



## Lichens of the Sirumalai hills, Eastern Ghats with one genus and six species new to India

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### Abstract

Lichens of Sirumalai hills are reported here for the first time. Lichen biota comprised of 95 species. The genus *Japewiella* is reported for the first time in India and is represented by *J. tavaresiana* (H. Magn.) Printzen. Furthermore, the following six taxa including one variety are new to India viz. *Arthonia atra* (Pers.) A. Schneid., *Graphis brevicarpa* M. Nakan., Kashiw. & K.H. Moon, *Micarea erratica* (Körb.) Hertel, Rambold & Pietschm., *Pertusaria cicatricosa* var. *deficiens* A.W. Archer, Elix & Streimam, *Porina subargillacea* Müll Arg., and *Pyxine schmidtii* Vain. Brief accounts for all the new records to India are provided to facilitate their identification. *Arthonia redingeri* Grube and *Lepraria caesiella* R.C. Harris are reported for the first time from south India. Besides all above, 29 species are recorded for the first time from the state of Tamil Nadu. The lichen biota of the area is primarily corticolous in habitats and dominated by crustose form.

**Keywords** – lichenized fungi – new records – south India – Tamil Nadu – tropical lichens

### Introduction

India supports high lichen biodiversity, with 2714 recorded species. As new areas have been explored as well as revisionary studies in the recent years have resulted in a steep rise in novel species being discovered. During the years 2010 to 2017, a total of 411 species were added to the recorded Indian lichen biota (Sinha et al. 2018). However, many natural habitats of scientific interest remain to be explored. Although, the Eastern Ghats contribute significantly to the species richness and number of endemic lichen species, it has received less attention for conservation than the Western Ghats (Muthumperumal & Parthasarathy 2010). Nayaka et al. (2013) emphasized the current extent of lichen research in the Eastern Ghats. The lichen survey in Horsley and Tirumala Hills in Andhra Pradesh and Shevaroy Hills in Tamil Nadu resulted in several new additions to the recorded species of the Eastern Ghats (Nayaka et al. 2013). In our ongoing effort to explore new and under explored areas of the country, an attempt to examine the lichen diversity of Sirumalai hills in south India was carried out as a part of the “Workshop on lichen biology and bioprospecting (LBB2017)”.

The Sirumalai hills are situated in the southern part of Eastern Ghats in Dindigul district of Tamil Nadu (10°.07′-10°.18′N and 77°.55′-78°.12′ E) (Fig. 1). The months March to July are the

hottest in the hills and temperature range between 28°C to 40°C. The temperature drops significantly during winter and range between 10°C to 18°C. The months from February to August are mostly dry with occasional showers in April and May. There is a little rainfall in September, followed by the heavy showers of the north-eastern monsoon from the middle of October till the end of December. The average annual rainfall in the region is 120 to 132 cm, while the relative humidity varies from 30% to 80% (Karuppusamy 2007, Santharam et al. 2014). The area is characterized by disturbed scrub forests cover on lower hills, the dry deciduous forest at mid-elevation, and semi-evergreen forests at the higher elevation. The slopes of these hills can also be covered by savannah grassland. There have been frequent studies in this region on higher plants, including both medicinal and ethnobotanical plants. Sankar et al. (2009) reported a total of 85 plant species as new records for the Sirumalai hills, while Karuppusamy (2007) listed 90 species of medicinal plants used mainly by the 'Paliyan' tribes dwelling in the area. The altitudinal gradient, rich flora and fauna in the Sirumalai hills, indicates the possibilities of harbouring the luxuriant growth of lichens. Therefore, we surveyed this area to document its anticipated high lichen diversity.



**Fig. 1** – Map showing the lichen collection sites in Sirumalai hills. The top left panel of the map shows the location of Sirumalai hills within India. The bottom left panel is the enlarged portion of southern India showing the location of Tamil Nadu state and Sirumalai hills.

### Materials & methods

A field survey was conducted during December 2017 in the Sirumalai hills and we collected about 200 lichen specimens from three localities viz., Agasthyarpuram (10°22'07.72"N; 77°37'63.02"E), Kurangupalam (10°18'56.31"N; 77°37'76.20"E) and near 18<sup>th</sup> Hairpin Bend (10°25'00.87"N; 77°39'67.25"E) (Fig. 1). The specimens were identified at CSIR-National Botanical Research Institute, Lucknow and deposited in herbarium LWG. The morphological details were examined using a stereo zoom Leica S8APO microscope. Anatomical details were studied using DM2500 optical microscopes attached with camera and image analysis software. Thin hand-cut sections of thalli and ascomata were mounted in either distilled water, KOH solution, or lactophenol cotton blue (LPCB). The amyloid reactions were tested using Lugol's iodine solution without or with pre-treatment with K. All measurements were made on material mounted in distilled water.

Thallus chemistry was studied by spot tests and thin layer chromatography, which was performed in solvent system A and C following Orange et al. (2001). Awasthi (1991, 2007) and several other recent publications were consulted for lichen species identification (Harris 1995, Marbach 2000, McCarthy 2001, Kalb et al. 2004, Nayaka 2005, Coppins 2009, Ertz et al. 2009, Lücking 2009, Saag et al. 2009, Mishra et al. 2011, Aptroot 2012, Allen & Lendemer 2015, Aptroot & Lücking 2016, Joseph et al. 2018). Lücking et al. (2017) was followed for the classification of lichens while Jayasiri et al. (2015) was followed to obtain facesoffungi numbers.

## Results

Lichen specimens were identified as belonging to 95 species under 49 genera and 23 families (Table 1). The genus *Japewiella* is being reported for the first time from India which is represented by species *J. tavaresiana* (H. Magn.) Printzen. Further, six more species of lichens are also being reported for the first time for India viz., *Arthonia atra* (Pers.) A. Schneid., *Graphis brevicarpa* M. Nakan., Kashiw. & K.H. Moon, *Micarea erratica* (Körb.) Hertel, Rambold & Pietschm., *Pertusaria cicatricosa* var. *deficiens* A.W. Archer, Elix & Streimam, *Porina subargillacea* Müll Arg., and *Pyxine schmidtii* Vain.

The lichen biota of Sirumalai hills is dominated by crustose lichens (54 spp.) followed by foliose (28 spp.), leprose (5 spp.), fruticose (4 spp.) and squamulose (2 spp.) lichens. Similarly, most of the species were corticolous while *Cratiria lauri-cassiae* (Fée) Marbach, *Micarea erratica* (Körb.) Hertel, Rambold & Pietschm., *Rinodina oxydata* (A. Massal.) A. Massal. and *Xanthoparmelia congensis* (J. Steiner) Hale are found as saxicolous. Further, *Lepraria coriensis* (Hue) Sipman was found growing both on soil and rock. *Cladonia cartilaginea* Müll. Arg. was found exclusively on the soil. The family Parmeliaceae is the most diverse group in the Sirumalai hills with 17 species under eight genera. Graphidaceae is the most dominant family with 18 species under four genera. Among the various genera *Graphis* is the most dominant genus with 12 species followed by *Parmotrema* and *Pyxine* with six species each. The lichen community is also represented a good diversity of pyrenocarpous lichens represented by genera *Anisomeridium*, *Anthracotheceum*, *Lithothelium*, *Polymeridium*, *Porina*, *Pyrenula* and *Trypethelium*. Although several specimens of *Lithothelium* were collected, we were unable to detect any ascospores. The most common lichens in the area are *Dirinaria consimilis* (Stirt.) D.D. Awasthi, *Heterodermia dissecta* (Taylor) D.D. Awasthi, *Lecanora helva* Stizenb. and *Parmotrema tinctorum* (Despr. ex Nyl.) Hale.

Previously the lichen biota of the state of Tamil Nadu comprised about 870 species. The present study has added seven new records for India, two new species for south India (*Arthonia redingeri* Grube and *Lepraria caesiella* R.C. Harris), and 29 species new to Tamil Nadu [marked as the asterisk (\*) in Table 1].

**Table 1** List of lichens recorded in the Sirumalai hills

Sl. No.	Lichen taxa	Family	Growth Form	Substratum	Voucher number
1	* <i>Alyxoria varia</i> (Pers.) Ertz & Tehler	Lecanographaceae	CR	Bark	17-030478
2	<i>Allographa hossei</i> (Vain.) Lücking & Kalb	Graphidaceae	CR	Bark	17-031125B
3	* <i>Anisomeridium biforme</i> (Borrer) R.C. Harris	Monoblastiaceae	CR	Bark	17-030479, 17-031125A
4	<i>Anthracotheceum macrosporum</i> (Hepp) Müll. Arg.	Pyrenulaceae	CR	Bark	17-030480
5	@ <i>Arthonia atra</i> (Pers.) A. Schneid.	Arthoniaceae	CR	Bark	17-030453
6	* <i>A. redingeri</i> Grube	Arthoniaceae	CR	Bark	17-030481A
7	* <i>A. subvelata</i> Nyl.	Arthoniaceae	CR	Bark	17-030482A
8	* <i>Arthothelium nigrescens</i> Makhija & Patw.	Arthoniaceae	CR	Bark	17-030483C

**Table 1** Continued.

Sl. No.	Lichen taxa	Family	Growth Form	Substratum	Voucher number
9	<i>Bacidia millegrana</i> (Taylor) Zahlbr.	Ramalinaceae	CR	Bark	17-030484
10	<i>Bulbothrix isidiza</i> (Nyl.) Hale	Parmeliaceae	FL	Bark	17-030485A, 17-031140B
11	* <i>B. setschwanensis</i> (Zahlbr.) Hale	Parmeliaceae	FL	Bark	17-030486A
12	<i>Caloplaca bassiae</i> (Ach.) Zahlbr.	Teloschistaceae	CR	Bark	17-030487, 17-031150B
13	* <i>C. herbidella</i> (Arnold) H. Magn.	Teloschistaceae	CR	Bark	17-030488
14	* <i>Canomaculina subsumpta</i> (Nyl.) Elix	Parmeliaceae	FL	Bark	17-030489
15	<i>Canoparmelia texana</i> (Tuck.) Elix & Hale	Parmeliaceae	FL	Bark	17-030490
16	* <i>Chrysothrix chlorina</i> (Ach.) J.R. Laundon	Chrysotrichaceae	LP	Bark	17-030491
17	<i>Cladonia cartilaginea</i> Müll. Arg.	Cladoniaceae	FR	Soil	17-030492
18	<i>Coenogonium</i> sp.	Coenogoniaceae	CR	Bark	17-030493B
19	<i>Cratiria lauri-cassiae</i> (Fée) Marbach	Caliciaceae	CR	Rock	17-030486C, 17-030495B
20	<i>C. obscurior</i> (Stirt.) Marbach & Kalb	Caliciaceae	CR	Bark	17-030494B, 17-031158B
21	* <i>Cryptothecia polymorpha</i> Makhija & Patw.	Arthoniaceae	CR	Bark	17-030495A
22	<i>Diorygma hieroglyphicum</i> (Pers.) Staiger & Kalb	Graphidaceae	CR	Bark	17-030496
23	<i>D. junghuhnii</i> (Mont. & Bosch) Kalb	Graphidaceae	CR	Bark	17-030483B
24	<i>Dirinaria applanata</i> (Fée) D.D. Awasthi	Caliciaceae	FL	Bark	17-030485B
25	<i>D. consimilis</i> (Stirt.) D.D. Awasthi	Caliciaceae	FL	Bark	17-030468C
26	<i>Glyphis cicatricosa</i> Ach.	Graphidaceae	CR	Bark	17-030497A
27	* <i>G. scyphulifera</i> (Ach.) Staiger	Graphidaceae	CR	Bark	17-030497B
28	<i>Graphis ajarekarii</i> Patw. & C.R. Kulk.	Graphidaceae	CR	Bark	17-030469C, 17-0304671
29	* <i>G. argentia</i> Makhija & Adaw.	Graphidaceae	CR	Bark	17-030498A
30	@ <i>G. brevicarpa</i> M. Nakan., Kashiw. & K.H. Moon	Graphidaceae	CR	Bark	17-030464
31	* <i>G. chlorotica</i> A. Massal.	Graphidaceae	CR	Bark	17-030499
32	<i>G. cincta</i> (Pers.) Aptroot	Graphidaceae	CR	Bark	17-030486B
33	<i>G. duplicata</i> Ach.	Graphidaceae	CR	Bark	17-030477A, 17-030483A
34	* <i>G. elegans</i> (Borrer ex Sm.) Ach.	Graphidaceae	CR	Bark	17-030476A
35	* <i>G. furcate</i> Fée	Graphidaceae	CR	Bark	17-030500A
36	* <i>G. handelii</i> Zahlbr.	Graphidaceae	CR	Bark	17-030481B
37	* <i>G. polystriata</i> Makhija, A. Dube, Adaw. & Chitale	Graphidaceae	CR	Bark	17-031126
38	* <i>G. pyrrhocheiloides</i> Zahlbr.	Graphidaceae	CR	Bark	17-030482B
39	* <i>Hafellia demutans</i> (Zahlbr.) Pusswald	Caliciaceae	CR	Bark	17-031127A
40	<i>Heterodermia diademata</i> (Taylor) D.D. Awasthi	Physciaceae	FL	Bark	17-030456B
41	<i>H. dissecta</i> (Kurok.) D.D. Awasthi	Physciaceae	FL	Bark	17-031128
42	<i>H. japonica</i> (M. Satô) Swinscow & Krog	Physciaceae	FL	Bark	17-031129A
43	<i>H. obscurata</i> (Nyl.) Trevis.	Physciaceae	FL	Bark	17-031130
44	<i>Hypotrachyna exsecta</i> (Taylor) Hale	Parmeliaceae	FL	Bark	17-031131
45	* <i>H. neodissecta</i> (Hale) Hale	Parmeliaceae	FL	Bark	17-031132
46	@ <i>Japewiella tavaresiana</i> (H. Magn.) Printzen	Lecanoraceae	CR	Bark	17-030462
47	<i>Lecanora albella</i> (Pers.) Ach.	Lecanoraceae	CR	Bark	17-031133B

**Table 1** Continued.

Sl. No.	Lichen taxa	Family	Growth Form	Substratum	Voucher number
48	<i>L. chlarotera</i> Nyl.	Lecanoraceae	CR	Bark	17-030477B
49	<i>L. helva</i> Stizenb.	Lecanoraceae	CR	Bark	17-030468B, 17-030482C
50	<i>L. perplexa</i> Brodo	Lecanoraceae	CR	Bark	17-031134
51	<i>Lepraria caesiella</i> R.C. Harris	Stereocaulaceae	LP	Bark	17-030463
52	<i>L. caesioalba</i> (B. de Lesd.) J.R. Laundon	Stereocaulaceae	LP	Bark	17-030455
53	* <i>L. coriensis</i> (Hue) Sipjman	Stereocaulaceae	LP	Rock & Soil	17-031135
54	* <i>L. jackii</i> Tønsberg	Stereocaulaceae	LP	Bark	17-031136
55	<i>Leptogium austroamericanum</i> (Malme) C.W. Dodge	Collemaaceae	FL	Bark	17-031137
56	<i>Lithothelium</i> sp.	Pyrenulaceae	CR	Bark	17-031138
57	@ <i>Micarea erratica</i> (Körb.) Hertel, Rambold & Pietschm.	Pilocarpaceae	CR	Rock	17-030460
58	<i>Ochrolechia subpallescens</i> Verseghy	Ochrolechiaceae	CR	Bark	17-030466B
59	<i>Parmelia erumpens</i> Kurok.	Parmeliaceae	FL	Bark	17-031139
60	<i>Parmelinella wallichiana</i> (Taylor) Elix & Hale	Parmeliaceae	FL	Bark	17-030466A, 17-030474B
61	<i>Parmotrema crinitum</i> (Ach.) M. Choisy	Parmeliaceae	FL	Bark	17-030473B, 17-030493A
62	* <i>P. cristiferum</i> (Taylor) Hale	Parmeliaceae	FL	Bark	17-031140A
63	<i>P. hababianum</i> (Gyeln.) Hale	Parmeliaceae	FL	Bark	17-031141
64	<i>P. praesorediosum</i> (Nyl.) Hale	Parmeliaceae	FL	Bark	17-031142
65	<i>P. reticulatum</i> (Taylor) M. Choisy	Parmeliaceae	FL	Bark	17-031143A
66	<i>P. tinctorum</i> (Despr. ex Nyl.) Hale	Parmeliaceae	FL	Bark	17-030469D, 17-031144
67	@ <i>Pertusaria cicatricosa</i> Müll. Arg. var. <i>deficiens</i> A.W. Archer, Elix & Streimam	Pertusariaceae	CR	Bark	17-030451A, 17-030450B
68	<i>P. cinchonae</i> Müll. Arg.	Pertusariaceae	CR	Bark	17-030476B
69	<i>P. endoxantha</i> Vain.	Pertusariaceae	CR	Bark	17-030473A
70	* <i>P. leucostoma</i> (Ach.) A. Massal.	Pertusariaceae	CR	Bark	17-030494C
71	<i>P. splendens</i> D.D. Awasthi & Preeti Srivast.	Pertusariaceae	CR	Bark	17-031145A
72	* <i>Phaeographis caesiodisca</i> Staiger	Graphidaceae	CR	Bark	17-030469B, 17-030473D
73	<i>Phyllopsora furfuracea</i> Zahlbr.	Ramalinaceae	SQ	Bark	17-031146
74	* <i>P. nemoralis</i> Timdal & Krog	Ramalinaceae	SQ	Bark	17-030495C
75	* <i>Polymeridium refertum</i> (Stirt.) Aptroot	Trypetheliaceae	CR	Bark	17-031147
76	@ <i>Porina subargillacea</i> Müll Arg.	Porinaceae	CR	Bark	17-030458
77	<i>Pyrenula adacta</i> Fée	Pyrenulaceae	CR	Bark	17-031148
78	<i>P. astroidea</i> (Fée) R.C. Harris	Pyrenulaceae	CR	Bark	17-031149
79	<i>Pyxine cocoes</i> (Sw.) Nyl.	Caliciaceae	FL	Bark	17-031150A
80	<i>P. petricola</i> Nyl.	Caliciaceae	FL	Bark	17-031151
81	* <i>P. philippina</i> Vain.	Caliciaceae	FL	Rock	17-031152
82	<i>P. reticulata</i> (Vain.) Vain.	Caliciaceae	FL	Bark	17-031153
83	@ <i>P. schmidtii</i> Vain.	Caliciaceae	FL	Bark	17-030457A, 17-030475
84	<i>P. subcinerea</i> Stirt.	Caliciaceae	FL	Bark	17-030451B, 17-030457B
85	<i>Ramalina conduplicans</i> Vain.	Ramalinaceae	FR	Bark	17-030468A
86	<i>R. pacifica</i> Asahina	Ramalinaceae	FR	Bark	17-031143B
87	<i>R. subpusilla</i> (Nyl.) Zahlbr.	Ramalinaceae	FR	Bark	17-031127B
88	<i>Remototrachyna flexilis</i> (Kurok.) Divakar & A. Crespo	Parmeliaceae	FL	Bark	17-031129A

**Table 1** Continued.

Sl. No.	Lichen taxa	Family	Growth Form	Substratum	Voucher number
89	<i>Rinodina oxydata</i> (A. Massal.) A. Massal.	Physciaceae	CR	Rock	17-031154
90	<i>Synarthonia inconspicua</i> (Stirt.) Van den Broeck & Ertz	Arthoniaceae	CR	Bark	17-030452
91	<i>Tephromela atra</i> (Huds.) Hafellner	Tephromelataceae	CR	Bark	17-031155
92	<i>Trypethelium eluteriae</i> Spreng.	Trypetheliaceae	CR	Bark	17-031156
93	<i>Usnea aciculifera</i> Vain.	Parmeliaceae	FR	Bark	17-031157
94	<i>Xanthoparmelia congensis</i> (J. Steiner) Hale	Parmeliaceae	FL	Rock	17-031158A
95	* <i>Zwackhia viridis</i> (Ach.) Poetsch & Schied.	Lecanographaceae	CR	Bark	17-031159

\* = new to Tamil Nadu, @ = new to India, CR = Crustose, FL = Foliose, FR = Fruticose, LP = Leprose, SQ = Squamulose

### New Records to India

***Arthonia atra*** (Pers.) A. Schneid., Guide Study Lich.: 131. 1898 Fig. 2A

Index Fungorum number: IF376348; Faces of fungi number: FoF09883

Thallus crustose, corticolous, whitish grey, ascomata lirellate, in groups, black, exciple carbonized, discontinuous at base, ascospores hyaline, transversely 3-septate,  $18.0\text{--}25.2 \times 4.1\text{--}4.5 \mu\text{m}$ .

Remarks – This is a cosmopolitan species found throughout Asia, Africa, Australia, Europe, Macaronesia, North and South America (Pentecost & James 2009). Previously this species was known as *Opegrapha atra* Pers., but recently Ertz et al. (2009) reinstated it as *Arthonia atra*.

Material examined – Nayaka et al. 17-030453 (LWG).

***Graphis brevicarpa*** M. Nakan., Kashiw. & K.H. Moon, Bull. Nat. Sci. Mus., Tokyo, B 28(4): 107. 2002 Fig. 2B

Index Fungorum number: IF372560; Faces of fungi number: FoF09882

Thallus crustose, corticolous, smooth, whitish grey, apothecia lirellate, immersed, short, mostly unbranched, covered by thick thalline margin up to top, disc concealed, epruinose, exciple laterally carbonized, hymenium inspersed, ascospores transversely septate,  $20.8\text{--}22.8 \times 6.3\text{--}7.2 \mu\text{m}$ , and trace amount of norstictic acid detected in TLC.

Remarks – Previously known from Oceania (Lücking 2009).

Material examined – Nayaka et al. 17-030464 (LWG).

***Japewiella tavaresiana*** (H. Magn.) Printzen, *Arnoldia* 18: 4. 2000 Fig. 2C

Index Fungorum number: IF462818; Faces of fungi number: FoF09881

Thallus crustose, corticolous, verruculose, greenish to matt, apothecia round, slightly irregular in shape, 0.2–0.5 mm diam., disc yellowish to cream, margin paler than the disc, thin and persistent at maturity, exciple with radiating hyphae, ascospores hyaline, simple,  $9.3\text{--}14.9 \times 5.6\text{--}6.2 \mu\text{m}$ , and atranorin (minor) detected in TLC.

Remarks – Earlier, this species was reported from Europe, Macaronesia (James 2009) and the Appalachian Mountains of Eastern North America (Allen & Lendermer 2015).

Material examined – Nayaka et al. 17-030462 (LWG).

***Micarea erratica*** (Körb.) Hertel, Rambold & Pietschm., *Biblioth. Lichenol.* 34: 227. 1989

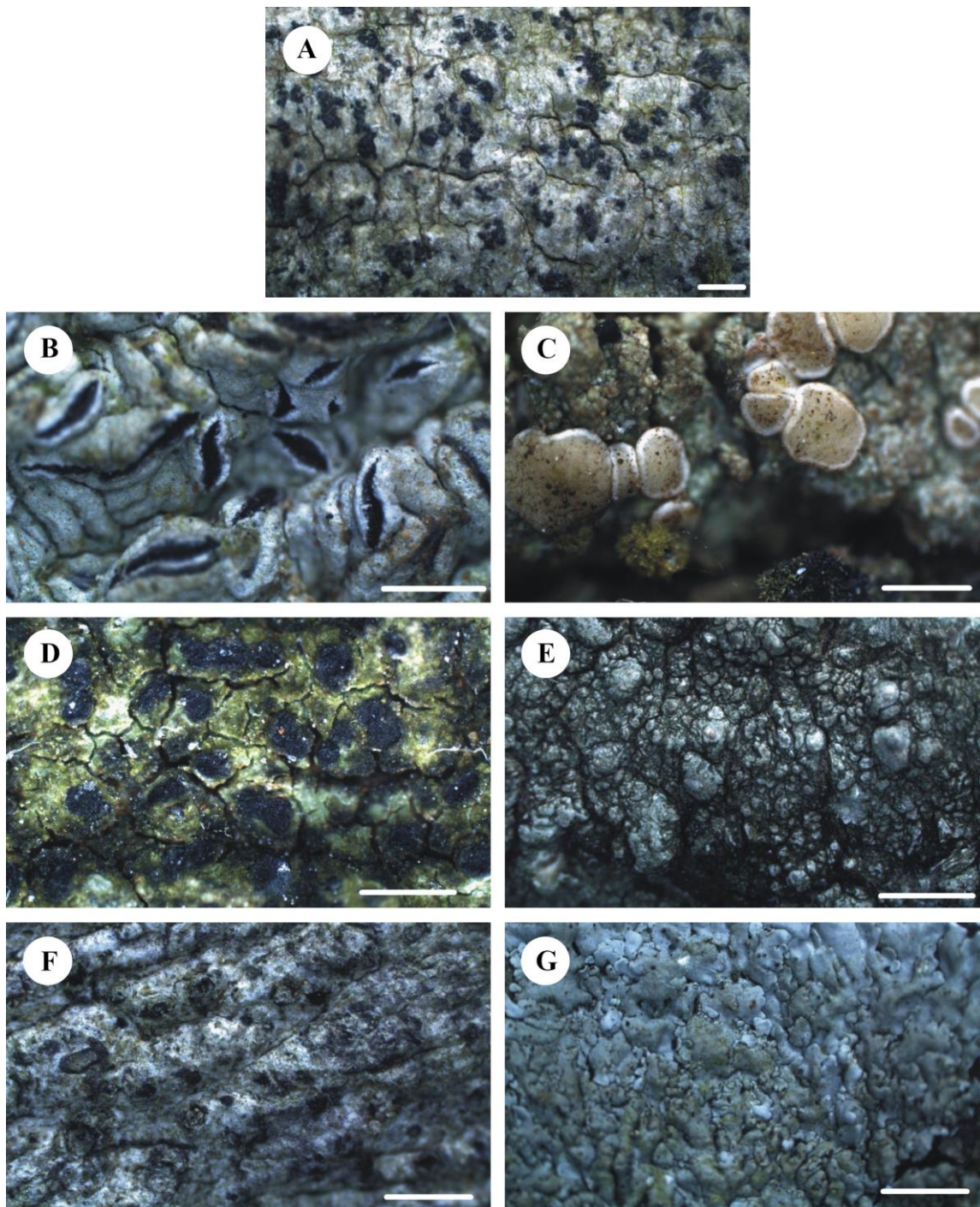
Fig. 2D

Index Fungorum number: IF125877; Faces of fungi number: FoF09880

Thallus crustose, saxicolous, smooth, areolate, greenish grey, apothecia small, up to 0.2 mm diam., round, disc and margin black, epithecium greenish, hymenium and hypothecium hyaline, ascospores haline, narrowly ellipsoid, up to 3 pseudoseptate,  $5.8\text{--}10.3 \times 3.6\text{--}4.2 \mu\text{m}$ , no lichen substances detected in TLC.

Remarks – This species was previously reported from England, Scotland, Ireland, Central Europe, North America, Australia and New Zealand (Coppins 2009). It also occurs on wood. Sirumalai hill specimen slightly differs in having hyaline hypothecium and pseudoseptate ascospores.

Material examined – Nayaka et al. 17-030460 (LWG).



**Fig. 2** – New records. A *Arthonia atra*. B *Graphis brevicarpa*. C *Japewiella tavaresiana*. D *Micarea erratica*. E *Pertusaria cicatricosa* var. *deficiens*. F *Porina subargillacea*. G *Pyxine schmidtii*. Scale bars: A = 2 mm, B, C, D, E = 1 mm, F, G = 2 mm.

*Pertusaria cicatricosa* var. *deficiens* A.W. Archer, Elix & Streimam, Mycotaxon 56: 389. 1995

Fig. 2E

Index Fungorum number: IF413724; Faces of fungi number: FoF09879

Thallus corticolous, crustose, greenish grey, cracked, verruculose, apothecia numerous, verruciform, tuberculate, irregular in outline, constricted at base, ostiole inconspicuous, ascospores 2 per ascus, hyaline, ellipsoidal, with prominent rough inner wall,  $120.5\text{--}184.8 \times 27.2\text{--}49.2 \mu\text{m}$ , stictic acid complex detected in TLC.

Remarks – *Pertusaria cicatricosa* var. *deficiens* differs from *P. cicatricosa* var. *cicatricosa* by lacking chlorinated lichexanthone. This species has previously only been reported from its type locality Papua New Guinea (Archer et al. 1995).

Material examined – Nayaka et al. 17-030451A (LWG).

*Porina subargillacea* Müll Arg., Bull. Herb. Boissier 1: 64. 1893

Fig. 2F

Index Fungorum number: IF402279; Faces of fungi number: FoF09878

Thallus corticolous, crustose, whitish grey, matt, ecorticate, perithecia emergent, black, 0.2–0.4 mm diam., ostiole inconspicuous, ascospores colourless, transversely 7-septate, fusiform,  $33.4\text{--}40.8 \times 2.1\text{--}2.5 \mu\text{m}$ , unidentified triterpenes at  $R_f$  class 6-7 detected in TLC.

Remarks – This species was reported from Australia and New Zealand (McCarthy 2001).

Material examined – Nayaka et al. 17-030458 (LWG).

*Pyxine schmidtii* Vain., Hedwigia 46: 170. 1907

Fig. 2G

Index Fungorum number: IF403619; Faces of fungi number: FoF09877

Thallus foliose, corticolous, whitish grey, up to 2.5 cm diam., adnate, lobes imbricate, plane to convex, upper surface pruinose towards lobe tips, pseudocyphellae rare, medulla white, lower surface black at centre, paler towards margin, rhizinate, apothecia absent, atranorin, zeorin, terpenes at  $R_f$  class 2 to 3 and at 3 are detected in TLC.

Remarks – Previously this species was reported from Australia, Asia and Papua New Guinea (Elix 2009).

Materials examined – Nayaka et al. 17-030457A, 17-030475 (LWG).

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## References

- Allen JL, Lendemer C. 2015 – *Japewiella dollypartoniana*, a new widespread lichen in the Appalachian Mountains of Eastern North America. *Castanea* 80, 59–65.
- Aptroot A. 2012 – A world key to the species of *Anthracotheceum* and *Pyrenula*. *Lichenologist* 44, 5–53.
- Aptroot A, Lücking R. 2016 – A revisionary synopsis of the Trypetheliaceae (Ascomycota: Trypetheliales). *Lichenologist* 48, 763–982.
- Archer A, Elix JA, Streimann H. 1995 – The lichen genus *Pertusaria* (Lichenised Ascomycotina) in Papua New Guinea. *Mycotaxon* 56, 387–401.
- Awasthi DD. 1991 – A key to the microlichens of India, Nepal and Sri Lanka. *Bibliotheca Lichenologica* 40, 1–336.
- Awasthi DD. 2007 – A Compendium of the Macrolichens from India, Nepal and Sri Lanka. Bishen



- Singh Mahendra Pal Singh, Dehra Dun.
- Coppins BJ. 2009 – *Micarea* Fr. Pp 583–606 in CW Smith et al., eds, The Lichens of Great Britain and Ireland. British Lichen Society, London.
- Elix JA. 2009 – *Pyxine*. Pp. 517–533 in PM McCarthy, ed, Flora of Australia. Volume 57, Lichenes 5. CSIRO Publishing, Canberra.
- Ertz D, Miadlikowska J, Lutzoni F, Dessein S et al. 2009 – Towards a new classification of the Arthoniales (Ascomycota) based on a three-gene phylogeny focussing on the genus *Opegrapha*. Mycological Research 113, 141–152.
- Harris RC. 1995 – More Florida Lichens. Including the 10ø Tour of the Pyrenolichens. Bronx: Published by the author.
- James PW. 2009 – *Japewiella* Printzen. Pp. 449–450 in CW Smith et al., eds, The Lichens of Great Britain and Ireland. British Lichen Society, London.
- Jayasiri SC, Hyde KD, Ariyawansa HA, Bhat DJ, Buyck B, Cai L, Dai Y et al. 2015 – The Faces of Fungi database: fungal names linked with morphology, phylogeny and human impacts. Fungal Diversity 74, 3–18.
- Joseph S, Sinha GP, Ramachandran VS. 2018 – Taxonomic Revision of the Lichen Genus *Opegrapha sensu lato* (Roccellaceae) in India. Indian Journal of Forestry, Additional Serie VI. Bishen Singh Mahendra Pal Singh, Dehradun.
- Kalb K, Staiger B, Elix JA. 2004 – A monograph of the lichen genus *Diorygma*-A first attempt. Symbolae Botanicae Upsalienses 34, 133–181.
- Karuppusamy S. 2007 – Medicinal plants used by Paliyan tribes of Sirumalai hills of southern India. Natural Product Radiance 6, 436–442.
- Lücking R. 2009 – The taxonomy of the genus *Graphis sensu* Staiger (Ascomycota: Ostropales: Graphidaceae). Lichenologist 41, 319–362.
- Lücking R, Hodkinson BP, Leavitt SD. 2017 – The 2016 classification of lichenized fungi in the Ascomycota and Basidiomycota-Approaching one thousand genera. Bryologist 119, 361–416.
- Marbach B. 2000 – Corticole und lignicole Arten der Flechtengattung *Buellia sensu lato* in den Subtropen und Tropen. Bibliotheca Lichenologica 74, 1–384.
- McCarthy PM. 2001 – Trichotheliaceae. Pp 105–157 in PM McCarthy, ed, Flora of Australia. Volume 58A, Lichens 3. CSIRO Publishing, Canberra.
- Mishra GK, Upreti DK, Nayaka S, Haridas B. 2011 – New taxa and new reports of *Phyllopsora* (lichenized Ascomycotina) from India. Mycotaxon 115, 29–44.
- Muthumperumal C, Parthasarathy N. 2010 – A large-scale inventory of liana diversity in tropical forests of South Eastern Ghats, India. Systematics and Biodiversity 8, 289–300.
- Nayaka S. 2005 – Revisionary studies on lichen genus *Lecanora sensu lato* from India. PhD thesis, Dr. RML Avadh University, Faizabad, India.
- Nayaka S, Reddy MA, Ponmurugan P, Anjali DB, Ayyappadasa G. 2013 – Eastern Ghats, biodiversity reserves with unexplored lichen wealth. Current Science 104, 821–825.
- Orange A, James PW, White FJ. 2001. Microchemical Methods for the Identification of Lichens. British Lichen Society, London.
- Pentecost A, James PW. 2009 – *Opegrapha* Ach. Pp. 631–647 in CW Smith et al., eds, The Lichens of Great Britain and Ireland. British Lichen Society, London.
- Saag L, Saag A, Randle T. 2009 – World survey of the genus *Lepraria* (Stereocaulaceae, lichenized Ascomycota). Lichenologist 41, 25–60.
- Sankar RV, Kottaimuthu R, Ravikumar K. 2009 – Addition to the flora of Sirumalai hills, Eastern Ghats, India. Journal of Threatened Taxa 1, 379–381.
- \Santharam V, Sathasivam K, Badrinarayanan T, Sudhakar KV. 2014 – Birds of the Sirumalai Hills. Indian Birds 9, 57–63.
- Sinha GP, Nayaka S, Joseph S. 2018 – Additions to the checklist of Indian lichens after 2010. Cryptogam Biodiversity and Assessment, Special Issue, 197–206.