

## THE LICHENS OF ALONISOS, SPORADES ISLANDS, GREECE

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### Abstract

Only two reports of lichen species have been published previously for Alonisos. Following a visit by the author in October 2018, a total of 120 species plus 2 infra-specific taxa are now known from the island. No lichenicolous fungi are known.

### Introduction

The lichens of the Sporades archipelago are little known. The Greek lichen checklist, Abbott (2009), listed just 10 species. For the island of Alonisos Abbott listed only a single species, *Caloplaca erythrocarpa*. One other published report, *Caloplaca cretensis* in Muggia et al. (2008), was received too late to be included in the checklist. In October 2018 I visited Alonisos and was able to study the lichens. As a result, 122 lichen taxa, 120 species and 2 infra-specific taxa, are now known. No lichenicolous fungi in sufficiently good condition to be determined were seen. No species new to Greece were found.

Alonisos is the most easterly inhabited island of the northern Sporades. To its SW is the large inhabited island of Skopelos, to its east is the small uninhabited island of Peristeri, and to its NE are several small uninhabited islands, the nearest of which is Kiri Panagia. It extends about 20 km along its principal axis, which runs SW to NE, but is nowhere more than 5 km wide. The total area is about 64 sq. km. The mid point of the island is at approximately 38° 13' N, 23° 55' E. The maximum elevation is 476 m.

Much of the exposed rock is limestone, and the remainder consists mostly of calcareous sediments. Non-calcareous rocks do occur, mainly as small inclusions in otherwise calcareous sediments, but are uncommon.

The climate is warm temperate. The Köppen classification is Cfa ("hot summer, Mediterranean climate"). The mean annual temperature is 16.6° C, the coolest month is January (monthly mean 8° C), and the warmest is July (monthly mean 26° C). The annual average precipitation is about 490 mm, with a distinct winter maximum.

The permanent human population is about 2000 people, but the summer population is considerably greater owing to tourism. Permanent human settlement is restricted to the SW half, and most habitations

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are in or close to the small town of Patitiri. However, the entire island has been greatly modified by human activity. In the SW there are extensive plantations of pine; they have low biodiversity. Elsewhere there is much grazing; large parts of the island appear to be over-grazed, though not so badly as to result in significant erosion. Sites with little contemporary disturbance and some degree of ecological continuity are rare; we found only one. However, large parts of the island are difficult to access, and other undisturbed sites may be present, such as along the very inaccessible NW coast.

### Materials and Methods

Seven sites were studied, as follows. At each site, all substrates were studied, unless otherwise noted.

1. 1 km north of Diaselo, 39° 15' 10" N, 23° 56' 35" E, altitude 200 m, 24 October 2018. Disturbed maquis with *Quercus ilex*, *Q. coccifera*, *Pistacia terebinthus*, etc. on limestone. Much evidence of grazing.

2. South side of Patitiri harbour, 39° 08' 30" N, 23° 52' 00" E, altitude 0 to a few m, 25 October 2018. Limestone rock at the coast bordering a plantation of *Pinus halepensis*.

3. Road cutting 500 m south east of Megali Ammos, 39° 10' 40" N, 23° 53' 10" E, altitude 120 m, 26 October 2018. The road cutting exposes an outcrop of rock intermediate in type between a sandy limestone and a calcareous sandstone; it had a schistose texture. Most attention was paid to lichens on this rock. Lichens on bark were not studied at all.

4. Valley north west of Kastraki, 39° 11' 10" N, 23° 53' 00" E, altitude 100 m, 26 October 2018. Small valley with calcareous sandstone and small abandoned agricultural terraces reverting to phrygana. Some disturbance by grazing.

5. Koutouria, 39° 13' 45" N, 23° 54' 50" E, altitude 280 m, 27 October 2018 (epiphytes) and 28 October 2018 (other substrates). Mature, undisturbed maquis on limestone in valley with mature trees of *Quercus ilex* and both Greek species of *Arbutus*, *A. andrachne* and *A. unedo*. (Fig.1).

6. Geraki Bay, 39° 16' 25" N, 23° 56' 30" E, altitude 0 m, 28 October 2018. Limestone outcrop near harbour. Only saxicolous lichens studied.

7. Top of Kastania gorge, below new dam, 39° 14' 00" N, 23° 56' 25" E, altitude 250 m. An area of open scrub above a sheltered valley, on limestone. The whole site was rather disturbed.

Determinations were made using an MBS-9 stereo microscope for external examination, an Olympus CX40 for study of thin sections, and the usual reagents for spot tests (see, for example, Smith et al. 2009). No chromatography was done, and as a result some sterile crustose lichens, including species of *Lepraria*, could not be determined. At present, collections are in the author's personal herbarium.

### Results and Discussion

All lichens now known for Alonisos are listed. Nomenclature follows Arcadia (2019). Mention of a phorophyte as substrate refers to its bark unless wood is stated explicitly. Lichens that were undetermined, or determined only to genus, are not listed.

*Arthrosporum populorum* A. Massal.; 5 on *Phillyrea* sp.

*Bactrospora patellarioides* var. *convexa* (de Lesd.) Egea & Torrente; 1 on: *Pistacia terebinthus*, *Quercus coccifera*, *Q. ilex*; 5 on *Pistacia terebinthus*; 7 on: *Acer* sp., *Quercus ilex*. All material seen was closer to var. *convexa* than to var. *patellarioides*, though it is unclear whether var. *convexa* really merits taxonomic recognition.

- Bagliettoa baldensis* (A. Massal.) Vězda; 3 on sandy limestone; 5 on limestone.
- Bagliettoa cazzae* (Zahlbr.) Vězda & Poelt; 1 on limestone.
- Bagliettoa marmorea* (Scop.) Gueidan & Cl. Roux; 5 on limestone.
- Bagliettoa parmigera* (J. Steiner) Vězda & Poelt; 1 on limestone.
- Buellia abstracta* (Nyl.) H. Olivier; 4 on siliceous rock.
- Caloplaca albopruinosa* (Arnold) H. Olivier; 2, 6, both on limestone.
- Caloplaca arenaria* (Pers.) Müll. Arg.; 5 on siliceous rock.
- Caloplaca aurantia* (Pers.) Hellb.; 1, 2, 4, 6, 7, all on limestone.
- Caloplaca calcitrata* Nav.-Ros., Gaya & Cl. Roux; 1, 2, 5, 6, all on limestone.
- Caloplaca cerinelloides* (Erichsen) Poelt; 1 on: *Pistacia terebinthus*, *Quercus ilex*; 2 on: *Cupressus sempervirens*, *Pinus halepensis*.
- Caloplaca chalybaea* (Fr.) Müll. Arg.; 2 on limestone.
- Caloplaca cretensis* (Zahlbr.) Wunder; Reported by Muggia, Grube & Tretiach (2008). No substrate reported. Not seen in October 2018.
- Caloplaca erythrocarpa* (Pers.) Zwackh; Reported by Abbott (2009). Specimen in herb. C. J. B. Hitch, collected by George Baron, July 1985, on stone wall to [sic] Patitiri. Not seen in October 2018.
- Caloplaca ferruginea* (Huds.) Th. Fr.; 7 on Acer sp.
- Caloplaca flavescens* (Huds.) J. R. Laundon; 1, 2, 4, 6, all on limestone.
- Caloplaca haematites* (Chaub.) Zwackh; 2 on *Cupressus sempervirens*.
- Caloplaca inconnexa* (Nyl.) Zahlbr.; 5, 7, both on limestone.
- Caloplaca lactea* (A. Massal.) Zahlbr.; 2 on limestone.
- Caloplaca lacteoides* Nav.-Ros. & Hladun; 2 on limestone.
- Caloplaca limonia* Nimis & Poelt; 2 on limestone.
- Caloplaca marmorata* (Bagl.) Jatta; 2, 5, 6, 7, all on limestone.
- Caloplaca ochracea* (Schaer.) Th. Fr.; 5, 7, both on limestone.
- Catillaria detractula* (Nyl.) H. Olivier; 2 on limestone; 3 on sandy limestone; 4 on limestone.
- Catillaria lenticularis* (Ach.) Th. Fr.; 3 on sandy limestone; 6, 7 both on limestone.
- Circinaria calcarea* (L.) A. Nordin, S. Savić & Tibell f. calcarea; 6 on limestone.
- Circinaria calcarea* f. *reagens* (Zahlbr.) ined.; 1, 4, 7, all on limestone.
- Cladonia foliacea* (Huds.) Willd.; 1 on calcareous soil; 2, 5, 7 all on soil. All material was the morph with large squamules, sometimes called *Cladonia convoluta* Lam.) Anders.
- Cladonia pocillum* (Ach.) Grognot; 1 on: bryophytes on soil, on calcareous soil; 2, 3 both on soil; 5 on: bryophytes on soil, on soil; 7 on soil.
- Cladonia pyxidata* (L.) Hoffm.; 5 on *Quercus ilex*.
- Cladonia rangiformis* Hoffm.; 1 on calcareous soil; 2, 3, 5, 7 all on soil.
- Clauzadea monticola* (Ach.) Hafellner & Bellem.; 3 on sandy limestone.
- Coenogonium luteum* (Dicks.) Kalb & Lücking; 5 on *Quercus ilex*.

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- Collema furfuraceum* (Schaer.) Du Rietz; 5 on *Olea europea*.  
*Collema nigrescens* (Huds.) DC.; 1 on: *Phillyrea* sp., *Quercus coccifera*; 4 on *Olea europea*; 5 on *Quercus ilex*.  
*Cresponea premnea* (Ach.) Egea & Torrente; 5 on *Quercus ilex*.  
*Diplotomma chlorophaeum* (Hepp ex Leight.) K. P. Singh & S. R. Singh; 5 on siliceous rock.  
*Diplotomma epipolium* (Ach.) Arnold; 2 on limestone.  
*Dirina massiliensis* Durieu & Mont.; 6 on limestone.  
*Enchylium polycarpon* (Hoffm.) Otálora, P. M. Jørg. & Wedin; 2, 6, both on limestone.  
*Enchylium tenax* (Sw.) Gray; 1 on: bryophytes on soil, on calcareous soil; 2 on: bryophytes on limestone, on soil; 5 on bryophytes on soil.  
*Evernia prunastri* (L.) Ach.; 5 on *Cercis siliquastrum*.  
*Flavoparmelia caperata* (L.) Hale; 1 on *Quercus coccifera*; 5 on: *Cercis siliquastrum*, *Phillyrea* sp., *Quercus ilex*.  
*Fuscopannaria olivacea* (P. M. Jørg.) P. M. Jørg.; 4 on *Olea europea*; 5 on *Quercus ilex*.  
*Gyalecta derivata* (Nyl.) H. Olivier; 5 on *Quercus ilex*.  
*Hydropunctaria adriatica* (Zahlbr.) Orange; 2 on limestone.  
*Hyperphyscia adglutinata* (Flörke) H. Mayrhofer & Poelt; 1, 7, both on *Quercus ilex*.  
*Hypogymnia tubulosa* (Schaer.) Hav.; 5 on *Cercis siliquastrum*.  
*Lathagrium cristatum* (L.) Otálora, P. M. Jørg. & Wedin; 6 on limestone.  
*Lecania erysibe* (Ach.) Mudd; 5, 6, both on limestone.  
*Lecania rabenhorstii* (Hepp) Arnold; 4 on limestone.

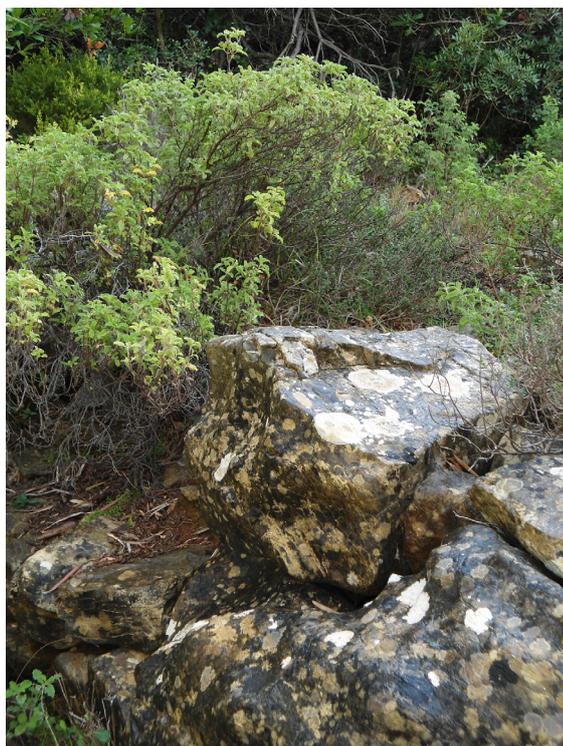


Fig. 1. Lichens on limestone at Site 5.

*Lecanora chlarotera* Nyl.; 1 on: *Pistacia terebinthus*, *Quercus coccifera*, *Q. ilex*; 2 on: *Olea europea*, *Pinus halepensis*; 4 on *Pistacia terebinthus*; 5 on: *Cercis siliquastrum*, *Phillyrea* sp., *Pistacia terebinthus*; 7 on: *Acer* sp., *Pistacia lentiscus*, *Quercus ilex*.

*Lecanora horiza* (Ach.) Linds.; 1 on *Pistacia terebinthus*.

*Lecanora poeltiana* Clauzade & Cl. Roux; 2 on limestone; 3 on sandy limestone; 6 on limestone. Material from site 2 was very scanty, so that determination is slightly tentative.

*Lecanora pruinosa* Chaub.; 4, 7, both on limestone.

*Lecidella elaeochroma* (Ach.) M. Choisy; 1 on: *Pistacia terebinthus*, *Quercus coccifera*, *Q. ilex*; 2 on: *Olea europea*, *Pinus halepensis*; 4 on: *Olea europea*, *Pistacia terebinthus*; 5 on: *Cercis siliquastrum*, *Olea europea*, *Phillyrea* sp., *Pistacia terebinthus*; 7 on: *Acer* sp., *Quercus ilex*.

*Leptogium lichenoides* (L.) Zahlbr.; 1 on bryophytes on soil.

- Leptogium teretiusculum* (Wallr.) Arnold; 5 on *Quercus ilex*.
- Lobothallia controversa* Cl. Roux & A. Nordin; 4 on limestone.
- Melanelia glabratula* (Lamy ex Nyl.) Essl.; 1 on: *Phillyrea* sp., *Quercus ilex*; 4 on *Olea europea*; 5 on: *Cercis siliquastrum*, *Phillyrea* sp.; 7 on *Acer* sp.
- Moelleropsis nebulosa* (Hoffm.) Gyeln.; 5 on soil.
- Nephroma laevigatum* Ach.; 5 on *Quercus ilex*.
- Normandina pulchella* (Borrer) Nyl.; 5 on *Quercus ilex*.
- Opegrapha calcarea* Turner ex Sm.; 1, 2 both on limestone; 3 on sandy limestone; 5, 7 both on limestone.
- Opegrapha culmigena* Lib.; 1 on *Acer* sp.; 2 on *Olea europea*; 5 on wood. Material from sites 1 and 2 was scanty and most apothecia were over-mature, so those determinations are slightly tentative.
- Opegrapha varia* Pers.; 1 on *Quercus ilex*; 5 on *Quercus ilex*; 7 on *Acer* sp.
- Parmelia sulcata* Taylor; 5 on: *Cercis siliquastrum*, *Olea europea*, limestone; 7 on *Acer* sp.
- Parmelina quercina* (Willd.) Hale; 4 on bark of undetermined dead species.
- Parmelina tiliacea* (Hoffm.) Hale; 1 on: *Pistacia terebinthus*, *Quercus ilex*; 4 on *Olea europea*; 5 on: *Cercis siliquastrum*, *Olea europea*; 7 on *Quercus ilex*.
- Parmotrema perlatum* (Huds.) M. Choisy; 5 on: *Acer* sp., *Cercis siliquastrum*.
- Peltigera neckeri*; Hepp ex Müll. Arg. 5 on bryophytes on soil.
- Pertusaria albescens* (Huds.) M. Choisy & Werner; 4 on *Olea europea*.
- Pertusaria coccodes* (Ach.) Nyl.; 4 on *Olea europea*; 5 on: *Phillyrea* sp., *Quercus ilex*.
- Pertusaria flavida* (DC.) J. R. Laundon; 5 on *Cercis siliquastrum*.
- Pertusaria hymenea* (Ach.) Schaer.; 5 on: *Olea europea*, *Quercus ilex*.
- Pertusaria leioplaca* (Ach.) DC.; 1 on: *Pistacia terebinthus*, *Quercus coccifera*, *Q. ilex*; 2 on *Acer* sp.; 4 on *Olea europea*; 5 on *Quercus ilex*; 7 on: *Quercus coccifera*, *Q. ilex*.
- Pertusaria pertusa* (L.) Tuck.; 1 on: *Pistacia terebinthus*, *Quercus coccifera*, *Q. ilex*; 4 on *Olea europea*.
- Phaeophyscia orbicularis* (Neck.) Moberg; 5 on *Quercus ilex*.
- Phlyctis agelaea* (Ach.) Flot.; 5 on *Pistacia terebinthus*; 7 on *Quercus ilex*.
- Physcia adscendens* H. Olivier; 1 on: *Pistacia terebinthus*, *Quercus ilex*; 2 on *Olea europea*; 3 on sandy limestone; 4 on: *Olea europea*, *Pistacia terebinthus*; 5 on: *Phillyrea* sp., *Pistacia lentiscus*, limestone; 7 on *Acer* sp.
- Physcia biziana* var. *phyllidiata* Poelt & Vězda; 2 on: *Cupressus sempervirens*, *Olea europea*.
- Physcia leptalea* (Ach.) DC.; 4 on bark of undetermined dead species; 5 on *Pistacia lentiscus*; 7 on: *Acer* sp., *Phillyrea angustifolia*, *Pistacia lentiscus*.
- Physcia tenella* (Scop.) DC.; 1 on *Quercus coccifera*.
- Physconia distorta* (With.) J. R. Laundon; 4 on *Olea europea*.
- Physconia perisidiosa* (Erichsen) Moberg; 4 on *Olea europea*.
- Physconia servitii* (Nàdv.) Poelt; 5 on: *Olea europea*, *Pistacia lentiscus*, *Quercus ilex*.
- Polysporina simplex* (Davies) Vězda; 4, 5, both on siliceous rock.

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- Porina linearis* (Leight.) Zahlbr.; 1 on limestone.
- Porpidia cinereoatra* (Ach.) Hertel & Knoph; 4, 5, both on siliceous rock.
- Protoblastenia calva* (Dicks.) Zahlbr.; 3 on sandy limestone.
- Protoblastenia lilacina* Poelt & Vězda; 1, 7, both on limestone.
- Protoblastenia rupestris* (Scop.) J. Steiner; 3 on sandy limestone.
- Pyrenula macrospora* (Degel.) Coppins & P. James; 5 on *Quercus ilex*.
- Pyrrhospora quernea* (Dicks.) Körb.; 7 on *Acer* sp.
- Ramalina canariensis* J. Steiner; 1 on *Quercus ilex*; 7 on *Acer* sp.
- Ramalina farinacea* (L.) Ach.; 5 on *Cercis siliquastrum*.
- Ramalina fastigiata* (Pers.) Ach.; 5 on: *Cercis siliquastrum*, *Pistacia lentiscus*; 7 on *Acer* sp.
- Ramalina fraxinea* (L.) Ach.; 4 on bark of undetermined dead species.
- Ramalina lacera* (With.) J. R. Laundon; 1 on *Quercus ilex*.
- Ramalina subgeniculata* Nyl.; 5 on *Pistacia lentiscus*.
- Rinodina plana* H. Magn.; 4, 5, both on *Pistacia terebinthus*.
- Romjularia lurida* (Ach.) Timdal; 3 on sandy limestone; 7 on limestone.
- Schismatomma dirinellum* (Nyl.) Zahlbr.; 2 on *Cupressus sempervirens*.
- Solenopsora olivacea* (Fr.) H. Kiliass subsp. *olivacea*; 1, 2, 4, 5, 6, 7, all on limestone.
- Solenopsora olivacea* subsp. *olbiensis* (Nyl.) Clauzade & Cl. Roux; 5, 7, both on limestone.
- Squamarina cartilaginea* (With.) P. James; 1, 6, 7, all on limestone.
- Squamarina gypsacea* (Sm.) Poelt; 1 on limestone.
- Tephromela atra* (Huds.) Hafellner; 1 on: *Pistacia terebinthus*, *Quercus ilex*; 2 on *Acer* sp.; 7 on: *Acer* sp., *Pistacia lentiscus*.
- Toninia aromatica* (Sm.) A. Massal.; 2, 6, both on limestone.
- Toninia athallina* (Hepp) Timdal; 1, 5, both on limestone. For site 1 the determination is slightly tentative as no green apothecial pigment was observed.
- Usnea esperantiana* P. Clerc; 5 on: *Acer* sp., *Phillyrea* sp.
- Verrucaria fuscoatroides* Servit; 2 on limestone.
- Verrucaria fusconigrescens* Nyl.; 3 on weakly calcareous rock. Determination slightly tentative since the substrate was not strongly siliceous.
- Verrucaria muralis* Ach.; 1, 2, 5, all on limestone.
- Verrucaria murina* Leight.; 3 on sandy limestone. Determination tentative as the exciple is not very dark brown.
- Verrucaria pinguicula* A. Massal.; 3 on sandy limestone; 5 on limestone. For site 3 the material was scanty and the determination is tentative.
- Verrucaria polysticta* Borrer; 1 on limestone; 3 on sandy limestone.
- Verrucaria viridula* (Schrad.) Ach.; 3 on sandy limestone.
- Xanthoparmelia verrucigera* (Nyl.) Hale; 5 on limestone.
- Xanthoria calcicola* Oxner; 2 on limestone.

*Xanthoria parietina* (L.) Th. Fr.; 1 on: *Pistacia terebinthus*, *Quercus coccifera*; 2 on *Olea europea*; 4 on bark of undetermined dead species; 5 on *Pistacia lentiscus*; 7 on *Acer* sp.

Except at site 5, the lichen biota consisted mainly of species that are widespread and fairly common in Greece. Site 5, however, had several species that are distinctly rare in Greece, including: *Arthrosporum populorum*, *Coenogonium luteum*, *Cresponea premnea*, *Moelleropsis nebulosa*, *Pyrenula macrospora* and *Usnea esperantiana*. This site clearly has more ecological continuity than is usual on the island, and it probably has a rich biota of other groups of organisms too. It merits some degree of protection.

*Hydropunctaria adriatica*, reported here for Site 2, is a species that has been confused with *H. maura*, a species of the Atlantic coast of Europe that probably does not occur in the eastern Mediterranean. Both occur at the sea on rocks that are often submerged by wave or tide action. In *H. adriatica* the thallus is continuous or has fine cracks, whereas in *H. maura* it is cracked to areolate. *H. adriatica* also has larger perithecia, 0.4 - 1 mm diameter, compared with 0.2 - 0.4 mm in *H. maura*. As there are no good published descriptions of *H. adriatica*, I include one here, prepared from material from Site 2.

### *Hydropunctaria adriatica* (Zahlbr.) Orange (2012)

in: *Lichenologist* 44(3): 305 (A combination by Keller & Gueidan in *Taxon* 58: 194. 2009 was not validly published); *Dermatocarpon adriaticum* Zahlbr. (1904) in: *Annls Mycol.* 2: 267.

Thallus: crustose, to several cm. diameter, very dark brown to black, black dots often visible in paler parts, usually continuous, sometimes with a few cracks, thin (80 - 120  $\mu\text{m}$ ); in section with prominent black inclusions of a wide range of shapes and sizes but typically 30 - 80  $\mu\text{m}$  in extent. Cortex: poorly developed; layer above photobiont cells 5 - 20  $\mu\text{m}$  thick, colourless except where interrupted by black inclusions, without distinct structure, K-. Perithecia: absent over large areas, conspicuous when present, black,  $\pm$ sessile, globose, 0.4 mm diameter, centrum 225 x 225  $\mu\text{m}$ . Exciple: colourless in lower half of perithecia; in upper half not distinguishable from involucrellum. Involucrellum: 600  $\mu\text{m}$  diameter, with flat top and rather steep sides, not separating from centrum. Photobiont: green; cells globose, 5 - 7  $\mu\text{m}$  diameter. Photobiont layer: 15 - 40  $\mu\text{m}$  thick,  $\pm$ regular but often interrupted by black inclusions.

The continuous thallus with black inclusions, and the unusual ecology are distinctive, and this species can be recognised even when sterile. Fertile collections are even more distinctive, as the almost sessile, globose perithecia are unusual for *Verrucariaceae*. *H. maura*, doubtfully reported for Greece, has a thicker areolate thallus. *Wahlenbergiella striatula*, not reported for Greece, usually has a green tinge and distinct black ridges on the thallus surface.

## Conclusions

The lichen biota of Alonisos is, for the most part, unremarkable, but there is at least one (and probably more than one) site with significantly enhanced diversity. That site was small and vulnerable to fire. Additional species were still being found on the final day, so further study would certainly add to the number of species known for the island. The true total may approach, or even exceed, 200 species.

## Acknowledgments

I wish to thank Mr. Georgos Bellos, taverna owner and dance teacher, for his hospitality during our visit to Alonisos. The proprietor of Liadromia Hotel in Patitiri provided helpful information about the island. Dr. C. J. B. Hitch kindly provided additional information concerning the specimen of *Caloplaca erythrocarpa* listed in Abbott (2009). For substantial assistance during the fieldwork, including pointing out several species that I would otherwise have overlooked, and for much assistance with all aspects of our visit, I am grateful to my husband, Reay Sutherland. Constructive comments from Mr. S. N. Christensen improved the manuscript.

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