming to *Pertusaria jurana* Erichs., considered by some to be a synonym of *P. albescens*: (6): 12934; (10): 13231; (14): 13347, 13366. TLC: fatty acids.

Pertusaria coccodes (Ach.) Nyl. – On trunk of *Quercus ilex*, c. 1000 m. (33): Schultz 09425a (with *Collema conglomeratum*), 09447.

Pertusaria hymenea (Ach.) Schaer. – On *Castanea sativa*, *Quercus coccifera*, *Q. ilex*, *Q. macrolepis* and *Q. pubescens*, 370–1000 m. (6): 12945; (16): 13395; (19): 13447, 13460; (23): 13499; (24): 13516; (29): 13640.

Pertusaria leioplaca DC. (syn. *P. leucostoma* A.Massal.) – On *Olea europaea* bark, 410 m. (20): 13480.

Pertusaria pertusa auct. – On bark of *Acer sempervirens*, *Cupressus sempervirens*, *Olea europaea*, *Pinus brutia* and *Quercus coccifera*, 500–1300 m. (6): 12936; (10): 13228; (14): 13305, 13318, 13324, 13367; (23): 13493; (29): 13673.

***Pertusaria** sp. 1 – On *Cupressus sempervirens* bark, c. 1400 m. (10): 13204, 13205 (sub *Candelariella* sp. 1). TLC: no lichen substances.
The specimen appears to agree with a possibly undescribed taxon outlined by SIPMAN & RAUS (2002) that in the past may have been confused with *Pertusaria rhodiensis* Erichs. The first author had the opportunity to study the type of *Pertusaria rhodiensis* at W. The specimen consists of a small patch of *Pertusaria* on a piece of branch, with the thallus apparently transitioning on one side into a *Lecanora*. A small fragment was removed from the middle of the *Pertusaria* thallus for investigation of secondary metabolites, including two apothecia that were also sectioned and studied. TLC yielded norstictic acid, thus in agreement with the original diagnosis of ERICHSEN (1938) of the thallus as being K+ yellow turning red and Pd+. In a detailed study of *Pertusaria* chemotypes, HANKO (1983) was unable to detect lichen substances in a specimen labelled as *P. rhodiensis* at HBG and presumed to be an isotype, and accordingly concluded that *P. rhodiensis* lacked lichen substances. Another sample lacking secondary constituents and producing no positive spot tests is known from Italy (Monte Pollino, leg. Poelt, GZU) and was also studied by HANKO (1983) and subsequently also by SIPMAN & RAUS (2002), though it was not seen in the present study. Our samples have in common with the Monte Pollino specimen (as described by SIPMAN & RAUS 2002) the presence of only 1 ascospore per ascus (2/ascus in the type of *P. rhodiensis*!) and the lack of lichen substances; in addition, our specimens have a K+ purplish epithe-

cium and ascospore wall. We agree with SIPMAN & RAUS (2002) that this may represent an undescribed taxon that superficially closely resembles *P. rhodiensis*. To avoid any future confusion, we hereby designate the W specimen (Rhodos, M. Attairo, 1100 m, auf *Phillyrea*, Mai 1933, K.H. Rechinger, W) as lectotype of *Pertusaria rhodiensis* Erichs., Revue de Mycologie 3: 103 (1938).

***Phaeophyscia nigricans** (Flörke) Moberg – On *Quercus macrolepis*, 370 m. (19): S. Abrahamczyk s.n. (GOET); 13470.

***Phaeophyscia orbicularis** (Neck.) Moberg – On *Zelkova abelicea* trunk, 1100 m. (9): 13072.

***Phlyctis argena** (Spreng.) Flot. – On bark of trunks and branches of *Acer sempervirens*, *Cupressus sempervirens*, *Pyrus spinosa*, *Quercus coccifera*, often on the undersides of branches, also on dead wood of *Cupressus* and *Quercus ilex*, 500–1300 m. (6): 12923, 12924, 12953; (10): 13226, 13239; (14): 13307, 13315, 13330, 13355, 13363, 13382; (29): 13638, 13669, 13699, 13705. TLC: norstictic and connorstictic acids.
This apparently overlooked species is perhaps the most common sorediate lichen in montane woodlands of western Crete.

***Physcia adscendens** (Fr.) H.Olivier – Common, on bark of *Acer sempervirens*, *Cupressus sempervirens*, *Olea europaea*, *Quercus coccifera*, *Q. macrolepis*, *Pinus spinosa*, on phrygana shrubs and on rock, near sea level to c. 1700 m. (2): 12832; (7): V. Wagner s.n. (GOET); (10): 13116; (14): 13358, 13377; (19): 13452; (25): 13566; (29): 13651, 13677, 13703.

***Physcia aipolia** (Ehrh. ex Humb.) Hampe – Corticolous on *Acer sempervirens*, *Pyrus spinosa*, *Quercus coccifera* and *Q. pubescens*, 700–1700 m. (5): 12865 (sub *Physcia leptalea*); (10): 13140; (24): 13525; (29): 13642, 13648, 13675; (33): Schultz 09443a (with *Leptogium tenuissimum*).

***Physcia biziana** (A.Massal.) Zahlbr. var. ***leptophylla** Vězda – On bark of *Platanus orientalis*, *Quercus coccifera* trunks and native, montane *Cupressus sempervirens* trunks as well as planted low elevation *C. sempervirens* in a monastery garden, 250–1400 m. (4): 12854; (7): Gradstein s.n. (GOET); (10): 13217; (11): 13255.

***Physcia leptalea** (Ach.) DC. – On twigs and branches of *Acer sempervirens*, *Pyrus spinosa*, *Quercus coccifera* and *Q. pubescens*, 700–1000 m. (4): 12851; (5): 12865; (24): 13518; (29): 13703, 13718.

***Physcia stellaris** (L.) Nyl. – On bark of *Acer sempervirens* trunk, 1000–1700 m. (10): 13123, 13137; (29): 13663.

***Physconia distorta** (With.) J.R.Laundon – Extremely common on *Acer sempervirens*, *Castanea sativa*, *Cupressus sempervirens*, *Pinus brutia*, *Platanus orientalis*, *Pyrus spinosa*, *Quercus coccifera* and *Zelkova abelicea*, 330 – c. 1600 m. (4): 12852; (5): 12866; (6): 12922, 12948; (9): 13069; (10): 13180, 13182; (13): 13294; (14): 13341, 13372; (16): 13392; (29): 13671; (33): Schultz 09427.

***Physconia perisidiosa** (Erichs.) Moberg – On *Quercus macrolepis* trunks, 370 m. (19): 13457, 13463.

***Physconia subpulverulenta** (Szatala) Poelt – On *Castanea sativa*, *Pinus brutia* and *Pyrus spinosa*, 500–1050 m. (14): 13337, 13380; (16): 13399.

***Physconia venusta** (Ach.) Poelt – On *Pinus brutia* and *Quercus coccifera*, 1050 m. (14): 13323, 13346.

***Placidiopsis cinerascens** (Nyl.) Breuss – On pale to reddish bare mineral soil in *Phlomis fruticosa-Sarcopoterium spinosum* and *Phlomis-Euphorbia dendroides* phrygana, c. 200–360 m. (18): 13433; (21): 13487.

***Placidiopsis custnani** (A.Massal.) Körb. – On soil in phrygana, 750 m. (5): 12874; (25): 13577.

****Placidium adami-borosi** Szatala – On soil over rock on cool, north-facing limestone cliffs, 1500 m. (10): 13100.
A rare species in the Mediterranean.

***Placidium imbecillum** (Breuss) Breuss – On terrace retaining wall in open phrygana, 750 m. (5): 12876.

***Placidium pilosellum** (Breuss) Breuss – On compact (hardpan, vernal puddles!), reddish, bare mineral soil on ridgetop in open phrygana, c. 200 m. (18): 13432.

***Placopyrenium trachyticum** (Hazsl.) Breuss – On vernally moist calcareous rock, 1000 m. (8): 13045.

Placynthiella icmalea (Ach.) Coppins & P.James – On *Castanea sativa* bark, 500 m. (16): 13390.

Placynthium nigrum (Huds.) Gray – On limestone rocks and thin soil deposits over walls of ruins, sea level to 1000 m. (8): 13043; (17): 13413, 13414; (30): 13748; (34): Schultz 09461.

****Placynthium subradiatum*** (Nyl.) Arnold – On steep limestone boulder, c. 1000 m. (33): Schultz 09408.

Platismatia glauca (L.) W.L.Culb. & C.F.Culb. – On wood of *Cupressus sempervirens*, c. 1400 m. (10): 13192.
Obviously a rare species on Crete. The only other record is from the mountain Gingilos (GRUBE et al. 2001), within 1 km of the present collecting site in the Levka Ori.

Pleurosticta acetabulum (Neck.) Elix & Lumbsch – Common and widespread on branches and trunks of *Acer sempervirens*, *Cupressus sempervirens*, *Phillyrea latifolia*, *Pinus brutia*, *Pyrus spinosa*, *Quercus coccifera*, *Q. pubescens* and *Q. macrolepis*, 370–1700 m. (6): 12933; (8): 13026; (10): 13110, 13189, 13210; (14): 13314, 13344, 13357; (19): 13468; (24): 13526; (29): 13643, 13652, 13711, 13723; (33): Schultz 09442, 09430b (with *Collema nigrescens*).

****Porpidia cinereoatra*** (Ach.) Hertel & Knoph – On shaded siliceous rock in *Quercus pubescens* forest and in dense macchia, 220–700 m. (11): 13243; (24): 13533. TLC (both specimens): confluentic acid, unidentified substance.

Protoblastenia calva (Dicks.) Zahlbr. – On calcareous rock, 750–1700 m. (5): 12889; (10): 13101.

*****Protoblastenia cyclospora*** (Körb.) Poelt – On limestone rock faces, c. 500 m. (6): 12978.

Pseudevernia furfuracea (L.) Zopf var. ***furfuracea*** – On bark of trunks and branches of *Cupressus sempervirens*, 1200–1500 m. (10): 13199, 13220.
Also reported from this locality and substrate by KLEINIG (1966), this continues to be the only known site for this variety on Crete. *P. furfuracea* is thus represented by both varieties in the Omalos Basin at sites a few kilometers from each other.

Pseudevernia furfuracea var. ***ceratea*** (Ach.) D.Hawksw. – On bark of *Pinus brutia*, 900 m. (14): 13342.
Otherwise reported from the Ida Mountains and Samaria (SZATALA 1943b, KLEINIG 1966, both as *Parmelia olivetorina*). This seems to be the more widespread chemical race of *P. furfuracea* on Crete, while the var. *furfuracea* is still known from only a single site. The incongruous distribution of the two varieties on Crete mirrors the distributional separation of the chemotypes reported by SIPMAN et al. (2005) from the Aegean island of Ikaria. We investigated both chemotypes using standard TLC but could not separate olivetoric and physodic acids using this method, as they produce more or less identical bands in the three solvent systems A, B and C (CULBERSON et al. 1977); the differentiation here is thus based solely on the C spot test.

Psora decipiens (Hedw.) Hoffm. – On soil in phrygana, 0–900 m. (2): 12843; (5): 12882, 12893; (7): 12992, 12994; (17): 13421 (O); (25): 13578, 13588; (30): 13744; (27): 13596 (O).

Psora pseudorussellii Timdal – On moss-covered limestone rock walls, 700 m. (28): 13607 (det E. Timdal).
P. pseudorussellii was described from North America by TIMDAL (1986). The report from Crete by GRUBE et al. (2001) was the first for Europe.

****Psorotichia vermiculata*** (Nyl.) Forssell – On exposed limestone boulders near sea level. (34): Schultz 09451.
Black areolate crust with immersed, dark red apothecia.

****Pterygiopsis affinis*** (A.Massal.) Henssen – On steep limestone boulders and overhangs near sea level. (34): Schultz 09465c (with *Thyrea confusa*, *Thelochroa montinii*), 09469, 09470.
Blackish or greyish pruinose areolate crust with ± distinctly effigurate margin, marginal areoles usually short and broad, apothecia rarely seen, asci with 24–32 ascospores.

Ramalina farinacea (L.) Ach. var. ***farinacea*** – On branches of *Quercus coccifera*, 1000 m. (29): 13653.

Ramalina fastigiata (Pers.) Ach. – Epiphytic on branches of *Pinus brutia*, *Pyrus spinosa* and *Quercus coccifera*, 900–1000 m. (14): 13322, 13378; (29): 13654, 13656, V. Wagner s.n. (GOET); (33): Schultz 09440.

Ramalina fraxinea (L.) Ach. var. ***fraxinea*** – Corticolous on *Acer sempervirens*, *Pyrus spinosa* and *Quercus coccifera*, 750–1500 m. (5): 12863; (10): 13126, 13184, 13188; (33): Schultz 09434.

****Ramalina fraxinea*** var. ***calicariformis*** Nyl. – On branches of *Acer sempervirens* and *Quercus coccifera*, 1000 m. (29): 13630, 13657; (33): Schultz 09439.

*****Ramalina panizzei*** De Not. – On trunk of *Quercus ilex*, 1000 m. (33): Schultz 09436.

First report for southeastern Europe since it was excluded from the Greek flora by GRONER & LA GRECA (1997).

****Ramalina subgeniculata*** Nyl. – Corticolous on *Quercus coccifera* branches, 1000 m. (29): 13661, 13635.

Rinodina calcarea (Arnold) Arnold – On calcareous rock, locally common, 1050 m. (8): 13042, 13046, 13047 (det. H. Mayrhofer), 13048, 13055.

*****Rinodina excrescens*** Vain. – On wood on scarred *Castanea sativa*, 500 m. (16): 13401 (ver. H. Mayrhofer).

A rarely collected species previously known in Eurasia only from the type locality in western Siberia, two localities in Austria and one site on the Croatian island of Mljet (GIRALT et al. 1995), otherwise from eastern North America. New to Greece and the eastern Mediterranean.

Rinodina immersa (Körb.) Arnold – On limestone rock in phrygana, sea level to 1000 m. (7): 13012; (33): Schultz 09418b (with *Aspicilia farinosa*); (34): Schultz 09457c (with *Rinodinella dubyanoides*, *Caloplaca variabilis*).

****Rinodina oleae*** Bagl. – On *Ceratonia siliqua* bark at sea level. (26): 13592 (det. H. Mayrhofer).

****Rinodina plana*** H. Magn. – On bark of *Cupressus sempervirens* and *Quercus coccifera*, 1000–1100 m. (14): 13361; (29): 13683, 13701 (13701 det. H. Mayrhofer).

Rinodina pyrina (Ach.) Arnold – On *Quercus coccifera* branches and on shrub branches in phrygana, 500–1000 m. (2): 12840; (29): 13701-B.

Rinodina sophodes (Ach.) A.Massal. – Corticolous on branches and trunks of *Acer sempervirens* and *Pyrus spinosa*, 1000–1500 m. (10): 13139, 13181; (29): 13726.

Rinodinella dubyanoides (Hepp) H.Mayrhofer & Poelt – On exposed limestone near sea level. (34): Schultz 09457a.

Sarcogyne privigna (Ach.) A.Massal. – On siliceous rock in open meadow-like phrygana, 800 m. (25): 13546.

****Scoliciosporum umbrinum*** (Ach.) Arnold – On wood of *Pinus brutia*, 1000 m. (14): 13336 (BG, ver. S. Ekman).

Solenopsora cesatii (A.Massal.) Zahlbr. var. ***cesatii*** – On thin soil over mortared wall and terricolous in phrygana, 180–500 m. (6): *12987* (sub *Solenopsora olivacea*); (18): 13439; (30): 13749.

Solenopsora olivacea (Fr.) H.Kilias – On exposed limestone, from near sea level to c. 500 m. (6): 12987 (det. C. Roux); (34): Schultz 09453b, 09454.

Solenopsora vulturiensis A.Massal. – On siliceous rocks in dense macchia, 220 m. (11): 13249 (det. C. Roux).

Squamarina cartilaginea (With.) P.James – On soil and on soil over rock, c. 1500 m. (10): 13086.

****Staurolemma omphalarioides*** (Anzi) P.M.Jørg. & Henssen – Epiphytic on bark of *Castanea sativa*, *Platanus orientalis*, *Quercus macrolepis* and *Q. pubescens*, 370–560(–1000) m. (13): 13303; (16): 13388, 13403; (19): 13449; (23): 13494, 13497; (33): Schultz 09438b, 09441b; in *Quercus*-Hain, 500 m, Bezirk Rethimnon, Kloster Arcadi östlich Karoussi südöstlich Rethimnon, 03.10.1982, T. Feuerer & N. Höhne 12670, det. M. Schultz (HBG); an *Quercus*, N-Exposition, 1000 m, Bezirk Lasithi, Dikti-Gebirge, Fahrweg von Kaminaki zum Afendis Hristos, etwa 1 km südlich des Ortes, 20.09.1982, T. Feuerer & N. Höhne 12543, det. M. Schultz (HBG).

This appears to be a frequent species of humid, mid-elevation woodlands, rarely in higher altitude woodlands.

Staurothele hymenogonia (Nyl.) Th.Fr. – On rocks in phrygana, 250 m. (7): 13008.

Tephromela atra (Huds.) Hafellner – On siliceous rock (phyllite, quartzite), 700–800 m: (5): 12897, 12909, 12910; (24): 13532; (25): 13547, 13548, 13763, 13764, 13773; also epiphytic once on *Quercus coccifera* trunks, 1000 m: (29): 13666.

****Thelidium*** sp. 1 – On compact calcareous soil on and around archaeological excavations, c. 100 m. (1): 12828.

This sample comes from the type locality of *Thelidium creticum* J.Steiner (STEINER 1917), but does not conform to the type. The type of *T. creticum* (at W) has ascospores 21–23 × 10 µm and a thin, epilithic (!), brownish farinose thallus with partially immersed perithecia. Our new material has ascospores 23–26 × 12.5–13 µm and a grayish thallus on compact soil; it may be allied to *T. obscurum* (Garov.) Zschacke.

One of us (OB) also had an opportunity to study the only other specimen of *T. creticum* that has been reported in the literature (Creta, Monophatsi, Asterusi-Gebirge bei Phurnopharangon, 300 m, 1.VII.1942, K. H. Rechinger fil., W; reported by SZATALA 1943b). The specimen has a white thallus, larger perithecia with a thicker involucrellum and smaller, 1–3-septate ascospores (15–18 × 6.5–7.5 µm). It is not *T. creticum*, which is thus known only from the type collection.

****Thelochroa montinii*** A.Massal. – On steep limestone boulders near sea level. (34): Schultz 09465b (with *Thyrea confusa*, *Pterygiopsis affinis*).

Thallus blackish to dark grey, very thin, powdery, apothecia very small with punctiform discs.

****Thyrea confusa*** Henssen – On steep limestone boulders near sea level. (34): Schultz 09465a (with *Thelochroa montinii*, *Pterygiopsis affinis*).

Toninia aromatica (Sm.) A.Massal. – On soil in phrygana, c. 200 m. (7): 13010.

Toninia candida (Weber) Th.Fr. – In rock crevices, c. 200 m. (7): 13017 (det. E. Timdal).

Toninia diffracta (A.Massal.) Zahlbr. – On moss over rock, at sea level and 1700 m. (10): 13097; (34): Schultz 09463. (13097 det. E. Timdal).

Toninia opuntioides (Vill.) Timdal – In rock crevices in shaded canyons, c. 700 m. (6): 12973; (28): 13612. TLC (both specimens): unidentified triterpenoids = 'chemotype Y' of TIMDAL (1991).

Toninia sedifolia (Scop.) Timdal – On soil in phrygana and archaeological excavations, 180–1700 m. (1): 12826; (5): 12875; (7): 12996; (10): 13094; (28): 13602; (30): 13743. TLC: no substances ('chemotype 0') or with unknown depside or depsidone ('chemotype C' of TIMDAL 1991).

13602 is an anomalous, richly pycnidiate specimen conforming to 'chemotype C' of TIMDAL (1991) (det. and TLC by E. Timdal, O).

Toninia tristis (Th.Fr.) Th.Fr. subsp. ***thalloedaemiformis*** (Szatala) Timdal – In rock crevices, 400 m. (21): 13488.

****Verrucaria calciseda*** auct. – On periodically moist limestone, 1000 m. (8): 13053 (sub *Verrucaria fuscoatroides*).

****Verrucaria fuscoatroides*** Servít – On periodically moist limestone, 1000 m. (8): 13053.

****Verrucaria geophila*** Zahlbr. – On reddish mineral soil in phrygana, 200–250 m. (7): 12997; (18): 13428.

Verrucaria macrostoma Dufour ex DC. – On bare mineral soil in open phrygana (f. *terrestris* de Lesd.) and walls of amphitheatre in archaeological excavation, 180–200 m. (18): 13437; (30): 13752.

Verrucaria marmorea (Scop.) Arnold – On large exposed limestone boulder, 700–1000 m. (28): 13598; (33): Schultz 09417a.

****Verrucaria murorum*** (Arnold) Lindau – On loose soil of bird perch on an altar-like structure in front of sheepfold used mainly by goats and pigeons, c. 200 m. (18): 13440.

This species is widespread but scattered in central Europe, the Mediterranean and north Africa.

Verrucaria nigrescens Pers. – On vernally moist calcareous rock, sea level to 1000 m. (5): 12896; (8): 13045 (sub *Placopyrenium trachyticum*), 13063; (34): Schultz 09450a.

*****Verrucaria thrombioides*** A.Massal. – On fine compact soil (dust) on walls of amphitheatre in archaeological excavation, 180 m. (30): 13746.

The studied amphitheatre walls were only laid bare c. 70 years ago by an Italian archaeological team,

but are already richly colonized by various macro- and microlichens. *V. thrombioides* is known with certainty only from a few collections in the Mediterranean area. Most characteristic is the development of the involucrellum, which envelops the entire perithecium, whereby only a thin outer zone contains dark pigments. The involucrellum forms a thin, black, concentric line around the entire perithecium at a short distance to the excipulum, which is also black.

***Verrucaria viridula** (Schrad.) Ach. – On limestone rock wall, c. 400–800 m. (6): 12982.

****Verrucaria werneri** Breuss – On upper surface of low concrete wall surrounding a giant *Platanus orientalis* tree on the grounds of a former agricultural school, c. 350 m. (22): 13489.
This species is otherwise known only from the type locality at 1600 m in the Atlas Mountains of Morocco. It was treated by BREUSS (1994a) as *Verrucaria macrospora* (Werner) Breuss, but this turned out to be a later homonym of *Verrucaria macrospora* Hepp in Zoll.; a new name was provided for it in BREUSS (1994b). The species resembles *V. geophila* but differs in having pyriform perithecia with walls consisting only of the excipulum, whereas in *V. geophila* the perithecial wall is globose and consists of the dark excipulum and the complete involucrellum, with which it is unified, and thus thicker. It is new to Europe.

Xanthoparmelia tinctina (Maheu & Gillet) Hale – On siliceous rock of shepherd's hut in open field, 800 m. (25): 13564.

Xanthoria parietina (L.) Th.Fr. – On trunks and branches of *Acer sempervirens*, *Olea europaea*, *Phillyrea latifolia*, *Pyrus spinosa*, *Quercus coccifera*, *Q. macrolepis* and on bases of phrygana shrubs, 100–1700 m. (2): 12835; (4): 12849; (5): 12861, 12862; (7): Gradstein s.n. (GOET); (10): 13113; (11): 13261, 13276; (14): 13381; (19): 13471; (29): 13686.

Non-lichenized, lichenicolous ascomycetes

***Arthonia varians** (Davies) Nyl. – Parasitic on apothecia of *Lecanora* sp. and *Lecidella elaeochroma* ('*A. intexta*'), on bark of *Acer sempervirens* and *Quercus coccifera* branches, 1000–1500 m. (10): 13124 (sub *Caloplaca cerina*); (29): 13701-B (sub *Rinodina pyrina*).

***Sphinctrina turbinata** (Pers. ex Fr.) De Not. – On *Pertusaria* sp. on *Cupressus sempervirens* bark, c. 1400 m. (14): 13204 (sub *Pertusaria* sp. 1).
Previously reported from Greece from Rhodos (LÖFGREN & TIBELL 1979).

***Toninia episema** (Nyl.) Timdal – Parasitic on *Aspicilia calcarea* var. *reagens* on calcareous rock, 100 m. (7): 13014 (ver. C. Roux).

Toninia verrucariae (Nyl.) Timdal – Parasitic on endolithic *Verrucaria* on exposed limestone boulder near sea level. (34): Schultz 09455a (with *Caloplaca aquensis*).

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