

LICHEN AND LICHENICOLOUS FUNGUS RECORDS FROM SANTA MARIA, AZORES ARCHIPELAGO

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Abstract

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One hundred seventy-seven species of lichens and lichenicolous fungi are recorded for the island Santa Maria (Azores Archipelago, Portugal). Eighteen species are new for the archipelago. A list of all pertinent specimens with their locality and substrate is presented. Six rare species are illustrated.

Keywords: biodiversity, ecology, Macaronesia, lichens of Portugal, new records, taxonomy.

INTRODUCTION

The volcanic Azores archipelago, situated in the northern Atlantic Ocean, comprises 9 inhabited islands. The main island, São Miguel, is situated 1360 km west of continental Portugal. The climate is mild with average daily temperatures of 16°–25 °C, and the temperature is never below 4 °C. The average annual rainfall increases from east to west from below 800 mm on the southeasternmost island Santa Maria, to 6300 mm on mount Pico, with 2350 m altitude the highest point of the archipelago. Santa Maria is situated south of São Miquel (Fig. 1) and is one of the smallest islands, measuring 96.89 km². It has a population of c. 5.500 inhabitants, and a highest point of 590 m (source Wikipedia). The Azores are a major stronghold for remnants of the Tertiary evergreen forest, laurisilva, formerly widely distributed in southern Europe. These remnants are favourable habitats for foliicolous lichens (VAN DEN BOOM, 2016). So far relatively few lichens or lichenicolous fungi are recorded from Santa Maria (APTROOT et al., 2010; GABRIEL, 2008).

At a first glance, the Azores seem to be well explored lichenologically. The first detailed list of li-

chens was by TAVARES (1941). SCHUMM (2008) and SCHUMM & APTROOT (2013) present numerous macrolichens. Recent studies include BREUSS (2018, 2019), ETAYO (2018), VAN DEN BOOM (2016), VAN DEN BOOM & ALVARADO (2019), VAN DEN BOOM & MAGAIN (2020). However, the few published systematic studies, about the genus *Usnea* (CLERC, 2006), the genus *Heterodermia* (MOBERG & PURVIS, 1997) and the genus *Anisomeridium* (VAN DEN BOOM, 2015), show that the taxonomical knowledge is still insufficient. In fact the crustose lichens as well as many macrolichen genera are in need of revision for this archipelago. In the summer of 2019, the author and his wife made a one-week excursion to Santa Maria, visiting 27 sites of lichenological interest, and collected lichens and lichenicolous fungi. Here we present a list of all 177 encountered species, which includes 18 species newly recorded for the Azores archipelago.

MATERIALS AND METHODS

All specimens have been studied by conventional macro- and microscopical techniques with hand-cut sections of the material mounted in tap water. Amyloid reactions were tested using Lugol's iodine solu-

tion (K/I). Voucher specimens are kept in the herbarium of P. van den Boom, a few specimens are deposited in the herbarium of Berlin Botanical Garden and Botanical Museum (B). Distribution data in Macaronesia were taken from the checklists of the Azores (APTROOT et al., 2010; GABRIEL, 2008) as well as more recently published papers, VAN DEN BOOM (2016), ETAYO (2018), VAN DEN BOOM & ALVARADO (2019), GUZOW-KRZEMINSKA et al. (2019). Species newly recorded from the Azores are marked with an asterisk. Fig. 1 gives a map of the Azores; Santa Maria is in the southeasternmost part. Fig. 2 presents habitus pictures of some of the more interesting species: *Amandinea polyspora*, *Biatora britannica*, *Coenogonium tavaresianum*, *Endohyalina ericina*, *Orcularia insperata* and *Schismatomma graphidioides*.

COLLECTING SITES

1. NE side of Vila Do Porto, Reserva Florestal de Valverde, mixed trees and shrubs, dominated by *Thuja* trees. 36° 57.52' N, 25° 08.06' W, 135 m, 12 September 2019.
2. N of Vila Do Porto, Anjos, wall of acidic stones and two long rows of *Metrosideros* trees in field. 37° 00.37' N, 25° 09.23' W, 20 m, 12 September 2019.
3. N of Vila Do Porto, E of Anjos, Barreiro da Faneca, open area with red earth, trees and shrubs at edge. 36° 59.99' N, 25° 07.48' W, 190 m, 12 September 2019.
4. Just west of Almagreira, wall of acidic stones at roadside, with some *Metrosideros* trees. 36° 57.94' N, 25° 06.42' W, 125 m, 13 September 2019.
5. ENE of Almagreira, road ER1-2, W of crossing to Pico Alto, picnic area with several tree ferns and wooden benches. 36° 58.47' N, 25° 05.53' W, 290 m, 13 September 2019.
6. NE of Almagreira, Pico Alto, top of mountain range, trail to the east in mixed forest with mainly *Cryptomeria* and *Pittosporum*. 36° 59.06' N, 25° 05.46' W, 555 m, 13 September 2019.
7. NE of Almagreira, Pico Alto, top of mountain range, short, steep trail to the antennas with shrubs of *Erica*, *Myrica faya* and steep slope with loamy soil. 36° 59.00' N, 25° 05.45' W, 580 m, 13 September 2019.
8. E of Santa Barbara, secondary road from Pico Vermelho to Santo Espirito, first part (near entrance) of trail to Cai Agua, with shrubs of mainly *Pittosporum*. 36° 58.80' N, 25° 03.22' W, 135 m, 13 September 2019.
9. NE of São Pedro, road ER-2-2, nearby N. Sra. de

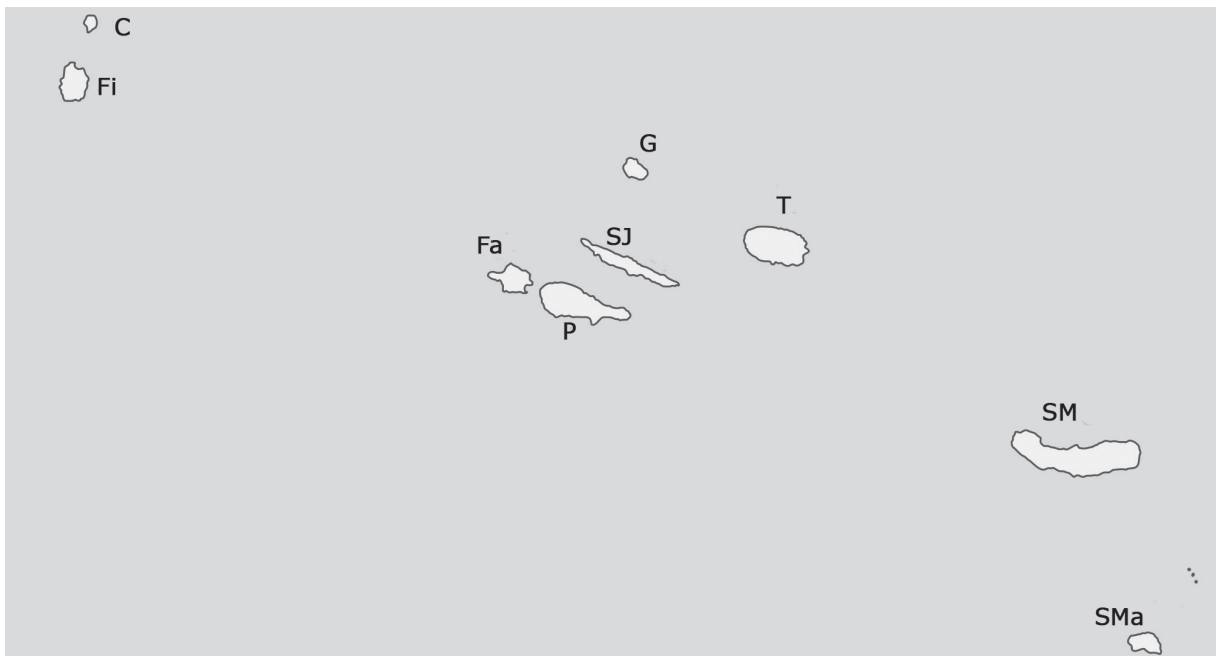


Fig. 1. The islands of the Azores archipelago. C – Corvo, Fi – Flores, Fa – Faial, G – Graciosa, P – Pico, SJ – São Jorge, SM – São Miguel, SMa – Santa Maria, T – Terceira

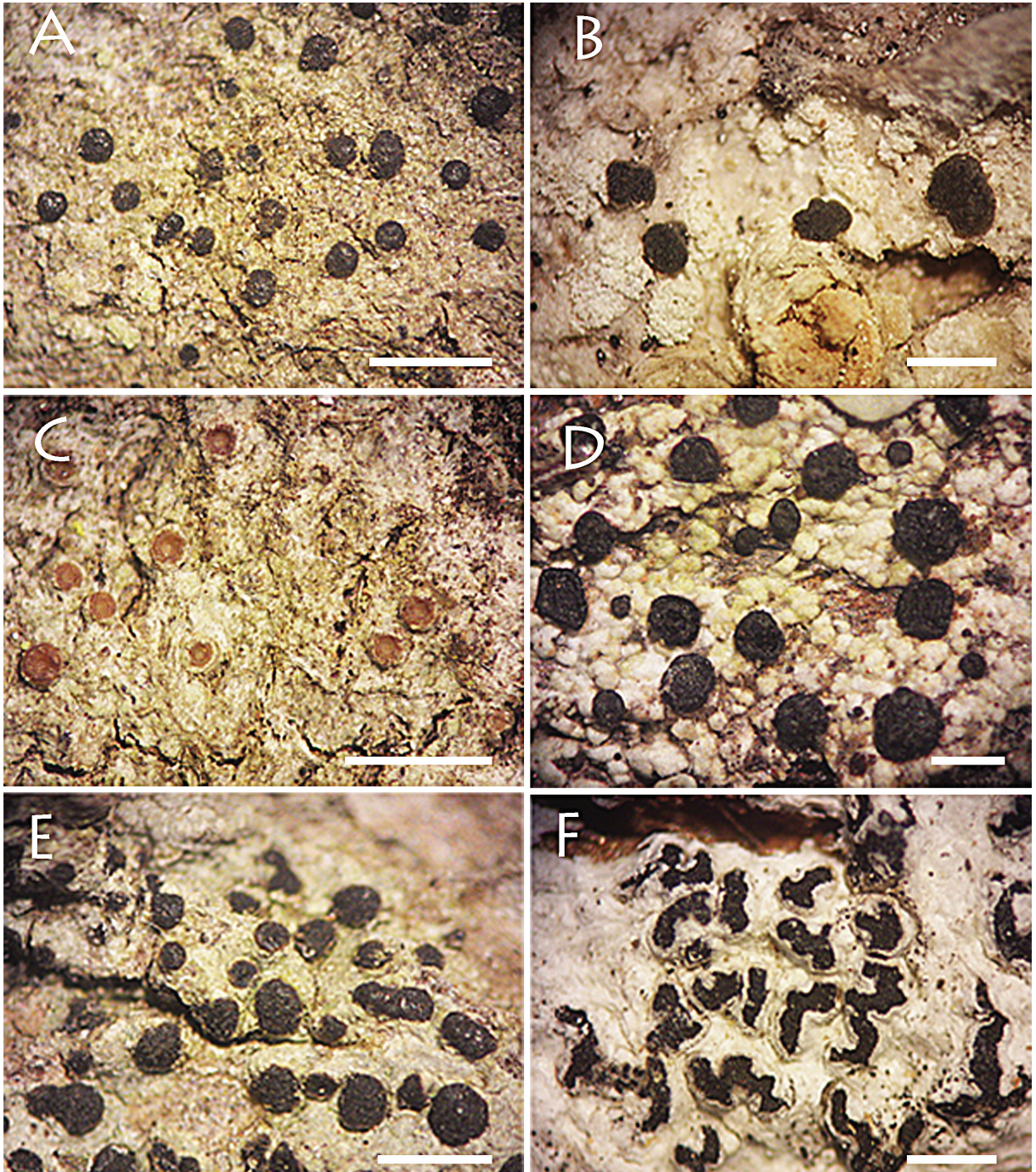


Fig. 2. Lichens from Santa Maria. A – *Amandinea polyspora* 58611, scale = 1 mm; B – *Biatora britannica* 58779, scale = 1 mm; C – *Coenogonium tavaresianum* 58608, scale = 1 mm; D – *Endohyalina ericina* 59003, scale = 0.5 mm; E – *Orcularia insperata* 58976, scale = 1 mm; F – *Schismatomma graphidioides* 58617, scale = 0.5 mm

Fátima, old, neglected barn, on N exposed wall of acidic stones and on some *Pittosporum* trees along field. 37° 00.11' N, 25° 06.25' W, 250 m, 13 September 2019.

10. NE of São Pedro, E of road ER-2-2, Chã do João Tolmé, trail to the east in forest, mature *Cryptomeria* and *Pittosporum* trees. 36° 59.52' N, 25° 06.16' W, 230 m, 13 September 2019.

11. S of São Pedro, along road ER-2-2, row of mature palm trees. 36° 58.70' N, 25° 07.42' W, 160 m, 14 September 2019.
12. E of São Pedro, along secondary road from Ribeira do Engenho to Almagreira, area of Monteiro, wood of fence post and small group of trees in meadow. 36° 58.77' N, 25° 06.48' W, 250 m, 14 September 2019.
13. NE of Almagreira, Pico Alto, along small road to the top (Pico Alto), c. 800 m from crossing with main road (ER-1-2), roadside *Cryptomeria* trees along forest. 36° 58.67' N, 25° 05.27' W, 460 m, 14 September 2019.
14. NE of Almagreira, Pico Alto, along small road to the top (Pico Alto), c. 500 m from crossing with main road (ER-1-2), *Erica* at roadside and along field. 36° 58.57' N, 25° 05.18' W, 465 m, 14 September 2019.
15. N of Vila do Porto, road to Anjos, c. 1 km SE of village (Anjos), acidic outcrops in field. 36° 59.86' N, 25° 08.89' W, 90 m, 14 September 2019.
16. N of Vila do Porto, road to Anjos, c. 500 m SE of village, near picnic area, acidic outcrops in field, steep outcrops along road and a *Metrosideros* tree. 37° 00.20' N, 25° 09.10' W, 50 m, 14 September 2019.
17. E of Vila do Porto, road ER-1-2, from Almagreira to Santo Espírito, Miradouro das Fontinhas, small picnic area (roadside), steep rock face and forest with *Cryptomeria*. 36° 57.95' N, 25° 04.73' W, 380 m, 15 September 2019.
18. SE of the island, along road ER-1, between Florestal das Fontinhas and Santo Espírito, just W before Santo Espírito, forest with *Cryptomeria*. 36° 57.46' N, 25° 03.97' W, 400 m, 15 September 2019.
19. S of Santo Espírito, S of Maia, Ponta do Castelo, near lighthouse, vertical and overhanging acidic outcrops. 36° 55.79' N, 25° 01.05' W, 100 m, 15 September 2019.
20. SE of the island, along road ER-1, between Santo Espírito and Castelo, Calheta, near house and small forest, steep soil bank and *Buxus* in garden. 36° 56.72' N, 25° 01.96' W, 255 m, 15 September 2019.
21. E of Almagreira, along road ER-1-2, to Santo Espírito, Reserva Florestal das Fontinhas, very big picnic area, few *Quercus* trees, many *Camellia* shrubs and a forest with mature *Cryptomeria* trees. 36° 57.61' N, 25° 04.40' W, 355 m, 16 September 2019.
22. Santa Barbara, centre, solitary *Camellia* shrub near brooklet. 36° 59.07' N, 25° 04.12' W, 170 m, 16 September 2019.
23. NNE of Santa Barbara, near Pico do Norte, N of picnic area, just S of Norte, small forest with mainly *Myrica faya*, along secondary road. 37° 00.18' N, 25° 03.77' W, 225 m, 16 September 2019.
24. SE of Santa Barbara, S side of the main road to São Lourenço, Pico Vermelho, Poço da Pedreira, *Erica* forest with view point. 36° 58.89' N, 25° 03.67' W, 305 m, 16 September 2019.
25. S of Malbusca, Piedade, trail to Ponta da Malbusca, field with shrubs, mainly *Erica* and volcanic outcrops. 36° 56.17' N, 25° 04.35' W, 160 m, 16 September 2019.
26. S of Santo Espírito, S of Cardal, trail in field with a row of small trees, *Erica* and *Myrica faya*. 36° 56.15' N, 25° 02.85' W, 240 m, 17 September 2019.
27. S of Santo Espírito, S of Cardal, trail in forest along brooklet, with mainly *Picconia* and *Pittosporum* trees. 36° 56.09' N, 25° 03.01' W, 180 m, 17 September 2019.

ANNOTATED SPECIES LIST

The numbers in brackets correspond to the collecting sites listed above; they are followed by the substrate and the collection number of the voucher.

Abrothallus hypotrachynae Etayo & Diederich – (26) on *Hypotrachyna* on *Erica*, 59055; (26) on *Hypotrachyna* on *Myrica*, 59066; (26) on *Hypotrachyna* on *Erica*, 59056.

Acarospora umbilicata Bagl. – (25) on volcanic rock, 59043.

Acrocordia macrospora A. Massal. – (16) on volcanic rock, 58855.

Alyxoria mougeotii (A. Massal.) Ertz, Frisch & G. Thor – (16) on volcanic rock, 58849.

Amandinea pelidna (Ach.) Fryday & L. Arcadia – (15) on volcanic rock, 58838.

Amandinea polyspora (Willey) E. Lay & P. May – (1) on *Thuja*, 58611; (3) on stump, 58681 [Fig. 2A].

Amandinea punctata (Hoffm.) Coppins & Scheid. – (2) on stone on soil, 58670.

- Anisomeridium robustum* Orange, Coppins & Apt-root – (4) on *Metrosideros*, 58718.
- **Arthonia anglica* Coppins – (1) on *Pittosporum*, 58647.
- Arthonia atra* (Pers.) A. Schneid. – (2) on *Metrosideros*, 58679; (22) on *Camellia*, 58971; (25) on *Erica*, 59023.
- Arthonia elegans* (Ach.) Almq. – (1) on tree, 58636; (27) on *Myrica*, 59083.
- Arthonia stellaris* Kremp. – (1) on *Grevillea*, 58628; (3) on *Pittosporum*, 58701; (22) on *Camellia*, 58969; (23) on *Myrica*, 58975; (25) on *Erica*, 59012; (26) on *Myrica*, 59068.
- Aspicilia* cf. *tenuis* (H. Magn.) Owe-Larss. & A. Nordin – (16) on volcanic rock, 58860.
- Bacidia arceutina* (Ach.) Arnold – (1) on *Eucalyptus*, 58615; (7) on wood of fence, 58704; (21) on wood of fence, 58967; (23) on tree, 58987.
- Bacidia heterochroa* (Müll. Arg.) Zahlbr. – (1) on *Thuja*, 58618, 58621; (1) on *Hibiscus*, 58632; (4) on *Metrosideros*, 58722; (8) on *Rubus*, 58763; (16) on *Metrosideros*, 58851; (20) on leaf of *Buxus*, 58917; (22) on *Camellia*, 58970; (23) on *Myrica*, 58978; (25) on *Erica*, 59011; (26) on *Myrica*, 59049, 59071; (27) on *Eucalyptus*, 59011; (27) on *Myrica*, 59081.
- Bacidina apiahica* (Müll. Arg.) Vězda – (13) on needles of *Cryptomeria*, 58816; (17) on needles of *Cryptomeria*, 58874; (20) on leaves of *Buxus*, 58923; (21) on needles of *Cryptomeria*, 58958.
- Bacidina chlorotricula* (Nyl.) A.L. Sm. – (3) on *Erica*, 58708; (20) on leaves of *Buxus*, 58928.
- Bacidina pallidocarpa* van den Boom & Magain – (21) on wood of fence, 58966.
- Baeomyces rufus* (Huds.) Rebent. – (21) terricolous, 58962.
- **Biatora britannica* Printzen, Lumbsch & Orange – (1) on *Pittosporum*, 58779 [Fig. 2B].
- Biatoropsis usnearum* Räsänen s.l. – (9) on *Usnea* on *Pittosporum*, 58980.
- Blastenia crenularia* (With.) Arup, Søchting & Frödén – (2) on stone on soil, 58668; (15) on volcanic rock, 58837; (16) on volcanic rock, 58853, 58859.
- **Botryolepraria lesdainii* (Hue) Canals et al. – (21) on stone of wall, 58961.
- Buellia mediterranea* Giralt – (12) on wood of fence, 58809.
- **Buellia schaeferi* De Not. – (3) on stump, 58684.
- **Buellia stellulata* (Taylor) Mudd – (2) on stone on soil, 58665; (15) on volcanic rock, 58840; (16) on volcanic rock, 58856.
- Byssoloma croceum* Sérus. & Puntillo – (3) on *Erica*, 58709; (21) on leaf of *Camellia*, 59107; (24) on *Erica*, 58993; (25) on *Erica*, 59013, 59030.
- Byssoloma fuscum* van den Boom – (6) on needles of *Cryptomeria*, 58736; (21) on leaves of *Buxus*, 58944; (24) on *Erica*, 59007.
- Byssoloma kakouettae* (Sérus.) Lücking & Sérus. – (10) on leaf, 58778; (17) on needles of *Cryptomeria*, 58873; (18) on needles of *Cryptomeria*, 58879, 58882; (21) on leaf of *Camellia*, 58938, 58939, 58940, 58947, 58948; (21) on needles of *Cryptomeria*, 58960.
- Byssoloma leucoblepharum* (Nyl.) Vain. em. R. Sant. – (27) on leaf of *Picconia*, 59090.
- Byssoloma maderense* Breuss – (3) on *Erica*, 58698.
- Byssoloma marginatum* (Arnold) Sérus. – (21) on needles of *Cryptomeria*, 58959; (21) on leaves of *Buxus*, 58943.
- Byssoloma subdiscordans* (Nyl.) P. James – (6) on *Pittosporum*, 58738, 58741; (6) on needles of *Cryptomeria*; (21) on leaves of palm; (21) on leaf of *Camellia*, 58937, 58946.
- Candelariella vitellina* (Hoffm.) Müll. Arg. – (2) on stone on soil, 58671; (16) on volcanic rock, 58870; (25) on volcanic rock, 59042.
- Canoparmelia amabilis* Heiman & Elix – (12) on tree, 58801.
- Canoparmelia caroliniana* (Nyl.) Elix & Hale – (5) on wood of bench, 58726.
- Cladonia coniocraea* (Flörke) Spreng. – (6) on *Pittosporum*, 58746; (21) on *Cryptomeria*, 58955.
- Cladonia nana* Vain. – (3) terricolous, 58712.
- Cladonia ochrochlora* Flörke – (13) on *Cryptomeria*, 58813.
- Cladonia peziziformis* (With.) J.R. Laundon – (3) terricolous, 58717.
- Cladonia ramulosa* (With.) J.R. Laundon – (3) on stump, 58683.
- Cladonia stereoclada* Abbayes – (3) terricolous, 58715; (17) on volcanic rock, 58878.
- Clandestinotrema antoninii* (Purvis & P. James) Rivas Plata, Lücking & Lumbsch – (7) on *Erica*, 58757, 58758; (14) on *Erica*;
- Cliomegalaria symmictoides* van den Boom & Al-

- varado – (3) on *Pinus*, 58695; (3) on *Pittosporum*; (12) on tree, 58800; (24) on *Erica*, 58996, 58999; (27) on *Eucalyptus*, 59102.
- Cliostomum griffithii* (Sm.) Coppins – (24) on *Erica*, 59010; (25) on *Erica*, 59016.
- Coenogonium tavaresianum* (Vězda) Lücking, Apt-root & Sipman – (1) on *Thuja*, 58608 [Fig. 2C].
- Coscinocladium gaditanum* (Clemente) A. Crespo, Llimona & D. Hawksw. – (9) on stone of wall, 58769.
- **Didymocyrtis cladoniicola* (Diederich, Kocourk. & Etayo) Ertz & Diederich – (1) on *Ramalina* on *Thuja*, 58646.
- Diploicia canescens* (Dicks.) A. Massal. – (9) on stone of wall, 58770; (16) on volcanic rock, 58862.
- Diploicia canescens* (Dicks.) A. Massal. ssp. *australasica* Elix & Lumbsch – (19) on volcanic rock, 58904.
- Diploschistes actinostomus* (Ach.) Zahlbr. – (25) on volcanic rock, 59035.
- Dirina insulana* (Tav.) Tehler – (19) on volcanic rock, 58913.
- Dirinaria appplanata* (Fée) D.D. Awasthi – (12) on wood of fence post, 58805; (26) on *Erica*, 59047.
- Enchylium tenax* (Sw.) Gray – (19) on mortar, 58892.
- Endococcus propinquus* (Körb.) D. Hawksw. – (15) on *Buellia* on volcanic rock, 58839.
- Endohyalina ericina* (Nyl.) Giralt, van den Boom & Elix – (23) on *Myrica*, 58974; (24) on *Erica*, 58995, 59003; (25) on *Erica*, 59028 [Fig. 2D].
- Enterographa crassa* (DC.) Fée – (9) on stone of wall, 58767.
- Fellhanera azorica* van den Boom – (18) on needles of *Cryptomeria*; (20) on leaves of *Buxus*; (27) on leaves of *Picconia*.
- Fellhanera seroexpectata* Sérus. – (21) on leaf of *Camellia*, 58935.
- **Fellhaneropsis myrtillicola* (Erichsen) Sérus. & Coppins – (13) on needles of *Cryptomeria*, 58817, 58819.
- Flavoparmelia caperata* (L.) Hale – (3) on stump, 58687.
- Flavoplaca citrina* (Hoffm.) Arup, Frödén & Søchting – (3) on stump; (19) on calcareous stone, on soil, 58898.
- Flavoplaca flavocitrina* (Nyl.) Arup, Frödén & Søchting – (26) on volcanic rock, 59045.
- Flavoplaca marina* (Wedd.) Arup, Frödén & Søchting – (2) on stone on soil, 58664.
- Fulvophyton sorediata* (Sparrius, L., P. James & M.A. Allen) Tehler & van den Boom – (19) on volcanic rock, 58907.
- Graphis scripta* (L.) Ach. – (1) on tree, 58634.
- Gyalecta schisticola* Werner – (16) on volcanic rock, 58854.
- **Gyalectidium membranaceum* Sérus. – (6) on leaf of *Pittosporum*, 58742; (17) on needles of *Cryptomeria*, 58875; (21) on leaf of *Camellia*, 58939.
- Gyalolechia flavorubescens* (Huds.) Søchting, Frödén & Arup – (1) on *Thuja*, 58643; (1) on tree, 58659; (4) on *Metrosideros*, 58721, 58725.
- Herteliana gagei* (Sm.) J.R. Laundon – (7) on volcanic rock, 58759.
- Heterodermia albicans* (Pers.) Swinscow & Krog – (15) on volcanic rock, 58841.
- Heterodermia leucomela* (Fée) Swinscow & Krog – (4) on stone of wall, 58724; (11) on palm, 58794.
- Heterodermia obscurata* (Nyl.) Trevisan – (1) on *Pittosporum*, 58649.
- Hyperphyscia adglutinata* (Flörke) Mayrh. & Poelt – (20) on leaves of *Buxus*, 58926.
- Hypotrachyna rockii* (Zahlbr.) Hale – (3) on *Erica*, 58694; (24) on *Erica*, 59001; (26) on *Myrica*, 59061.
- Lecania cyrtella* (Ach.) Th.Fr. – Loc. (1) on *Hibiscus*, 58630; (18) on needles of *Cryptomeria*, 58883; (21) on needles of *Cryptomeria*, 58957.
- Lecania naegelii* (Hepp) Diederich & van den Boom – (22) on *Camellia*, 58972.
- **Lecania nigra* van den Boom & Ertz – (19) on volcanic rock, 58909.
- Lecanora albella* (Pers.) Ach. – (1) on *Thuja*, 58619; (3) on stump, 58682; (12) on wood, 58812; (23) on *Myrica*, 58979; (25) on *Erica*, 59029.
- Lecanora chlarotera* Nyl. – (23) on *Myrica*, 58973.
- Lecanora gangaleoides* Nyl. – (19) on volcanic rock, 58901.
- Lecanora hybocarpa* (Tuck.) Brodo – (1) on shrub 58655; (1) on *Thuja*, 2716; (8) on *Rubus*, 58764; (26) on *Myrica*, 59072.
- Lecanora strobilina* (Spreng.) Kieff. – (25) on *Erica*, 59025.

- Lecanora subrugosa* Nyl. – (2) on *Metrosideros*, 58673.
- **Lecanora subsaligna* M. Brand & van den Boom – (3) on stump, 58685; (26) on *Erica*, 59059.
- Lecidella asema* (Nyl.) Knoph & Hertel – (2) on stone on soil, 58672; (19) on volcanic rock, 58900.
- Lepraria finkii* (B. de Lesd.) R.C. Harris – (17) on *Platanus*, 58877; (27) on *Picconia*, 59093.
- Lepraria incana* (L.) Ach. – (6) on needles of *Cryptomeria*, 58740; (10) on *Cryptomeria*, 58782.
- Leprocaulon microscopicum* (Vill.) Gams ex D. Hawksw. – (19) on volcanic rock, 58895.
- Leptogium brebissonii* Mont. – (3) on *Pittosporum*, 58691; (9) on *Pittosporum*, 58774; (12) on tree, 58802.
- Leptogium cyanescens* (Rabenh.) Körb. – (1) on *Eucalyptus*, 58651.
- **Lichenocodium lichenicola* (P. Karst.) Petr. et Syd. – (12) on *Buellia* on wood of fence, 58835.
- Lichenocodium usneae* (Anzi) D. Hawksw. – (19) on *Heterodermia leucomela* on volcanic rock, 58910; (27) on *Heterodermia leucomela* on *Myrica*, 59085.
- Lichenodiplis lecanorae* (Vouaux) Dyko & D. Hawksw. – (12) on *Caloplaca* s.l. on wood of fence, 58811; (25) on *Caloplaca* s.l. on *Erica*, 59017.
- **Lichenodiplis pertusariicola* (Nyl.) Diederich – (27) on *Pertusaria* on *Eucalyptus*, 59104.
- Lobaria immixta* Vain. – (6) on *Pittosporum*, 58743.
- Lobaria virens* (With.) J.R. Laundon – (6) on *Pittosporum*, 58745.
- **Marchantiana asserigena* (J. Lahm) Søchting & Arup – (24) on *Erica*, 58994; (25) on *Erica*, 59015; (26) on *Erica*, 59053.
- Massalongia carnosa* (Dicks.) Körb. – (21) terricolous, 58963.
- Megalaria albocincta* (Degel.) Tønsberg – (14) on *Erica*, 58824, 58828.
- Megalaria pulvereae* (Borrer) Hafellner & E. Schreiner – (7) on *Erica*, 58756.
- Minutoexcipula marina* V. Atienza – (1) on *Pertusaria* on *Grevillea*, 58625; (27) on *Pertusaria* on *Myrica*, 59087.
- Moelleropsis nebulosa* (Hoffm.) Gyeln. – (20) terricolous, 58914.
- Muellerella lichenicola* (Sommerf.) D. Hawksw. – (3) on *Lecanora* on stump, 58686; (12) on *Le- canora* on wood of fence, 59024.
- Normandina pulchella* (Borrer) Nyl. – (3) on *Pittosporum*, 58692; (6) on needles of *Cryptomeria*, 58737; (13) on needles of *Cryptomeria*, 58821.
- Ochrolechia parella* (L.) A. Massal. – (2) on stone on soil, 58663.
- **Opegrapha foreau* (Moreau) Hafellner & R. Sant. – (27) on *Heterodermia* on *Myrica*, 59084.
- **Opegrapha melanospora* Müll. Arg. – (9) on *Parmotrema* on *Pittosporum*, 58772.
- Orcularia insperata* (Nyl.) Kalb & Giralte – (2) on *Metrosideros*, 58677; (16) on *Metrosideros*, 58976 (Fig. 2E).
- Parmelinopsis minarum* (Vain.) Elix & Hale – (3) on *Erica*, 58699; (27) on *Psidium*, 59095.
- Parmotrema perlatus* (Huds.) M. Choisy – (1) on *Thuja*, 58612; (1) on tree, 58660; (7) on *Erica*, 58754; (20) on leaves of *Buxus*, 58903.
- Parmotrema reticulatum* (Taylor) M. Choisy – (3) on *Erica*; (27) on *Psidium*, 59096.
- Parmotrema robustum* (Degel.) Hale – (14) on *Erica*, 58832.
- Parmotrema subsidiosum* (Müll. Arg.) Hale – (12) on tree, 58803; (26) on *Erica*, 59057; (26) on volcanic rock, 59076.
- Pectenaria atlantica* (Degel.) P.M. Jørg., L. Lindblom, Wedin & S. Ekman – (6) on *Pittosporum*, 58744.
- Pectenaria ligulata* (P. James) P.M. Jørg., L. Lindblom, Wedin & S. Ekman – (19) on volcanic rock, 58912; (26) on *Myrica*, 59079.
- Peltigera hymenina* (Ach.) Delise ex Duby – (7) terricolous, 58751; (21) terricolous, 58964.
- **Pertusaria coronata* (Ach.) Th. Fr. – (19) on volcanic rock, 58894.
- Pertusaria pseudocorallina* (Lilj.) Arnold – (15) on volcanic rock, 58844.
- Pertusaria pustulata* (Ach.) Duby – (26) on *Myrica*, 59063.
- Phaeographis dendritica* (Ach.) Müll. Arg. – (23) on tree, 58981; (27) on *Eucalyptus*, 59089, 59099.
- Phaeophyscia hirsuta* (Mereschk.) Essl. – (25) on volcanic rock, 59036.
- Phaeophyscia orbicularis* (Neck.) Moberg – (11) on palm, 58792; (16) on volcanic rock, 58863.
- Physcia adscendens* H. Olivier – (1) on shrub, 58656; (2) on *Metrosideros*, 58675; (27) on *Myrica*, 59082.

- Physcia atrostriata* Moberg – (1) on tree, 58657.
- Physcia erumpens* Moberg – (1) on tree, 58653, 58654; (11) on palm, 58788.
- Physcia tribacioides* Nyl. – (20) on leaves of *Buxus*, 58925; (26) on volcanic rock, 59046.
- Porina aenea* (Wallr.) Zahlbr. – (20) on leaves of *Buxus*, 58934.
- Porina coralloidea* P. James – (24) on *Erica*, 59004; (25) on *Erica*, 59034.
- Porina leptalea* (Durieu & Mont.) A.L. Sm. – (21) on tree-fern, 58942.
- Porina leptospora* (Nyl.) A.L. Sm. – (1) on *Thuja*, 58610; (19) on volcanic rock (cf.), 58911; (20) on leaves of *Buxus*, 58930; (23) on *Myrica*, 58983; (24) on *Erica*, 58990; (25) on *Erica*, 59020, 59031, 59040.
- Porina tetramera* (Malme) R. Sant. – (6) on needles of *Cryptomeria*, 58734; (13) on needles of *Cryptomeria*, 58815; (17) on needles of *Cryptomeria*, 58876; (21) on leaf of *Camellia*, 58936.
- Porpidia crustulata* (Ach.) Hertel & Knoph – (7) on wood of fence post, 58747.
- **Pronectria angulospora* Etayo – (26) on *Heterodermia* on *Myrica*, 59077.
- Pseudocyphellaria aurata* (Ach.) Vain. – (3) on *Pittosporum*, 58690; (6) on needles of *Cryptomeria*, 58735; (27) on *Myrica*, 59088.
- Pyrenula dermatodes* (Borrer) Schaer. – (14) on *Erica*, 58836, 59106.
- Pyrenula laevigata* (Pers.) Arnold – (1) on *Grevillea*, 58624.
- Pyrenula macrospora* (Degel.) Coppins & P. James – (1) on tree, 58637; (9) on *Pittosporum*, 58773; (12) on tree, 58798.
- Pyrrhospora quernei* (Dicks.) Körber – (1) on *Eucalyptus*, 58614; (3) on stump, 58688.
- Pyxine sorediata* (Ach.) Mont. – (16) on volcanic rock, 58867.
- Pyxine subcinerea* Stirt. – (1) on tree, 58640; (1) on shrub, 58658; (2) on *Metrosideros*, 58678; (19) on volcanic rock, 58899; (26) on volcanic rock, 59044; (26) on *Erica*, 59054, 59058.
- Ramalina azorica* Schumm & Aptroot – (19) on volcanic rock, 58887.
- Ramalina chondrina* J. Steiner – (9) on *Pittosporum*, 58777; (26) on *Myrica*, 59052.
- Ramalina lacera* (With.) J.R. Laundon – (2) on *Metrosideros*, 58674; (4) on stone of wall, 58719.
- Ramalina lusitanica* H. Magn. – (16) on *Metrosideros*, 58850.
- Ramalina peruviana* Ach. – (1) on *Hibiscus*, 58631; (1) on tree, 58662; (9) on *Pittosporum*, 58775; (12) on wood of fence (cf.), 58808.
- Ramalina pusilla* Le Prév. ex Duby – (1) on tree, 58661; (8) on *Pittosporum*, 58762; (12) on wood of fence post, 58806.
- Ramalina requienii* (De Not.) Jatta – (2) on stone on soil, 58669; (9) on stone of wall, 58768; (11) on palm, 58793; (16) on volcanic rock, 58846, 58858; (19) on volcanic rock, 58891.
- Ramalina siliquosa* (Huds.) A.L. Sm. – (19) on volcanic rock, 58885, 58890.
- Ramalina subpusilla* (Nyl.) Krog & Swinscow – (3) on *Pittosporum*, 58689; (8) on *Pittosporum*, 58765; (23) on *Myrica*, 58982; (23) on tree, 58988; (26) on *Myrica*, 59051; (27) on *Eucalyptus*, 59103.
- Rinodina anomala* (Zahlbr.) H. Mayrhofer & Giralto – (1) on *Thuja*, 58623, 58645; (25) on *Erica*, 59022, 59032.
- Rinodina beccariana* Bagl. v. *beccariana* – (1) on stone on soil, 58667; (16) on volcanic rock, 58864, 58869, 58871; (25) on volcanic rock, 59039.
- **Rinodina boleana* Giralto & H. Mayrhofer – (25) on *Erica*, 59021.
- Rinodina colobinoides* (Nyl.) Zahlbr. – (1) on tree, 58641.
- Roccella allorgei* Abbayes – (19) on volcanic rock, 58888.
- Roccella elisabethae* Tehler – (16) on volcanic rock, 58857.
- Roccella fuciformis* (L.) DC. – (11) on palm, 58787; (19) on volcanic rock, 58902.
- Roccella tinctoria* DC. – (11) on palm, 58795; (16) on volcanic rock, 58847.
- Roccella tuberculata* Vain. – (19) on volcanic rock, 58905.
- Sagiolechia atlantica* Henssen – (16) on volcanic rock, 58848; (19) on volcanic rock, 58897.
- Schismatomma graphidioides* (Leight.) Zahlbr. – (1) on *Thuja*, 58617 [Fig. 2F].
- Scoliciosporum umbrinum* (Ach.) Arnold – (3) on stump, 58713, 58714; (3) on *Pittosporum*, 58702; (3) on *Erica*, 58711; (7) on wood of fence, 58748, 58749; (12) on wood of fence, 58810; (25) on *Erica*, 59014.

- Scytinium teretiusculum* (Wallr.) Otálora, P.M. Jørg. & Wedin – (1) on *Eucalyptus*, 58652.
- Solitaria chrysophthalma* (Degel.) Arup, Söchting & Frödén – (2) on *Metrosideros*, 58676.
- Sphinctrina tubiformis* A. Massal. – (1) on *Pertusaria* on tree, 58638; (26) on *Pertusaria* on *Myrica*, 59075.
- Sticta canariensis* (Ach.) Bory – (7) on *Vaccinium*, 58752.
- Sticta limbata* (Sm.) Ach. – (7) on *Vaccinium*, 58753.
- Stigmatidium triebeliae* Etayo – (2) on *Parmotrema reticulatum* on stone on soil, 58666; (15) on *Parmotrema reticulatum* on volcanic rock, 58842.
- Syncesia myrticola* (Fée) Tehler – (1) on *Thuja*, 58616; (8) on *Pittosporum*, 58761; (11) on palm, 58790; (12) on tree, 58797; (27) on *Psidium*, 59094.
- Teloschistes chrysophthalmus* (L.) Th.Fr. – (1) on *Camellia*, 58642.
- Teloschistes flavicans* (Sw.) Norman – (4) on stone of wall, 58720.
- Tephromela atra* (Huds.) Hafellner – (16) on volcanic rock, 58845, 58866; (25) on volcanic rock, 59038.
- Thelocarpon microsporum* van den Boom – (6) on *Cryptomeria*, 58730; (21) on *Cryptomeria*, 58952.
- Thelotrema lepadinum* (Ach.) Ach. – (10) on *Pittosporum*, 58780, 58783; (14) on *Erica*, 58827; (21) on tree-fern, 58941; (24) on *Erica*, 59002; (26) on *Myrica*, 59073.
- Toniniopsis aromatica* (Sm.) Kistenich, Timdal, Bendiksby & S. Ekman – (16) on *Aspicilia* s.l. on volcanic rock, 59110; (19) on volcanic rock, 58908, 58909a.
- Trapelia corticola* Coppins & P. James – (6) on *Cryptomeria*, 58733.
- Tremella ramalinae* Diederich – (9) on *Ramalina* on *Pittosporum*, 58776.

DISCUSSION

The checklist of Aptroot et al. (2010) includes 56 lichen species for Santa Maria, mainly macro lichens from genera such as *Heterodermia*, *Lobaria*, *Parmotrema*, *Ramalina* and *Roccella*, usually common species occurring on nearly all of the other islands. Only

a very few rare species in the checklist are known from Santa Maria and not from other islands in the archipelago: *Cetrelia olivetorum* (Nyl.) W.L. Culb. & C.F. Culb. and *Lecanora leprosa* Fée. No lichenicolous fungi for Santa Maria can be found in this checklist.

A recent survey on the genus *Cladonia* in the Azores by Pino-Bodas et al. (2017) treated 29 species in detail. An annotated list of all previously reported *Cladonia* species from the Azores is included and 24 further species are mentioned of which they regard some as doubtful. The only recorded species from Santa Maria in that study is *Cladonia caespiticia* (Pers.) Flörke. In Aptroot et al. (2010) are recorded 3 *Cladonia* species for the island and in this study 6 species.

For this study, in total 500 specimens of lichens and lichenicolous fungi have been collected, on all available substrata, in 27 localities all over the island. At least 177 species could be identified (annotated species list). Of these, 18 records are new to the Azores archipelago. Twenty-one foliicolous species are recorded on leaves or on needles. Not any foliicolous record for Santa Maria can be found in the recent study about foliicolous lichens in Macaronesia (van den Boom 2021). One species from that recent study, newly described, *Fellhanera azorica* van den Boom, has been found and is listed here.

Several specimens still remain unidentified, for instance because there are no identification keys or reliable treatments (e.g., in the case of *Bacidia*, *Bacidina*, *Buellia*, *Fissurina*, *Graphis*, *Lecanora*, *Lepraria*, *Opegrapha* and lichenicolous fungi). This indicates that the lichen biota on Santa Maria is certainly more diverse than reported here and additional records can be expected, including newly described species.

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DUOMENYS APIE KERPEIS IR LICHENOFILINIUS GRYBUS IŠ SANTA MARIJA SALOS (AZORŲ ARCHIPELAGAS)

Pieter P.G. VAN DEN BOOM

Santrauka

Straipsnyje pateikiami duomenys apie šimtą septyniasdešimt septynias kerpių ir lichenofilinių grybų rūšių, aptiktas Santa Marija saloje (Azorų archipelagas, Portu-

galija). Iš jų aštuoniolika rūšių yra naujos archipelagui. Sudarytas rūšių sąrašas su radavietėmis ir jų substratais. Šešių retų rūšių pateiktos originalios nuotraukos.