PARNASSIANA ARCHIVES 7: 31-49 2019

A LICHEN INVENTORY ON THE ISLAND OF IRAKLIA (CYCLADES ISLANDS, GREECE)

Ioannis Gavalas[1] and Harrie J. M. Sipman[2]

[1] Email: jgavalas2008@gmail.com
[2] Botanical Garden & Museum, Free University, Koenigin-Luise-Str. 6-8, D-14195 Berlin, Germany; email: H.Sipman@bgbm.org; corresponding author

Published online: October 1, 2019

Abstract

A total of 161 species of lichens and lichenicolous fungi and 4 varieties are recorded on the island of Iraklia (Central Cyclades, Greece) in 2018 and early 2019. This figure is surprisingly high in comparison with surrounding islands. Four lichen species are recorded as new for Greece, *Agonimia allobata* (Stizenb.) P. James, *Buellia caloplacivora* Llimona & Egea, *Gloeoheppia erosa* (J. Steiner) Marton and *Pertusaria lactescens* Mudd. Discussions of these are provided, as well as for a squamulose form of *Dirina massiliensis* Durieu & Mont. and an unusual form of *Physcia adscendens* H. Olivier, which is compared with *P. ucrainica* S.Y. Kondr. et al. A list of all recorded species with vouchers and habitat information is included.

Keywords: lichenized fungi, distribution, systematics, Mediterranean, diversity, lichenicolous fungi, Aegean Sea

Introduction

The island Iraklia is situated in the southern part of the Aegean Sea (Greece) at about 36° 50' N and 25° 27' E. It is an inhabited but small island south of Naxos, measuring about 8 km in length and 4 km in width, and occupying about 18 km². It is hilly, with tall cliffs along the shore. The highest point is at 420 m. The climate is Mediterranean, with dry and warm summers and cool, rainy winters; for the nearby island of Amorgos mean annual precipitation is 540 mm; mean temperature of the warmest month 24.7°C and the mean temperature of the coldest month 10.4°C. A weather station operating on Iraklia itself since 5 years has mean annual precipitation 280 mm, mean temperature of the warmest month 27.3°C and mean temperature of the coldest month 12.5°C. This indicates a particularly warm and dry climate. The bedrock is metamorphic, mostly calcareous rock, sometimes rich in mica or iron, occasionally poor in lime. The vegetation is mostly shrubby (macchia) to dwarf shrubby (phrygana), with only few larger, cultivated trees. Many slopes are terraced, relics of former agriculture, but larger fields are found only in the center. Until now a single lichen species is reported from the island, *Xanthoria parietina*, collected by K. H. Rechinger, probably on his way to Amorgos in 1932 (Abbott 2009, Szatala 1943).

ISSN (print-edition) : 2241-7834
ISSN (on-line edition) : 2241-7842

Material & Methods

Fieldwork was done mostly in December 2018 to February 2019, partly in spring 2018. A numbered list of the localities surveyed is presented in Table 1.

Table 1: List of investigated localities, Greece, Cyclades, Iraklia island.

No.	Date(s)	Locality	Alt.	Coordinates
1.	22 Dec. 2018, 24 Dec. 2018, 03 Febr. 2019	1 Km N of cave Ag. Ioannis towards Selladi	180 m	36˚50.08′ N, 25˚26.3′ E
2.	23 Dec. 2018	1 Km S of Panagia, Path Nr. 2	290 m	36˚49.78′ N, 25˚27.25′ E
3.	30 Jan. 2018, 08 Febr. 2018, 04 March 2018	Ag. Georgios, home	50 m	36˚51.54′ N, 25˚28.12′ E
4.	20 Jan. 2018	Ag. Georgios, port	2 m	36˚51.74′ N, 25˚28.22′ E
5.	28 Dec. 2018	Ag. Mamas stream, 400 m SE of Panagia	80 m	36˚49.97′ N, 25˚27.66′ E
6.	21 Jan. 2018, 27 Dec. 2018, 12 Jan. 2019	Ageli, 800 m NE of Panagia	80 m	36˚50.51′ N, 25˚27.75′ E
7.	26 Jan. 2019	Agios Athanasios, 1 km NW of Panagia	165 m	36˚50.86′ N, 25˚26.70′ E
8.	08 Jan. 2018, 16 Jan. 2018, 01 March 2018, 29 Dec. 2018	Dexameni, 1 km N of Panagia	40 m	36˚50.80′ N, 25˚27.43′ E
9.	11 Jan. 2019	Lakkos near Panagia	140 m	36˚50.37′ N, 25˚27.41′ E
10.	4 Jan. 2019	Livadi stream, 500 m SW of Livadi beach	17 m	36˚50.67′ N, 25˚28.22′ E
11.	20 Dec. 2018	Livadi, E-side	30 m	36˚51.00′ N, 25˚28.54′ E
12.	19 Febr. 2018, 24 Dec. 2018, 08 Feb. 2019	Near entrance of cave Ag. Ioanni	125 m	36˚49.73′ N, 25˚26.21′ E
13.	27 Dec. 2018	NW of Livadi beach, Poria	2 m	36˚51.23′ N, 25˚28.32′ E
14.	6 Jan. 2019	NW-Shore, SW of Vorini Spilia	40 m	36˚51.19′ N, 25˚26.96′ E
15.	31 Jan. 2019	NW-Shore, Vorini Spilia	1 m	36˚51.23′ N, 25˚27.09′ E
16.	10 Feb. 2019	Panagia, fields	138 m	36˚50.16′ N, 25˚27.38′ E
17.	29 Dec. 2018, 21 Jan. 2019	Vrisi, 500 m SW of Panagia	245 m	36˚49.90′ N, 25˚27.05′ E
18.	22 Dec. 2018	Panagia	170 m	36˚50.22′ N, 25˚27.24′ E
19.	30 Jan. 2018, 29 Dec. 2018, 03 Feb. 2019	Papas (island summit)	400 m	36˚49.69′ N, 25˚26.77′ E
20.	06 March 2018	Pournaria, 1 km NE of Panagia	40 m	36˚50.75′ N, 25˚27.82′ E

21.	27 Dec. 2018, 26 Feb. 2019	SE of Panagia, Oak Trees	90 m	36˚50.08′ N, 25˚27.69′ E
22.	28 Jan. 2018	Skali, 500 m S of Panagia	300 m	36˚49.72′ N, 25˚27.24′ E
23.	21 Dec. 2018	S-side of Panagia, Dexameni Kanaki	175 m	36˚50.12′ N, 25˚27.24′ E
24.	23 Dec. 2018, 18 Feb, 2019	S-side, Ftero Mericha	270 m	36˚49.52′ N, 25˚27.15′ E
25.	22 Dec. 2018	SW-side, Alimia	100 m	36˚49.78′ N, 25˚25.70′ E
26.	22 Dec. 2018	SW-side, small cave NE of Alimia bay	43 m	36˚49.78′ N, 25˚25.50′ E
27.	28 Dec. 2018, 14 Feb. 2019	Tourkopigado on E-shore	12 m	36˚49.98′ N, 25˚28.37′ E
28.	17 March 2019	Smirni on N-coast NW of Panagia	50 m	36˚51.20′ N, 25˚26.83′ E

Lichens were photographed using a Canon EOS 60 D camera with a Canon 100 mm macro USM lens, using the built-in flash and an aperture from 11 to 16, in manual mode, speed 1/250, ISO 100, sometimes with a KENKO extension tube set DG, for a magnification of 1,6 x at ISO 250.

Samples were studied using a stereomicroscope and a compound microscope with tap-water mounts. For selected groups the chemistry was analyzed using TLC (Orange 2001) or samples were sent to Alvalab (Spain) for ITS sequence generation, often samples from which the secondary substances were extracted for TLC. For evaluation of the sequences the websites https://www.ebi.ac.uk/Tools/msa/muscle/ (for sorting of the alignment, with standard settings and pearson-fasta output) and http://iqtree.cibiv.univie.ac.at/ (Trifinopoulos et al. 2016) (for tree calculation; standard settings, sequence type = DNA) were used (accessed 18 June 2019). Branch supports were obtained with the ultrafast bootstrap (Hoang et al., 2018) implemented in the IQ-TREE software (Nguyen et al., 2015).

Table 2. Newly generated ITS sequences with Genbank numbers

Aspicilia contorta	Iraklia (8) IRGA-473	[B 60 0202378]	MN512246
Aspicilia contorta	Iraklia (8) IRGA-479	[B 60 0203805]	MN512247
Caloplaca arnoldii subsp. *oblitterata*	Iraklia (23) IRGA-137	[B 60 0203655]	MN512248
Caloplaca chalybaea	Iraklia (13) IRGA-345	[B 60 0203823]	MN512249
Caloplaca communis	Iraklia (13) IRGA-331	[B 60 0203666]	MN512250
Caloplaca flavocitrina	Iraklia (17) in IRGA-539	[B 60 0203781]	MN512251
Caloplaca lactea	Iraklia (13) IRGA-331	[B 60 0203666]	MN512252
Caloplaca limonia	Iraklia (4) IRGA-21	[B 60 0202365]	MN512253
Caloplaca marmorata	Iraklia (16) IRGA-576	[B 60 0203668]	MN512254
Caloplaca navasiana	Iraklia (27) IRGA-385	[B 60 0203672]	MN512255
Caloplaca navasiana	Iraklia (23) IRGA-135	[B 60 0203671]	MN512256
Caloplaca ulcerosa	Iraklia (8) IRGA-458	[B 60 0203675]	MN512257
Dirina massiliensis (squamulose form)	Iraklia (1) IRGA-560	[B 60 0202373]	MN512258
Pertusaria lactescens	Iraklia (12) IRGA-85	[B 60 0202362]	MN512259
Pertusaria lactescens	Iraklia (12) IRGA-301	[B 60 0203758]	MN512260
Physcia adscendens	Iraklia (8) IRGA-438	[B 60 0203761]	MN512261
Physcia adscendens	Iraklia (21) IRGA-353	[B 60 0203760]	MN512262

Physcia adscendens	Iraklia (19) IRGA-500	[B 60 0203762]	MN512263
Pertusaria rhodiensis	Chios, Sipman & Raus 61036	[B 60 0194093]	MN512264
Pertusaria rhodiensis	Chios, Sipman & Raus 61281	[B 60 0194338]	MN512265
Pertusaria rhodiensis	Milos, Sipman & Raus 59746	[B 60 0189363]	MN512266
Pertusaria pentelici	Lesbos, Sipman & Raus 61906	[B 60 0199461]	MN512267
Pertusaria pentelici	Lesbos, Sipman & Raus 62352	[B 60 0199915]	MN512268
Pertusaria pentelici	Lesbos, Sipman & Raus 62304	[B 60 0199867]	MN512269
Pertusaria pentelici	Lesbos, Sipman & Raus 62712	[B 60 0200664]	MN512270
Pertusaria lactescens	Germany, Kison s.n.	[B 60 0201045]	MN512271
Pertusaria chiodectonoides	Chios, Sipman & Raus 60988	[B 60 0194045]	MN512272
Pertusaria chiodectonoides	Lesbos, Sipman & Raus 62613	[B 60 0200175]	MN512273
Pertusaria chiodectonoides	Lesbos, Sipman & Raus 61913	[B 60 0199474]	MN512274

The fieldwork was done by the first author, who lives on the island. Initially he photographed the lichens which he recognized. The photos were sent to the second author, trained by several lichen visits to Aegean islands, including a visit to the nearby island of Amorgos in autumn 2018. He identified the species when recognizable from the photos, and instructed the first author to collect specimens of species not well recognizable from the pictures and of species on habitats not well represented by the photos. At the end samples were available for most species.

For the identification the floras of Clauzade et al. (1985, 1987) and Smith et al. (2009) were used as well as the draft key of Arcadia (2019). In addition various recent group treatments were consulted, the most important being Arup (2006), Breuss (1990, 1994), Egea & Torrente (1993), Lumbsch (1989), Mayrhofer (1988), Guttová et al. (2014), Moreno & Egea (1992), Saag et al. (2009), Timdal (1991), Torrente & Egea (1989) and Vondrak et al. (2009).

Results and discussion

Fig. 1. Colorful mixture of lichen species on a *Pinus halepensis* dry twig (*Caloplaca flavorubescens*, *Xanthoria parietina*, *Physcia adscendens*, *Lecanora chlarotera*, *Caloplaca haematites*, *Lecanora dispersa* and *Lecidella elaeochroma*).

A total of 161 species of lichens and lichenicolous fungi and 4 varieties were recognized. The actual number of species present on the island is certainly higher, because about a dozen species remain unidentified. And probably a visit of a lichen specialist to the island would yield further records. Thus it can be assumed that Iraklia houses close to 200 species of lichens. Such a number is quite unexpected for a small, low island in the Aegean with a semi-arid climate where many centuries of human activity have seriously changed the landscape. It is similar to the numbers known from some nearby, much larger islands and island groups, the Santorini archipelago with 157 reported species and Kalymnos with 169 reported species (Sipman & Raus 1995, 2002). Only much larger islands with

much higher mountains score significantly higher, like Chios (highest point 1280 m, 390 species reported by Sipman & Raus 2015). In a recent inventory on nearby Amorgos, with its highest peak (Mt. Kroukelos) reaching 800 m, so far 216 species have been recognized (Sipman & Raus in Biel & Tan, in prep.). Compared to Iraklia, Amorgos has a considerably larger size, a more varied composition of the bedrock, and the mountains are twice as high, up to about 800 m. This results in a potentially much richer lichen biodiversity, in particular above ca. 400 m, where numerous macrolichen species occur which are absent from Iraklia, like *Cladonia furcata* (Huds.) Schrad., *Evernia prunastri* (L.) Ach., *Ramalina breviuscula* Nyl., *Ramalina farinacea* (L.) Ach., *Ramalina fastigiata* (Pers.) Ach. and *Parmotrema perlatum* (Huds.) M. Choisy.

Worth noting is that our result is based on the cooperation between a person with good knowledge of the habitats on Iraklia, and one with the technical equipment, literature and herbarium required for identification at hand. Thus the disadvantage of a specialist visiting the island, who is likely to miss many rewarding habitats by lack of time, is compensated.

Among the species found on Iraklia four are particularly notable because they are observed for the first time in Greece.

1. *Agonimia allobata*, an inconspicuous species with a small, greenish thallus and tiny, c. 0.1 mm wide, black, free-standing perithecia. It is widespread in Europe and easily overlooked due to its small size. The Iraklia sample is tiny, with a thallus of few square mm, and was discovered only in the lab under the stereomicroscope.

2. *Buellia caloplacivora*, a species related to the more well-known *B. abstracta* (Nyl.) H. Olivier, from which it differs by its preference for calcareous rather than siliceous rock, the distinct, white thallus areoles and the often slightly pruinose apothecia. Its distribution is not well known because the two species have been confused and were synonymized in a recent revision (Scheidegger 1993). See also note in Nimis (2016: 96). Probably it is more strictly Mediterranean than *B. abstracta*, which is also known from the Atlantic coasts of the UK (Smith et al. 2009). *Buellia caloplacivora*, described from southern Spain, is also present in the Aegean, most frequently on the southern islands like Karpathos (unpublished). Specimens from Antiparos (Sipman & Raus 42928, 42960) were confirmed by M. Giralt, Barcelona, 2009.

Fig. 2. *Gloeoheppia erosa*, in wet condition. The rosette-like individuals are coalescing and form a closed cover on the stone. In dry state they look very similar. The lobes lack a lower cortex and medulla, and the lower surface is covered by *Nostoc* glomerules.

3. *Gloeoheppia erosa* (Fig. 2), a rather conspicuous lichen from loam-covered, periodically wet cliff faces, with cyanobacteria as photobiont (Fig. 1). It is a desert lichen known so far from North Africa and southern Spain, with its nearest locality in Israel (Egea 1989, sub *Heppia*). It is also present in Amorgos (Sipman & Raus in Biel & Tan, in prep.) and Karpathos (unpublished, mixed in Sipman & Raus 56584 [B 60 0154839]).

4. *Pertusaria lactescens*, a saxicolous, sterile, crustose lichen with norstictic acid and a coarsely granular surface. The granules are dense, variably remaining attached and becoming isidioid, or falling off and soredium-like. It was recognized by its ITS sequences, which cluster with those of *P. pentelici* J. Steiner (Fig. 3). The latter is a common species on siliceous rocks in the Aegean with characteristic, immersed apothecia with stellate, vaguely visible discs and darkened ascospores, and a

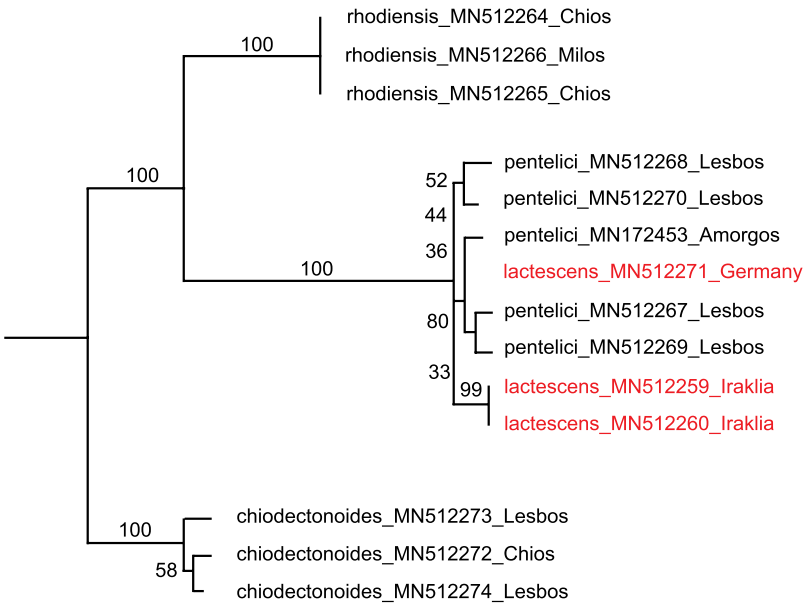

Fig. 3. Cladogram of ITS sequences of *Pertusaria lactescens* and *P. pentelici* with bootstrap support. Outgroups are *P. chiodectonoides* Bagl. ex A. Massal. and *P. rhodiensis* Erichsen. *Pertusaria lactescens* clusters with *P. pentelici*, and the samples of *P. lactescens* from Iraklia are separate from the German record.

smooth thallus without propagules. Its distribution is poorly known and it is possibly endemic to the Aegean. *Pertusaria lactescens* appears to be a vegetatively reproducing relative of *P. pentelici* which seems to prefer calcareous sandstone and is mainly known from Western Europe. The determination is provisional because its presence on Iraklia seems far outside its range, and the granules are unusually coarse, with a diameter of 0.2-0.4 mm instead of ca 0.1 mm. Moreover the intron which is present in all 5 ITS sequences available from *P. pentelici* and one of *P. lactescens* from Germany, is lacking in the only complete sequence of *P. lactescens* from Iraklia. Thus the population on Iraklia may be an independent phylogenetic lineage. However, since little is known of the genetic variability of *P. pentelici* and *P. lactescens*, the Iraklia population is retained provisionally in *P. lactescens*.

Notable is also a squamulose form of *Dirina massiliensis* (Fig. 4) which occurs on Iraklia. Such forms have been known before (Tehler 1983, Tehler et al. 2013) but without detailed description. In the available material from Iraklia the thallus produces well delimited, folded lobes on the upper surface. The very fragmented specimens suggest that the structures start as a crest-like extension on top of the thallus, which becomes much folded and incised and about 0.5 cm tall. At the base these folded lobes are about as thick as the thallus, 0.5-1 mm, at the tips they thin out to about 0.2 mm, and they are without differentiation between upper and lower side. Sometimes juvenile lecanorine apothecia are present on the lobes. TLC shows erythrin as dominant substance, just like normal *D. massiliensis*. An ITS sequence also seems to fit *D. massiliensis*, as far as the few sequences available in Genbank allow such a conclusion. Thus apothecia,

Fig. 4. The crustose *Dirina massiliensis* has a chalky white thallus with white apothecia. It covers large surfaces on N-facing cliffs, which receive full light but not direct sunshine. Very rarely it forms folded lobes on its thallus, as shown on this picture, somewhat reminding the genus *Roccella*. The lobes are usually only 5 mm long, those on the picture may be a bit longer.

chemistry and ITS agree with *D. massiliensis* and the structures might be compared with galls. Unclear is what drives the development of these folded lobes, which seem to grow in very windy situations. They may transgrade into thallus patches that become partly detached.

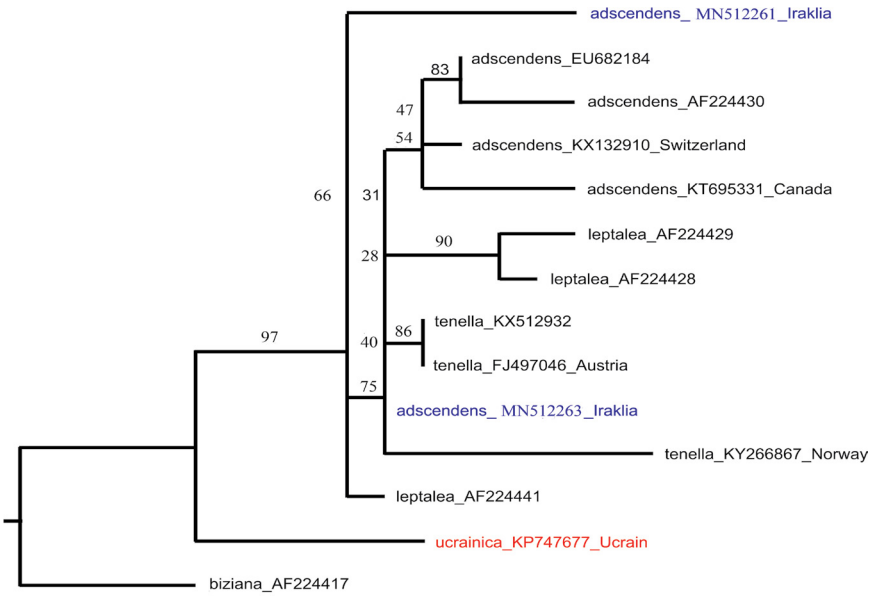

Fig. 5. Cladogram of ITS sequences with bootstrap support of *Physcia adscendens* and related taxa. Outgroup is *Physcia biziana*. An unusual form of *Physcia adscendens* from Iraklia (blue) appears close to *Physcia adscendens*, *P. leptalea* and *P. tenella*, and not to *P. ucrainica* (red). Sequences downloaded from Genbank, 15 March 2019.

The folded lobes of *D. massiliensis* remind a bit of *Ingaderia trogloditica* Feige & Lumbsch (Feige & Lumbsch 1993), which looks as if a normally crustose lichen (*Paralecanographa grumulosa*) develops a three-dimensional thallus on very windy, coastal cliffs, in this case composed of narrow straps (unpublished observation by HS on Karpathos). Ertz & Tehler (2011), using molecular data, found that *I. troglodytica* is actually malformed *Roccella phycopsis* parasitised and overtaken or partly overtaken by *Paralecanographa grumulosa*. In the case of the folded lobes of *D. massiliensis* there is no evidence for parasites, however.

The very common *Physcia adscendens* is often represented in the Aegean by an unusual form. Normally this species produces soralia in helmet-shaped, raised lobe tips. In several specimens from Iraklia (and elsewhere) the soralia occur mainly scattered on the thallus surface, where they cause perforations of the thallus lobes (Fig. 6). Recently a related, seemingly comparable species was described, *Physcia ucrainica* S.Y. Kondr. et al., supported by ITS-analysis (Kondratyuk et al. 2015). Therefore we tested if the Iraklia material might belong to this species. It appeared that the two ITS sequences from Iraklia specimens cluster with *P. adscendens* agg. and not with the single downloadable good-quality sequence of *P. ucrainica* (Fig. 5). This suggests that the Iraklian specimens do not belong to *P. ucrainica* and should be retained in *P. adscendens*.

Fig. 6. Atypical form of *Physcia adscendens* with soralia scattered over the thallus surface and erumpent rather than in hood-shaped lobe tips.

List of species

For each species some herbarium specimens are presented, when available. These are kept in the herbarium of the Botanical Garden & Museum in Berlin, Germany (B). When the species is in a mixed gathering not deposited under its name, this is indicated by placing "in" before its IRGA-number. The locality is indicated by the number from Table 1 in brackets. Added are the substrate and any results from chemical analysis by TLC and Genbank registration numbers for the generated ITS sequences. For species reported by photograph only, the photo number of I. Gavalas is given. To facilitate comparison with the literature, the nomenclature is sometimes conservative, or synonyms are given. The lichenicolous fungi are marked by an *. For details about distribution and ecology see Nimis (2017).

Acarospora schleicheri (Ach.) A. Massal, (17) IRGA-490 [B 60 0203619], on soil.

Acarospora veronensis A. Massal, (15) IRGA-551 [B 60 0203620], on small ferrite stone; (28) IRGA-609 [B 60 0203824], on ferrite rock in open vegetation.

Agonimia allobata (Stizenb.) P. James, (17) in IRGA-539 [B 60 0203781], on bark of dead *Prunus dulcis*. **New for Greece**.

Alyxoria subelevata (Nyl.) Ertz & Tehler (syn. *Opegrapha subelevata* Nyl.), (6) IRGA-44 [B 60 0061807], on soil; (23) IRGA-132 [B 60 0203621], on soil. The substrate is unusual, probably soil in a cliff fissure, and the identification needs further attention.

Alyxoria variiformis (Anzi) Ertz (syn. *Opegrapha variaeformis* Anzi), (23) IRGA-136 [B 60 0203623], on rock.

Anaptychia ciliaris (L.) Flot., (19) IRGA-504 [B 60 0203624], on *Juniperus phoenicea* bark. Corrected authorship provided by L. Arcadia.

Anema nodulosum (Nyl.) Forssell, (1) IRGA-319 [B 60 0203625], on rock; (12) IRGA-569 [B 60 0203627], on rock; (13) IRGA-323 [B 60 0203626], on rock. The specimens fit the description in Moreno & Egea (1992), but no authorized specimens for comparison were available.

Fig. 7. The white rosettes belong to the species *Lecanora pruinosa*. It has pale brown apothecium discs with a margin of the same color as the thallus. On the photograph most apothecium discs are occupied by small, black apothecia of the lichenicolous species *Arthonia apotheciorum*.

Anema nummularium (Dufour ex Durieu & Mont.) Nyl. ex Forssell, (22) in IRGA-60 [B 60 0202355], on calcareous rock; (27) IRGA-412 [B 60 0203628], on rock.

Anthracocarpon virescens (Zahlbr.) Breuss (1), IRGA-552 [B 60 0203678], on rock; (5) IRGA-107 [B 60 0202370], on soil.

****Arthonia apotheciorum*** (A. Massal.) Almq., (5) IRGA-427 [B 60 0107877], lichenicolous on *Lecanora* sp. on rock (Fig. 7).

Arthonia calcarea (Turner ex Sm.) Ertz & Diederich (syn. *Opegrapha calcarea* Turner ex Sm.), (16) IRGA-572 [B 60 0203622], on rock; (22) IRGA-52 [B 60

0057557], on calcareous rock; (23) in IRGA-136 [B 60 0203623], on rock; (27) IRGA-373 [B 60 0203750], on rock.

Arthonia cretacea Zahlbr., (26) IRGA-194 [B 60 0203629], on rock.

Arthrosporum populorum A. Massal., (8) IRGA-451 [B 60 0203631], on *Ceratonia siliqua* bark.

Aspicilia calcarea (L.) Bagl. (syn. *Circinaria calcarea* (L.) A. Nordin et al.), (13) IRGA-339 [B 60 0203633], on rock; (23) in IRGA-144 [B 60 0203673], on rock; (23) IRGA-156 [B 60 0203632], on rock. Corrected authorship provided by L. Arcadia.

Aspicilia cheresina (Müll. Arg.) Hue (syn. *Lobothallia cheresina* (Müll. Arg.) A. Nordin et al.), (23) IRGA-133 [B 60 0203636], on rock.

Aspicilia contorta (Hoffm.) Koerb. (syn. *Circinaria contorta* (Hoffm.) A. Nordin et al.), (7) in IRGA-546 [B 60 0203670], on small ferrite stone; (7) IRGA-548 [B 60 0203635], on small ferrite stone; (8) IRGA-473 [B 60 0202378], on rock, TLC (j807) aspicilin, ITS: MN512246; (8) in IRGA-479 [B 60 0203805], on rock, TLC (j671) no substances found, ITS: MN512247; (13) IRGA-349 [B 60 0203634], on rock. Corrected authorship provided by L. Arcadia.

Aspicilia intermutans (Nyl.) Arnold (1) IRGA-214 [B 60 0203637], on rock; (2) IRGA-285 [B 60 0203638], on rock; (15) in IRGA-551 [B 60 0203620], on small ferrite stone; (28) IRGA-611 [B 60 0203826], on ferrite rock in open vegetation.

Bacidia parathalassica Llop & Gómez-Bolea, (8) IRGA-439 [B 60 0203639], on *Pistacia lentiscus* bark; (17) in IRGA-533 [B 60 0203697], on dead *Prunus dulcis*; (19) in IRGA-500 [B 60 0203762], on *Olea europaea* bark; (24) IRGA-588 [B 60 0203827], on *Juniperus phoenicea* bark. For the identification Llop (2007) was used.

Bactrospora patellarioides (Nyl.) Almq., (8) IRGA-447 [B 60 0203640], on *Ceratonia siliqua* bark.

Bagliettoa baldensis (A. Massal.) Vězda, (2) IRGA-267 [B 60 0203641], on rock; (27) in IRGA-400 [B 60 0203792], on rock.

Bagliettoa calciseda (DC.) Gueidan & Cl. Roux, (4) IRGA-29 [B 60 0164193], on calcareous rock; (12) IRGA-296 [B 60 0203643], on rock; (23) IRGA-153 [B 60 0203642], on rock.

Bagliettoa marmorea (Scop.) Gueidan & Cl. Roux, (2) IRGA-278 [B 60 0203644], on rock.

Botryolepraria lesdainii (Hue) Canals et al. (10) IRGA-507 [B 60 0203645], on soil; (14) IRGA-523 [B 60 0203646], on soil; (17) IRGA-485 [B 60 0203818], on rock.

Buellia caloplacivora Llimona & Egea, (2) IRGA-273 [B 60 0203647], on rock; (16) IRGA-571 [B 60 0203649], on rock; (24) IRGA-237 [B 60 0203648], on rock; (25) IRGA-184 [B 60 0117115], on rock. **New for Greece**.

Buellia tesserata Körb., (1) IRGA-229 [B 60 0203650], on rock.

Caloplaca albolutescens (Nyl.) H. Olivier, (2) IRGA-269 [B 60 0203659], on rock; (12) IRGA-298 [B 60 0203660], on rock.

Caloplaca albopruinosa (Arnold) H. Olivier, (1) IRGA-311 [B 60 0203652], on rock.

Caloplaca alociza (A. Massal.) Lettau, (13) IRGA-326 [B 60 0203654], on rock; (23) IRGA-176 [B 60 0203653], on rock. Corrected authorship provided by L. Arcadia.

Caloplaca arnoldii subsp. ***oblitterata*** (Pers.) Gaya, (23) IRGA-137 [B 60 0203655], on rock, ITS: MN512248; (23) in IRGA-138 [B 60 0203722], on rock. Corrected variety epithet and authorship provided by L. Arcadia.

Caloplaca aurantia (Pers.) Hellb., (8) in IRGA-474 [B 60 0203709], on rock; (12) IRGA-297 [B 60 0203657], on rock; (23) IRGA-164 [B 60 0203656], on rock.

Caloplaca cerina (Hedw.) Th. Fr., (21) in IRGA-355 [B 60 0203664], on *Olea europaea* bark.

Caloplaca cerinelloides (Erichsen) Poelt, (8) in IRGA-451 [B 60 0203631], on *Ceratonia siliqua* bark.

Caloplaca chalybaea (Fr.) Müll. Arg., (13) IRGA-345 [B 60 0203823], on rock, TLC (j806) no substances, ITS: MN512249.

Caloplaca communis Vondrák et. al., (3) in IRGA-115 [B 60 0202371], on wall; (23) in IRGA-159 [B 60 0203730], on rock; (28) IRGA-628 [B 60 0203829], on ferrite rock in open vegetation; (13) IRGA-343 [B 60 0203669], on rock; in IRGA-331 [B 60 0203666], on rock, ITS: MN512250.

Caloplaca cretensis (Zahlbr.) Wunder, (16) IRGA-575 [B 60 0203658], on rock.

Caloplaca flavescens (Huds.) J.R. Laundon, (1) IRGA-320 [B 60 0203661], on rock.

Caloplaca flavocitrina (Nyl.) H. Olivier, (17) in IRGA-539 [B 60 0203781], on dead *Prunus dulcis*, ITS: MN512251.

Caloplaca flavorubescens (Huds.) J.R. Laundon, (11) IRGA-122 [B 60 0203662], on *Pinus halepensis* bark.

Caloplaca haematites (Chaub.) Zwackh, (11) IRGA-123 [B 60 0203663], on *Pinus halepensis* bark; (21) IRGA-355 [B 60 0203664], on *Olea europaea* bark. Corrected authorship provided by L. Arcadia.

Caloplaca inconnexa (Nyl.) Zahlbr., (23) IRGA-140 [B 60 0203665], on rock.

Caloplaca lactea (A. Massal.) Zahlbr., (13) IRGA-331 [B 60 0203666], on rock, ITS: MN512252.

Caloplaca limonia Nimis & Poelt, (3) in IRGA-112 [B 60 0202416], on wall; (4) IRGA-21 [B 60 0202365], on soil, ITS: MN512253; (23) IRGA-134 [B 60 0203667], on rock.

Caloplaca marmorata (Bagl.) Jatta, (16) IRGA-576 [B 60 0203668], on rock, ITS: MN512254.

Caloplaca navasiana Nav.-Ros. & Cl. Roux, (4) in IRGA-28 [B 60 0202392], on calcareous rock; (13) in IRGA-332 [B 60 0203727], on rock; (23) IRGA-135 [B 60 0203671], on rock, ITS: MN512256; (27) IRGA-385 [B 60 0203672], on rock, ITS: MN512255.

Caloplaca oasis (A. Massal.) Szatala, (3) in IRGA-115 [B 60 0202371], on wall; (13) IRGA-336 [B 60 0203674], on rock; (23) IRGA-144 [B 60 0203673], on rock.

Caloplaca obscurella (J. Lahm ex Körb.) Th. Fr., (21) IRGA-595 [B 60 0203830], on bark of *Quercus macrolepis* tree. Corrected authorship provided by L. Arcadia.

Caloplaca ulcerosa Coppins & P. James, (8) IRGA-458 [B 60 0203675], on *Juniperus phoenicea* bark, ITS: MN512257.

Caloplaca variabilis (Pers.) Th. Fr., (2) IRGA-281 [B 60 0203676], on rock; (7) IRGA-546 [B 60 0203670], on small ferrite stone; (8) in IRGA-479 [B 60 0203805], on rock; (13) in IRGA-331 [B 60 0203666], on rock; (27) IRGA-583 [B 60 0203831], on rock. Corrected authorship provided by L. Arcadia.

Candelariella oleaginescens Rondon, (4) IRGA-22 [B 60 0117109], on calcareous rock; (23) IRGA-147 [B 60 0203677], on rock.

Candelariella viae-lacteae G. Thor & V. Wirth, (24) in IRGA-588 [B 60 0203827], on *Juniperus phoenicea* bark.

Catillaria chalybaea (Borrer) A. Massal. var. ***chalybeia***, (1) IRGA-558 [B 60 0203682], on rock;

(12) IRGA-300 [B 60 0203681], on rock; (25) in IRGA-185 [B 60 0203706], on rock.

Catillaria chalybeia var. ***chloropoliza*** (Nyl.) H. Kilias, (25) IRGA-187 [B 60 0203680], on rock.

Catillaria lenticularis (Ach.) Th. Fr., (20) in IRGA-117 [B 60 0202395], on calcareous rock.

Cladonia foliacea (Huds.) Willd., (8) IRGA-7 [B 60 0107883], on soil. No difference between specimens on siliceous substrate and on calcareous substrate was recognizable, thus no var. *convoluta* (Lam.) Vain. was recognized.

Cladonia pyxidata (L.) Hoffm. *s.l.*, (6) IRGA-49 [B 60 0107866], on soil; (19) IRGA-72 [B 60 0202406], on soil. Partly blackened by parasitic fungus?

Cladonia rangiformis Hoffm., (8) IRGA-2 [B 60 0107884], on soil.

Clauzadea immersa (Hoffm.) Hafellner & Bellem., (1) IRGA-315 [B 60 0203685], on rock; (5) IRGA-433 [B 60 0203684], on rock; (11) IRGA-531 [B 60 0203683], on hardened soil.

Clauzadea metzleri (Körb.) Clauzade & Cl. Roux ex D. Hawksw., (6) IRGA-365 [B 60 0203686], on hardened soil; (27) IRGA-381 [B 60 0203687], on rock. Corrected authorship provided by L. Arcadia.

Clauzadea monticola (Ach.) Hafellner & Bellem., (2) IRGA-268 [B 60 0203688], on rock; (13) IRGA-330 [B 60 0203689], on rock; (22) in IRGA-52 [B 60 0057557], on calcareous rock.

Collema callopismum A. Massal. {syn. *Scytinium callopismum* (A. Massal.) Otálora et al.}, (1) IRGA-314 [B 60 0203690], on rock; (8) IRGA-478 [B 60 0203692], on rock; (13) IRGA-346 [B 60 0203691], on rock.

Collema crispum (Huds.) F. H. Wigg. {syn. *Blennothallia crispa* (Weber ex F.H. Wigg.) Otálora et al.}, (3) IRGA-71 [B 60 0168374], on soil; (16) IRGA-574 [B 60 0203693], on soil. Corrected authorship provided by L. Arcadia.

Collema cristatum (L.) F. H. Wigg. {syn. *Lathagrium cristatum* (L.) Otálora et al.}, (6) IRGA-37 [B 60 0202352], on calcareous rock.

Collema tenax (Sw.) Ach. {syn. *Enchylium tenax* (Sw.) Gray}, (5) IRGA-106 [B 60 0202364], on soil; (8) IRGA-15 [B 60 0202363], on soil; (10) IRGA-515 [B 60 0203694], on soil.

Dendrographa decolorans (Turner & Borrer) Ertz & Tehler {syn. *Schismatomma decolorans* (Erichsen) Clauzade & Vězda}, (7) IRGA-543 [B 60 0203696], on *Juniperus phoenicea* bark.

Diploicia canescens (Dicks.) A. Massal., (1) IRGA-212 [B 60 0203698], on rock; (17) IRGA-533 [B 60 0203697], on dead *Prunus dulcis*.

Diploschistes actinostoma (Ach.) Zahlbr., (25) IRGA-188 [B 60 0203699], on rock. Corrected epithet provided by L. Arcadia.

Diploschistes diacapsis (Ach.) Lumbsch, (6) IRGA-527 [B 60 0203700], on soil; (8) IRGA-5 [B 60 0202354], on soil; (12) in IRGA-85 [B 60 0202362], on schistose rock.

Diploschistes muscorum (Scop.) R. Sant., (1) IRGA-555 [B 60 0203702], on rock; (21) IRGA-362 [B 60 0203701], on soil.

Diploschistes scruposus (Schreb.) Norman, (2) IRGA-274 [B 60 0203703], on rock; (12) IRGA-299 [B 60 0203704], on rock.

Diplotomma chlorophaeum (Hepp ex Leight.) Szatala, (15) in IRGA-551 [B 60 0203620], on small ferrite stone; (23) IRGA-158 [B 60 0203705], on rock; (25) IRGA-185 [B 60 0203706], IRGA-186 [B 60 0203707], on rock.

Diplotomma hedinii (H. Magn.) P. Clerc & Cl. Roux, (5) IRGA-435 [B 60 0203708], on rock; (8) IRGA-474 [B 60 0203709], on rock; (23) in IRGA-140 [B 60 0203665], on rock.

Dirina ceratoniae (Ach.) Fr., (20) IRGA-119 [B 60 0202360], on *Quercus coccifera* bark.

Dirina cretacea (Zahlbr.) Tehler, (24) IRGA-240 [B 60 0203710], on rock.

Dirina massiliensis Durieu & Mont. f. ***massiliensis***, (22) IRGA-65 [B 60 0061727], on calcareous rock; (23) IRGA-157 [B 60 0203711], on rock.

Dirina massiliensis f. ***sorediata*** auct., (24) IRGA-250 [B 60 0203712], on rock.

Dirina massiliensis Durieu & Mont. (**squamulose form**), (1) IRGA-317 [B 60 0203714], IRGA-560 [B 60 0202373], on rock, TLC (j808) erythrin, tr. ? lecanoric acid, ITS: MN512258; (12) IRGA-566 [B 60 0203715], on rock; (24) IRGA-239 [B 60 0203713], on rock (Fig. 4).

Fulgensia subbracteata (Nyl.) Poelt {syn. *Gyalolechia subbracteata* (Nyl.) Søchting et al.}, (6) IRGA-529 [B 60 0203716], on soil; (8) IRGA-4 [B 60 0202412], on soil; (21) in IRGA-356 [B 60 0203778], on soil.

Gloeoheppia erosa (J. Steiner) Marton, (1) IRGA-223 [B 60 0203717], on rock; (1) IRGA-313 [B 60 0203718], on rock; (22) in IRGA-60 [B 60 0202355], on calcareous rock; (27) IRGA-414 [B 60 0203719], on rock. **New for Greece** (Fig. 2).

Heppia solorinoides (Nyl.) Nyl., (1) in IRGA-554 [B 60 0203769], on rock.

Heteroplacidium fusculum (Nyl.) Gueidan & Cl. Roux, (28) IRGA-625 [B 60 0203833], on ferrite rock in open vegetation.

Lecania cyrtellina (Nyl.) Sandst., (26) IRGA-198 [B 60 0203720], on rock. Provisional identification. The small, ca. 0.3 mm in diam., pale brown apothecia with often simple, ca. 11 x 3 µm ascospores fit *L. cyrtellina*, but the saxicolous substrate is unusual.

Lecania inundata (Hepp ex Körb.) M. Mayrhofer, (3) IRGA-112 [B 60 0202416], on wall; (23) IRGA-138 [B 60 0203722], on rock.

Lecania spadicea (Flot.) Zahlbr., (1) in IRGA-320 [B 60 0203661], on rock; (4) IRGA-35 [B 60 0117049], on calcareous rock; (9) IRGA-524 [B 60 0203725], on rock; (23) IRGA-172 [B 60 0203723], on rock, an unusual form; (27) IRGA-376 [B 60 0203724], on rock (Fig. 8).

Fig. 8. *Lecania spadicea* is common on calcareous rocks near the coast.

Lecania sylvestris (Arnold) Arnold var. ***sylvestris***, (5) IRGA-436 [B 60 0203726], on rock; (27) in IRGA-389 [B 60 0203752], on rock.

Lecania sylvestris var. ***umbratica*** (Nyl.) M. Mayrhofer, (4) IRGA-28 [B 60 0202392], on calcareous rock; (13) IRGA-332 [B 60 0203727], on rock. Corrected authorship provided by L. Arcadia.

Lecania turicensis (Hepp) Müll. Arg., (13) in IRGA-331 [B 60 0203666], on rock; (23) IRGA-127 [B 60 0203728], on rock.

Lecanora agardhiana Ach., (23) in IRGA-148 [B 60 0203751], on rock.

Lecanora bandolensis B. de Lesd., (3) IRGA-113 [B 60 0202397], on wall; (4) IRGA-26 [B

60 0088431], on calcareous rock; (23) IRGA-159 [B 60 0203730], on rock.

Lecanora bolcana (Pollini) Poelt {syn. *Protoparmeliopsis bolcana* (Pollini) Lumbsch}, (28) IRGA-627 [B 60 0203837], on ferrite rock in open vegetation.

Lecanora chlarotera Nyl., (17) IRGA-541 [B 60 0203731], on dead *Prunus dulcis*.

Lecanora dispersa (Pers.) Röhl., (17) in IRGA-539 [B 60 0203781], on dead *Prunus dulcis*; (28) IRGA-622 [B 60 0203838], on ferrite rock in open vegetation.

Lecanora expallens Ach. s.l., (7) IRGA-542 [B 60 0203733], on *Juniperus phoenicea* bark; (11) IRGA-121 [B 60 0203732], on *Pinus halepensis* bark.

Lecanora horiza (Ach.) Lindsay, (8) in IRGA-439 [B 60 0203639], on *Pistacia lentiscus* bark; (8) in IRGA-458 [B 60 0203675], on *Juniperus phoenicea* bark; (17) in IRGA-541 [B 60 0203731], on dead *Prunus dulcis*; (21) in IRGA-354 [B 60 0203819], on *Olea europaea* bark; (21) in IRGA-355 [B 60 0203664], on *Olea europaea* bark; (21) IRGA-352 [B 60 0203735], on *Calicotome villosa* bark; (24) IRGA-236 [B 60 0203734], on *Pistacia lentiscus* root.

Lecanora lividocinerea Bagl., (8) IRGA-18 [B 60 0202381], on bark.

Lecanora prophetae-eliae Sipman, (22) IRGA-58 [B 60 0202415], on calcareous rock.

Lecanora pruinosa Chaub., (1) in IRGA-320 [B 60 0203661], on rock; (4) IRGA-20 [B 60 0202389], on rock; (16) in IRGA-571 [B 60 0203649] cf., IRGA-573 [B 60 0203736], on rock.

Lecanora semipallida H. Magn., (3) IRGA-115 [B 60 0202371], on wall.

Lecanora sulphurata Nyl. {syn. *Lecanora rupicola* ssp. *sulphurata* (Nyl.) Leuckert & Poelt}, (1) IRGA-213 [B 60 0203738], on rock; (18) IRGA-183 [B 60 0203737], on rock. Corrected authorship provided by L. Arcadia.

Lecanora sulphurea (Hoffm.) Ach., (2) IRGA-270 [B 60 0203740], on rock.

Lecanora symmicta (Ach.) Ach., (8) in IRGA-439 [B 60 0203639], on *Pistacia lentiscus* bark.

Lecidella asema (Nyl.) Knoph & Hertel, (1) IRGA-210 [B 60 0203742], on rock, thallus C+ orange.

Lecidella elaeochroma (Ach.) M. Choisy, (8) IRGA-19 [B 60 0117105], on bark; (8) in IRGA-439 [B 60 0203639], on *Pistacia lentiscus* bark; (8) IRGA-446 [B 60 0203743], on *Ceratonia siliqua* bark; (11) in IRGA-121 [B 60 0203732], on *Pinus halepensis* bark; (17) in IRGA-541 [B 60 0203731], on dead *Prunus dulcis*; (21) in IRGA-355 [B 60 0203664], on *Olea europaea* bark. No TLC was done to distinguish the xanthone patterns, and all samples were included in *C. elaeochroma* regardless of thallus color or C-reaction.

Lemmopsis arnoldiana (Hepp) Zahlbr., (17) IRGA-491 [B 60 0203744], on rock. The specimen is tiny and the identification therefore not completely certain.

Lepraria isidiata (Llimona) Llimona & A. Crespo, (6) IRGA-47 [B 60 0107876], on soil.

Lepraria leuckertiana (Zedda) L. Saag, (22) IRGA-64 [B 60 0061688], on calcareous rock.

Lichinella cribellifera (Nyl.) P.P. Moreno & Egea, (28) IRGA-626 [B 60 0203839], on ferrite rock in open vegetation.

Lichinella iodopulchra (Couderc ex Croz.) P. P. Moreno & Egea, (22) IRGA-57 [B 60 0168664], on calcareous rock; (26) IRGA-193 [B 60 0203745], on rock.

Lichinella stipatula Nyl., (1) IRGA-234 [B 60 0203746], on rock; (28) IRGA-634 [B 60 0203840], on ferrite rock in open vegetation.

Ocellomma picconianum (Bagl.) Ertz & Tehler {syn. *Schismatomma picconianum* (Bagl.) J. Steiner},

(8) in IRGA-446 [B 60 0203743], on *Ceratonia siliqua* bark; (8) IRGA-459 [B 60 0203748], on *Juniperus phoenicea* bark; (17) in IRGA-533 [B 60 0203697], on dead *Prunus dulcis*. Ertz et al. (2015) recognized by DNA analysis the separate status of this misunderstood species, which had been confused with *Diromma dirinellum* (Nyl.) Ertz & Tehler.

Ochrolechia pallescens (L.) A. Massal., (17) IRGA-534 [B 60 0203749], on dead *Prunus dulcis*.

Opegrapha rupestris Pers., (5) in IRGA-432 [B 60 0203759], on rock; (23) IRGA-148 [B 60 0203751], on rock; (27) in IRGA-385 [B 60 0203672], on rock; (27) IRGA-389 [B 60 0203752], on rock.

Paralecanographa grumulosa (Dufour) Ertz & Tehler, (1) IRGA-308 [B 60 0203754], on rock; (8) IRGA-445 [B 60 0203755], on *Ceratonia siliqua* bark; (26) IRGA-202 [B 60 0203753], on rock.

Peccania coralloides (A. Massal.) Arnold, (22) IRGA-55 [B 60 0202402], on soil. Corrected authorship provided by L. Arcadia.

Peltula euploca (Ach.) Poelt, (28) IRGA-606 [B 60 0203841], on ferrite rock in open vegetation.

Peltula obscurans (Nyl.) Gyeln., (28) IRGA-605 [B 60 0203842], on ferrite rock in open vegetation.

Pertusaria lactescens Mudd, (12) IRGA-85 [B 60 0202362], on schistose rock, TLC (j585, 586) norstictic, connorstictic acids, ITS: MN512259; (12) IRGA-301 [B 60 0203758], on rock, TLC (j668) norstictic, connorstictic acids, ITS: MN512260. **New for Greece**.

Petractis luetkemuelleri (Zahlbr.) Vězda, (5) IRGA-432 [B 60 0203759], on rock.

Fig. 9. *Placidiopsis cinerascens* is an inconspicuous, crustose lichen on soil, more easy to find in wintertime when the soil is wet.

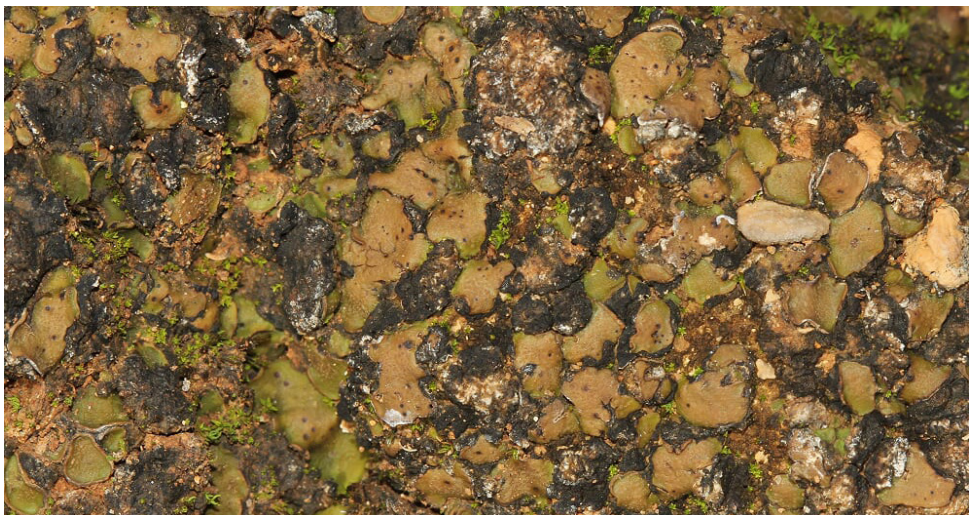

Fig. 10. *Placidium semaforonense* grows on open, loamy soil. Its lobes are rather loosely applicate to the soil and connected by pale rhizoids, and in wet condition its lobes turn greenish.

Physcia adscendens H. Olivier, (7) in IRGA-543 [B 60 0203696], on *Juniperus phoenicea* bark; (8) IRGA-438 [B 60 0203761], on *Pistacia lentiscus* bark, TLC (j632) atranorin, ITS: MN512261; (17) in IRGA-533 [B 60 0203697], on dead *Prunus dulcis*; (19) IRGA-500 [B 60 0203762], on *Olea europaea* bark. TLC (j633) atranorin, ITS: MN512263; (20) in IRGA-117 [B 60 0202395], on calcareous rock; (21) IRGA-353 [B 60 0203760], on *Calicotome villosa* bark, TLC (j634) atranorin, ITS: MN512262; with apothecia; (23) in IRGA-164 [B 60 0203656], on rock. Corrected authorship provided by L. Arcadia.

Physcia biziana (A. Massal.) Zahlbr. var. ***biziana***, (6) IRGA-38 [B 60 0202410], on bark; (11) in IRGA-122 [B 60 0203662], on *Pinus halepensis* bark.

Physcia biziana var. ***leptophylla*** Vězda, (17) IRGA-540 [B 60 0203763], on dead *Prunus dulcis*.

Physcia caesiella (B. de Lesd.) Suza {syn. *Physcia caesia* var. *caesiella* (de Lesd.) Clauzade & Cl. Roux},(24) in IRGA-588 [B 60 0203827], on *Juniperus phoenicea* bark.

Placidiopsis cinerascens (Nyl.) Breuss, (6) IRGA-526 [B 60 0203765], on soil; (14) IRGA-521 [B 60 0203764], on soil; (19) IRGA-562 [B 60 0203766], on soil (Fig. 9).

Placidium pilosellum (Breuss) Breuss, (12) IRGA-87 [B 60 0107893], on soil; (14) IRGA-522 [B 60 0203767], on soil; (22) in IRGA-55 [B 60 0202402], on soil.

Placidium semaforonense (Breuss) Breuss, (1) IRGA-554 [B 60 0203769], on rock; (6) IRGA-367 [B 60 0203768], on soil; (12) IRGA-89 [B 60 0192947], on soil (Fig. 10).

Placopyrenium canellum (Nyl.) Gueidan & Cl. Roux, (23) in IRGA-140 [B 60 0203665], on rock.

Placopyrenium trachyticum (Hazsl.) Breuss, (28) IRGA-630 [B 60 0203843], on ferrite rock in open vegetation.

Placynthium nigrum (Huds.) Gray, (10) IRGA-520 [B 60 0203775], on soil.

Porina chlorotica (Ach.) Müll. Arg., (26) in IRGA-198 [B 60 0203720], on rock.

Porina linearis (Leight.) Zahlbr., (2) IRGA-265 [B 60 0203776], on rock; (20) IRGA-117 [B 60 0202395], on calcareous rock; (26) in IRGA-194 [B 60 0203629], on rock.

Protoparmelia montagnei (Fr.) Poelt & Nimis var. ***montagnei***, (2) IRGA-271 [B 60 0203777], on rock.

Psora decipiens (Hedw.) Hoffm., (8) IRGA-9 [B 60 0110821], on soil; (21) IRGA-356 [B 60 0203778], on soil.

Ramalina canariensis J. Steiner, (7) in IRGA-543 [B 60 0203696], on *Juniperus phoenicea* bark; (8) IRGA-16 [B 60 0202411], on bark; (19) IRGA-503 [B 60 0203779], on *Juniperus phoenicea* bark.

Ramalina fastigiata (Pers.) Ach., (19) IRGA-499 [B 60 0117044], on *Olea europaea* bark, TLC (j789) tr. usnic, vs. evernic acids.

Ramalina requienii (De Not.) Jatta, Megalos Avelas islet, on schist rock (photo IMG_7401.JPG, IMG_3957.JPG)

Rhizocarpon distinctum Th. Fr., (12) IRGA-92 [B 60 0107869], on schistose rock.

Rinodina immersa (Körb.) J. Steiner, (23) in IRGA-140 [B 60 0203665], on rock.

Rinodina oleae Bagl., (11) in IRGA-123 [B 60 0203663], on *Pinus halepensis* bark; (17) IRGA-539 [B 60 0203781], on dead *Prunus dulcis*.

Roccella phycopsis Ach., (1) in IRGA-317 [B 60 0203714], on rock; (12) IRGA-91 [B 60 0202357], on calcareous rock; (17) IRGA-495 [B 60 0203782], on rock.

Romjularia lurida (Ach.) Timdal, (12) IRGA-100 [B 60 0202356], on calcareous rock; (17) IRGA-487 [B 60 0203783], on rock.

Sarcogyne regularis Körb., (5) IRGA-429 [B 60 0203784], on rock.

Solenopsora candicans (Dicks.) J. Steiner, (12) IRGA-292 [B 60 0203787], on rock; (13) in IRGA-346 [B 60 0203691], on rock.

Solenopsora cesatii (A. Massal.) Zahlbr., (13) IRGA-335 [B 60 0203788], on rock, TLC (j635) pannarin, zeorin.

Solenopsora grisea (Bagl.) Kotlov, (2) IRGA-272 [B 60 0203789], on rock; (12) in IRGA-292 [B 60 0203787], on rock; (17) IRGA-489 [B 60 0203790], on rock; (23) in IRGA-177 [B 60 0203809], on rock.

Solenopsora olivacea (Fr.) H. Kilias, (2) in IRGA-268 [B 60 0203688], on rock; (23) IRGA-139 [B 60 0203791], on rock; (27) IRGA-400 [B 60 0203792], on rock.

Solenopsora vulturiensis A. Massal., (4) IRGA-25 [B 60 0061825], on soil; (27) IRGA-585 [B 60 0203844], on rock.

Squamarina cartilaginea (With.) P. James, (1) IRGA-217 [B 60 0203793], on rock; (1) IRGA-561 [B 60 0088421], on rock, tlc (j809) psoromic, 2'-O-demethylpsoromic acid; (8) IRGA-1 [B 60 0107903], on soil; (19) IRGA-563 [B 60 0202380], on soil, TLC (j810) usnic acid, fatties, terpenoids.

Squamarina concrescens (Müll. Arg.) Poelt, (12) IRGA-93 [B 60 0202375], on soil (Fig. 11).

Squamarina gypsacea (Sm.) Poelt, (17) IRGA-486 [B 60 0203795], on rock; (24) IRGA-243 [B 60 0203794], on rock.

Squamarina lentigera (Weber) Poelt, (3) IRGA-80 [B 60 0202379], on soil; (6) IRGA-528 [B 60 0203796], on soil; (8) IRGA-8 [B 60 0107870], on soil.

****Stigmidium tabacinae*** (Arnold) Triebel, (8) IRGA-470 [B 60 0203798], lichenicolous on *Toninia sedifolia* on soil.

Fig. 11. *Squamarina concrescens* grows on soil on warm and dry places. It differs from the more common *S. cartilaginea* by producing marginal lobules, which spread and develop into new thalli.

Fig. 12. *Toninia albilabra* deviates from the more widespread *T. sedifolia* by the more greenish thallus lobes when wet, which develop whitish lines along their margins.

Tephromela atra (Huds.) Hafellner, (1) IRGA-209 [B 60 0203799], on rock; (2) IRGA-282 [B 60 0203800], on rock.

Thelopsis isiaca Stizenb., (8) in IRGA-458 [B 60 0203675], on *Juniperus phoenicea* bark.

Toninia albilabra (Dufour) H. Olivier, (1) IRGA-559 [B 60 0203801], on rock (Fig. 12).

Toninia aromatica (Turner) A. Massal. {syn. *Toniniopsis aromatica* (Sm.) Kistenich et al.}, (1) IRGA-205 [B 60 0203802], on rock; (13) IRGA-324 [B 60 0203803], on rock; (17) in IRGA-487 [B 60 0203783], on rock; (19) IRGA-75 [B 60 0202376], on soil; (22) IRGA-63 [B 60 0202408], on soil.

Toninia episema (Nyl.) Timdal, (8) IRGA-479 [B 60 0203805], lichenicolous on *Aspicilia contorta* on rock.

Toninia opuntioides (Vill.) Timdal {syn. *Thalloidima opuntioides* (Vill.) Kistenich et al.}, (24) IRGA-245 [B 60 0203806], on rock; (27) IRGA-403 [B 60 0203807], on rock.

Toninia sedifolia (Scop.) Timdal {syn. *Thalloidima sedifolium* (Scop.) Kistenich et al.}, (2) IRGA-266 [B 60 0203808], on rock; (6) in IRGA-47 [B 60 0107876], on soil; (8) IRGA-109 [B 60 0202369], in IRGA-470 [B 60 0203798], on rock; (22) IRGA-68 [B 60 0202414], on soil.

Tornabaea scutellifera (With.) J.R. Laundon, (19) IRGA-501 [B 60 0203810], on *Juniperus phoenicea* bark.

Verrucaria macrostoma DC., (12) IRGA-290 [B 60 0203811], on rock.

Verrucaria nigrescens Pers., (1) in IRGA-315 [B 60 0203685], on rock; (10) IRGA-506 [B 60 0203815], on soil; (12) in IRGA-297 [B 60 0203657], on rock; (26) in IRGA-199 [B 60 0203812], on rock; (27) IRGA-404 [B 60 0203814], on rock.

Verrucaria pinguicula A. Massal., (7) in IRGA-546 [B 60 0203670], IRGA-547 [B 60 0203816], on small ferrite stone.

Verrucaria polysticta Borrer, (8) IRGA-468 [B 60 0203773], on rock; (11) IRGA-532 [B 60 0203774], on rock.

Xanthoparmelia attica (Leuckert et al.) O. Blanco et al. {syn. *Neofuscelia attica* (Leuckert et al.) Essl.}, (1) IRGA-220 [B 60 0203747], on rock, TLC (j667) norstictic, gyrophoric acids.

Xanthoparmelia tinctina (Maheu & A. Gillet) Hale, photo IMG-0349, IMG-0351, on rock.

Xanthoria parietina (L.) Th. Fr., (8) IRGA-441 [B 60 0203820], on *Pistacia lentiscus* bark; (11) in IRGA-122 [B 60 0203662], on *Pinus halepensis* bark; (19) IRGA-77 [B 60 0202413], on calcareous rock; (21) IRGA-354 [B 60 0203819], on *Olea europaea* bark. The only species published before from Iraklia, by Szatala (1943), leg. Rechinger 6427.

About a dozen further lichen species are represented in the samples, which are left unidentified because the material was too scarce or the group insufficiently known.

Acknowledgement

Linda in Arcadia (Kastri, Greece) and Helmut Mayrhofer (Graz, Austria) are gratefully acknowledged for kindly reviewing the manuscript and for giving many valuable suggestions for improvement. Linda in Arcadia was particularly generous to provide several unpublished corrections of author citations. The Botanical Museum Berlin-Dahlem generously supported our work by placing its facilities (library, herbarium, laboratory) at our disposal. A special word of thanks is for Linda in Arcadia, for the “notes on Greek lichens” which bring so much lichen information of possible interest

for Greece under our attention, which is difficult to find otherwise, because it is published scattered in an immense, ever-increasing fundus of literature. This is a great help in particular in recognizing new records.

Literature

Abbott, B. F. M. 2009. Checklist of the lichens and lichenicolous fungi of Greece. - Bibliotheca Lichenologica 103. J. Cramer in der Gebrüder Borntraeger Verlagsbuchhandlung, Berlin and Stuttgart. 368 pages.

Arcadia, L. 2019. Lichen flora of Greece including lichenicolous fungi. Version: 4 May 2019. - http://www.lichensofgreece.com/flora.pdf, accessed on 18 June 2019.

Arup, U. 2006. A new taxonomy of the *Caloplaca citrina* group in the Nordic countries, except Iceland. - Lichenologist 38 (1): 1-20.

Breuss, O. 1990. Die Flechtengattung *Catapyrenium* (Verrucariaceae) in Europa. - Stapfia 23: 1-153.

Breuss, O 1994. Die Flechtengattungen *Catapyrenium* und *Placidiopsis* (Verrucariaceae) in Nordafrika. - Nova Hedwigia 58 (1-2): 229-237.

Clauzade, G. & Roux, C. 1985. Likenoj de okcidenta Europo, Ilustrita determinlibro. - Bulletin de la Société Botanique du Centre-Ouest, Nouvelle Serie, Numero Spécial 7. Royan, France. 893 pages.

Clauzade, G., Diederich, P. & Roux, C. 1989. Nelikenigintaj fungoj likenlogaj. Ilustrita determinlibro. - Bulletin de la Société Linnéenne de Provence, Numero Spécial 1: 1-142.

Egea, J. M. 1989. Los generos *Heppia* y *Peltula* (Liquenes) en Europa occidental y norte de Africa. - Bibliotheca Lichenologica 31. J. Cramer, Berlin-Stuttgart. 122 pages

Egea, J. M. & Torrente, P. 1993. The lichen genus *Bactrospora*. - Lichenologist 25(3): 211-255.

Ertz, D. & Tehler, A. 2011. The phylogeny of Arthoniales (Pezizomycotina) inferred from nucLSU and RPB2 sequences. - Fungal Diversity 49: 47-71.

Ertz, D., Tehler, A., Irestedt, M., Frisch, A., Thor, G. & van den Boom, P. 2015. A large-scale phylogenetic revision of Roccellaceae (Arthoniales) reveals eight new genera. - Fungal Diversity 70(1): 31-53.

Feige, G. B. & Lumbsch, H. T. 1993. A European species of the lichen genus *Ingaderia* and comments on the relationship of the genera *Darbishirella* and *Ingaderia* (Roccellaceae). - Mycotaxon 48: 381-387.

Guttová, A., Zozomová-Lihová, J., Timdal, E., Kučera, J., Slovák, M., Piknová, K. & Paoli, L. 2014. First insights into genetic diversity and relationships of European taxa of *Solenopsora* (Catillariaceae, Ascomycota) with implications for their delimitation. - Botanical Journal of the Linnean Society 176 (2): 203-223.

Hoang, D. T., Chernomor, O., Haeseler, A. von, Minh, B. Q. & Vinh, L. S. 2018. UFBoot2: Improving the ultrafast bootstrap approximation. - Mol. Biol. Evol. 35: 518-522. DOI: 10.1093/molbev/msx281

Kondratyuk, S.Y., Lőkös, L., Kapetz, N. V., Pleskach, L. Ya., Kim, J., Kondratiuk, A. S. & Hur, J.-S. 2015. *Physcia ucrainica* sp. nova (Physciaceae, Ascomycota) from the Crimean Peninsula, proved by molecular phylogeny. - Acta Botanica Hungarica 57 (1-2): 143-163.

Llop, E. 2007. Flora Liquenologica Iberica 3: Lecanorales: Bacidiaceae I: Bacidia y Bacidina. - Sociedad Espanola de Liquenologica. 49 pages

Lumbsch, H. T. 1989. Die holarktischen Vertreter der Flechtengattung *Diploschistes* (Thelotremataceae). - Journal of the Hattori Botanical Laboratory 66: 133-196.

Mayrhofer, M. 1988. Studien uber die saxicolen Arten der Flechtengattung *Lecania* in Europa II.

Lecania s. str. - Bibliotheca Lichenologica No. 28. J. Cramer, Berlin-Stuttgart. 133 pp.
Moreno, P. P. & Egea, J. M. 1992. Estudios sobre el complejo *Anema-Thyrea-Peccania* en el sureste de la Peninsula Iberica y norte de Africa [Studies on the *Anema-Thyrea-Peccania* complex from the southeastern Iberian Peninsula and northern Africa]. - Acta Botanica Barcinonensia 41: 1-66.
Nguyen, L.-T., Schmidt, H. A., Haeseler, A von, & B.Q. Minh, B. Q. 2015. IQ-TREE: A fast and effective stochastic algorithm for estimating maximum likelihood phylogenies. - Mol. Biol. Evol. 32: 268-274. DOI: 10.1093/molbev/msu300.
Nimis, P. L. 2016. The Lichens of Italy - a second annotated catalogue. - Trieste, EUT Edizioni Universita di Trieste. 740 pages.
Orange, A., James, P. W, & White, F. J. 2001. Microchemical methods for the identification of lichens. - British Lichen Society. 101 pages.
Saag, L., Saag, A. & Randlane, T. 2009. World survey of the genus *Lepraria* (Stereocaulaceae, lichenized Ascomycota). - Lichenologist 41(1): 25-60.
Scheidegger, C. 1993. A revision of European saxicolous species of the genus *Buellia* de Not. and formerly included genera. - Lichenologist 25(4): 315-364.
Sipman, H. J. M. & Raus, T. 1995. Lichen observations from Santorini (Greece). - In: Knoph, J.-G., Schrüfer, K. & Sipman, H. J. M. (eds.), Studies in lichenology with emphasis on chemotaxonomy, geography and phytochemistry. Festschrift Christian Leuckert. - Bibliotheca Lichenologica 57, J. Cramer, Berlin, Stuttgart, pp. 409-428.
Sipman, H. J. M. & Raus, T. 2002. An inventory of the lichen flora of Kalimnos and parts of Kos (Dodecanisos, Greece). - Willdenowia 32: 351-392.
Sipman, H. J. M. & Raus, T. 2015. Lichens and lichenicolous fungi from the island of Chios (Aegean Sea, Greece). - Herzogia 28 (2): 520-544.
Sipman, H. J. M., & Raus, T. in Biel & Tan, in prep. Flora of Amorgos.
Smith, C. W., Aptroot, A., Coppins, B. J., Fletcher, A., Gilbert, O. L., James, P. W. & Wolseley, P. A. (eds.) 2009. The lichens of Great Britain and Ireland. - British Lichen Society, London, 1046 pages.
Szatala, Ö. 1943. Lichens. - In: K. H. Rechinger, Flora Aegaea - Flora der Inseln und Halbinseln des Ägäischen Meeres. - Denkschriften der Akademie der Wissenschaften in Wien, Mathematisch-Naturwissenschaftliche Klasse 105 (1): 16-58.
Tehler, A. 1983. The genera *Dirina* and *Roccellina*. - Opera Botanica 70: 1-86.
Tehler, A., Ertz, D. & Irestedt, M. 2013. The genus *Dirina* (Roccellaceae, Arthoniales) revisited. - The Lichenologist 45 (4): 427-476.
Timdal, E. 1991. A monograph of the genus *Toninia* (Lecideaceae, Ascomycetes). - Opera Botanica 110: 1-137.
Torrente, P. & Egea, J. M. 1989. La Familia Opegraphaceae en el Area Mediterránea de la Península Ibérica y Norte de Africa. - Bibliotheca Lichenologica 32. 282 pp.
Trifinopoulos; J., Nguyen, L.-T., Haeseler, A. von & Minh, B. Q. (2016) W-IQ-TREE: a fast online phylogenetic tool for maximum likelihood analysis. - Nucleic Acids Res. 44 (W1): W232-W235. DOI: 10.1093/nar/gkw256
Vondrak, J., Řiha, P., Arup. U. & Søchting, U. 2009. The taxonomy of the *Caloplaca citrina* group (Teloschistaceae) in the Black Sea region; with contributions to the cryptic species concept in lichenology. - Lichenologist 41 (6): 571-604.