CHAPTER 4

RESULTS

4.1 Lichen diversity

From the study area, Ultapani Forest Range, a total of 217 lichen taxa were reported belonging to 69 genera under 31 families, and a genus under Arthoniales (Table 4.1 & 4.2). The lichen biota of UFR is dominated by crustose lichen with 172 species (79%) followed by foliose with 34 species (16%), squamulose with six species (3%), fruticose with three species (1%), and leprose with two species (1%) (Fig. 4.1).

Table 4.1. Growth forms, families, genera and lichen taxa from UFR

Growth forms	No. of families	No. of genera	No. of taxa
Crustose	21	50	172
Foliose	6	12	34
Fruticose	2	2	3
Leprose	1	1	2
Squamulose	3	4	6
Total	**33**	**69**	**217**

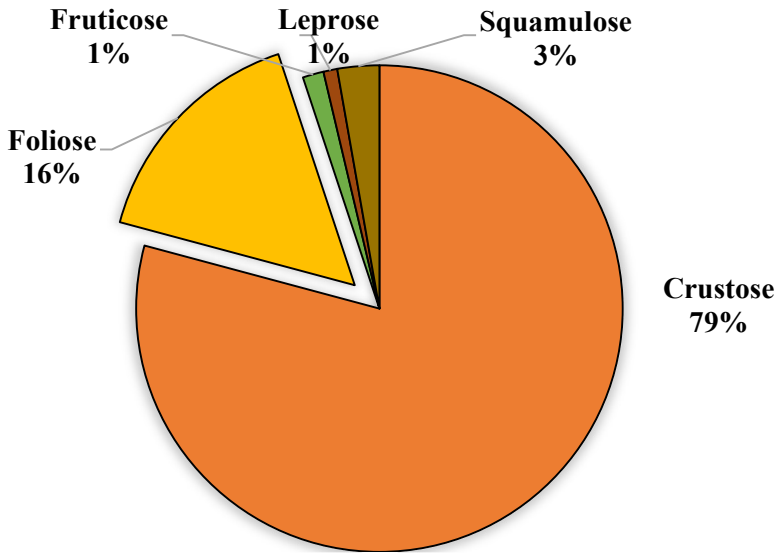

Fig. 4.1. Representation of different growth forms of lichen taxa

Of the total taxa, Graphidaceous lichens are the most dominant and diverse with 45 species under 10 genera followed by Diploschistaceae and Malmideaceae with 22 and 21 species, respectively (Fig. 4.2). Amongst the genera, *Malmidea* is the most dominant with 21 species followed by *Pyrenula* and *Graphis* with 16 and 15 species, respectively (Fig. 4.3).

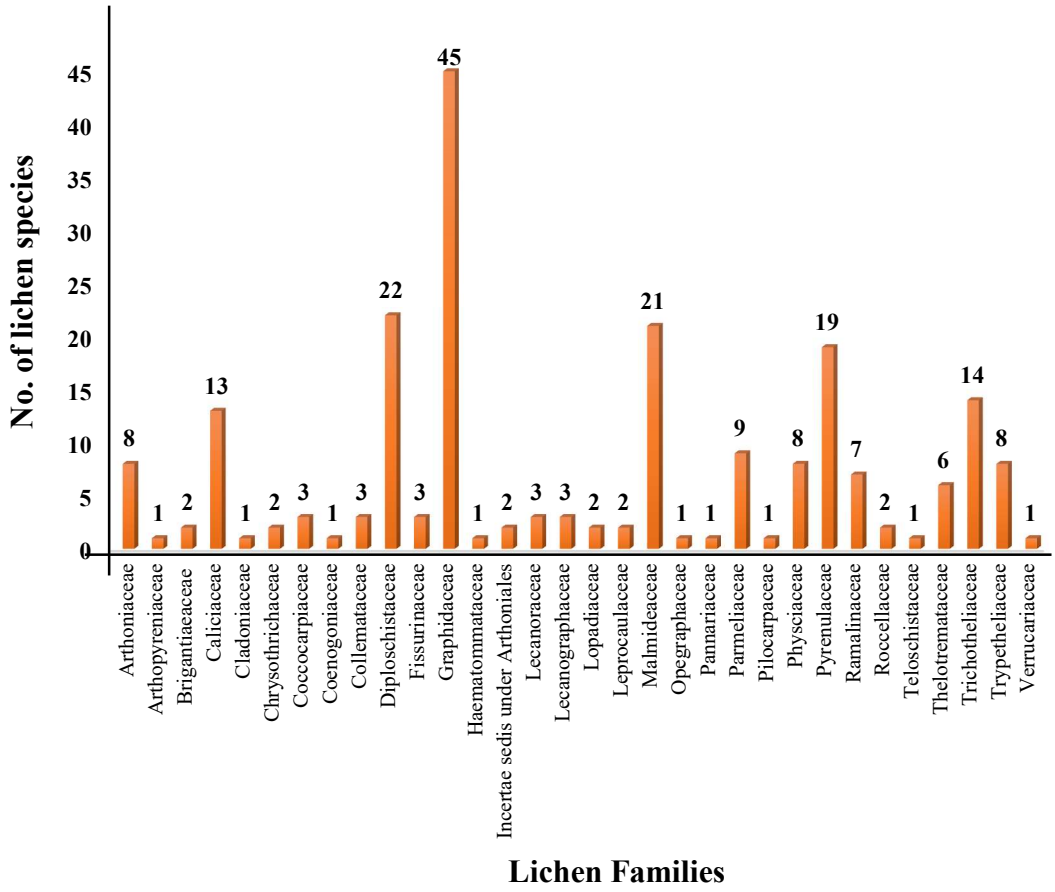

Fig. 4.2. Family wise representation of the lichen taxa

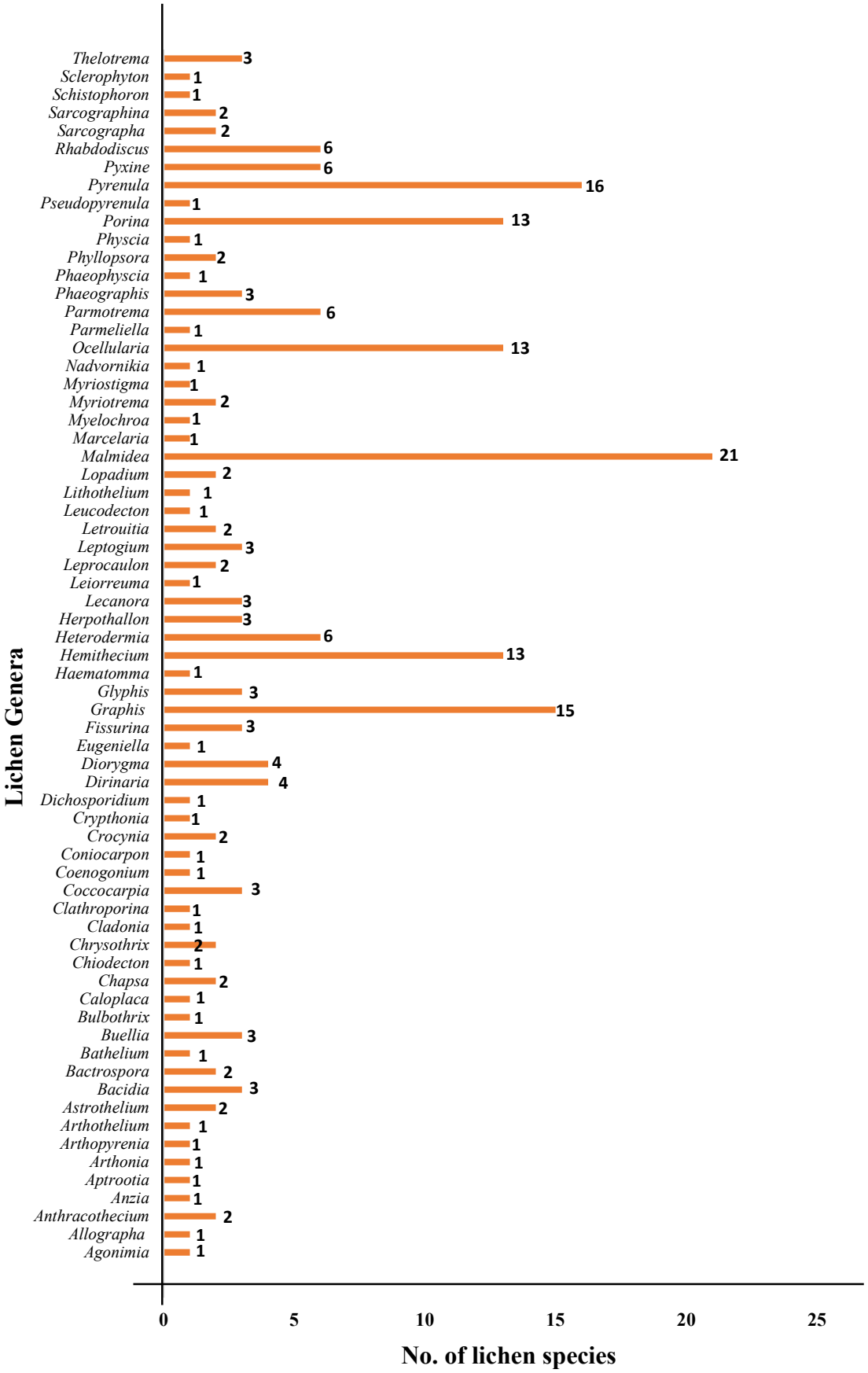

Fig. 4.3. Representation of the lichen genera

Table 4.2. List of lichen taxa, their growth forms and families along with their frequency and relative abundance of UFR

Sl No.	Lichen taxa	GF	L	S	U	Fre (%)	RA
Arthoniaceae							
1	*Arthonia dispersula* Nyl.	Cr	–	–	1	33.33	0.0019
2	*A. inconspicua* Stirt.	Cr	–	–	1	33.33	0.0019
3	*Arthothelium abnorme* (Ach.) Müll. Arg.	Cr	–	–	1	33.33	0.0019
4	*Coniocarpon cinnabarinum* De Candolle	Cr	–	–	2	33.33	0.0038
5	*Crypthonia albida* (Fée) Frisch & Thor	Cr	–	–	1	33.33	0.0019
6	*Herpothallon albidum* (Fée) Aptroot, Lücking & Thor	Cr	–	–	3	33.33	0.0057
7	*H. granulare* (Sipman) Aptroot & Lücking	Cr	–	1	–	33.33	0.0019
8	*H. isidiatum* Jagad. Ram & Sinha	Cr	–	1	–	33.33	0.0019
9	*Myriostigma candidum* Kremp.	Cr	–	–	1	33.33	0.0019
Arthopyreniaceae							
10	*Arthopyrenia claviformis* (Stirt.) Hawksw.	Cr	–	–	1	33.33	0.0019
Brigantiaeaceae							
11	*Letrouitia transgressa* (Malme) Hafellner & Bellem.	Cr	1	–	6	66.67	0.0134
12	*L. vulpina* (Tuck ex Nyl.) Hafellner & Bellem.	Cr	–	–	2	33.33	0.0039
Caliciaceae							
13	*Buellia curtisii* (Tuck.) Imshaug	Cr	1	–	–	33.33	0.0019
14	*B. morehensis* Singh & Singh	Cr	–	–	1	33.33	0.0019
15	*B. tincta* Steiner ex Magn.	Cr	1	–	1	66.67	0.0038
16	*Dirinaria aegialita* Afzel. Ex Ach. Moore	F	1	5	1	100	0.0134
17	*D. applanata* (Fée) Awasthi	F	4	4	4	100	0.0229
18	*D. confluens* (Fr.) Awasthi	F	–	1	–	33.33	0.0019
19	*D. consimilis* (Stirt.) Awasthi	F	–	–	1	33.33	0.0019
20	*Pyxine cocoes* (Sw.) Nyl.	F	2	1	3	100	0.0115
21	*P. coralligera* Malme	F	1	–	1	66.67	0.0038
22	*P. cylindrica* Kashiw.	F	1	–	–	33.33	0.0019
23	*P. endochrysina* Nyl.	F	–	1	–	33.33	0.0019
24	*P. meissnerina* Nyl.	F	–	1	–	33.33	0.0019
25	*P. retirugella* Nyl.	F	–	–	2	33.33	0.0038
Cladoniaceae							

26	*Cladonia subradiata* (Vain.) Sandst.	Fr	-	-	1	33.33	0.0019
Chrysothrichaceae							
27	*Chrysothrix candelaris* (L.) Laundon	Le	2	-	-	33.33	0.0038
28	*Ch. chlorina* (Ach.) Laundon	Le	-	-	1	33.33	0.0019
Coccocarpiaceae							
29	*Coccocarpia erythroxyli* (Spreng.) Swinscow & Krog	F	-	-	1	33.33	0.0019
30	*C. palmicola* (Spreng.) Arv. & Galloway	F	-	2	1	66.67	0.0057
31	*C. pellita* (Ach.) Müll. Arg.	F	-	1	13	66.67	0.0267
Coenogoniaceae							
32	*Coenogonium degeneri* (Kalb & Vêzda) Kalb & Lücking	Cr	-	-	1	33.33	0.0019
Collemataceae							
33	*Leptogium brebissonii* Mont.	F	-	1	-	33.33	0.0019
34	*L. denticulatum* Tuck.	F	1	-	1	66.67	0.0038
35	*L. ulvaceum* (Pers.) Vain.	F	-	1	-	33.33	0.0019
Diploschistaceae							
36	*Myriotrema classicum* Lücking	Cr	-	-	1	33.33	0.0019
37	*M. olivaceum* Fée	Cr	-	-	1	33.33	0.0019
38	*Nadvornikia hawaiensis* (Tuck.) Tibell	Cr	-	-	1	33.33	0.0019
39	*Ocellularia allosporoides* (Nyl.) Patw. & Kulk.	Cr	-	-	3	33.33	0.0057
40	*O. andamanica* (Nyl.) Tat. Matsumoto & Deguchi	Cr	-	-	2	33.33	0.0038
41	*O. calvescens* (Fée) Müll. Arg.	Cr	-	-	1	33.33	0.0019
42	*O. conformis* (Fée) Hale	Cr	-	-	2	33.33	0.0038
43	*O. diacida* Hale	Cr	1	-	9	66.67	0.0191
44	*O. garoana* Patw. & Nagarkar	Cr	1	-	1	66.67	0.0038
45	*O. neopertusariiformis* Hale	Cr	-	-	11	33.33	0.03
46	*O. subgranulosa* (Homchant. & Coppins) Lumbsch & Papong	Cr	-	-	1	33.33	0.0019
47	*O. terebrata* (Ach.) Müll. Arg.	Cr	-	-	1	33.33	0.0019
48	*O. thelotremoides* (Leight.) Zahlbr.	Cr	-	-	1	33.33	0.0019
49	*O. upretii* S. Joshi, Divakar, Lumbsch & Lücking	Cr	-	-	4	33.33	0.0076
50	*O. violacea* Räsänen	Cr	-	-	1	33.33	0.0019
51	*O. wandoorensis* Nagarkar, Sethy & Patw.	Cr	-	1	-	33.33	0.0019
52	*Rhabdodiscus asiaticus* (Vain.) Rivas Plata, Lücking & Lumbsch	Cr	-	-	8	33.33	0.0153
53	*R. epitrypus* (Nyl.) Vain.	Cr	-	-	1	33.33	0.0019
54	*R. fissus* (Müll. Arg.) Vain.	Cr	-	-	2	33.33	0.0038

55	*R. indicus* Pushpi Singh & Singh	Cr	–	–	1	33.33	0.0019
56	*R. marivelensis* (Vain.) Rivas Plata, Lücking & Lumbsch	Cr	–	–	1	33.33	0.0019
57	*R. subcavatus* (Nyl.) Rivas Plata, Lücking & Lumbsch	Cr	–	–	1	33.33	0.0019
Fissurinaceae							
58	*Fissurina rugosa* Knight	Cr	–	–	1	33.33	0.0019
59	*F. simplex* Sharma, Khadilkar & Makhija	Cr	–	–	1	33.33	0.0019
60	*F. subnitidula* (Nyl.) Staiger	Cr	–	–	1	33.33	0.0019
Graphidaceae							
61	*Allographa myolensis* (Aptroot) Lücking & Kalb	Cr	1	1	–	66.67	0.0038
62	*Diorygma hieroglyphicum* (Pers.) Staiger & Kalb	Cr	–	1	2	66.67	0.0057
63	*D. junghuhnii* (Mont. & Bosch) Kalb, Staiger & Elix	Cr	1	2	–	66.67	0.0057
64	*D. roseopruinatum* Papong, Lücking & Parnmen	Cr	–	1	2	66.67	0.0057
65	*D. soozanum* (Zahlbr.) Nakan. & Kashiw.	Cr	1	–	3	66.67	0.0076
66	*Glyphis cicatricosa* Ach.	Cr	–	–	2	33.33	0.0038
67	*G. confluens* Zenker	Cr	–	–	1	33.33	0.0019
68	*G. duriuscula* Stirt.	Cr	2	–	–	33.33	0.0038
69	*Graphis ajarekarii* Patw. & Kulk.	Cr	–	–	1	33.33	0.0019
70	*G. argentea* Makhija & Adaw.	Cr	–	–	1	33.33	0.0019
71	*G. assimilis* Nyl.	Cr	1	–	–	33.33	0.0019
72	*G. capillacea* Stirt.	Cr	–	–	4	33.33	0.0076
73	*G. copelandii* Vain.	Cr	–	–	1	33.33	0.0019
74	*G. emersa* Müll. Arg.	Cr	–	–	1	33.33	0.0019
75	*G. glaucescens* Fée	Cr	1	–	–	33.33	0.0019
76	*G. handelii* Zahlbr.	Cr	3	–	5	66.67	0.0153
77	*G. japonica* (Müll. Arg.) Archer & Lücking	Cr	–	1	10	66.67	0.03
78	*G. longispora* Awasthi & Singh	Cr	–	2	–	33.33	0.0038
79	*G. nanodes* Vain.	Cr	2	–	1	66.67	0.0057
80	*G. pinicola* Zahlbr.	Cr	–	–	2	33.33	0.0038
81	*G. renschiana* (Müll. Arg.) Stizenb.	Cr	–	–	1	33.33	0.0019
82	*G. subintermedians* Hale ex Lücking	Cr	1	–	–	33.33	0.0019
83	*G. tenella* Ach.	Cr	–	–	4	33.33	0.0076
84	*Hemithecium amboliense* Makhija & Dube	Cr	–	–	15	33.33	0.0286
85	*H. aphaneomicrosporum* Makhija & Adaw.	Cr	–	–	1	33.33	0.0019

86	*H. aphane*s (Mont. & Bosch) Nakan. & Kashiw.	Cr	1	–	4	66.67	0.0095
87	*H. balaghatense* Adaw. & Makhija	Cr	1	–	3	66.67	0.0076
88	*H. fulvescens* Adaw. & Makhija	Cr	–	–	4	33.33	0.0076
89	*H. isidiatum* Upreti & Dubey	Cr	–	–	3	33.33	0.0057
90	*H. nagalandicum* (Singh & Sinha) Adaw. & Makhija	Cr	–	–	2	33.33	0.0038
91	*H. nakanishianum* (Patw. & Kulk.) Makhija & Dube	Cr	2	–	4	66.67	0.0115
92	*H. norsticticum* Makhija & Dube	Cr	–	–	1	33.33	0.0019
93	*H. pulchellum* Makhija & Adaw.	Cr	–	–	1	33.33	0.0019
94	*H. salacinilabiatum* (Patw. & Kulk.) Chitale & Makhija	Cr	–	1	1	66.67	0.0038
95	*H. scariosum* Makhija & Adaw.	Cr	–	–	1	33.33	0.0019
96	*H. verrucosum* Sharma & Khadilkar	Cr	2	–	1	66.67	0.0057
97	*Leiorreuma exaltatum* (Mont. & Bosch) Staiger	Cr	–	–	1	33.33	0.0019
98	*Phaeographis dendritica* (Ach.) Müll. Arg.	Cr	1	–	–	33.33	0.0019
99	*P. endophaeiza* (Stirt.) Zahlbr.	Cr	–	–	1	33.33	0.0019
100	*P. firmula* (Stirt.) Pushpi Singh & Singh	Cr	–	–	2	33.33	0.0038
101	*Sarcographa labyrinthica* (Ach.) Müll. Arg.	Cr	–	–	1	33.33	0.0019
102	*S. tricosa* (Ach.) Müll. Arg.	Cr	–	–	2	33.33	0.0038
103	*Sarcographina glyphiza* (Nyl.) Singh & Awasthi	Cr	–	–	1	33.33	0.0019
104	*S. subtorquescens* (Nyl.) Zahlb.	Cr	–	–	1	33.33	0.0019
105	*Schistophoron tenue* Stirt.	Cr	1	–	–	33.33	0.0019
Haematommataceae							
106	*Haematomma africanum* (Steiner) Dodge	Cr	1	–	1	66.67	0.0038
Incertae sedis under Arthoniales							
107	*Bactrospora arthonioides* Egea & Torrente	Cr	–	–	1	33.33	0.0019
108	*B. metabola* (Nyl.) Egea & Torrente	Cr	–	–	1	33.33	0.0019
Lecanoraceae							
109	*Lecanora achroa* Nyl.	Cr	–	2	–	33.33	0.0038
110	*L. sambuci* (Pers.) Nyl.	Cr	–	–	1	33.33	0.0019
111	*L. tropica* Zahlbr.	Cr	–	1	–	33.33	0.0019
Lecanographaceae							
112	*Zwackhia bonplandii* (Fée) Ertz	Cr	–	–	1	33.33	0.0019
113	*Z. prosodea* (Afzel.) Ertz	Cr	–	–	3	33.33	0.0057
114	*Z. viridis* (Ach.) Poetsch & Schied.	Cr	–	–	1	33.33	0.0019

Lopadiaceae							
115	*Lopadium coorgianum* Patw. & Makhija	Cr	-	-	2	33.33	0.0038
116	*L. vulpinum* (Tuck ex Nyl.) Zahlbr.	Cr	-	-	1	33.33	0.0019
Leprocaulaceae							
117	*Leprocaulon adhaerens* (Knudsen, Elix & Lendemer) Lendemer & Hodk.	Fr	-	-	1	33.33	0.0019
118	*L. arbuscula* (Nyl.) Nyl.	Fr	-	-	1	33.33	0.0019
Malmideaceae							
119	*Malmidea atlantica* (Cáceres & Lücking) Cáceres & Kalb	Cr	-	-	1	33.33	0.0019
120	*M. aurigera* (Fée) Kalb, Rivas Plata & Lumbsch	Cr	-	-	1	33.33	0.0019
121	*M. bacidinoides* (Lücking) Kalb & Lücking	Cr	1	-	2	66.67	0.0057
122	*M. bakeri* (Vain.) Kalb, Rivas Plata & Lumbsch	Cr	-	-	1	33.33	0.0019
123	*M. cinereonigrella* (Vain.) Kalb	Cr	-	-	1	33.33	0.0019
124	*M. coralliformis* Kalb	Cr	-	-	1	33.33	0.0019
125	*M. duplomarginata* (Papong & Kalb) Kalb & Papong	Cr	-	4	-	33.33	0.0076
126	*M. fuscella* (Müll. Arg.) Kalb & Lücking	Cr	3	1	5	100	0.0172
127	*M. granifera* (Ach.) Kalb, Rivas Plata & Lumbsch	Cr	-	-	1	33.33	0.0019
128	*M. gyalectoides* (Vain.) Kalb & Lücking	Cr	1	1	6	100	0.0153
129	*M. hypomelaena* (Nyl.) Kalb & Lücking	Cr	-	-	1	33.33	0.0019
130	*M. leptoloma* (Müll. Arg.) Kalb & Lücking	Cr	-	-	4	33.33	0.0076
131	*M. nigromarginata* (Malme) Lücking & Breuss	Cr	1	-	2	66.67	0.0057
132	*M. papillosa* Weerakoon & Aptroot	Cr	3	-	3	66.67	0.0115
133	*M. perplexa* Kalb	Cr	1	-	1	66.67	0.0038
134	*M. piperis* (Spreng.) Kalb, Rivas Plata & Lumbsch	Cr	1	-	-	33.33	0.0019
135	*M. psychotrioides* (Kalb & Lücking) Kalb, Rivas Plata & Lumbsch	Cr	-	-	1	33.33	0.0019
136	*M. subaurigera* (Vain.) Kalb, Rivas Plata & Lumbsch	Cr	-	-	2	33.33	0.0038
137	*M. subgranifera* (Kalb & Elix) Kalb & Elix	Cr	-	-	3	33.33	0.0057
138	*M. tratiana* Kalb & Mongk.	Cr	1	-	4	66.67	0.0095
139	*M. variabilis* Kalb	Cr	-	-	1	33.33	0.0019

Opegraphaceae							
140	*Sclerophyton desertorum* Sparrius	Cr	-	-	1	33.33	0.0019
Pannariaceae							
141	*Parmeliella cinerata* (Zahlbr.) Jørg.	F	-	-	1	33.33	0.0019
Parmeliaceae							
142	*Anzia ornatoides* Yoshim.	F	-	-	17	33.33	0.0324
143	*Bulbothrix isidiza* (Nyl.) Hale	F	-	2	2	66.67	0.0076
144	*Myelochroa aurulenta* (Tuck.) Elix & Hale	F	-	1	-	33.33	0.0019
145	*Parmotrema crinitoides* Wei	F	3	-	-	33.33	0.0057
146	*P. praesorediosum* (Nyl.) Hale	F	1	1	1	100	0.0057
147	*P. pseudotinctorum* (Abbayes) Hale	F	1	-	-	33.33	0.0019
148	*P. reticulatum* (Taylor) Choisy	F	-	-	1	33.33	0.0019
149	*P. tinctorum* (Despr. Ex Nyl.) Hale	F	1	1	-	66.67	0.0038
150	*P. tsavoense* (Krog & Swinscow) Krog & Swinscow	F	1	1	2	100	0.0076
Pilocarpaceae							
151	*Eugeniella ortizii* (Lücking) Lücking	Cr	-	-	2	33.33	0.0038
Physciaceae							
152	*Heterodermia albidiflava* (Kurok.) Awasthi	F	-	1	-	33.33	0.0019
153	*H. comosa* (Eschw.) Follmann & Redón	F	-	2	-	33.33	0.0038
154	*H. diademata* (Taylor) Awasthi	F	1	2	2	100	0.0095
155	*H. dissecta* (Kurok.) Awasthi	F	-	1	-	33.33	0.0019
156	*H. incana* (Stirt.) Awasthi	F	-	-	1	33.33	0.0019
157	*H. speciosa* (Wulfen) Trevis.	F	-	-	1	33.33	0.0019
158	*Phaeophyscia endococcina* (Körb.) Moberg	F	-	-	1	33.33	0.0019
159	*Physcia stellaris* (L.) Nyl.	F	-	2	-	33.33	0.0038
Pyrenulaceae							
160	*Anthracothecium macrosporum* (Hepp) Müll. Arg.	Cr	-	-	9	33.33	0.0172
161	*A. prasinum* (Eschw.) Harris	Cr	-	-	1	33.33	0.0019
162	*Lithothelium obtectum* (Müll. Arg.) Aptroot	Cr	-	-	1	33.33	0.0019
163	*Pyrenula albothallina* Vain.	Cr	-	-	2	33.33	0.0038
164	*P. approximans* (Kremp.) Müll. Arg.	Cr	-	1	-	33.33	0.0019
165	*P. aspistea* (Afzel. ex Ach.) Ach.	Cr	-	-	2	33.33	0.0038
166	*P. brunnea* Fée	Cr	1	-	-	33.33	0.0019
167	*P. leucotrypa* (Nyl.) Upreti	Cr	-	-	1	33.33	0.0019
168	*P. macrospora* (Degel.) Coppins & P. James	Cr	1	-	1	66.67	0.0038

169	*P. mamillana* (Ach.) Trevis.	Cr	1	–	7	66.67	0.0153
170	*P. maravalensis* Vain.	Cr	–	–	1	33.33	0.0019
171	*P. microtheca* Harris	Cr	–	–	1	33.33	0.0019
172	*P. minor* Fée	Cr	1	–	–	33.33	0.0019
173	*P. oculata* Ajay Singh & Upreti	Cr	–	1	–	33.33	0.0019
174	*P. punctella* (Nyl.) Trevis.	Cr	2	–	4	66.67	0.0115
175	*P. quassiaecola* Fée	Cr	–	–	1	33.33	0.0019
176	*P. scutata* (Stirt.) Zahlbr.	Cr	–	1	1	66.67	0.0038
177	*P. subelliptica* (Tuck.) Harris	Cr	–	–	1	33.33	0.0019
178	*P. subglabriuscula* Vain.	Cr	1	–	–	33.33	0.0019
Ramalinaceae							
179	*Bacidia alutacea* (Kremp.) Zahlbr.	Cr	–	1	–	33.33	0.0019
180	*B. incongruens* (Stirt.) Zahlbr.	Cr	–	1	–	33.33	0.0019
181	*B. rubella* (Hoffm.) Massal.	Cr	–	–	1	33.33	0.0019
182	*Crocynia gossypina* (Sw.) Massal.	Sq	–	–	1	33.33	0.0019
183	*C. pyxinoides* Nyl.	Sq	–	–	2	33.33	0.0038
184	*Phyllopsora corallina* (Eschw.) Müll. Arg.	Sq	–	1	2	66.67	0.0038
185	*P. manipurensis* (Müll. Arg.) Müll. Arg.	Sq	–	2	–	33.33	0.0038
Roccellaceae							
186	*Chiodecton leptosporum* Müll. Arg.	Cr	1	–	2	66.67	0.0057
187	*Dichosporidium boschianum* (Mont.) Thor	Sq	1	–	–	33.33	0.0019
Teloschistaceae							
188	*Caloplaca bassiae* (Ach.) Zahlbr.	Cr	–	–	1	33.33	0.0019
Thelotremataceae							
189	*Chapsa discoides* (Stirt.) Lücking	Cr	–	–	1	33.33	0.0019
190	*C. patens* (Nyl.) Frisch	Cr	1	–	1	66.67	0.0038
191	*Leucodecton occultum* (Eschw.) Frisch	Cr	1	–	1	66.67	0.0038
192	*Thelotrema canarense* Patw. & Kulk.	Cr	–	–	1	33.33	0.0019
193	*T. lepadinum* (Ach.) Ach.	Cr	–	–	1	33.33	0.0019
194	*T. porinoides* Mont. & Bosch	Cr	–	–	1	33.33	0.0019
Trichotheliaceae							
195	*Clathroporina anoptella* (Stirt.) Zahlbr.	Cr	–	–	2	33.33	0.0038
196	*Porina ahlesiana* (Körb.) Zahlbr.	Cr	1	–	–	33.33	0.0019
197	*P. atroperiostiola* Makhija, Adaw. & Patw.	Cr	–	–	1	33.33	0.0019
198	*P. belanospora* (Nyl.) Müll. Arg.	Cr	–	1	–	33.33	0.0019
199	*P. eminentior* (Nyl.) McCarthy	Cr	–	–	1	33.33	0.0019
200	*P. interestes* (Nyl.) Zahlbr.	Cr	1	1	11	100	0.0248

201	*P. internigrans* (Nyl.) Müll. Arg.	Cr	-	-	9	33.33	0.0172
202	*P. luteopallens* (Nyl.) Zahlbr.	Cr	-	1	-	33.33	0.0019
203	*P. mastoidea* Fée	Cr	1	-	1	66.67	0.0038
204	*P. mastoidella* (Nyl.) Müll. Arg.	Cr	-	-	2	33.33	0.0038
205	*P. nuculastrum* (Müll. Arg.) Harris	Cr	-	-	4	33.33	0.0076
206	*P. platystoma* Müll. Arg.	Cr	-	-	1	33.33	0.0019
207	*P. subcutanea* Ach.	Cr	1	1	6	100	0.0153
208	*P. subhibernica* Upreti	Cr	-	-	3	33.33	0.0057
Trypetheliaceae							
209	*Aptrootia elatior* (Stirt.) Aptroot	Cr	-	-	1	33.33	0.0019
210	*Astrothelium cinereorosellum* (Kremp.) Aptroot & Lücking	Cr	-	-	1	33.33	0.0019
211	*A. rubrocrystallinum* Aptroot & Cáceres	Cr	-	-	1	33.33	0.0019
212	*Bathelium carolinianum* (Tuck.) Harris	Cr	1	-	1	66.67	0.0038
213	*Marcelaria benguelensis* (Müll. Arg.) Aptroot, Nelsen & Parnmen	Cr	-	-	1	33.33	0.0019
214	*Pseudopyrenula subvelata* (Nyl.) Müll. Arg.	Cr	-	-	1	33.33	0.0019
215	*Trypethelium eluteriae* Spreng.	Cr	1	-	1	66.67	0.0038
216	*T. xanthoplatystomum* Flakus & Aptroot	Cr	1	-	-	33.33	0.0019
Verrucariaceae							
217	*Agonimia bryophilopsis* (Vain.) Hafellner	Sq	1	-	-	33.33	0.0019

(**Note**: Cr = crustose, F = Foliose, Fr = Fruticose, Le = Leprose, Sq = Squamulose, L = Labanyapur, S = Saralpara, U = Ultapani, Fre = Frequency, RA = Relative abundance)

4.2 Taxonomic Keys

Key to the major groups

1a. Thallus fruticose, foliose……..2

1b. Thallus leprose, squamulose, crustose…….3

2a. Thallus fruticose……...**Group I**

2b. Thallus foliose…….....**Group II**

3a. Thallus leprose, squamulose……4

3b. Thallus crustose……...5

4a. Thallus leprose……**Group III (2. Chrysotrichaceae)**

4b. Thallus squamulose……...**Group IV**

5a. Ascomata apothecia……...……..**Group V**

5b. Ascomata perithecia…….…….**Group VI**

Group I

Key to the families

1a. Lobes cylindrical and hollow……..……..……**19. Cladoniaceae**

1b. Lobes not cylindrical and hollow….…….……**27. Leprocaulaceae**

Group II

Key to the families

1a. Photobiont blue-green algae……...…….……2

1b. Photobiont green algae……...…….……3

2a. Thallus gelatinous, usually olive-green to blackish……**29. Collemataceae**

2b. Thallus not gelatinous, whitish-grey to lead grey……..…..**28. Coccocarpiaceae**

3a. Prothallus present……..**30. Pannariaceae**

3b. Prothallus absent……..4

4a. Lobes broad……...**23. Parmeliaceae**

4b. Lobes not broad……...…….……...5

5a. Ascospores *Lecanora*-type……**11. Caliciaceae**

5b. Ascospores *Physcia*-type…….……**12. Physciaceae**

Group IV

Key to the families

1a. Ascomata unorganized to semi-organized……....**6. Roccellaceae**

1b. Ascomata organized…….2

2a. Thallus granular ……**10. Verrucariaceae**

2b. Thallus not granular……...……..…**25. Ramalinaceae**

Group V

Key to the families

1a. Excipuloid tissue thin to absent……...2

1a. Excipuloid tissue distinctly present…….3

2a. Excipuloid tissue absent……..**1. Arthoniaceae**

2b. Excipuloid tissue thin…….……....**5. Incertae sedis under Arthoniales**

3a. Ascomata elongate to lirellate….…….....4

3b. Ascomata typically round……7

4a. Lirellae fissurine……...**14. Fissurinaceae**

4b. Lirellae not fissurine……5

5a. Excipulum brown……**4. Opegraphaceae**

5b. Excipulum carbonized…….6

6a. Disc concealed……...**3. Lecanographaceae**

6b. Disc exposed to concealed……...**15. Graphidaceae**

7a. Ascomata opening by pore……...8

7b. Ascomata not opening by pore…….9

8a. Ascomata ocellurioid……...**13. Diploschistaceae**

8b. Ascomata thelotremoid……..**16. Thelotremataceae**

9a. Thallus teloschistacean……..…**32. Teloschistaceae**

9b. Thallus not teloschistacean……10

10a. Ascomata unorganized to semi organized……..…**6. Roccellaceae**

10b. Ascomata organized……...……..11

11a. Ascomata lecanorine……...…….……12

11b. Ascomata biatorine or lecidine……..…….…….....13

12a. Ascospores simple…….…….**21. Lecanoraceae**

12b. Ascospores transversely-septate…….....**20. Haematommataceae**

13a. Ascomata lecidine……...…..……...14

13b. Ascomata biatorine…….…….....15

14a. Ascospores brown…….....**11. Caliciaceae**

14b. Ascospores hyaline……...…….....**26. Lopadiaceae**

15a. Disc pale yellow to yellow, orange……**17. Coenogoniaceae**

15b. Thallus otherwise…….16

16a. Ascospores simple…….……**22. Malmideaceae**

16b. Ascospores transversely septate or submuriform…….……17

17a. Ascospores transversely septate…….……**25. Ramalinaceae**

17b. Ascospores transversely septate to submuriform…….……18

18a. Apothecial margin thin……..…….……**24. Pilocarpaceae**

18b. Apothecial margin thick…….…….……**31. Brigantiaeaceae**

Group VI

Key to the families

1a. Perithecia embedded in pseudostroma……**8. Trypetheliaceae**

1b. Perithecia not embedded in pseudostroma……...…….…….….2

2a. Ascospores brown……...**9. Pyrenulaceae**

2b. Ascospores hyaline……..……..…..**18. Trichotheliaceae**

4.3 Taxonomic enumeration

1. ARTHONIACEAE Rchb., Deut. Bot. Herb.-Buch. 13. 1841.

About 9 genera and 139 species in India; 9 genera and 52 species in Assam; 6 genera and 9 species reported from the present study

Key to the genera

1a. Thallus sterile……..…..……...2
1b. Thallus fertile……..….3

2a. Stictic acid absent……..**4. *Cryptonia***
2b. Stictic acid present…..…….**5. *Herpothallon***

3a. Ascomata or ascigerous areas in stroma……**6. *Myriostigma***
3b. Ascomata not in stroma……4

4a. Ascospores round to stellate, colourless or brown, transversely 1–9-septate……..5
4b. Ascospores round to irregular, colourless, multicelled-muriform…...**2. *Arthothelium***

5a. Ascomata brown to black ……..…..**1. *Arthonia***
5b. Ascomata orange, red or purple.……..…….**3. *Coniocarpon***

1. *Arthonia* Ach. in Neu. J. Bot. 1:3. 1806.

Key to the species

1a. Ascomata non-pruinose……**1. *A. dispersula***
1b. Ascomata pruinose……**2. *A. inconspicua***

1. *Arthonia dispersula* Nyl. in Flora 59:285. 1876.

Thallus crustose, corticolous, whitish, ecorticated. Ascomata apothecia, sunken in thallus, round, irregular, stellate in outline. Excipuloid tissue absent, hymenium yellowish brown, epithecium brown to olivaceous brown, hypothecium brown to dark brown, paraphyses branched. Asci globular, bitunicate, thick wall, 6-spored, ascospores oblong to angular, hyaline to light brown, one end cell larger, transversely 1-septate, 8–11 × 3–5 µm. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Assam, Sikkim, West Bengal), China, Cuba, Egypt, Mexico, Sri Lanka, USA, Venezuela.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46′04.53″, E90°17′34.04″, Elev. 162 m, on the bark of *Schima wallichii* in forest, 13/12/2019, 2019–0435 (BUBH); coll. Pungbili Islary.

2. *Arthonia inconspicua* Stirt. in Proc. Roy. Phil. Soc. Glasgow 11:319. 1844.

Thallus crustose, corticolous, whitish grey, ecorticated. Ascomata apothecia, immersed to erumpent, rounded, pale, disc plane, brown with white-pruinose. Excipuloid tissue absent, hymenium colourless, epithecium thin, colourless, hypothecium indistinct, paraphyses branched. Asci globular, 8-spored, ascospores oblong-ovoid, hyaline to light brown, one end cell larger, transversely 4–7-septate, 18–24 × 6–8 µm. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Tamil Nadu), China.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°44.50′, E90°18.16′, Elev. 126 m, on the bark of *Ilex odorata* in forest, 02/04/2023, 2023–1616 (BUBH); coll. Pungbili Islary.

2. *Arthothelium* Massal., Ric. Aut. Lich. Crost. 54. 1852.

1. *Arthothelium abnorme* (Ach.) Müll. Arg. in Flora 63:287. 1880. *Opegrapha abnormis* Ach., Lich. Univ. 259. 1810.

Thallus crustose, corticolous, whitish, ecorticated. Ascomata apothecia, round to stellate, black, non-pruinose. Excipuloid tissue absent, paraphyses branched. Asci bitunicate, thick wall, 8-spored, ascospores oblong, hyaline, muriform with 8–10-transverse and 2–4-vertical septa, 26–33 × 12–15 µm. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Assam, Karnataka, Maharashtra, Tamil Nadu, West Bengal), China, Costa Rica, Cuba, Jamaica, New Caledonia, Uruguay, USA.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°47.14′, E90°16.09′, Elev. 185 m, on the bark of *Tetrameles nudiflora* in forest, 28/11/2022, 65074 (LWG), coll. Pungbili Islary.

3. *Coniocarpon* de Candolle in Lamarck & de Candolle, Flor. Franc. Edn 3, 2:323. 1805.

1. *Coniocarpon cinnabarinum* de Candolle in Lamarck & de Candolle, Flor. Franc. Edn 3, 2:323. 1805.

Thallus crustose, corticolous, greenish, corticated. Ascomata apothecia, sunken in thallus, red-brown, oblong, linear, stellate in outline. Excipuloid tissue absent, hymenium colourless to pale, epithecium and hypothecium reddish-brown, paraphyses branched. Asci globular, bitunicate, thick wall, 6-spored, ascospores oblong to angular, hyaline to light brown, one end cell larger, transversely 3–5-septate, 12–19 × 4–8 µm. Chemistry: Thallus K –, C –, P –, U –; TLC: no substances detected.

Distribution: India (Arunachal Pradesh, Assam, Goa, Karnataka, Tamil Nadu, West Bengal), Australia, China, Europe, France, Galapagos Island, Hawaii, Ireland, New Zealand, Netherlands, Norway, Spain, Sri Lanka, Switzerland, USA.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.055′, E90°17.559′, Elev.161 m, on the bark of *Syzygium formosum* in forest, 16/10/2020, 63322 (LWG); N26°45.38′, E90°18.20′, Elev. 144 m, on the bark of *Magnolia hodgsonii* in forest, 19/12/2022, 2022–1346 (BUBH); coll. Pungbili Islary.

4. *Cryptonia* Frisch & Thor in Mycol. Prog. 9(2):282. 2010.

1. *Crypthonia albida* (Fée) Frisch & Thor in Mycol. Progr. 9(2):290. 2010. *Hypochnus albidus* Fée, Essai Les Crypt. Suppl. Révis. 13. 1837.

Thallus crustose, corticolous, greyish to pale yellowish green, byssoid, upto 7 cm diam., more or less loosely appressed to substrate, with clusters of calcium oxalate crystals. Hypothallus dark olivaceous green, byssoid, hyphae, 1–3 µm wide. Prothallus white, upto 3 mm wide, fibrous-like. Pseudoisidioid outgrowths few to numerous, polymorphic, irregularly cushion-shaped, fluffy-felty with many projecting at the centre of thallus, small, globular to short branched at periphery regions, whitish upto 2 × 1 mm. Photobiont cells 6–13 × 5–9 um. Pycnidia and ascomata not seen. Chemistry: Thallus K –, C –, P + yellow, UV –; TLC: Psoromic acid.

Distribution: India (Assam), Bolivia, Brazil, Colombia, Congo, Ecuador, French Guiana, Guyana, Venezuela.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.212′, E90°17.136′, Elev. 172 m, on the bark of *Syzygium formosum* in forest, 26/07/2020, 65072 (LWG), 2020–1600 (BUBH); coll. Pungbili Islary.

5. *Herpothallon* Tobler in Flora 131:446. 1937.

Key to the species

1a. Pseudoisidia absent. Psoromic acid present……..…….…….**1. *H. albidum***
1b. Pseudoisidia present. Psoromic acid absent……...……..…...2

2a. Pseudoisidia warts, rarely with pinkish discolouration.……..…….**2. *H. granulare***
2b. Pseudoisidia cylindrical, concolorous with thallus. ……..**3. *H. isidiatum***

1. *Herpothallon albidum* (Fée) Aptroot, Lücking & Thor in Biblthca Lichenol. 99:29. 2009. *Hypochnus albidus* Fée, Essai Les Crypt. Suppl. Révis. 13. 1837.

Thallus crustose, corticolous, olivaceous green to pale mineral grey, without isidia and soredia, byssoid whitish prothallus and whitish hypothallus. Ascomata and pycnidia not seen. Chemistry: Thallus K + olive yellow, C –, P + yellowish orange UV –; TLC: Psoromic acid.

Distribution: Bolivia, Brazil, Colombia, Costa Rica, Venezuela.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.013′, E90°17.310′, Elev. 221 m, on the bark of *Semecarpus anacardium* in forest, 14/07/2020, 65093 (LWG); N26°46.123′, E90°17.323′, Elev. 159 m, on the bark of *Ilex odorata* in forest, 14/07/2020, 65094 (LWG); N26°46.190′, E90°16.935′, Elev. 170 m, on the bark of *Syzygium formosum* in forest, 03/10/2020, 2020–1614 (BUBH); coll. Pungbili Islary.

2. *Herpothallon granulare* (Sipman) Aptroot & Lücking in Biblthca Lichenol. 99:43. 2009. *Cryptothecia granularis* Sipman in Biblthca Lichenol. 86:177. 2003.

Thallus crustose, corticolous, whitish grey to grey, with many calcium oxalate crystals, soredia like granules, to 0.05 × 0.05 mm, pigments absent in thallus, pseudoisidia warts, numerous, rarely with pinkish discolouration, whitish hypothallus and prothallus. Asci and pycnidia not seen. Chemistry: Thallus K –, C –, P –, UV –; TLC: Perlatolic acid.

Distribution: India (Assam), China, Colombia, Costa Rica, Singapore, Thailand.
Species examined: INDIA– Assam, Kokrajhar district, **Saralpara**, N26°49.947′, E90°15.560′, Elev. 243 m, on the bark of *Magnolia champaca* on road side, 05/03/2023, 2023–1596 (BUBH); coll. Pungbili Islary.

3. *Herpothallon isidiatum* Jagad. Ram & Sinha in Lichenologist 41(6):611. 2009.

Thallus crustose, corticolous, glaucous grey to whitish grey, with calcium oxalate crystals, without pigments. Pseudoisidia numerous, cylindrical, 0.5–1.5 × 0.08–0.15 mm, concolorous with thallus. Pycnidia dark brown to black at tips of pseudoisidia, hypothallus white and prothallus whitish. Asci not seen. Chemistry: Thallus K + yellow, C –, P + orange, UV –; TLC: Constictic and stictic acid.

Distribution: India (Assam, Sikkim, West Bengal), Brazil.
Species examined: INDIA– Assam, Kokrajhar district, **Saralpara**, N26°51.294′, E90°15.753′, Elev. 279 m, on the bark of *Magnolia champaca* on road side, 05/03/2023, 2023–1606 (BUBH); coll. Pungbili Islary.

6. *Myriostigma* Kremp. in Lich. Foliic. Leg. Beccari 22. 1874.

1. *Myriostigma candidum* Kremp. in Nuo. Gior. Bot. Itali. 7(1):45. 1875. (Plate 47F)

Thallus crustose, corticolous, green with black margin, lacking isidia or soredia. Photobiont layer and medulla with dense calcium oxalate crystals. Ascomata or ascigerous areas in stroma, rounded, flat, distinctly raised with densely white-pruinose, K –. Asci globular, 60–70 × 50–55 µm, 8-spored, frequent, aggregated in ascigerous areas and visible externally as dots. Ascospores curved-shaped, thick-wall, hyaline, muriform, 46–60 × 14–18 µm. Chemistry: Thallus K + olive green, C + red, P –, UV –; TLC: 2'-*O*-methylanziaic and 2'-*O*-methylperlatolic acid.

Distribution: India (Arunachal Pradesh, Sikkim, West Bengal), Brazil, Congo, Cuba, Ecuador, Gabon, Indonesia, Malaysia, Netherland, Sri Lanka, Uganda, Vietnam.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.290′, E90°16.806′, Elev. 172 m, on the bark of *Syzygium formosum* in forest, 10/10/2020, 63321 (LWG), 2020–0355 (BUBH); coll. Pungbili Islary.

2. CHRYSOTRICHACEAE Zahlbr. in Engler *et al*., Nat. Pflanz. 1:117. 1905.

About 1 genus and 4 species in India; 1 genus and 2 species in Assam; 1 genus and 2 species reported from the present study.

1. *Chrysothrix* Mont. in Ann. Sci. Nat. ser. 3, 18:312. 1852.

Key to the species

1a. Thallus thin, yellow with slight orange or greenish tinge or greenish yellow, granules minute, 0.01–0.1 mm diam.…….…….....**1. *C. candelaris***

1b. Thallus thick, vivid primary yellow, granules 0.1–0.2 mm diam….....**2. *C. chlorina***

1. *Chrysothrix candelaris* (Linn.) Laundon in Lichenologist 13(2):110. 1981. *Byssus candelaris* Linn., Sp. Plant. 2:1169. 1753.

Thallus, leprose, corticolous, ecorticated, thin, greenish yellow, granules minute, 0.01–0.1 mm diam. Apothecia not seen. Chemistry: Thallus K –, C –, KC –, P + yellow-orange, UV –; TLC: no substances detected.

Distribution: India (Assam, Himachal Pradesh, Jammu & Kashmir, Sikkim, Tamil Nadu), Australia, Bhutan, Brazil, Canada, Denmark, East Africa, France, Great Britain, Mauritius, Morocco, Netherlands, New Zealand, Northern Ireland, Portugal, Sierra Leone, South Africa, Sri Lanka, Thailand, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Labanyapur**, N26°47.704′, E90°18.775′, Elev. 177 m, on the bark of *Tetrameles nudiflora* on road side, 10/11/2021, 2021–1472 (BUBH); N26°46.603′, E90°16.837′, Elev. 178 m, on the bark of *Stereospermum chelonoides* in forest, 29/01/2023, 2023–1537 (BUBH); coll. Pungbili Islary.

2. *Chrysothrix chlorina* (Ach.) Laundon in Lichenologist 13(2):106. 1981. *Lichen chlorinus* Ach., Lich. Svec. Prodr. 6. 1798.

Thallus leprose, corticolous, thick, vivid primary yellow, granules 0.1–0.2 mm diam., forming pulverulent mass. Excipulum poorly developed, paraphyses septate, anastomosing above. Ascomata apothecia, round, yellow, Asci arrested bitunicate, 8-

spored, ascospores hyaline, obovoid to ellipsoid, 1–3-septate. Chemistry: Thallus K –, C –, KC –, P –, P –, UV –; TLC: Calycin and vulpinic acid.

Distribution: India (Himachal Pradesh, Jammu & Kashmir, Sikkim), Australia, Canada, China, Europe, Finland, France, Nepal, Norway, Peru, Sweden, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°42.52′, E90°18.02′, Elev. 226 m, on the bark of *Macaranga denticulata* on road side, 02/04/2023, 2023–1598 (BUBH); coll. Pungbili Islary.

3. LECANOGRAPHACEAE Ertz, Tehler, Thor & Frisch in Taxon 63(4):740. 2014.

About 4 genera and 10 species in India; 3 genera and 7 species in Assam; 1 genus and 3 species reported from present study.

1. *Zwackhia* Körb., Sys. Lich. Germ. 285. 1855.

Key to the species

1a. Ascospores transversely 11–17-septate, 63–78 × 5–8 µm…..……..**2. *Z. prosodea***

1b. Ascospores transversely 7–12-septate, 21–56 × 2–6 µm……...……..2

2a. Ascospores transversely 9–12-septate, 35–56 × 4–6 µm……..…….**1. *Z. bonplandii***

2b. Ascospores transversely 7–8-septate, 21–36 × 2–4 µm……..……..**3. *Z. viridis***

1. *Zwackhia bonplandii* (Fée) Ertz, in Bull. Soc. Nat. Luxemb. 113:106. 2012. *Opegrapha bonplandii* Fée, Essai La Crypt. 25. 1824.

Thallus crustose, corticolous, yellowish grey, smooth, thin to inconspicuous. Ascomata apothecia, lirellae, black, erumpent, scattered, straight to curved, rarely branched, disc concealed, non-pruinose. Excipulum carbonized, broadly continuous below the hypothecium, hymenium clear and colourless, I + red, paraphysoids branched and anastomising. Asci clavate, 8-spored, ascospores hyaline, transversely 9–12-septate, fusiform, 35–56 µm × 4–6 µm. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Assam, Kerala, West Bengal), Argentina, Australia, Benin, Bermuda, Brazil, Colombia, Congo, Costa Rica, Cuba, Ecuador, Guyana, Mexico, New Caledonia, New Zealand, Paraguay, Puerto Rico, Thailand, Uganda, USA, Venezuela.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.058′, E90°17.262′, Elev. 169 m, on the bark of *Semecarpus anacardium* in forest, 26/07/2020, 2020–0351 (BUBH); coll. Pungbili Islary.

2. *Zwackhia prosodea* (Afzel.) Ertz in Bull. Soc. Nat. Luxemb. 113:106. 2012. *Opegrapha prosodea* Afzel. in Acharius, Method. Lich. 22. 1803.

Thallus crustose, corticolous, greenish grey to brownish, smooth. Ascomata apothecia, emergent, lirellae black, generally straight, sometimes slightly curved, simple. Excipulum carbonized, extending below the ascigerous layer, hymenium clear and colourless, I + red, hypothecium brown, paraphysoids branched and anastomising. Asci clavate, 8-spored, ascospores hyaline, thin wall, transversely 11–17-septate, 63–78 µm × 5–8 µm. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Andaman & Nicobar Islands, Assam, Tamil Nadu), Brazil, Europe Malaysia, Myanmar, Paraguay, Sierra Leone, Spain, USA.
Species examined: India– Assam, Kokrajhar district, **Ultapani**, N26°46.142′, E90°17.331′, Elev. 171 m, on the bark of *Semecarpus anacardium* in forest, 14/07/2020, 2020–0350 (BUBH); N26°46.217′, E90°17.138′, Elev. 156 m, on the bark of *Liana* sp. in forest, 26/07/2020, 2020–0356 (BUBH); N26°45′48.53″, E90°17′04.34″, Elev. 162 m, on the bark of *Semecarpus anacardium* in forest, 21/12/2019, 2019–0342 (BUBH); coll. Pungbili Islary.

3. *Zwackhia viridis* (Ach.) Poetsch & Schied. in Sys. Aufzähl. Samenlos. Pflanz. 186. 1872. *Opegrapha rubella* var. *viridis* Ach., Method. Lich. 22. 1803.

Thallus crustose, corticolous, yellowish grey, thin to inconspicuous, smooth to cracked. Ascomata apothecia, lirellate, scattered, rarely aggregated, short, black, straight to flexuous, disc concealed, non-pruinose. Excipulum broadly continuous below the hypothecium, hymenium clear and colourless I + red, paraphysoids branched and anastomising. Asci clavate, 8-spored, ascospores hyaline, transversely 7–10-septate, cells

almost equal in size, 21–36 × 2–4 µm. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Andaman & Nicobar Islands, Assam, Karnataka, Uttarakhand), Africa, Australia, Colombia, Czechia, Denmark, Europe, France, Germany, Indonesia, Malaysia, Netherlands, Papua New Guinea, Philippines, Poland, Portugal, Sweden, Taiwan, Thailand, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.067′, E90°17.299′, Elev. 157 m, on the bark of *Mesua ferrea* in forest, 14/07/2020, 2020–0347 (BUBH); coll. Pungbili Islary.

4. OPEGRAPHACEAE Stizenb. in Ber. Tät. St. Gall. Naturw. Ges. 153. 1862.

About 2 genera and 37 species in India; 1 genus and 7 species in Assam; 1 genus and 1 species reported from the present study.

1. *Sclerophyton* Eschw., Sys. Lich. 25. 1824.

1. *Sclerophyton desertorum* Sparrius in Biblthca Lichenol. 89:69. 2004.

Thallus crustose, corticolous, grey, corticated. Ascomata apothecia, lirellate, immersed to slightly emergent, 0.5–1.8 mm long, simple to branched, basally covered by thalline layer, disc black, concealed. Excipulum olivaceous brown, hymenium clear, paraphyses simple. Asci 8-spored, ascospores hyaline, transversely 3–6-septate, 16–21 × 4–6 µm. Chemistry: Thallus K + yellow turning red, C –, P + yellow, UV –; TLC: Constictic and norstictic acid.

Distribution: Chile.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°41.454′, E90°17.842′, Elev. 107 m, on the bark of *Tetrameles nudiflora* on road side, 08/01/2023, 65120 (LWG), 2023–1610 (BUBH); coll. Pungbili Islary.

5. INCERTAE SEDIS UNDER ARTHONIALES

About 4 genera and 16 species in India; 1 genus and 2 species in Assam; 1 genus and 2 species reported from the present study.

1. *Bactrospora* Massal., Ric. Auton. Lich. Crost. 133. 1852.

Key to the species

1a. Asci 65–80 × 11–14 µm, ascospores transversely 10–16-septate, 40–60 × 2–4 µm. Excipulum IKI/K –, sub-hymenium IKI/K + pale blue……....**1. *B. arthonioides***

1b. Asci 150–224 × 23–45 µm, ascospores muriform, 60–95 × 8–12 µm. Excipulum and sub-hymenium IKI/K + deep blue.……..…….....**2. *B. metabola***

1. *Bactrospora arthonioides* Egea & Torrente in Lichenologist 25(3):221. 1993. (Plate 41C)

Thallus crustose, corticolous, white, glossy. Ascomata apothecia, round, flat and black. Excipulum thin, not inspersed IKI/K –, subhymenium IKI/K + pale blue, paraphyses branched. Asci 60–85 × 12–14 µm, ascospores hyaline, transversely 10–16-septate without constrictions, 42–57 × 3–4 µm. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: Australia, New Zealand, Tasmania.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.146′, E90°17.336′, Elev. 164 m, 14/07/2020, on the bark of *Syzygium formosum* in forest, 2020–63291 (LWG), 0343 (BUBH); coll. Pungbili Islary.

2. *Bactrospora metabola* (Nyl.) Egea & Torrente in Mycotaxon 53:58. 1995. *Melaspilea metabola* Nyl. in Bull. Soc. Linn. ser. 2, 2:69. 1868. (Plate 41D)

Thallus crustose, corticolous, smooth, greenish grey with carbonaceous margin. Ascomata apothecia, round flat and black. Photobiont layer and medulla with dense calcium oxalate crystals. Excipulum and sub-hymenium IKI/K + deep blue, hymenium without gel, paraphyses branched. Asci 150–224 × 23–33 µm, ascospores hyaline, transversely 22–36-septate, with one or more constrictions at some septa, 60–129 × 6–8 µm. Chemistry: Thallus K + slightly olive, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Kerala), Australia, Brazil, Congo, Fiji, Florida, New Caledonia, New Zealand, Papua New Guinea, Puerto Rico, Seychelles, Singapore, Tasmania, Thailand.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.011′, E90°16.929′, Elev. 178 m, on the bark of *Ilex odorata* in forest, 16/10/2020, 2020–0349 (BUBH), 63292 (LWG); coll. Pungbili Islary.

6. ROCCELLACEAE Chevall., Flor. Des Env. Paris 1:604. 1826.

About 19 genera and 47 species in India; 8 genera and 13 species in Assam; 2 genera and 2 species reported from the present study.

Key to the genera

1a. Thallus crustose……..……..……...**1. *Chiodecton***
1b. Thallus squamulose…….**2. *Dichosporidium***

1. *Chiodecton* Ach., Syn. Method. Lich. 108. 1814.

1. *Chiodecton leptosporum* Müll. Arg. in Flora 65(21):332. 1882.

Thallus crustose, somewhat leprose, yellow-olivaceous, corticated, continuous or areolate, rough, matt or pulverulent, usually with black hypothallus. Ascomata perithecioid apothecia, sunken, innate, well developed, stromoid verrucae concolorous to thallus, hemispherical, round, polycarpic, disc sub-concave, black. Hypothecium brown to black, paraphyses branched. Asci 8-spored, bitunicate, ascospores hyaline, fusiform to acicular, transversely 3–5-septate, 48–71 × 3–5 µm. Chemistry: Thallus K –, C –, P + orange yellow, UV –; TLC: no substances detected.

Distribution: India (Arunachal Pradesh, Assam, Manipur, Tamil Nadu, West Bengal), Australia, Indonesia, Japan, Malaysia, Mexico, Papua New Guinea, Philippines, Réunion, Singapore, Solomon Islands, Sri Lanka, Thailand.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.089′, E90°16.830′, Elev. 159 m, on the bark of *Semecarpus anacardium* in forest, 16/10/2020, 63294 (LWG), 2020–1309 (BUBH); N26°46.035′, E90°17.199′, Elev. 162, on the bark of *Syzygium formosum* in forest, 27/10/2020, 2020–1308 (BUBH); **Labanyapur**, N26°47.900′, E90°18.778′, Elev. 183 m, on the bark of *Tetrameles nudiflora* in forest, 10/11/2021, 2021–1592 (BUBH); coll. Pungbili Islary.

2. *Dichosporidium* Pat. in Duss, Enum. Method. Champ. 20. 1903.

1. *Dichosporidium boschianum* (Mont.) Thor in Op. Bot. 103:64. 1991. *Chiodecton boschianum* Mont., Syll. Gen. Sp. Plant. Crypt. 356. 1856.

Thallus squamulose, corticolous, grey with yellowish green tinge, byssoid. Prothallus whitish in inner part and brown in outer part. Medulla whitish thin or sometimes lacking, with few calcium oxalate granules. Ascomata pseudoangiocarpic apothecia, numerous, aggregated, into distinctly elevated stroma with distinctly constricted bases. Excipulum brown, hymenium I + pale blue turns red, hypothecium fusing with medulla, upper part black and lower part pale brown, paraphysoids branched. Asci 85–97 × 14–17 µm, ascospores hyaline, obovate, hooked, transversely 5–8-septate, 60–65 × 3–4 µm. Pycnidia few, conidia bacilliform, 4–6 × 1 µm. Chemistry: Thallus K –, C –, P + yellow, UV –; TLC: Salazinic acid.

Distribution: India (Karnataka, Kerala), Australia, Costa Rica, Cuba, Fiji, France, Guadeloupe, Guyana, Japan, Malaysia, New Caledonia, Panama, Papua New Guinea, Philippines, Puerto Rico, Singapore, Sri Lanka, Suriname, Thailand, USA, Vietnam, Western Samoa.

Species examined: INDIA– Assam, Kokrajhar district, **Labanyapur**, N26°47.912′, E90°18.770′, Elev. 182 m, on the bark of *Citrus* sp. in village, 10/11/2021, 2021–1601 (BUBH); coll. Pungbili Islary.

7. ARTHOPYRENIACEAE Watson in New Phytol. 28:107. 1929.

About 2 genera and 25 species in India; 1 genus and 4 species in Assam; 1 genus and 1 species reported from the present study.

1. *Arthopyrenia* Massal, Ric. Aut Ric. Aut. Lich. Crost. 165 (1852)

1. *Arthopyrenia claviformis* (Stirt.) Hawksw. in Bull. Br. Mus. Nat. Hist. Bot. 14(2):142. 1985. *Verrucaria claviformis* Stirt. in Proc. Roy. Phil. Soc. Glasgow 11:320. 1879.

(Plate 40E)

Thallus crustose, corticolous, whitish to dull-grey, ecorticated. Ascomata perithecia, covered by whitish thalline layer, later nude. Peridium dimidiate, black, absent at base, paraphyses thick. Asci 8-spored, ascospores hyaline, oval to ellipsoid with blunt ends, transversely 3-septate, upper cell rounded, lower angular to triangular, 20–25 × 4–5 µm. Chemistry: Thallus K + pale yellow, C –, P + pale yellow, UV –; TLC: no substances detected.

Distribution: India (Arunachal Pradesh, Kerala, Tamil Nadu).

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.472′, E90°14.546′, Elev. 215 m, on the bark of *Ficus* sp. in forest, 02/04/2022, 2022–0469 (BUBH); coll. Pungbili Islary.

8. TRYPETHELIACEAE Eschw., Sys. Lich. 17. 1824.

About 10 genera and 74 species in India; 7 genera and 25 species in Assam; 5 genera and 8 species reported from the present study.

Key to the genera

1a. Ascomata not in pseudostroma……**5. *Pseudopyrenula***

1b. Ascomata in pseudostroma……..2

2a. Ascospores hyaline……...……3

2b. Ascospores brown, when mature……..……...……**1. *Aptrootia***

3a. Ascospores muriform ……..…..…..4

3b. Ascospores transversely septate ……..6

4a. Pseudostroma red or yellow orange pigments…...……..**4. *Marcelaria***

4b. Pseudostroma brown-black or variously coloured...…….……5

5a. Ascomata in prominent to sessile pseudostroma……**3. *Bathelium***

5b. Ascomata in immersed to prominent, sessile pseudostromata…....…**2. *Astrothelium***

6a. Ascospores surrounded by gelatinous sheath……7

6b. Ascospores not surrounded by gelatinous sheath…...……...……**2. *Astrothelium***

7a. Pseudostroma brown to black with yellow orange pigment, rarely whitish-pruinose with thin septa and more or less angular lamina, fusiform with acute or rounded ends, not constricted at the median septum……..……..……**3. *Bathelium***

7b. Pseudostroma variously coloured, lumina lens-shaped, rectangular when mature ……..……...……**6. *Trypethelium***

1. *Aptrootia* Lücking & Sipman in Lichenologist 39(2):188. 2007.

1. ***Aptrootia elatior*** (Stirt.) Aptroot in Flora Austral. 57:660. 2009. *Ascidium elatius* Stirt. in J. Linn. Soc. 14(78):466. 1875. (Plate 40D)

Thallus crustose, corticolous, olive yellow to olive green, corticated, verrucose to bullate, covered by thallus except the ostiolar region. Ascomata perithecia, ostiole apical, black, ampulliform, oval to subglobose (in section) 0.7–1.5 mm in diam. Hamathecium clear except near the ostioles, paraphyses branched. Asci 4-spored, ascospores oblong, ellipsoid, muriform, 200–300 × 60–86 µm, becoming dark brown and ornamented, verruculose, wall distinctly bilayered, outer layer dark brown and inner layer hyaline. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: Australia, France, Malaysia, New Zealand, Sabah, Sri Lanka.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°49.23′, E90°17.43′, Elev. 243 m, on the bark of *Holarrhena* sp. on road side, 02/04/2023, 65073 (LWG), 2023–1599 (BUBH); coll. Pungbili Islary.

2. ***Astrothelium*** Eschw., Sys. Lich. 26. 1824.

Key to the species

1a. Thallus UV +. Pigments absent. Ascomata solitary to irregularly confluent, erumpent, covered by thallus. Ascospores 5–9-septate.....……..…**1.** ***A. cinereorosellum***
1b. Thallus UV –. Ascomata with internal red pigments. Ascospores transversely 3-septate, 20–30 × 7–9 µm.……..…….…….....**2.** ***A. rubrocrystallinum***

1. ***Astrothelium cinereorosellum*** (Kremp.) Aptroot & Lücking in Lichenologist 48(6):853. 2016. *Trypethelium cinereorosellum* Kremp. in Nuo. Gior. Bot. ital. 7 (1):56. 1875. (Plate 40F)

Thallus crustose, corticolous, olive green, without pigment, smooth to uneven, corticated. Ascomata perithecia, covered by thallus except ostiole, solitary to irregularly confluent, erumpent, not distinctly pseudostromatic, 0.3–0.5 mm diam., lichexanthone on perithecia, ostiole apical. Peridium black, hamathecium inspersed, paraphyses branched. Asci 8-spored, ascospores hyaline, fusiform, transversely 5–8-septate, 40–60 × 8–13 µm, IKI –.

Chemistry: Thallus K –, C –, P + orange yellow, UV + yellow; TLC: unknown substances present.

Distribution: Australia, Borneo, Indonesia, Papua New Guinea, Sarawak, Thailand.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°43.46′, E90°17.40′, Elev. 237 m, on the bark of *Trema orientale* on road side, 02/04/2023, 2023–1581 (BUBH); coll. Pungbili Islary.

2. *Astrothelium rubrocrystallinum* Aptroot & Cáceres in Lichenologist 48(6):719. 2016. (Plate 41A)

Thallus crustose, corticolous, whitish green to green, corticated. Ascomata perithecia, with internal red pigments, UV –, immersed to prominent to sessile pseudostromata, partly covered by thallus or exposed, ostiole apical, black. Peridium black, hymenium inspersed, paraphyses branched. Asci elongated, cylindrical, 6–8-spored, 95–120 × 17–24 µm, ascospores hyaline, transversely 3-septate, 20–28 × 7–9 µm. Chemistry: Thallus K + light orange yellow, C –, P + olive yellow, UV –; TLC: unknown substances present.

Distribution: Brazil
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°43.46′, E90°17.40′, Elev. 237 m, on the bark of *Trema orientale* on road side, 2023–1570 (BUBH); coll. Pungbili Islary.

3. *Bathelium* Ach., Method. Lich. 111. 1803.

1. *Bathelium carolinianum* (Tuck.) Harris, More Flor. Lich. 116. 1995. *Trypethelium carolinianum* Tuck. in Amer. J. Sci. & Art. ser. 2, 25:429. 1858. (Plate 41E)

Thallus crustose, corticolous, yellowish green, corticated. Ascomata perithecia, with internal yellow, K + persistently yellow, numerous, distinctly pseudostromata black, ostiole apical, black. Peridium black, Hymenium inspersed, paraphyses branched. Asci 8-spored, elongate, cylindrical, 90–123 × 18–25 µm, ascospores hyaline, transversely 3–5-septate, 25–28 × 6–10 µm. Chemistry: Thallus K + light orange yellow, C –, P + brownish yellow, UV –; TLC: no substances detected.

Distribution: Colombia, Mexico, Panama, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Labanyapur**, N26°46.612′, E90°16.847′, Elev. 175 m, on the bark of *Wrightia arborea* in forest, 29/01/2023, 2023–1471 (BUBH); **Ultapani**, N26°43.46′, E90°17.40′, Elev. 237 m, on the bark of *Trema orientale* on road side, 02/04/2023, 2023–1555 (BUBH); coll. Pungbili Islary.

4. *Marcelaria* Aptroot, Nelson & Parnmen in Glalia 5(2):3. 2013.

1. *Marcelaria benguelensis* (Müll. Arg.) Aptroot, Nelsen & Parnmen in Glalia 5(2):4. 2013. *Bathelium benguelense* Müll. Arg. in Flora 68(12):256. 1885. (Plate 47C)

Thallus crustose, corticolous, olive-green, corticated, smooth, with yellow-pruinose. Perithecia sessile with flattened top, solitary to irregularly grouped and confluent, UV + blood red, covered with yellow pigment except ostiole, ostiolar region narrow, hamathecium densely inspersed. Asci clavate, 8-spored, biseriate, ascospores hyaline, muriform, ellipsoid to fusiform, IKI –, 60–78 × 17 × 22 µm, surrounded by gelatinous sheath. Chemistry: Thallus K + blood red where orange pigment is present as pruinose, C –, P + orange yellow, UV –yellow; TLC: unknown substances present.

Distribution: India (Assam), Cambodia, Myanmar, Thailand, Vietnam.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°47.08′, E90°16.17′, Elev. 158 m, on the bark of *Elaeocarpus* sp. in forest, 28/11/2022, 2022–1018 (BUBH); coll. Pungbili Islary.

5. *Pseudopyrenula* Müll Arg. in Flora 66(16):247. 1883.

1. *Pseudopyrenula subvelata* (Nyl.) Müll. Arg. in Flora 66(16):249. 1883. *Verrucaria subvelata* Nyl., Exp. Syn. Pyrenocarp. 56. 1858. (Plate 49B)

Thallus crustose, corticolous, whitish, thin, ecorticated. Ascomata perithecia, covered by thallus, black, hemispherical, 0.1–0.3 mm diam., ostiole vertical. Peridium dimidiate, black, hymenium yellow and inspersed with oil globules, paraphyses branched. Asci 8-spored, ascospores hyaline, oblong, transversely 3-septare, 25–30 × 8–12 µm. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Pondicherry), USA.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°47.06′, E90°16.00′, Elev. 181 m, on the bark of *Ficus* sp. in forest, 28/11/2022, 2022–1006 (BUBH); coll. Pungbili Islary.

6. *Trypethelium* Spreng., Einleit. Stud. Krypt. Gew. 3:350. 1804.

Key to the species

1a. Thallus UV –. Pseudostroma inside or outside with yellow to orange pigment, prominent to sessile. Ascospores transversely 3–9-septate, 26–40 × 8–10 µm.....**1. *T. eluteriae***

1b. Thallus UV +. Pseudostroma covered with orange pigment. Ascospores transversely 8–14-septate, 52–65 × 8–12 µm……..……..…....**2. *T. xanthoplatystomum***

1. *Trypethelium eluteriae* Spreng., Einleit. Stud. der Krypt. Gew. 3:351. 1804.

Thallus crustose, corticolous, yellowish-glaucous. Ascomata perithecia, embedded in stroma, rounded to irregular, plane to convex, constricted at base, grey-brown, inside or outside yellow or orange pigments, K + reddish violet. Asci cylindrical to clavate, 8-spored, ascospores hyaline, transversely 3–5-septate, elongate-fusiform, 26–37 × 8–9 µm, lumina lens-shaped. Chemistry: Thallus K + brownish yellow, C –, P + slightly yellow, UV –; TLC: no substances detected.

Distribution: India (Andaman & Nicobar Islands, Arunachal Pradesh, Assam, Karnataka, Kerala, Maharashtra, Meghalaya, Nagaland, Tamil Nadu), Australia, Brazil, China, Chinese Taipei, Colombia, Cuba, France, French Guiana, Guadeloupe, Guatemala, Indonesia, Japan, Mexico, Myanmar, New Caledonia, Papua New Guinea, Philippines, Puerto Rico, Seychelles, Thailand, USA, Vanuatu, Vietnam.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46′04.74″, E90°18′33.28″, Elev. 161 m, on the bark of *Semecarpus anacardium* in forest, 04/03/2020, 2020–0328 (BUBH); **Labanyapur**, N26°46.339′, E90°19.308′, Elev. 152 m, on the bark of *Areca catechu* in village, 25/01/2021, 63356 (LWG), 2021–0295 (BUBH); coll. Pungbili Islary.

2. *Trypethelium xanthoplatystomum* Flakus & Aptroot in Lichenologist 48(6):686. 2016.

(Plate 50F)

Thallus crustose, corticolous, yellow to brownish yellow, corticated. Ascomata perithecia, pseudostromata with yellow to orange pigment, ostiole apical, black. Peridium black, hymenium clear, paraphyses branched. Asci 8-spored, 140–155 × 28–32 µm, ascospores hyaline, transversely 8–14-septate, 52–65 × 8–12 µm, lumina cylindrical. Chemistry: Thallus K + orange yellow, C –, P + orange yellow, UV + yellow; TLC: Lichexanthone present.

Distribution: Bolivia.

Species examined: INDIA– Assam, Kokrajhar district, **Labanyapur**, N26°46.612′, E90°16.827′, Elev. 175 m, on the bark of *Wrightia arborea* in forest, 29/01/2023, 2023–1466 (BUBH); coll. Pungbili Islary.

9. PYRENULACEAE Rabenh. in Krypt. Flora Sach., 2:42. 1870.

About 4 genera and 151 species in India; 3 genera and 81 species in Assam; 3 genera and 19 species reported from the present study.

Key to the genera

1a. Perithecia embedded in stroma…….……..……**2. *Lithothelium***
1b. Perithecia not imbedded in stroma……...2

2a. Ascospores transversely 3-septate……...**3. *Pyrenula***
2a. Ascospores muriform…….……**1. *Anthracothecium***

1. *Anthracothecium* Hampe ex. Massal. in Atti. Ins. Veneto Sci. ser. 3, 5:330. 1860.

Key to the species

1a. Asci 4-spored, ascospores 80–171 × 28–34 µm, with 26–32-transverse tiers, upto 7 cells in each tire ……..…..……**1. *A. macrosporum***
1b. Asci 8-spored, ascospores 60–90 × 20–35 µm, with 10–22-transverse tiers, upto 8 cells in each tier……..…….……..**2. *A. prasinum***

1. *Anthracothecium macrosporum* (Hepp) Müll. Arg. in Linnaea 43(9):44. 1880. *Verrucaria macrospora* Hepp in Zollinger, Sys. Verz. 9. 1854.

Thallus crustose, corticolous, greenish grey to yellowish green, corticated. Ascomata perithecia, solitary, ostiole apical. Peridium black carbonized, laterally broadly expanded near base with a central columella, centrum globose to sub-globose, without oil globules, paraphyses simple and free. Asci clavate, 4-spored, ascospores ellipsoid to oblong-ellipsoid, brown, multicelled-muriform, 80–171 × 28–34 µm, with 26–32-transverse tiers of cells each tire upto 7 cells. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Andaman & Nicobar Islands, Arunachal Pradesh, Assam, Karnataka, Kerala, Manipur, Tamil Nadu), Africa, Australia, Brazil, Colombia, Costa Rica, Fiji, Indonesia, Japan, North America, Philippines, Papua New Guinea, Réunion, Solomon Islands, Sri Lanka, Vietnam.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.106′, E90°17.319′, Elev. 165 m, on the bark of *Ilex odorata*, in forest, 14/07/2020, 63286 (LWG), 2020–0309 (BUBH); N26°46′04.74″, E90°18′33.28″, Elev. 158 m, on the bark of *Semecarpus anacardium* in forest, 04/03/2020, 2020–0301 (BUBH); N26°46.029′, E90°17.292′, Elev. 162 m, on the bark of *Ilex odorata* in forest, 05/12/2020, 2020–0302 (BUBH); N26°46.070′, E90°18.082′, Elev. 162 m, on the bark of *Ilex odorata* in forest, 05/12/2020, 2020–0304 (BUBH); N26°46.360′, E90°17.157′, Elev. 167 m, on the bark of *Ficus* sp. in forest, 22/07/2020, 2020–0306 (BUBH); N26°46.082′, E90°17.303, Elev. 156 m, on the bark of *Ilex odorata* in forest, 14/07/2020, 2020–0307 (BUBH); N26°45′46.59″, E90°16′55.02″, Elev. 159 m, on the bark of *Ficus hispida* in forest, 26/02/2020, 2020–0300 (BUBH); N26°46.342′, E90°17.156′, Elev. 155 m, on the bark of *Elaeocarpus* sp. in forest, 22/07/2020, 2020–0303 (BUBH); N26°45′58.56″, E90°17′31.39″, Elev. 169 m, on the bark of *Semecarpus anacardium* in forest, 13/12/2019, 2019–0308 (BUBH); coll. Pungbili Islary.

2. *Anthracothecium prasinum* (Eschw.) Harris in Bryologist 90(2):163. 1987. *Verrucaria prasina* Eschw. in Martius *et al*., Flora Bras. Enum. Plant. 1(1):124. 1833.

Thallus crustose, corticolous, dull grey, corticated. Ascomata perithecia, solitary, ostiole apical. Peridium black carbonized, slightly spreading laterally, centrum globose to sub-globose, without oil globules, paraphyses simple and free. Asci clavate, 8-spored, ascospores ellipsoid to oblong-ellipsoid, brown, multicelled-muriform, 60–90 × 20–35

µm, with 10–22-transverse tiers, upto 8 cells in each tier. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Arunachal Pradesh, Assam), Africa, Australia, Brazil, Chinese Taipei, Colombia, Costa Rica, Cuba, El Salvador, Gabon, Guyana, Liberia, Malaysia, Panama, Papua New Guinea, Philippines, Puerto Rico, Thailand, Vietnam, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46′04.74″, E90°18′33.28″, Elev. 171 m, on the bark of *Semecarpus anacardium* in forest, 04/03/2020, 63287 (LWG), 2020–0305 (BUBH); coll. Pungbili Islary.

2. *Lithothelium* Müll. Arg. in Bot. Jb. Sys. Pflanz. 6:386. 1885.

1. *Lithothelium obtectum* (Müll. Arg.) Aptroot in Biblthca. Lichenol. 44:62. 1991. *Sagedia obtecta* Müll. Arg. in Linnaea 43:42. 1880. (Plate 44D)

Thallus crustose, corticolous, greenish grey to brownish grey, dull, to slightly glossy. Photobiont layer and medulla with dense crystals. Ascomata perithecia, black, erumpent, hemispherical, irregular in shape to shortly elongate, 0.4–1.0 mm diam., solitary and 2–5 fused together with ostioles, ostioles brown and lateral. Peridium black carbonized, paraphyses simple. Asci 8-spored, 60–80 × 8–12 µm, ascospores hyaline, fusiform, transversely 3-septate, with subacute ends, distoseptate, lumina rounded, 10–13 × 4–6 µm. Chemistry: Thallus K + brown, C –, P + slightly yellowish, UV –; TLC: no substances detected.

Distribution: India (Andaman & Nicobar, Arunachal Pradesh, Karnataka, Maharashtra), Angola, Australia, Brazil, China, Chinese Taipei, Costa Rica, Iran, Korea, Tanzania, Thailand, Vietnam.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°45′55.74″, E90°17′30.01″, Elev. 161 m, on the bark of *Stereospermum chelonoides* in forest, 26/02/2020, 63310 (LWG), 2020–0346 (BUBH); coll. Pungbili Islary.

3. *Pyrenula* Ach. in Kungl. Svenska Vetenskap. 30:160. 1809.

Key to the species

1a. Ascomata mostly aggregated, fused walls with separate ostioles. Lumina more or less rounded……..……...**5. *P. leucotrypa***

1b. Ascomata mostly solitary……..……..…….....2

2a. Thallus ecorticated……..**1. *P. albothallina***

2b. Thallus corticated…….3

3a. End lumina directly against the exospore wall.……4

3b. End lumina mostly separated from the exospore wall…….5

4a. Ascospores 20–29 µm long. Hamathecium clear…...……..…….**2. *P. approximans***

4b. Ascospores 20–25 µm long. Hamathecium inspersed...…….……...**8. *P. maravalensis***

5a. Hamathecium inspersed……...……6

5b. Hamathecium clear……...……...8

6a. Central lumina strongly elongated……...……..…...**15. *P. subelliptica***

6b. Central lumina not elongated……...……7

7a. Ascomata mostly < 0.7 mm diam. Ascospores 27–50 µm long……..**11. *P. oculata***

7b. Ascomata mostly > 0.7 mm diam. Ascospores 17–21 µm long..……**7. *P. mamillana***

8a. Ascospores mostly > 25 µm long……...….....9

8b. Ascospores mostly < 25 µm long…...…….....11

9a. Thallus without pseudocyphellae. Ascospores 32–42 µm long.…...…..**12. *P. punctella***

9b. Thallus with pseudocyphellae……10

10a. Ascomata > 0.7 mm in diam……...……**6. *P. macrospora***

10b. Ascomata < 0.7 mm in diam.……..**13. *P. quassiaecola***

11a. Peridium not spreading laterally…….**9. *P. microtheca***

11b. Peridium spreading laterally…….12

12a. Two middle lumina of ascospores rhomboidal….…….13

12b. Lumina rounded to lentiform.…...14

13a. Ascomata 0.4–0.7 mm diam……..……..…….**3. *P. aspistea***

13b. Ascomata < 0.4 mm diam..……**10. *P. minor***

14a. Ostiole indistinct……**14. *P. scutata***
14b. Ostiole distinct……15

15a. Ascospores 12–14 × 6–8 µm……..……**4. *P. brunnea***
15b. Ascospores 16–23 × 6–9 µm.……**16. *P. subglabriuscula***

1. *Pyrenula albothallina* Vain. in Ann. Acad. Sci. Fenn. ser. A, 15(6):334. 1921.

(Plate 49C)

Thallus crustose, corticolous, whitish, ecorticated, glossy. Photobiont layer and medulla with dense crystals. Ascomata perithecia, solitary, somewhat aggregate, black, ostiole apical, depressed. Peridium slightly spreading laterally and carbonized, indistinct or absent at base, hymenium inspersed, colourless, paraphyses simple. Asci 8-spored, ascospores brown, ellipsoid, transversely 3-septate, lumina in a straight line, 18–20 × 8–11 µm. Chemistry: Thallus K + brownish yellow, C –, P –, UV –; TLC: no substances detected.

Distribution: Panama, Philippines.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.385′, E90°13.431′, Elev. 206 m, on the bark of *Ficus* sp. in forest, 02/04/222, 2022–1023 (BUBH); N26°49.21′, E90°17.43′, Elev. 242 m, on the bark of *Aglaia spectabilis* on road side, 02/04/2023, 2023–1556 (BUBH); coll. Pungbili Islary.

2. *Pyrenula approximans* (Kremp.) Müll. Arg. in Flora 68:335. 1885. *Verrucaria approximans* Kremp. in Vidensk. Meddel. Dansk Nat. Foren. Kjøbenhavn 5:396. 1873.

(Plate 49D)

Thallus crustose, corticolous, olive green to yellow, corticated. Ascomata perithecia, < 0.5 mm diam., mostly solitary, lack, ostiole apical, plane to slightly depressed. Peridium spreading laterally and carbonized, hymenium not inspersed, paraphyses simple. Asci 8-spored, ascospores brown, transversely 3-septate, 20–29 µm long, lumina in a straight line, end lumina elongated and all directly against the exospore wall. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Assam), Brazil, China, Ecuador, Guyana, Mexico, Réunion, Solomon Islands.

Species examined: INDIA– Assam, Kokrajhar district, **Saralpara**, N26°50.013′, E90°15.518′, Elev. 247 m, on the bark of *Jatropha curcas* on road side, 05/03/2023, 65116 (LWG), 2023–1582 (BUBH); coll. Pungbili Islary.

3. *Pyrenula aspistea* (Afzel. ex Ach.) Ach. in Mag. Gesell. Nat. Freun. 6(1):17. 1814. *Verrucaria aspistea* Afzel. ex Ach., Method. Lich. 121. 1803.

Thallus crustose, corticolous, woody yellow, smooth, without pseudocyphellae. Ascomata perithecia, solitary, conical-depressed-conical, ostiole papillate-mamillate. Peridium black carbonized, wall spreading laterally without columellate, hymenium I –, without oil-globules, paraphyses simple. Asci 8-spored, ascospores ellipsoid, brown, transversely 3-septate, two middle lumina of ascospores rhomboidal, ends thick wall, not papillate, 15–18 × 6–8 µm. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Andaman & Nicobar Islands, Andhra Pradesh, Assam, Arunachal Pradesh, Goa, Maharashtra, Tamil Nadu), Australia, Brazil, Chinese Taipei, Colombia, Costa Rica, Cuba, Guinea, Indonesia, New Caledonia, Panama, Sierra Leone, Spain, Sri Lanka, Thailand, Vietnam, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46′03.12″, E90°18′33.91″, Elev. 172 m, on the bark of *Semecarpus anacardium* in forest, 04/03/2020, 63341 (LWG), 2020–0185 (BUBH); N26°46.124′, E90°17.023′, Elev. 165 m, on the bark of *Aesculus assamica* in forest, 03/10/2020, 2020–0105 (BUBH); coll. Pungbili Islary.

4. *Pyrenula brunnea* Fée, Essai Les Crypt. Suppl. Révis. 81. 1837.

Thallus crustose, corticolous, smooth, buff-brownish yellow, corticated. Ascomata perithecia, < 0.7 mm diam., mostly solitary, depressed, conical to semiglobose, black, ostiole apical, indistinct to papillate. Peridium spreading laterally, hymenium not inspersed, paraphyses simple. Asci 8-spored, ascospores ellipsoidal, brown, transversely 3-septate, 12–14 × 6–8 µm, lumina in a straight line, rounded to lentiform, middle lumina not transversely elongated, ends thick wall and end lumina separated from the exospore wall. Chemistry: Thallus K –, C –, P –, UV – or greenish/whitish reflecting. TLC: no substances detected.

Distribution: India (Arunachal Pradesh, Assam, Meghalaya), Brazil, Guyana, Jamaica, New Caledonia, Paraguay, Solomon Islands, USA, Vietnam.

Species examined: INDIA– Assam, Kokrajhar district, **Labanyapur**, N26°49.289′, E90°17.895′, Elev. 210 m, on the bark of *Wrightia arborea* in forest, 29/01/2023, 2023–1538 (BUBH); coll. Pungbili Islary.

5. *Pyrenula leucotrypa* (Nyl.) Upreti in Nova Hedwigia 66(3-4):570. 1998. *Trypethelium leucotrypum* Nyl. in Flora 50:9. 1867.

Thallus crustose, corticolous, olive green, smooth. Ascomata perithecia, black carbonized, hemispherical, embedded in pseudostromata, fused laterally, ostiole black, apical, punctuate, fused laterally. Peridium black carbonized, hymenium not inspersed, paraphyses simple. Asci 8-spored, ascospores ellipsoid, brown, transversely 3-septate, 19–24 × 5–8 µm, lumina more or less rounded. Chemistry: Thallus K + red, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Arunachal Pradesh, Assam, Sikkim, West Bengal), Brazil.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.009′, E90°17′.509′, Elev. 159 m, on the bark of *Ilex odorata* in forest, 24/11/2020, 63347 (LWG), 2020–0188 (BUBH); coll. Pungbili Islary.

6. *Pyrenula macrospora* (Degel.) Coppins & James in Lichenologist 12(1):107. 1980.

Thallus crustose, corticolous, pseudocyphellae, corticated. Ascomata perithecia, without external pigments, ostiole apical. Peridium black carbonized, hymenium not inspersed with oil globules, paraphyses simple. Asci 8-spored, ascospores ellipsoid, brown, transversely 3-septate, without cilia, terminal lumina mostly separated from exospore wall by endospore thickening, mature ascospores without orange oil, lumina in a straight-line. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Assam), France, Ireland, Jarmany, Norway, Russian Federation, Sweden.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.080′, E90°17.335′, Elev. 145 m, on the bark of *Syzygium formosum* in forest, 14/07/2020,

63346 (LWG); **Labanyapur**, N26°47.910′, E90°18.768′, Elev. 182 m, on the bark of *Tetrameles nudiflora*, in forest, 10/11/2021, 2021–1021 (BUBH); coll. Pungbili Islary.

7. *Pyrenula mamillana* (Ach.) Trevis., Conspec. Verruc. 13. 1860. *Verrucaria mamillana* Ach., Method. Lich. 120. 1803.

Thallus crustose, corticolous, buff-yellowish brown. Ascomata perithecia, solitary, hemispherical, scattered, ostiole mamillate-papillate. Peridium black carbonized, wall spreading laterally, hymenium with oil-globules, paraphyses simple. Asci clavate, 8-spored, ascospores (*brunnea*-type), ellipsoid, brown, without papillate, transversely 3-septate, 15–19 × 4–7 µm, ends thick wall, lumina rounded to lens-shaped, not transversely elongated. Chemistry: Thallus K –, C –, P –, UV + pale yellow; TLC: no substances detected.

Distribution: India (Andaman & Nicobar Islands, Assam, Karnataka), Australia, Brazil, Chile, Chinese Taipei, Colombia, Costa Rica, Dominica, Gabon, Myanmar, New Caledonia, New Guinea, Panama, Philippines, Singapore, Sri Lanka, Thailand, Trinidad & Tobago, USA, Vietnam.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46′05.76″, E90°18′32.36″, Elev. 157 m, on the bark of *Lagerstroemia speciosa* in forest, 04/03/2020, 63342 (LWG), 2020–0087 (BUBH); N26°46.106′, E90°17.319′, Elev. 163 m, on the bark of *Ilex odorata* in forest, 14/07/2020, 2020–0086 (BUBH); N26°46′15.57″, E90°17′33.29″, Elev. 167 m, 04/03/2020, on the bark of *Elaeocarpus* sp. in forest, 2020–0085 (BUBH); N26°46′12.12″, E90°17′22.88″, Elev. 153 m, on the bark of *Elaeocarpus* sp. in forest, 21/12/2019, 2019–0083 (BUBH); N26°45′46.59″, E90°16′55.02″, Elev. 148 m, on the bark of *Ficus* sp. in forest, 26/02/2020, 2020–0088 (BUBH); N26°46′04.65″, E90°18′33.12″, Elev. 157 m, on the bark of *Elaeocarpus* sp. in forest, 04/03/2020, 2020–0084 (BUBH); N26°46.134′, E90°17.376′, Elev. 169 m, on the bark of *Holarrhena* sp. in forest, 14/07/2020, 2020–0089 (BUBH); **Labanyapur**, N26°49.352′, E90°17.867′, Elev. 225 m, on the bark of *Holarrhena* sp. in forest, 29/01/2023, 2023–1463 (BUBH); coll. Pungbili Islary.

8. *Pyrenula maravalensis* Vain. in Proc. Amer. Acad. Art. & Sci. 58:145. 1923.

(Plate 49E)

Thallus crustose, corticolous, reddish brown with brown to black margin. Photobiont layer and medulla with clusters of crystals. Ascomata perithecia, solitary, ostiole mostly apical. Peridium black carbonized, not spreading laterally, hymenium inspersed, paraphyses simple. Asci 8-spored, ascospores brown, oval with papillate ends, transversely 3-septate, 18–25 × 7–10 µm. Chemistry: Thallus K + reddish, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Arunachal Pradesh, Kerala), Guatemala, Guyana, Solomon Islands.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46′03.41″, E90°18′33.25″, Elev. 174 m, on the bark of *Syzygium formosum* in forest, 04/03/2020, 63344 (LWG), 2020–0104 (BUBH); coll. Pungbili Islary.

9. *Pyrenula microtheca* Harris in Mem. N. Y. Bot. Gdn. 49:96. 1989. (Plate 49F)

Thallus, crustose, corticolous, corticated, olive green, yellowish green to brownish green, smooth, slightly glossy with brown to black carbonized margin. Photobiont layer and medulla with dense crystals. Ascomata perithecia, solitary, ostiole mostly eccentric to lateral, without red colour. Peridium not spreading laterally and carbonized, hymenium clear, colourless, paraphyses simple. Asci 8-spored, ascospores ovoid to ellipsoid, light brown, transversely 3-septate, middle of the two lumina transversely elongated, end lumina separated from the exospore wall by endospore thickening, 16–23 × 6–9 µm. Chemistry: Thallus K + brownish yellow, C –, P –, UV –; TLC: no substances detected.

Distribution: Brazil, Guinea, North America North-West England, Panama, West Scotland, South West Ireland.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.054′, E90°17.081′ Elev. 179 m, on the bark of *Ilex odorata* in forest, 24/11/2020, 63345 (LWG), 2020–0103 (BUBH); coll. Pungbili Islary.

10. *Pyrenula minor* Fée, Essai Les Crypt. Suppl. Révis. 79. 1837.

Thallus crustose, corticolous, thin, greenish-glaucous, areolate, smooth, without external pigments, Perithecia < 0.4 mm, solitary, semi-emergent to erumpent, hemispherical to conical, black, naked, shining, ostiole apical, depressed, punctiform. Peridium carbonized, not columellate, slightly spreading laterally, hymenium clear, I –, paraphyses

simple. Asci clavate, 8-spored, ascospores ellipsoid, brown, transversely 3-septate, 12–18 × 5–6 µm, lumina in a straight line, end lumina thick wall and separated from the exospore wall, two middle lumina rhomboidal. Chemistry: Thallus K + brown to dark, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Andaman & Nicobar Islands, Assam), Brazil, Colombia, El Salvador, French Guiana, Guyana, Philippines.
Species examined: INDIA– Assam, Kokrajhar district, **Labanyapur**, N26°48.418′, E90°18.413′, Elev. 180 m, on the bark of *Holarrhena* sp. in forest, 29/01/2023, 2023–1460 (BUBH); coll. Pungbili Islary.

11. *Pyrenula oculata* Ajay Singh & Upreti in Geophytology 17(1):84. 1987

Thallus crustose, corticolous, woody brown, rugolose, indistinctly pseudocyphellae. Ascomata perithecia, globose, ostiole visible as depressed. Peridium carbonized, hymenium inspersed with oil globules, I –, paraphyses simple. Asci 8-spored, ascospores ellipsoid, brown, (*subducta*-type), 25–46 × 12–17 µm, end thick wall, two middle lumina rhomboidal, papillae towards adjoining lumina, end lumina papillate towards the middle lumina. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Andaman & Nicobar Islands, Arunachal Pradesh, Assam, Goa, Himachal Pradesh, Kerala, Sikkim), China, USA.
Species examined: INDIA– Assam, Kokrajhar district, **Saralpara**, N26°51.023′, E90°14.655′, Elev. 258 m, on the bark of *Ficus* sp. in forest, 05/01/2021, 2021–0102 (BUBH); coll. Pungbili Islary.

12. *Pyrenula punctella* (Nyl.) Trevis. Conspec. Verruc. 13. 1860. *Verrucaria punctella* Nyl., Exp. Syn. Pyrenocarp. 46. 1858.

Thallus crustose, corticolous, olive green to yellowish green, corticated. Perithecia solitary, sometimes confluent, black, < 0.7 mm diam., ostiole apical, depressed. Peridium not spreading laterally and carbonized, hymenium clear, colourless, paraphyses simple. Asci 8-spored, ascospores brown, oval to ellipsoidal, without dark bands, transversely 3-septate, rounded lumina, end lumina not elongated and separated from the exospore wall

from endospore thickening, 35–42 × 17–20 µm. Chemistry: Thallus K –, C –, P + light yellow, UV – or whitish reflecting; TLC: no substances detected.

Distribution: Australia, Colombia, Mexico, Sri Lanka, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.00′, E90°18.23′, Elev. 140 m, on the bark of *Magnolia champaca* in forest, 16/12/2022, 2022–1328 (BUBH); N26°40.43′, E90°17.44′, Elev. 123 m, on the bark of *Elaeocarpus* sp. in forest, 03/01/2023, 2023–1448 (BUBH); N26°45.54′, E90°18.23′, Elev. 145 m, on the bark of *Magnolia champaca* in forest, 16/12/2022, 2022–1310 (BUBH); N26°41.911′, E90°18.832′, Elev. 106 m, on the bark of *Elaeocarpus* sp. in forest, 08/01/2023, 2023–1566 (BUBH); **Labanyapur**, N26°49.289′, E90°17.895′, Elev. 210 m, on the bark of *Wrightia arborea* in forest, 29/01/2023, 2023–1468 (BUBH); N26°44.260′, E90°18.268′, Elev. 268 m, on the bark of *Elaeocarpus* sp. on road side, 02/04/2023, 2023–1568 (BUBH); coll. Pungbili Islary.

13. *Pyrenula quassiaecola* Fée, Essai Les Crypt. Suppl. Révis. 79. 1837.

Thallus crustose, corticolous, corticated, yellow to olive green, often pseudocyphellae, without external pigments. Ascomata perithecia, solitary, subglobose, immersed to erumpent, black, partly immersed in thallus, ostiole apical, umbonate. Peridium globose, carbonized, spreading laterally, hymenium inspersed, IKI –, paraphyses simple. Asci cylindrical, biseriate, 8-spored, ascospores fusiform, brown, ends thick wall, transversely 3-septate, 26–33 × 14–17 µm, lumina in a straight line, central lumina rounded, end lumina not elongated and mostly separated from the exospore wall. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Arunachal Pradesh, Sikkim), Argentina, Australia, Brazil, Costa Rica, Cuba, Dominican Republic, El Salvador, Guyana, Haiti, Jamaica, Papua New Guinea, Paraguay, Réunion, South Africa, Thailand, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°42.454′, E90°17.852′, Elev. 110 m, on the bark of *Elaeocarpus* sp. in forest, 08/01/2023, 2023–1409 (BUBH); coll. Pungbili Islary.

14. *Pyrenula scutata* (Stirt.) Zahlbr., Cat. Lich. Univ. 1:452. 1922. *Verrucaria scutata* Stirt. in Proc. Roy. Phil. Soc. Glasgow 13:192. 1881.

Thallus crustose, corticolous, olive yellow, smooth to areolate. Ascomata perithecia, solitary, adnate, sessile, rounded, black, convex-depressed conical, ostioles indistinct. Peridium black carbonized, spreading laterally, hymenium without oil globules. Asci cylindrical, 8-spored, ascospores ellipsoid, brown, transversely 3-septate, thick wall, 15–23 × 5–9 µm, lumina rounded to lens-shaped (*brunnea*-type). Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Assam), Vietnam.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°45.972′, E90°16.969′ Elev. 168 m, on the bark of *Ilex odorata* in forest, 16/10/2020, 63344 (LWG), 2020–0186 (BUBH); **Saralpara**, N26°50.351′, E90°16.208′, Elev. 250 m, on the bark of *Magnolia champaca* in forest, 05/03/2023, 2023–1505 (BUBH); coll. Pungbili Islary.

15. *Pyrenula subelliptica* (Tuck.) Harris in Bryologist 90(2):164. 1987. *Verrucaria subelliptica* Tuck. in Lea, Cat. Plants Cincin. 47. 1849.

Thallus crustose, corticolous, creamy to yellowish, corticated. Ascomata perithecia, mostly simple, somewhat aggregated, black, ostiole apical, greyish white, indistinct and slightly depressed. Peridium laterally spreading and carbonized, hymenium inspersed, colourless, paraphyses simple. Asci 8-spored, ascospores brown, ellipsoidal, transversely 3-septate, lumina in a straight line, central lumina strongly elongated, end lumina mostly separated from the exospore wall by endospore thickening, 16–18 × 7–9 µm. Chemistry: Thallus K + orange yellow, C –, P –, UV –; TLC: no substances detected.

Distribution: Colombia, Georgia, Iran, Türkiye, USA, India (Assam).
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°47.08′, E90°16.17′, Elev. 158 m, on the bark of *Elaeocarpus* sp. in forest, 28/11/2022, 2022–1008 (BUBH); coll. Pungbili Islary.

16. *Pyrenula subglabriuscula* Vain. in Ann. Acad. Sci. Fenn. ser. A, 15 (6):344. 1921.

Thallus, crustose, corticolous, corticated, creamy to ash grey, smooth, slightly glossy with black carbonized margin. Photobiont layer and medulla with dense crystals. Ascomata perithecia, solitary, somewhat 3–4 group in together, ostiole apical, lateral, depressed-hemispherical. Peridium slightly spreading laterally and carbonized, indistinct or absent at base, hymenium inspersed with oil globules, colourless, paraphyses simple. Asci 8-spored, ascospores ellipsoid, 4-locular, brown, transversely 3-septate, middle lumina not transversely elongated, end lumina thick wall and separated from the exospore wall by endospore thickening, 16–23 × 6–9 µm. Chemistry: Thallus K + reddish brown, C –, P – , UV –; TLC: no substances detected.

Distribution: India (Arunachal Pradesh, Himachal Pradesh, Karnataka), Philippines.
Species examined: INDIA– Assam, Kokrajhar district, **Labanyapur**, N26°47.896′, E90°18.731′, Elev. 178 m, on the bark of *Tetrameles nudiflora* in forest, 10/11/2021, 2021–0463 (BUBH); coll. Pungbili Islary.

10. VERRUCARIACEAE Eschw., Sys. Lich. 15. 1824.

About 10 genera and 33 species in India, no records in Assam; 1 genus and 1 species from the present study.

1. ***Agonimia*** Zahlbr. in Oest. Bot. Zeit. 59(9):350. 1909.

1. ***Agonimia bryophilopsis*** (Vain.) Hafellner in MycoKey 31:10. 2018. *Polyblastia bryophilopsis* Vain. in Acta Soc. Fauna Flora Fenn. 49(2):104. 1921. (Plate 40A)

Thallus squamulose, corticolous, greenish grey, glossy, granular, lacks black glossy globules. Ascomata perithecia, superficial, globose to ovoid, smooth, without a distinct plicate neck, 0.25–0.5 mm diam. Asci cylindrical, 4-spored, 150–170 × 34–37 µm, ascospores muriform, 45–70 × 15–23 µm. Chemistry: Thallus K + olive green, C –, P + orange yellow, UV –; TLC: Atranorin and sekikaic acid.

Distribution: Europe.
Species examined: INDIA– Assam, Kokrajhar district, **Labanyapur**, N26°47.910′, E90°18.768′, Elev. 182 m, on the bark of *Tetrameles nudiflora* in forest, 10/11/2021, 2021–1608 (BUBH); coll. Pungbili Islary.

11. CALICIACEAE Chevall., Flora Gén. Env. 1:314. 1826.

About 13 genera and 116 species in India; 8 genera and 29 species in Assam; 3 genera and 13 species reported from the present study.

Key to the genera

1a. Thallus crustose……**1. *Buellia***
1b. Thallus foliose……...…….**2**

2a. Rhizines absent……..……..**2. *Dirinaria***
2b. Rhizines present……..**3. *Pyxine***

1. *Buellia* de Not. in Gior. Bot. Ital. 2(1.1):195. 1846.

Key to the species

1a. Ascospores 12–15 × 7–8 µm. Internal stipe dark...…….....**3. *B. tincta***
1b. Ascospores 16–23 × 5–9 µm, Internal stipe dark brown to reddish-brown……...…2

2a. Internal stipe reddish-brown, K –……...……...……..…**1. *B. curtisii***
2b. Internal stipe dark brown, K + red crystals……...……..…….**2. *B. morehensis***

1. *Buellia curtisii* (Tuck.) Imshaug in Brodo, Bull. N.Y. St. Mus. Sci. Serv. 410:253. 1968. *Gyrostomum curtisii* Tuck. in Amer. J. Sci. & Art. ser. 2, 25:430. 1858. (Plate 41F)

Thallus crustose, corticolous, whitish grey, granulose-verruculose, lacking isidia or soredia. Ascomata apothecia, adnate-sessile, 0.3–0.7 mm diam., lecidine, black, disc non-pruinose. Medulla K + red, P + yellow. Excipulum brown outwards and pallid inwards, K –, internal stipe reddish brown, K –, hymenium not inspersed with oil globules, hypothecium colourless in upper part, dark brown internal stipe in lower part. Asci 8-spored, ascospores brown, transversely 1-septate (*Buellia*-type), wall uniformly thickened, 17–22 × 6–9 µm. Chemistry: Thallus K + red, C –, P + light yellow, UV –; TLC: Norstictic and stictic acid.

Distribution: India (Jammu & Kashmir, Madhya Pradesh, Manipur, Tamil Nadu), USA.

Species examined: INDIA– Assam, Kokrajhar district, **Labanyapur**, N26°47.897′, E90°18.781′, Elev. 178 m, on the bark of *Tetrameles nudiflora* in forest, 10/11/2021, 2021–0286 (BUBH); coll. Pungbili Islary.

2. *Buellia morehensis* Singh & Singh in Geophytology 12(1):128. 1982.

Thallus crustose, corticolous, grey, granulose-verruculose, lacking isidia or soredia. Ascomata apothecia, adnate, sessile, lecidine, 0.5–1.0 mm diam., black, disc non-pruinose, plane to slightly convex. Medulla K + red, P + yellow. Excipulum dark brown on outerside, pallid in the middle and dark brown on inner side, internal stipe dark brown, K + red crystals, hymenium not inspersed with oil globules, hypothecium colourless in upper part, dark brown internal stipe in lower part. Asci 8-spored, ascospores brown, transversely 1-septate (*Buellia*-type), wall uniformly thickened, 18–24 × 6–8 µm. Chemistry: Thallus K + red, C –, P + pale yellow, UV –; TLC: Atranorin, norstictic and salazinic acid.

Distribution: India (Assam, Manipur).
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.387′, E90°18.022′, Elev. 177 m, on the bark of *Areca catechu* in village, 09/05/2021, 2021–0277 (BUBH); coll. Pungbili Islary.

3. *Buellia tincta* Steiner ex Magn. in Ark. Bot. 32A(2):44. 1945.

Thallus crustose, corticolous, sordid-white, rimulose, lacking isidia and soredia. Apothecia ascomata, round, black, lecideine, 0.5–1.2 mm diam. Medulla K + red, P + deep yellow. Excipulum indistinctly cellular (paraplectenchymatous), internal stipe dark, hymenium not inspersed with oil globules. Asci 8-spored, ascospores brown, transversely 1-septate, wall uniformly thickened (*Buellia*-type), 12–15 × 7–9 µm. Chemistry: Thallus K + yellow, C + pale yellow, P + orange yellow, UV –; TLC: Atranorin and norstictic acid.

Distribution: India (Uttarakhand, Himachal Pradesh), USA.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.413′, E90°14.545′, Elev. 179 m, on the bark of *Ficus* sp. in forest, 02/04/2022, 2022–0520

(BUBH); **Labanyapur**, N26°47.912′, E90°18.770′, Elev. 182 m, on the bark of *Macaranga denticulata* in forest, 10/11/2021, 2021–0415 (BUBH); coll. Pungbili Islary.

2. *Dirinaria* (Tuck.) Clem., Gen. Fung. 84. 1909.

Key to the species

1a. Thallus isidiate, sorediate……...……..2
1b. Thallus without isidiate and sorediate……...…….……**3. *D. confluens***

2a. Thallus with thick isidia becoming sorediate apically……..…**1. *D. aegialita***
2b. Thallus directly sorediate on lamina……...……...……..3

3a. Divaricatic acid in medulla.....**2. *D. applanata***
3b. Sekikaic acid in medulla……..……..…….**4. *D. consimilis***

1. *Dirinaria aegialita* (Afzel. ex Ach.) Moore in Bryologist 71:248. 1968. *Parmelia aegialita* Afzel. ex Ach., Method. Lich. 191. 1803.

Thallus foliose, corticolous, grey, to 5 cm across, grey, heteromerous, corticated on both sides, lacking rhizines, lobes dichotomously to subdicotomously divided, 0.6–1.3 mm wide, flabellate, plicate, centrally confluent, upper side grey, isidioid verrucae or dactyls becoming apically crateriform and sorediate. Medulla white, K –, C –, P –. Apothecia not seen. Chemistry: Thallus K + yellow, C + olive, P + olive yellow, UV –; TLC: Atranorin and divaricatic acid.

Distribution: India (Andaman & Nicobar Islands, Arunachal Pradesh, Assam, Chhattisgarh, Kerala, Madhya Pradesh, Orissa, Sikkim, Tamil Nadu, West Bengal), Africa, Australia, Brazil, Cambodia, French Polynesia, Japan, Myanmar, Nepal, New Zealand, Pacific Ocean Islands, Réunion, USA, Sri Lanka, Taiwan.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.405′, E90°15.285′, Elev. 171 m, on the bark of *Ficus* sp. in forest, 02/04/2022, 2022–0533 (BUBH); **Labanyapur**, N26°47.896′, E90°17.731′, Elev. 178 m, on the bark of *Tetrameles nudiflora* in forest, 10/11/2021, 2021–0284 (BUBH); **Saralpara**, N26°51.011′, E90°15.518′, Elev. 280 m, on the bark of *Areca catechu* in village, 05/03/2023, 2023–1518 (BUBH); N26°51.290′, E90°15.757′, Elev. 287 m, on the bark of

Elaeocarpus sp. on road side, 05/03/2023, 2023–1522 (BUBH); N26°50.780′, E90°16.516′, Elev. 260 m, on the bark of *Terminalia* sp. on road side, 14/03/2023, 2023–1517 (BUBH); N26°50.142′, E90°15.777′, Elev. 243 m, on the bark of *Magnolia champaca* on road side, 05/03/2023, 2023–1523 (BUBH); N26°50.921′, E90°15.481′ Elev. 270 m, on the bark of *Spondias pinnata* on road side, 05/03/2023, 2023–1521 (BUBH); coll. Pungbili Islary.

2. *Dirinaria applanata* (Fée) Awasthi in J. Indian Bot. Soc. 49:135. 1970. *Parmelia applanata* Fée, Essai La Crypt. 126. 1824.

Thallus foliose, corticolous, grey, to 5 cm across, heteromerous, corticated on both sides, lacking rhizines, directly sorediate on lamina, soredia globose, capitate with farinose to granular, lobes dichotomous to sub-dichotomous, flabellate, confluent from the peripheral region. Medulla white, K –, C –, P –. Apothecia not seen. Chemistry: Thallus K + yellow, C –, P + olive yellow, UV –; TLC: Atranorin and divaricatic acid.

Distribution: India (Andaman & Nicobar Islands, Assam, Karnataka, Madhya Pradesh, Maharashtra, Nagaland, Sikkim, Tamil Nadu, Uttar Pradesh, Uttarakhand, West Bengal), Australia, Bhutan, Chinese Taipei, Colombia, Eswatini, Japan, Mexico, New Zealand, Portugal, Samoa, Singapore, South Africa, Sri Lanka, Zambia, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°41.914′, E90°18.825′, Elev. 107 m, on the bark of *Elaeocarpus* sp. in forest, 08/01/2023, 2023–1394 (BUBH); N26°46.535′, E90°15.085′, Elev. 162 m, on the bark of *Ficus* sp. in forest, 02/04/2022, 2022–0534 (BUBH); N26°46.07′, E90°16.30′, Elev. 172 m, on the bark of *Stereospermum chelonoides* in forest, 28/11/2022, 2022–1016 (BUBH); N26°46.48′, E90°17.454′, Elev. 174 m, on the bark of *Gmelina arborea* on road side, 29/01/2023, 2023–1539 (BUBH); **Labanyapur**, N26°47.704′, E90°18.775′, Elev. 177 m, on the bark of *Tetrameles nudiflora* on road side, 10/11/2021, 2021–0660 (BUBH); N26°47.909′, E90°18.746′, Elev. 179 m, on the bark of *Morus alba* on road side, 10/11/2021, 2021–0519 (BUBH); N26°46.48′, E90°17.454′, Elev. 174 m, on the bark of *Gmelina arborea* on road side, 29/01/2023, 2023–1539 (BUBH); N26°48.828′, E90°18.097′, Elev. 188 m, on the bark of *Magnolia hodgsonii* in forest, 29/01/2023, 2023–1473 (BUBH); **Saralpara**, N26°47.700′, E090°17.833′, Elev. 187 m, on the bark of *Tetrameles nudiflora* on road side, 02/04/2023, 2023–1547 (BUBH); N26°51.105′, E90°16.320′, Elev. 258 m,

on the bark of *Tetrameles nudiflora* on road side, 14/03/2023, 2023–1516 (BUBH); N26°51.000′, E90°15.952′, Elev. 262 m, on the bark of *Wrightia arborea* on road side, 14/03/2023, 2023–1515 (BUBH); N26°50.341′, E90°16.228′, Elev. 255 m, on the bark of *Magnolia champaca* on road side, 05/03/2023, 2023–1519 (BUBH); coll. Pungbili Islary.

3. *Dirinaria confluens* (Fr.) Awasthi in Biblthca Lichenol. 2:281. 1975. *Parmelia confluens* Fr., Sys. Orb. Veg. 1:284. 1825.

Thallus foliose, corticolous, to 6 cm across, lobes 2 mm wide, flabellate, plicate, and confluent, heteromerous, corticated on both sides, upper side glaucous white to grey, without isidia and soredia. Medulla white, K –, C –, P –. Apothecia not seen. Chemistry: Thallus K + yellow, C –, P + olive yellow, UV –; TLC: Divaricatic acid and triterpenes.

Distribution: India (Andaman & Nicobar Islands, Arunachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Nagaland, Orissa, Sikkim, Tamil Nadu, Uttar Pradesh), Africa, Australia, Nepal, Pacific Ocean Islands, Sri Lanka, Taiwan, Thailand, USA.
Species examined: INDIA– Assam, Kokrajhar district, **Saralpara**, N26°50.341′, E90°16.227′, Elev. 255 m, on the bark of *Magnolia champaca* on road side, 05/03/2023, 2023–1501 (BUBH); coll. Pungbili Islary.

4. *Dirinaria consimilis* (Stirt.) Awasthi in J. Indian Bot. Soc. 49:135. 1970. *Physcia consimilis* Stirt. in Proc. Roy. Phil. Soc. Glasgow 11:310. 1879.

Thallus foliose, corticolous, to 8 cm across, greyish white, heteromerous, corticated on both sides, directly sorediate on lamina, soredia capitate with granular soredia, lacking rhizines, lobes flabellate, plicate, 1–2 mm wide. Medulla white, K –, C –, P –. Apothecia not seen. Chemistry: Thallus K + green, C –, P + olive green, UV –; TLC: Sekikaic acid.

Distribution: India (Arunachal Pradesh, Assam, Himachal Pradesh, Kerala, Madhya Pradesh, Manipur, Nagaland, Sikkim, Tamil Nadu, Uttar Pradesh, West Bengal), Africa, Australia, Brazil, Cambodia, Congo, Japan, Myanmar, Nepal, Thailand, Uganda.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°41.454′, E90°17.842′, Elev. 107 m, on the bark of *Elaeocarpus* sp. in forest, 08/01/2023, 2023–1395 (BUBH); coll. Pungbili Islary.

3. *Pyxine* Fr., Sys. Orb. Veg. 267. 1825.

Key to the species

1a. Thallus isidiate……2
1b. Thallus lacking isidiate……4

2a. Medulla K + yellow or faint pink……3
2b. Medulla K –, isidia cylindrical to clavate, aggregated……**2. *P. coralligera***

3a. Isidia elongate, filiform……**3. *P. cylindrica***
3b. Isidia pustulate, exposing white base, producing white soredia……**4. *P. endochrysina***

4a. Thallus UV +……**1. *P. cocoes***
4b. Thallus UV –……5

5a. Medulla yellowish to deep yellow……**5. *P. meissnerina***
5b. Medulla white……**6. *P. retirugella***

1. *Pyxine cocoes* (Sw.) Nyl. in Mem. Soc. Imp. Des Sci. Nat. 5:108. 1857. *Lichen cocoes* Sw. in Swartz, Nova Gen. & Sp. Plant. 146. 1788.

Thallus foliose, corticolous, 6 cm across, heteromerous, corticated on both sides, greyish to pale grey, lobes 0.5–1.5 mm wide, lacking isidia, maculae laminal and marginal turning into pseudocyphellae and then into soralia, soralia laminal and marginal, speck-like, orbicular, linear to irregular. Medulla white, K –, C –, P –. Apothecia not seen. Chemistry: Thallus K + green, C –, P –, UV + yellow; TLC: Triterpene.

Distribution: India (Assam, Goa, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Orissa, Tamil Nadu, Uttar Pradesh, West Bengal), Australia, Brazil, China, Colombia, Cuba, Curaçao, Ethiopia, French Guiana, Grenada, Guyana, Fiji, French Polynesia, Guatemala, Guyana, Hong Kong, Jamaica, Kenya, Kiribati, Mexico, New Caledonia, Norfolk Island, Norway, Papua New Guinea, Peru, Philippines, Saint Lucia, Singapore, Spain, Suriname, Sri Lanka, Tanzania, Thailand, USA, Venezuela, Zimbabwe.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°48.665′ E90°17.354′, Elev. 168 m, on the bark of *Areca catechu* in village, 22/07/2020, 2020–

1641 (BUBH); N26°48.145′, E90°17.591′, Elev. 159 m, on the bark of *Areca catechu* in village, 26/07/2020, 2020–1642 (BUBH); N26°47.580′, E90°17.460′, Elev. 172 m, on the bark of *Areca catechu* in village,10/10/2020, 2020–1643 (BUBH); **Saralpara**, N26°49.366′, E90°17.126′, Elev. 187 m, on the bark of *Magnolia champaca* on road side,14/03/2023, 2023–1644 (BUBH); **Labanyapur**, N26°47.226′, E90°19.112′, Elev. 185 m, on the bark of *Tetrameles nudiflora* in forest, 29/01/2023, 2023–1645 (BUBH); N26°47.400′, E90°19.178′, Elev. 181 m, on the bark of *Tetrameles nudiflora* in forest, 29/01/2023, 2023–1646 (BUBH); coll. Pungbili Islary.

2. *Pyxine coralligera* Malme in Bih. Kongl. Sven. Vetensk-Akad. Hand. Afd. 3, 23(13):40. 1897.

Thallus foliose, corticolous, to 6 cm across, lobes 1 mm wide, heteromerous, upper side grey, lower side creamy brown, corticated on both sides, rhizines concolorous to lower thallus and black, isidia cylindrical to clavate, apically crateriform producing granular soredia. Medulla white, K –, C –, P + yellow orange. Apothecia not seen. Chemistry: Thallus K + yellow, P + yellow, C –, UV –; TLC: Atranorin and norstictic acid.

Distribution: India (Andaman & Nicobar Islands, Assam, Kerala, Manipur), Australia, Brazil, China, Colombia, Costa Rica, East Africa, El Salvador, Ethiopia, Kenya, Papua New Guinea, Peru, Réunion, Rwanda, Seychelles, Sri Lanka, Tanzania, Thailand, Tropical America, Venezuela.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.392′, E90°15.888′, Elev. 168 m, on the bark of *Ficus* sp. in forest, 02/04/2022, 2022–0419 (BUBH); **Labanyapur**, N26°47.910′, E90°18.768′, Elev. 182 m, on the bark of *Tetrameles nudiflora* in forest, 10/11/2021, 2021–0294 (BUBH); coll. Pungbili Islary.

3. *Pyxine cylindrica* Kashiw. in Bull. Nat. Sci. Mus. Tok. B 3(2): 66. 1977.

Thallus foliose, corticolous, to 4 cm across, lobes 0.8–1.4 mm wide, heteromerous, corticated on both sides, upper side whitish grey, lower side brown, isidia elongate, laminal, cylindrical, maculae linear to sub-reticulate, turning into pseudocyphellae in older parts, rhizines brown to black. Medulla white, K + yellow, P + orange-red, C –.

Apothecia not seen. Chemistry: Thallus K + yellow, P + slightly orange yellow, C –, UV –; TLC: Atranorin and norstictic acid.

Distribution: India (Andaman & Nicobar Islands, Goa, Karnataka, Kerala, Madhya Pradesh), Australia, Chinese Taipei, Malaysia, Papua New Guinea, Philippines, Taiwan, Thailand.

Species examined: INDIA– Assam, Kokrajhar district, **Labanyapur**, N26°47.909′, E90°18.746′, Elev. 179 m, on the bark of *Morus alba* in forest, 10/11/2021, 2021–0334 (BUBH); coll. Pungbili Islary.

4. *Pyxine endochrysina* Nyl., Lich. Japon. 34. 1890.

Thallus foliose, corticolous, heteromerous, corticated on both side, lobes 1.5–2.5 mm wide, upper side grey to brownish grey, isidia laminal to marginal, simple to branched, stout, becoming pustulate, exposing white base, producing white soredia, lower side brown to black rhizines. Medulla orange yellow to ochraceous, P –. Apothecia not seen. Chemistry: Thallus K + yellow, C –, P + light orange, UV –; TLC: Atranorin, norstictic and zeorin.

Distribution: India (Manipur, Kerala), Africa, Australia, Japan, Korea, Russian Federation, Taiwan, Tanzania.

Species examined: INDIA– Assam, Kokrajhar district, **Saralpara,** N26°51.011′, E90°15.517′, Elev. 281 m, on the bark of *Tetrameles nudiflora* on road side, 05/03/2023, 65117 (LWG), 2023–1586 (BUBH); coll. Pungbili Islary.

5. *Pyxine meissnerina* Nyl. in Bull. Soc. Linn. ser. 2, 7:164. 1873.

Thallus foliose, corticolous, to 9 cm across, heteromerous, corticated on both sides, lobes 1–2 mm wide, thick, upper side greyish with persistent agglutinated plaques of pruinose, lacking isidia, soralia marginal to submarginal, linear, yellowish, lower side brown to black rhizines. Medulla yellowish to deep yellow, K –, C –, P –. Apothecia not seen. Chemistry: Thallus K –, C –, P –, UV –; TLC: Triterpenes.

Distribution: India (Assam, Madhya Pradesh, Manipur, Tamil Nadu, Tanzania, Uttar Pradesh, Uttarakhand, West Bengal), Africa, Cambodia, China, Japan, Madagascar, Mauritius, Nepal, Papua New Guinea, Philippines, Sri Lanka.

Species examined: INDIA–, Assam, Kokrajhar district, **Saralpara**, N26°51.010′, E90°15.517′, Elev. 280 m, on the bark of *Tetrameles nudiflora* on road side, 05/03/2023, 65118 (LWG), 2023–1594 (BUBH); coll. Pungbili Islary.

6. *Pyxine retirugella* Nyl. in Ann. Sci. Nat. ser. 4, 11:240. 1859.

Thallus foliose, corticolous, to 3 cm across, lobes 0.7–1.3 mm wide, upper side grey, maculae raised becoming reticulate-pseudocyphellate, soredia laminal, orbicular. Medulla white, K + yellow turning red, C –, P + yellow. Apothecia not seen. Chemistry: Thallus K + yellow turning red, C –, P + slightly orange yellow, UV –; TLC: Atranorin and norstictic acid.

Distribution: India (Andaman & Nicobar Islands, Assam, Goa, Karnataka, Kerala, Madhya Pradesh), Australia, Brazil, Dominica, French Polynesia, Kenya, Nepal, New Caledonia, Papua New Guinea, Philippines, Seychelles, South Africa, Taiwan, Thailand, Tonga, Trinidad & Tobago, United states of America, Vietnam.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.297′, E90°14. 561′, Elev. 174 m, on the bark of *Ficus* sp. in forest, 02/04/2022, 2022–0404 (BUBH); N26°46.230′, E90°15.809′ Elev. 170 m, on the bark of *Ficus* sp. in forest, 02/04/2022, 2022–0403 (BUBH); coll. Pungbili Islary.

12. PHYSCIACEAE Zahlbr. in Engler, Syl. Edn 2, 46. 1898.

About 8 genera and 106 species in India; 6 genera and 14 species in Assam; 3 genera and 8 species reported from the present study.

Key to the genera

1a. Upper cortex K –…..…….……..…...…..**2. *Phaeophyscia***

1b. Upper cortex K + yellow……...……..……..…...…2

2a. Thallus non-pruinose, rhizines black……...……...**1. *Heterodermia***

2b. Thallus slightly pruinose, rhizines mostly paler…..……...**3. *Physcia***

1. *Heterodermia* Trevis**.** in Atti. Soc. Ital. Sci. Nat. 11:613. 1868.

Key to the species

1a. Thallus corticated only on upper side…….……..…….2
1b. Thallus corticated on both sides……..…….3

2a. Upper side with concolorous cilia, lobes spathulate…...……..**2. *H. comosa***
2b. Upper side lacking cilia, lobes adnate to suborbicular……**5. *H. incana***

3a. Thallus with sorediate, soralia capitate to labriform on main and lateral lobes, …….…….……..**6. *H. speciosa***
3b. Thallus lacking sorediate……..4

4a. Margins with subisidial lobules…….....……..**4. *H. dissecta***
4b. Margins without subisidial lobules……...5

5a. Medulla yellow-ochraceous, P + deep yellow.....……..**1. *H. albidiflava***
5b. Medulla white, P + pale yellow…….....…….……...**3. *H. diademata***

1. *Heterodermia albidiflava* (Kurok.) Awasthi in Geophytology 3(1):113. 1973. *Anaptychia albidiflava* Kurok. in Nova Hedwigia 6:42. 1962.

Thallus foliose, corticolous, green to greenish grey, to 6 cm across, heteromerous, corticated on both sides, lobes sublinear to 2 mm wide, upper side grey, lacking isidia and soredia, lower side dark, rhizinate. Medulla yellow, K + red, C –, P + deep yellow. Ascomata apothecia, laminal, sessile, substipitate, lecanorine, cortex of receptacle I + violet blue. Asci 8-spored, ascospores 2-celled, thick walled, (*Pachysporaria*-type), 25–32 × 11–13 µm, without sporoblastidia. Chemistry: Thallus K + olive yellow, C –, P + orange, UV –; TLC: Atranorin and zeorin.

Distribution: India (Assam, Himachal Pradesh, Madhya Pradesh, Sikkim, West Bengal).
Species examined: INDIA– Assam, Kokrajhar district, **Saralpara**, N26°51.051′, E90°16.449′, Elev. 260 m, on the bark of *Magnolia champaca* on road side, 14/03/2023, 2023–1584 (BUBH); coll. Pungbili Islary.

2. *Heterodermia comosa* (Eschw.) Follmann & Redón in Willdenowia 6(3):446. 1972. *Parmelia comosa* Eschw. in Martius *et al*., Icon. Plant. Crypt. 2:25. 1834.

Thallus foliose, corticolous, to 6 cm across, lobes suberect, spathulate, to 4–6 mm wide at apices, heteromerous, corticated only on upper side, upper side whitish grey, with dense concolorous cilia, lower side ochraceous, veined. Medulla white, K + yellow, C –, P –. Apothecia not seen. Chemistry: Thallus K + yellow, C –, P + orange, UV –; TLC: Atranorin and zeorin.

Distribution: India (Karnataka, Kerala, Manipur, Nagaland, Sikkim, Tamil Nadu, Uttarakhand, West Bengal), Africa, Argentina, Australia, Bhutan, Bolivia, Chinese Taipei, Mexico, Nepal, Papua New Guinea, Paraguay, Sri Lanka, Thailand, USA.
Species examined: INDIA– Assam, Kokrajhar district, **Saralpara**, N26°49.941′, E90°15.568′, Elev. 240 m, on the bark of *Magnolia champaca* on road side, 05/03/2023, 2023–1509 (BUBH); N26°51.289′, E90°15.755′, Elev. 287 m, on the bark of *Elaeocarpus* sp. on road side, 05/03/2023, 2023–1504 (BUBH); coll. Pungbili Islary.

3. *Heterodermia diademata* (Taylor) Awasthi in Geophytology 3:113. 1973. *Parmelia diademata* Taylor in Lond. J. Bot. 6:165. 1847.

Thallus foliose, corticolous, heteromerous, to 15 cm across, corticated on both sides, branched, lacking isidia and soredia, upper side grey and lower side creamy to sordid brown, concolorous with sparse rhizines. Ascomata apothecia, lecanorine, numerous, disc brown. Medulla white, K + yellow, C –, P + yellow. Asci 8-spored, ascospores brown, 2-celled, (*Pachysporaria*-type) thick wall, 22–30 × 10–17 µm. Chemistry: Thallus K + yellow, C –, P + yellow, UV –; TLC: Atranorin and zeorin.

Distribution: India (Arunachal Pradesh, Assam, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Nagaland, Rajasthan, Sikkim, Tamil Nadu, Uttarakhand, West Bengal), Africa, Argentina, Australia, Brazil, Bhutan, Bolivia, China, Ethiopia, Japan, Kenya, Korea, Mexico, Nepal, Sri Lanka, Tanzania, Uruguay, USA.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°45′53.46″, E90°17′22.97″, Elev. 178 m, on the bark of dry wood in forest, 26/02/2020, 2020–0279

(BUBH); N26°47.693′, E90°17.819′, Elev. 187 m, on the bark of *Morus alba* on road side, 02/04/2023, 2023–1554 (BUBH); **Labanyapur**, N26°47.911′, E90°18.750′, Elev. 181 m, on the bark of *Tetrameles nudiflora* in forest, 10/11/2021, 2021–0287 (BUBH); **Saralpara**, N26°50.780′, E90°16.516′, Elev. 260 m, on the bark of *Terminalia* sp. on road side, 14/03/2023, 65095 (LWG); N26°51.051′, E90°16.449′, Elev. 260 m, on the bark of *Magnolia champaca* on road side, 14/03/2023, 65096 (LWG); coll. Pungbili Islary.

4. *Heterodermia dissecta* (Kurok.) Awasthi in Geophytology 3:113. 1973. *Anaptychia dissecta* Kurok. in J. Jap. Bot. 34:182. 1959.

Thallus foliose, corticolous, heteromerous, up to 9 cm across, branched, lobes linear to 2 mm wide, corticated on both sides, upper side greyish, margins microphyllous with subisidial lobules, lacking soredia, lower side creamy white, rhizines on lower side. Medulla white, K + yellow to reddish, C –, P + deep yellow. Apothecia not seen. Chemistry: Thallus K + olive yellow, C –, P + yellowish orange, UV –; TLC: Atranorin and zeorin.

Distribution: India (Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Manipur, Nagaland, Sikkim, Tamil Nadu, Uttarakhand, West Bengal), Australia, Central America, China, Costa Rica, Honshu, Japan, Nepal, Réunion, Thailand, Taiwan.
Species examined: INDIA– Assam, Kokrajhar district, **Saralpara**, N26°51.021′, E90°14.680′, Elev. 260 m, on the bark of *Tetrameles nudiflora* on road side, 05/01/2021, 2021–0417 (BUBH); coll. Pungbili Islary.

5. *Heterodermia incana* (Stirt.) Awasthi in Geophytology 3(1):114. 1973. *Physcia incana* Stirt. in Proc. Roy. Phill. Soc. Glasgow 11:322. 1879.

Thallus foliose, corticolous, heteromerous, to 6 cm across, dichotomously branched, corticated on upper sides, lacking isidiate and sorediate, upper side grey, lower side white, veined, with marginal rhizines. Ascomata apothecia, pedicellate, to 7 mm diam., lecanorine, disc black and pruinose, margin lacinulate. Medulla white, K + yellow, C –, P + yellow. Asci 8-spored, ascospores hyaline, 2-celled, with 2−3 sporoblastidia in each lumina, thick wall (*Pachysporaria*-type), 33−40 × 18−23 µm. Chemistry: Thallus K + yellow, C –, P + yellow, UV –; TLC: Atranorin, norstictic acid and zeorin.

Distribution: India (Assam, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Maharashtra, Manipur, Meghalaya, Nagaland, Sikkim, Tamil Nadu, Uttarakhand, West Bengal), Bhutan, China, Fiji, Indonesia, Nepal, Philippines, South Africa, Sri Lanka, Thailand, Taiwan.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°45′59.04″, E90°11′31.54″, Elev. 190 m, on the bark of *Semecarpus anacardium* in forest, 13/12/2019, 2019–0278 (BUBH); coll. Pungbili Islary.

6. *Heterodermia speciosa* (Wulfen) Trevis. in Att. Soc. Ital. Sci. Nat. 11:614. 1868. *Lichen speciosus* Wulfen in Jacquin, Colln. Bot. Chem. Hist. Nat. 3:119. 1789.

Thallus foliose, corticolous, greenish grey, attached by basal part, lobes suberect, spathulate, to 4–8 mm wide at apices, corticated only on upper side, upper side whitish grey with dense, concolorous cilia, lower side ochraceous, veined. Medulla white, K + yellow, C –, P –. Apothecia not seen. Chemistry: Thallus K + yellow, C –, P + yellowish orange, UV –; TLC: Atranorin and zeorin.

Distribution: India (Arunachal Pradesh, Assam, Himachal Pradesh, Kerala, Madhya Pradesh, Maharashtra, Manipur, Nagaland, Sikkim, Tamil Nadu, Uttarakhand, West Bengal), Africa, China, France, Japan, Nepal, Norway, Spain, Sweden, Taiwan, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°45′55.74″, E90°17′30.01″, Elev. 161 m, on the bark of *Stereospermum chelonoides* in forest, 26/02/2020, 63310 (LWG), 2020–0346 (BUBH); coll. Pungbili Islary.

2. *Phaeophyscia* Moberg in Sym. Bot. Upsal. 22(1):29. 1977.

1. *Phaeophyscia endococcina* (Körb.) Moberg in Sym. Bot. Upsal. 22(1):35. 1977. *Parmelia endococcina* Körb., Parerga Lichenol. 1:36. 1865.

Thallus foliose, corticolous, loosely adnate, heteromerous, corticated, lobes 0.5–1.3 mm wide, radiating, lacking isidia and soredia, upper side grey, lower side black, rhizinate, medulla orange-red in lower part, K + deep purple. Ascomata apothecia, round, lecanorine, laminal, mostly rhizinate at base (coronate), 0.5–1 mm diam., hymenium and hypothecium colourless, epihymenium brown. Asci 8-spored, ascospores brown, 2-

celled, thick-wall (*Physcia*-type), 20–26 × 9–12 µm. Chemistry: Thallus K –, C –, P –, UV –; TLC: Skyrin and zeorin.

Distribution: India (Arunachal Pradesh, Assam, Himachal Pradesh, Jammu & Kashmir, Maharashtra, Sikkim, Uttarakhand), Antarctica, Austria, Finland, France, Iceland, Nepal, Norway, Russian Federation, Sweden, Switzerland, United Kingdom of Great Britain and Northern Ireland.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°51.008′, E90°14.608′, Elev. 261 m, on the bark of *Tetrameles nudiflora* in forest, 05/01/2021, 63363 (LWG), 2021–1287 (BUBH); coll. Pungbili Islary.

3. *Physcia* (Schreb.) Michx., Flora. Boreali-Amer. 2: 326. 1803.

1. *Physcia stellaris* (Linn.) Nyl. in Bot. Notiser (10-11):155. 1853. *Lichen stellaris* Linn., Sp. Plant. 2:1144. 1753.

Thallus foliose, corticolous, to 5 cm across, lobes upto 3 mm wide, heteromerous, corticated on both sides, without isidia and soredia, upper side grey, lacking maculae, lower side pale brown, with concolorous rhizines, lower cortex prosoplectenchymatous. Medulla white, K –. Ascomata apothecia, laminal, to 3 mm diam. Asci 8-spored, ascospores brown, 2-celled, 16–22 × 6–9 µm. Thallus K + yellow, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Himachal Pradesh, Jammu & Kashmir, Karnataka, Uttarakhand), Africa, Europe, France, Japan, Nepal, New Zealand, Sri Lanka, Sweden, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Saralpara,** N26°51.289′, E90°15.755′, Elev. 287 m, on the bark of *Elaeocarpus* sp. on road side, 05/03/2023, 2023–1500 (BUBH); N26°50.343′, E90°16.242′, Elev. 253 m, on the bark of *Magnolia champaca* on road side, 05/03/2023, 2023–1510 (BUBH); coll. Pungbili Islary.

13. DIPLOSCHISTACEAE Zahlbr. in Engler & Prantl, Nat. Pflanz. 1:121. 1905.

About 21 genera and 136 species in India; 9 genera and 22 species in Assam; 4 genera and 22 species reported from the present study.

Key to the genera

1a. Ascomata mazaediod……..……...**2. *Nadvornikia***
1b. Ascomata not in mazaediod…….……..…2

2a. Columella absent……..…**1. *Myriotrema***
2b. Columella variable…….……..3

35a. Columella finger like to plug-shaped, rarely becoming irregular, broad stump-shaped (if present)…….…… ……..…**3. *Ocellularia***
35b. Columella lobate to reticulate, fissured……..**4. *Rhabdodiscus***

1. *Myriotrema* Fée, Essai La Crypt. 103. 1825.

Key to the species

1a. Ascospores submuriform, 15–27 × 8–10 µm…..……...**1. *M. classicum***
1b. Ascospores transversely septate, 11–18 × 6–9 µm…….…...**2. *M. olivaceum***

1. *Myriotrema classicum* Lücking in Phytotaxa 55:92. 2012. (Plate 47D)

Thallus crustose, corticolous, olivaceous-grey, smooth to uneven, dense prosoplectenchymatous cortex. Photobiont layer and medulla with calcium oxalate crystals. Ascomata apothecia, immersed, rounded, 0.3–0.5 mm diam., disc narrow, 0.1–0.2 mm wide pore, invisible, margin entire, fused, yellow-white rim around pore. Columella absent, excipulum colourless, hymenium clear, periphysoids absent, paraphyses simple. Asci 8-spored, ascospores hyaline, ellipsoid, submuriform with 3-transverse and 0–1-longitudinal septa per segment with thick septa and lens-shaped lumina, 15–27 × 8–10 µm, I + violet blue. Chemistry: Thallus K + yellow, C –, P + olive yellow, UV –; TLC: Psoromic and olivaceic acid.

Distribution: Costa Rica, Guyana, Thailand.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°45.54′, E90°18.23′, Elev. 145 m, on the bark of *Magnolia champaca* in forest, 16/12/2022, 2022–1321 (BUBH); coll. Pungbili Islary.

2. *Myriotrema olivaceum* Fée, Essai La Crypt. 103. 1824. (Plate 47E)

Thallus crustose, corticolous, olive green to green, smooth to uneven, dense prosoplectenchymatus cortex. Photobiont layer and medulla with calcium oxalate crystals. Ascomata apothecia, immersed, rounded, 0.2–0.3 mm diam., disc narrow, 0.05–0.2 mm wide pore, invisible, margin entire, white, splitting between thallus and proper margin. Columella absent, excipulum colourless, hymenium clear, periphysoids absent, paraphyses simple. Asci 8-spored, ascospores hyaline, ellipsoid with thick septa and lens-shaped lumina, 11–18 × 6–9 µm, I + violet blue. Chemistry: Thallus K + orange yellow, C –, P + olive yellow, UV –; TLC: Olivaceic acid.

Distribution: India (Andaman & Nicobar Islands), Australia, Belize, Brazil, Cameroon, Colombia, Dominica, France, Fiji, French Guiana, Indonesia, Jamaica, Malaysia, New Caledonia, Papua New Guinea, Philippines, Saint Kitts & Nevis, Saint Lucia, Solomon Islands, Sri Lanka, Tanzania, Thailand, Trinidad & Tobago, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.330′, E90°16.778′, Elev. 178 m, on the bark of *Syzygium formosum* in forest, 10/10/2020, 2020–1019 (BUBH); coll. Pungbili Islary.

2. *Nadvornikia* Tibell in Nova Hedwigia 79:672. 1984.

1. *Nadvornikia hawaiensis* (Tuck.) Tibell in Nova Hedwigia 79:672. 1984. *Acolium hawaiense* Tuck. in Proc. Amer. Acad. Art. & Sci. 7:232. 1868.

Thallus crustose, corticolous, white, spongy, glossy, smooth to uneven. Photobiont layer and medulla with dense calcium oxalate crystals. Ascomata apothecia, emergent, rounded, mazaediate, 0.8–1.8 mm diam., disc exposed, appearing black and powdery due to accumulation of ascospores, margin entire to fissured and layer appearing coronate, fused to partially free apically. Columella absent, excipulum paraplectenchymatous, colourless, hymenium disintegrating, periphysoids absent, paraphyses simple. Asci 8-spored later expelled and accumulating above asci, ascospores dark brown, transversely1-septate, oval to ellipsoid, with thick septa and wall, 6–10 × 3–5 µm. Chemistry: Thallus K + yellow, C –, P + light brown, UV –; TLC: Constictic and protocetraric acid.

Distribution: India (Andaman & Nicobar Islands, Karnataka), Australia, Brazil, Costa-Rica, Cuba, Hawaii, New Caledonia, Papua New Guinea, Thailand, Venezuela.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.135′, E90°17.149′, Elev. 161 m, on the bark of *Mesua ferrea* in forest, 26/07/2020, 63322 (LWG), 2020–0093 (BUBH); coll. Pungbili Islary.

3. *Ocellularia* Mey., Nebenst. Beschaef. Geb. Pflanz. 1:327. 1825.

Key to the species

1a. Columella absent……...……...2
1b. Columella present……...……..5

2a. Ascospores transversely septate……...……3
2b. Ascospores submuriform to muriform.……...……...……**2. *O. andamanica***

3a. Psoromic acid present……...**3. *O. calvescens***
3b. Psoromic acid absent……4

4a. Hypoprotocetraric acid present.…….……**7. *O. neopertusariiformis***
4b. Hypoprotocetraric acid absent.....**8. *O. subgranulosa***

5a. Ascospores submuriform to muriform.……...……..6
5b. Ascospores transversely septate…….....7

6a. Psoromic acid present. Ascospores 20–40 × 7–11 µm……...**4. *O. conformis***
6b. Protocetraric acid present. Ascospores 15–40 × 7–13 µm..…..…**10. *O. thelotremoides***

7a. Ascospores > 40 µm long…...……...……...…….....8
7b. Ascospores 10–40 µm long……...……...……...…….....9

8a. Secondary substances absent. Ascospores 110–125 × 15–20 µm..……**11. *O. upretii***
8b. Secondary substances present. Ascospores 50–200 × 10–18 µm…..**1. *O. allosporoides***

9a. Secondary substances absent…...……..**13. *O. wandoorensis***
9b. Secondary substances present…...…….10

10a. Psoromic acid present……...……...…….11
10b. Psoromic acid absent…….……...……..…..12

11a. Columella and excipulum carbonized apically to upper half. Pore surrounded by black, white-pruinose rim. Ascospores 15–25 × 5–7 µm.……**6. *O. garoana***

11b. Columella and excipulum carbonized completely. Pore surrounded by yellowish rim. Ascospores 15–30 × 7–10 µm.....……...……..**9. *O. terebrata***

12a. Hirtifructic acid present. Ascospores 29–38 × 6–9 µm…….....**5. *O. diacida***

12b. Hirtifructic acid absent. Ascospores 21–24 × 5–7 µm...……..**12. *O. violacea***

1. *Ocellularia allosporoides* (Nyl.) Patw. & Kulk. in Kavaka 5:5. 1977. *Thelotrema allosporoides* Nyl. in Bull. Soc. Linn. ser. 2, 7:167. 1873.

Thallus crustose, corticolous, green, glossy, smooth, corticated. Photobiont layer and medulla with dense calcium oxalate crystals. Ascomata apothecia, erumpent, covered by thalline layer, pore 0.3–0.5 mm diam. Columella entire, with pruinose, carbonized, excipulum brown to carbonized, hymenium clear, paraphyses simple. Asci 8-spored, ascospores hyaline, oblong to fusiform, transversely 13–20-septate, 94–163 × 10–15 µm, I + violet blue (amyloid). Chemistry: Thallus K + pale yellow, C –, P –, UV –; TLC: Norisonotatic and norsubnotatic acid.

Distribution: India (Andaman & Nicobar Islands, Assam, Maharashtra, Karnataka, Kerala, Meghalaya), New Zealand, Philippines, Thailand, Vietnam.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.281′, E90°17.152′, Elev. 181 m, on the bark of *Semecarpus anacardium* in forest, 26/07/2020, 2020–1260 (BUBH); N26°46.075′, E90°18.244′, Elev. 172 m, on the bark of *Vatica lanceaefolia* in forest, 12/08/2022, 63331 (LWG), 2020–1245 (BUBH); N26°46.074′, E90°18.134′, Elev. 189 m, on the bark of *Vatica lanceaefolia* in forest, 05/12/2020, 2020–1249 (BUBH); coll. Pungbili Islary.

2. *Ocellularia andamanica* (Nyl.) Matsumoto & Dequchi in Bryologist 102(1):89. 1999. *Thelotrema andamanicum* Nyl. in Bull. Soc. Linn. ser. 2, 7:167. 1873. (Plate 48A)

Thallus crustose, corticolous, pale grey to greenish grey, slightly glossy, smooth, continuous to verruculose. Ascomata apothecia, inconspicuous, round, immersed to emergent, 0.1–0.3 mm wide pore. Columella absent or sometimes rarely developed, excipulum non carbonized, hymenium clear, paraphyses simple. Asci 6–8-spored,

ascospores hyaline, submuriform, subglobose to ovoid, becomes brown when maturity, 25–40 × 10–15 µm, I + violet blue (amyloid). Chemistry: Thallus K + pale yellow, C –, P + yellow, UV –; TLC: Psoromic acid.

Distribution: India (Andaman & Nicobar Islands, Western Ghats), Japan, Philippines, Sri Lanka.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.253′, E90°16.842′, Elev. 139 m, on the bark of *Garcinia* sp. in forest, 10/10/2020, 63325 (LWG), 2020– 1251 (BUBH); N26°45′59.00″, E90°17′34.27″, Elev. 165 m, on the bark of *Cinnamomum glaucescens* in forest, 13/12/2019, 2019–1265 (BUBH); coll. Pungbili Islary.

3. *Ocellularia calvescens* (Fée) Müll. Arg. in Mem. Soc. Phys. Hist. Nat. 29(8):8. 1887. *Thelotrema calvescens* Fée, Essai Les Crypt. 89. 1825.

Thallus crustose, corticolous, whitish grey, smooth to uneven with black carbonized margin, with dense prosoplectenchymatous cortex. Photobiont layer with clusters of calcium oxalate crystals. Ascomata apothecia, disc opening by pore, covered by thalline layer, narrow, erumpent, rounded, 0.5–0.7 mm diam., singular mostly and sometimes confluent, 0.1–0.2 mm wide pore, invisible, annulate margin. Columella absent, excipulum carbonized, hymenium clear, paraphyses simple, periphysoids absent. Asci 8-spored, ascospores ellipsoid, hyaline, transversely 5–7-septate, with thick septa and lumina lens-shaped, 15–24 × 6–8 µm, I + violet blue (amyloid). Chemistry: Thallus K + pale yellow, C –, P + yellow, UV –; TLC: Psoromic acid.

Distribution: Brazil, Costa Rica, Panama, Peru.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.303′, E90°17.023′, Elev. 191 m, on the bark of *Macaranga denticulata* in forest, 10/10/2020, 20-035705 (LWG), 2020–1262 (BUBH); coll. Pungbili Islary.

4. *Ocellularia conformis* (Fée) Hale in Mycotaxon 11(1):136. 1980. *Thelotrema conforme* Fée, Essai Sur Les Crypt. Révis. 89. 1837.

Thallus crustose, corticolous, olivaceous grey, glossy, smooth to uneven, with dense, prosoplectenchymatous cortex. Photobiont layer with clusters of calcium oxalate crystals.

Ascomata apothecia, erumpent, rounded, 0.6–1.0 mm diam., disc covered by narrow, filled by brown-black, white-pruinose columella, margin entire, yellow-white, laterally covered by thalline layer. Columella simple, carbonized, excipulum apically carbonized, hymenium clear, paraphyses simple. Asci 6-spored, ascospores ellipsoid, with thick septa, lumina rounded, 20–32 × 10–13 µm, I + violet blue (amyloid). Chemistry: Thallus K + yellowish, C –, P + yellow, UV –; TLC: Psoromic acid.

Distribution: India (Assam), Costa Rica, Panama, Thailand, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.316′, E90°17.163′, Elev. 173 m, on the bark of *Syzygium cumini* in forest, 22/07/2020, 2020–1261 (BUBH); N26°46.077′, E90°17.080′, Elev. 170 m, *Ilex odorata* in forest, 24/11/2020, 63328 (LWG), 2020–1257 (BUBH); coll. Pungbili Islary.

5. *Ocellularia diacida* Hale in Mycotaxon 7(2):378. 1978. (Plate 48B)

Thallus crustose, corticolous, grey to greenish grey, dull to glossy, whitish to pale orange medulla. Ascomata apothecia, rounded, immersed to emergent, 0.5–0.8 mm diam. Columella carbonized, excipulum apically carbonized, hymenium inspersed, paraphyses simple. Asci 8-spored, ascospores hyaline, transversely 5–7-septate, lens-shaped lumina, 29–38 × 7–9 µm, I + violet blue (amyloid). Chemistry: Thallus K + yellowish, C –, P + yellow, UV –; TLC: Hirtifructic acid.

Distribution: India (Karnataka), Australia, Thailand, Sri Lanka.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°45′59.95″, E90°17′42.40″, Elev. 172 m, on the bark of *Semecarpus anacardium* in forest, 13/12/2019, 2019–1250 (BUBH); N26°46.004′, E90°17.389′, Elev. 159 m, on the bark of *Mesua ferrea* in forest, 24/11/2020, 2020–1258 (BUBH); N26°46.108′, E90°17.084′, Elev. 159 m, on the bark of *Ilex odorata* in forest, 03/10/2020, 2020–1272 (BUBH); N26°46.195′, E90°17.382′, Elev. 225 m, on the bark of *Magnolia hodgsonii* in forest, 03/10/2020, 2020–1540 (BUBH); N26°46.232′, E90°16.931′, Elev. 167 m, on the bark of *Machilus gamblei* in forest, 03/10/2020, 2020–1544 (BUBH); N26°45.974′, E90°16.970′, Elev. 165 m, on the bark of *Mesua ferrea* in forest, 12/08/2022, 63324 (LWG); 2020–1244 (BUBH); N26°46′11.05″, E90°17′23.48″, Elev. 173 m, on the bark of *Machilus gamblei* in forest, 22/12/2019, 2019–1271 (BUBH); N26°46′01.43″, E90°18′33.77″,

Elev. 173 m, on the bark of *Mesua ferrea* in forest, 04/03/2020, 2020–1270 (BUBH); N26°46.194′, E90°17.384′, Elev. 158 m, on the bark of *Magnolia* sp. in forest, 14/07/2020, 2020–1248 (BUBH); **Labanyapur**, N26°46.204′, E90°19.436′, Elev. 164 m, on the bark of *Areca catechu* in village, 25/01/2021, 2021–1252 (BUBH); coll. Pungbili Islary.

6. *Ocellularia garoana* Patw. & Nagarkar in Biovigyanam 6(1):7. 1980.

Thallus crustose, corticolous, grey to greenish grey. Photobiont and medulla layer with clusters of calcium oxalate crystals. Ascomata apothecia, rounded, semi-emergent to emergent, pores surrounded by black, whitish-pruinose rims. Columella entire, carbonized, excipulum apically carbonized, hymenium clear, paraphyses simple. Asci 8-spored, ascospores hyaline, ellipsoid, transversely 5–9-septate, lens-shaped lumina, 15–25 × 5–7 µm, I + violet blue (amyloid). Chemistry: Thallus K + yellowish, C –, P + yellow, UV –; TLC: Psoromic acid.

Distribution: India (Assam, Karnataka, Meghalaya), Fiji, Peru, Thailand.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.123′, E90°17.323′, Elev. 159 m, on the bark of *Ilex odorata* in forest, 14/07/2020, 63330 (LWG); **Labanyapur**, N26°47.549′, E90°19.262′, Elev. 178 m, on the bark of *Stereospermum chelonoides* in forest, 10/11/2021, 2021–0518 (BUBH); coll. Pungbili Islary.

7. *Ocellularia neopertusariiformis* Hale in Bull. Br. Mus. Nat. Hist. Bot. 8(3):315. 1981.

Thallus crustose, corticolous, corticated, whitish grey, glossy, smooth. Ascomata apothecia, solitary, sessile, erumpent, 0.8–2.2 mm diam., constricted, covered by thalline layer. Columella absent, excipulum apically carbonized, hymenium clear, paraphyses simple. Asci 8-spored, ascospores hyaline, oblong-fusiform, transversely 24–35-septate, 88–270 × 14–40 µm, I + violet blue (amyloid) with acute or slightly appendiculate ends. Chemistry: Thallus K + yellow, C –, P + yellowish, UV –; TLC: Hypoprotocetraric acid.

Distribution: India (Assam, Arunachal Pradesh), Australia, Malaysia, Sri Lanka, Thailand, Vietnam.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46′03.02″, E90°17′33.60″, Elev. 176 m, on the bark of *Syzygium formosum* in forest, 21/12/2019, 2019–1266 (BUBH); N26°46.072′, E90°18.190′, Elev. 179 m, on the bark of *Semecarpus anacardium* in forest, 05/12/2020, 2020–1268 (BUBH); N26°45.920′, E90°16.916′, Elev. 159 m, on the bark of *Syzygium formosum* in forest, 27/10/2020, 2020–1267 (BUBH); N26°46.072′, E90°18.173′, Elev. 167 m, on the bark of *Vatica lanceaefolia* in forest, 05/12/2020, 2020–1259 (BUBH); N26°46.055′, E90°17.559′, Elev. 187 m, on the bark of *Syzygium formosum* in forest, 16/10/2020, 2020–1274 (BUBH); N26°46.019′, E90°17.475′, Elev. 182 m, on the bark of *Syzygium formosum* in forest, 24/11/2020, 2020–1273 (BUBH); N26°46.081′, E90°18.234′, Elev. 166 m, on the bark of *Semecarpus anacardium* in forest, 05/12/2020, 2020–1247 (BUBH); N26°46.077′, E90°18.233′, Elev. 156 m, on the bark of *Ilex odorata* in forest, 05/12/2020, 2020–1256 (BUBH); N26°46.065′, E90°18.235′, Elev. 178 m, on the bark of *Vatica lanceaefolia* in forest, 05/12/2020, 2020–1255 (BUBH); N26°46.084′, E90°18.226′, Elev. 209 m, on the bark of *Vatica lanceaefolia* in forest 05/12/2020, 2020–0659 (BUBH); N26°49.21′, E90°17.43′, Elev. 242 m, on the bark of *Aglaia spectabilis* in forest, 02/04/2023, 2023–1564 (BUBH); coll. Pungbili Islary.

8. *Ocellularia subgranulosa* (Homchant. & Coppins) Lumbsch & Papong, in Lichenologist 42(2):133. 2010. *Myriotrema subgranulosum* Homchant. & Coppins in Lichenologist 34(2):117. 2002.

Thallus crustose, corticolous, pale olivaceous-brown to greyish brown, dull, areolate, verrucose to warty. Ascomata apothecia, semi-emergent, 0.4–0.8 mm diam. Photobiont and medulla layer with clusters of calcium oxalate crystals. Columella absent, excipulum apically carbonized, hymenium clear, paraphyses simple. Asci 2-spored, ascospores hyaline, transversely 10–12-septate, 100–120 × 10–20 μm, I + violet blue. Chemistry: Thallus K + pale yellow, C –, P –, UV –; TLC: Norisonotatic and norsubnotatic acids.

Distribution: India **(**Arunachal Pradesh, Assam), Thailand.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°45′46.29″, E90°16′55.95″, Elev. 173 m, on the bark of *Syzygium cumini* in forest, 26/02/2020, 63323 (LWG); coll. Pungbili Islary.

9. *Ocellularia terebrata* (Ach.) Müll. Arg. in Flora 70:398. 1887. *Thelotrema terebratum* Ach. in Kungl. Svenska Vetenskap. Hand. 33:88. 1812. (Plate 48C)

Thallus crustose, corticolous, greyish to light olivaceous-yellow uneven, prosoplectenchymatous cortex. Ascomata apothecia, erumpent, rounded, 0.1–0.2 mm wide pore. Columella with white-pruinose, irregular, carbonized, excipulum carbonized, hymenium clear, paraphyses simple. Asci 8-spored, ascospores ellipsoid, hyaline, transversely 5–8 septate, lens-shaped lumina, 15–22 × 6–10 µm, I + violet blue (amyloid). Chemistry: Thallus K + slightly brownish, C –, P + yellow, UV –; TLC: Psoromic acid.

Distribution: India (Andaman & Nicobar Islands, Western Ghats), Australia, Brazil, Cameroon, Colombia, Costa Rica, El Salvador, French Guiana, New Caledonia, Papua New Guinea, Philippines, Thailand, USA, Venezuela.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.176′, E90°17.371′, Elev. 133 m, on the bark of *Semecarpus anacardium* in forest, 22/07/2020, 63332 (LWG), 2020– 1263 (BUBH); coll. Pungbili Islary.

10. *Ocellularia thelotremoides* (Leight.) Zahlbr., Cat. Lich. Univ. 2:603. 1924. *Ascidium thelotremoides* Leight. in Trans. Linn. Soc. Lond. 27(2):170. 1869.

Thallus crustose, corticolous, olivaceous-green to olive yellow, corticated. Ascomata apothecia, immersed to strongly emergent. Columella carbonized, confined apically, excipulum slightly carbonized at apices, hymenium clear, paraphyses simple. Asci 8-spored, ascospores hyaline, muriform, 6–10 × 1–4 locular, 17–28 × 8–12 µm, I + violet blue (amyloid). Chemistry: Thallus K + yellow, C –, P + orange yellow, UV –; TLC: Protocetraric acid.

Distribution: India (Kerala, Tamil Nadu), Australia, Malaysia, Papua New Guinea, Sri Lanka, Thailand, Venezuela.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.095′, E90°17.311′, Elev. 179 m, on the bark of *Syzygium* sp. in forest, 14/07/2020, 2020–1579 (BUBH); coll. Pungbili Islary.

11. *Ocellularia upretii* Joshi, Divakar, Lumbsch & Lücking in Lichenologist 50(6):660. 2018.

Thallus crustose, corticolous, corticate, yellowish grey, smooth to uneven or verruculose, glossy, hard, continuous. Ascomata apothecia, numerous, 0.1–0.5 mm diam., dispersed, porinoid, immersed to prominent, round to slightly angular, pore rounded to oval, surrounded by mottled or pale coloured thalline margin. Columella simple, entire, conical, entirely carbonized, apically pruinose, excipulum entire, brown, hymenium clear, paraphyses simple. Asci 8-spored, ascospores hyaline, fusiform, transversely 10–18-septate, 100–120 × 15–23 µm, with thick septa and lens-shaped lumina, I + violet blue (amyloid). Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Assam, Karnataka).

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.075′, E90°18.244′, Elev. 163 m, on the bark of *Vatica lanceaefolia*, 05/12/2020, 63327 (LWG), 2020–1253 (BUBH); N26°46.126′, E90°17.027′, Elev. 161 m, on the bark of *Ilex odorata* in forest, 03/10/2020, 2020–1246 (BUBH); N26°46.225′, E90°17.132′, Elev. 148 m, on the bark of *Neolamarckia cadamba* in forest, 26/07/2020, 2020–1243 (BUBH); N26°46.090′, E90°17.994′, Elev. 168 m, on the bark of *Syzygium formosum* in forest, 06/02/2021, 2021–1254 (BUBH); coll. Pungbili Islary.

12. *Ocellularia violacea* Räsänen in Arch. Soc. Zool. Bot. Fenn. 3:184. 1949. (Plate 48D)

Thallus crustose, corticolous, olive grey, dense paraplectenchymatous cortex. Photobiont layer and medulla with clusters of calcium oxalate crystals. Ascomata apothecia, immersed to semi-emergent, angular-rounded, disc covered by narrow, pore 0.1–0.2 mm wide, filled by brown. Columella with white-pruinose, simple, carbonized, excipulum brown, hymenium clear, paraphyses simple. Asci 8-spored, ascospores ellipsoid, hyaline, transversely 5–6-septate, lens-shaped lumina, 15–25 × 7–8 µm, I + violet blue (amyloid). Chemistry: Thallus K –, C –, P + yellow, UV –; TLC: Protocetraric acid.

Distribution: India (Karnataka, Kerala), Brazil, Colombia, Costa Rica, Cuba, Dominican Republic, Philippines, Thailand.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°45.974′, E90°16.970′, Elev. 140 m, on the bark of *Ilex odorata* in forest, 16/10/2020, 63333 (LWG), 2020–1264 (BUBH); coll. Pungbili Islary.

13. *Ocellularia wandoorensis* Nagarkar, Sethy & Patw. in Mycotaxon 27:78. 1986.

Thallus crustose, corticolous, whitish to greyish-white, corticated. Ascomata apothecia, semi-emergent to emergent, 0.5–1.0 mm diam., pore 0.1–0.2 mm wide. Excipulum carbonized, columella irregularly reticulate, with pruinose, carbonized, hymenium inspersed, paraphyses simple. Asci 8-spored, ascospores hyaline, fusiform, transversely 3-septate, 14–16 × 8–10 µm. Chemistry: Thallus K + olive yellow, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Andaman & Nicobar Islands).

Species examined: INDIA– Assam, Kokrajhar district, **Saralpara**, N26°50.769′, E90°16.510′, Elev. 255 m, on the bark of *Terminalia* sp. on road side, 14/03/2023, 2023–1512 (BUBH); coll. Pungbili Islary.

4. *Rhabdodiscus* Vain. in Ann. Acad. Sci. Fenn. ser. A, 15(6):184. 1921.

Key to the species

1a. Ascospores transversely septate.……..…….2
1b. Ascospores muriform……...3

2a. Ascospores 10–15 × 5–6 µm. Psoromic acid absent…….…….….**4. *R. indicus***
2b. Ascospores 12–20 × 6–7 µm. Psoromic acid present.…….……..**6. *R. subcavatus***

3a. Ascospores hyaline...……...**1**. ***R. asiaticus***
3b. Ascospores brown……...…….4

4a. Columella entire, broad stump-shaped...…….**2. *R. epitrypus***
4b. Columella becoming dissected…….……...….5

5a. Columella forming irregularly radiating strands...……**3. *R. fissus***
5b. Columella forming 3–5 teeth..……...……...**5. *R. marivelensis***

1. *Rhabdodiscus asiaticus* (Vain.) Rivas Plata, Lücking & Lumbsch in Taxon 61(6):1175. 2012. *Thelotrema asiaticum* Vain. in Hedwigia 46:175. 1907.

Thallus crustose, corticolous, corticated, olive, greyish to pale greenish, glossy, smooth. Ascomata apothecia, semi-emergent to emergent, pore 1–2 mm diam. Photobiont layer

and medulla with clusters of calcium oxalate crystals. Columella entirely pruinose, carbonized, excipulum brownish to carbonized, hymenium clear, paraphyses simple. Asci 8-spored, ascospores hyaline, fusiform, transversely septate to submuriform, sometimes pale brownish, 10–19 × 5–7 µm, I + violet blue. Chemistry: Thallus K + yellowish, C –, P + yellow, UV –; TLC: Psoromic acid.

Distribution: India (Andaman & Nicobar Islands, Arunachal Pradesh, Kerala), New Caledonia, Thailand.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.138′, E90°17.358′, Elev. 152 m, on the bark of *Semecarpus anacardium* in forest, 26/07/2020, 2020–0240 (BUBH); N26°45′48.54″, E90°17′04.61″, Elev. 171 m, on the bark of *Ficus* sp. in forest, 21/12/2019, 2019–0239 (BUBH); N26°46.274′, E90°16.812′, Elev. 157 m, on the bark of *Elaeocarpus* sp. in forest, 10/10/2020, 2020–0238 (BUBH); N26°46.225′, E90°17.132′, Elev. 162 m, on the bark of *Neolamarckia cadamba* in forest, 26/07/2020, 63348 (LWG); N26°46.317′, E90°16.782′, Elev. 173 m, on the bark of *Semecarpus anacardium* in forest, 10/10/2020, 2020–1290 (BUBH); N26°45′48.54″, E90°17′04.61″, Elev. 161 m, on the bark of *Ficus* sp. in forest, 21/12/2019, 2019–1289 (BUBH); N26°46.323′, E90°16.783′, Elev. 176 m, on the bark of *Semecarpus anacardium* in forest, 10/10/2020, 2020–1293 (BUBH); N26°45.34′, E90°18.15′, Elev. 142 m, on the bark of *Elaeocarpus* sp. in forest, 19/12/2022, 2022–1370 (BUBH); coll. Pungbili Islary.

2. *Rhabdodiscus epitrypus* (Nyl.) Vain. in Ann. Acad. Sci. Fenn. ser. A, 15(6):184. 1921. *Thelotrema epitrypum* Nyl. in Acta Soc. Sci. Fenn. 7(2):454. 1863.

Thallus crustose, corticolous, greenish grey, smooth, glossy. Ascomata apothecia, emergent, 0.5–1.0 mm wide pore. Photobiont layer and medulla with calcium oxalate crystals. Columella entire, pruina, carbonized, excipulum carbonized, hymenium clear, paraphyses simple. Asci 8-spored, ascospores submuriform, hyaline to brown, 15–20 × 6–8 µm, I + violet blue. Chemistry: Thallus K + yellow, C –, P + yellowish, UV –; TLC: Psoromic acid.

Distribution: India (Andaman & Nicobar Islands, Kerala, Tamil Nadu), Thailand.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.274′, E90°16.812′, Elev. 167 m, on the bark of *Elaeocarpus* sp. & *Semecarpus anacardium* in forest, 10/10/2020, 63349 (LWG), 2020–0235 (BUBH); coll. Pungbili Islary.

3. *Rhabdodiscus fissus* (Müll. Arg.) Vain. in Ann. Acad. Sci. Fenn. ser. A, 15(6):184. 1921. *Leptotrema fissum* Müll. Arg. in Flora 11:258. 1859.

Thallus crustose, corticolous, green, continuous, glossy. Photobiont layer and medulla with calcium oxalate crystals. Ascomata apothecia, erumpent, solitary, 0.5–1.5 mm wide pore, covered by thalline layer. Columella entire to complex, carbonized, excipulum apically carbonized, hymenium clear, paraphyses simple. Asci 8-spored, ascospores pale brown at maturity, muriform, 13–16 × 7–10 µm, I + violet blue. Chemistry: Thallus K + pale yellow, C –, P + yellow, UV –; TLC: Psoromic acid.

Distribution: India (Andaman & Nicobar Islands, Assam, Eastern Himalaya, Western Ghats), Brazil, Colombia, Cuba, Réunion.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.085′, E90°18.226′, Elev. 164 m, on the bark of *Syzygium formosum* in forest, 05/12/2020, 63351 (LWG), 2020–0237 (BUBH); N26°45.785′, E90°16.924′, Elev. 181 m, on the bark of *Semecarpus anacardium* in forest, 27/10/2020, 2020–1292 (BUBH); coll. Pungbili Islary.

4. *Rhabdodiscus indicus* Singh & Singh in Taiwania 58(4):246. 2013. (Plate 50A)

Thallus crustose, corticolous, yellow to yellowish grey, lacking isidia, corticated. Photobiont layer and medulla with calcium oxalate crystals. Ascomata apothecia, numerous, rounded to irregular, disc white-pruinose. Columella reticulate, excipulum brown, hymenium clear, paraphyses simple. Asci 8-spored, ascospores hyaline, transversely 3-septate, 10–13 × 5–6 µm. Chemistry: Thallus K + orange yellow, C –, P + yellow, UV –; TLC: Unknown substances present.

Distribution: India (Arunachal Pradesh).
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°49.21′, E90°17.43′, Elev. 242 m, on the bark of *Aglaia spectabilis* on roadside, 02/04/2023, 2023–1546 (BUBH); coll. Pungbili Islary.

5. *Rhabdodiscus marivelensis* (Vain.) Rivas Plata, Lücking & Lumbsch in Taxon 61(6):1176. 2012. *Thelotrema marivelense* Vain. in Ann. Acad. Sci. Fenn. ser. A, 15(6):176. 1921. (Plate 50B)

Thallus crustose, corticolous, olive green to green, glossy, smooth to verrucose. Photobiont layer and medulla with calcium oxalate crystals. Ascomata apothecia, emergent, 0.5–1.0 mm wide pore. Columella entire, pruinose, carbonized, excipulum carbonized, hymenium clear, paraphyses simple. Asci 8-spored, ascospores hyaline, submuriform to muriform, brownish when maturity, 12–22 × 6–8 µm, I + violet blue (amyloid). Chemistry: Thallus K + brown, C –, P + yellow, UV –; TLC: Psoromic acid.

Distribution: India (Kerala), Fiji, Malaysia, Papua New Guinea, Thailand.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.049′, E90°16.311′, Elev. 181 m, on the bark of *Ilex odorata* 28/10/2020, 63350 (LWG), 2020–0236 (BUBH); coll. Pungbili Islary.

6. *Rhabdodiscus subcavatus* (Nyl.) Rivas Plata, Lücking & Lumbsch in Taxon 61(6):1176. 2012. *Thelotrema subcavatum* Nyl. in Flora 59:561. 1876.

Thallus crustose, corticolous, olivaceous green, smooth, dense prosoplectenchymatous cortex. Photobiont layer and medulla with clusters of calcium oxalate crystals. Ascomata apothecia, prominent, angular to rounded, pore 0.5–0.8 mm wide, solitary, sometimes confluent and fused, flesh-coloured, partly filled by white-pruinose columella, margin entire, brown to black with felty white-pruinose. Columella broad-stump-shaped to fissured, carbonized, excipulum carbonized, hymenium clear, paraphyses simple, periphysoids absent. Asci 8-spored, ascospores ellipsoid, colourless, transversely 3–5-septate, with thick septa, lens-shaped lumina, 12–20 × 6–7 µm, I + violet blue (amyloid). Chemistry: Thallus K + yellowish brown, C –, P + light yellow, UV –; TLC: Psoromic acid.

Distribution: Australia, Brazil, Colombia, Congo, Costa Rica, Cuba, Guyana, Jamaica, Madagascar, Panama, Saint Lucia, Thailand, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.232′, E90°16.931′, Elev. 187 m, on the bark of *Machilus gamblei* in forest, 03/10/2020, 20-035704 (LWG); 2020–1288 (BUBH); coll. Pungbili Islary.

14. FISSURINACEAE Hodk. in Opusc. Philolich. 11:7. 2012.

About 4 genera and 46 species in India; 2 genera and 15 species in Assam; 1 genus and 3 species reported from the present study.

1. *Fissurina* Fée, Essai Crypt. Exot.:59. 1824.

Key to the species

1a. Stictic acid present. Ascospores muriform, 70–78 × 20–25 µm……..…....**2. *F. simplex***
1b. No substances present. Ascospores transversely 3-septate……...……...2

2a. Ascomata 0.5–1.5 mm long. Ascospores 10–13 × 5–7 µm……..…….**3. *F. subnitidula***
2b. Ascomata upto 1 mm long. Ascospores 13–16 × 3–5 µm…….**1. *F. rugosa***

1. *Fissurina rugosa* Knight in Trans. Proc. N.Z. Inst. 16:404. 1883.

Thallus crustose, corticolous, olive green to greenish brown. Ascomata apothecia, lirellate, 0.3–1.0 mm long, semi-immersed to immersed, simple to rarely branched, disc narrow. Excipulum colourless to pale yellow, not distinct at the base, hymenium clear, colourless, 56–82 µm high, paraphyses simple. Asci 8-spored, ascospores ovoid, ellipsoid to globose, outer wall jelly like, hyaline, rarely brownish at maturity, lumina lens-shaped to globose, transversely 3-septate, 19–21 × 6–8 µm, I + reddish. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Tamil Nadu), New Zealand.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.346′, E90°16.769′, Elev. 192 m, on the bark of *Macaranga denticulata* in forest, 10/10/2020, 63297 (LWG), 2020–0327 (BUBH); coll. Pungbili Islary.

2. *Fissurina simplex* Sharma, Khadilkar & Makhija in Lichenologist 44(3):351. 2012.

Thallus crustose, corticolous, greenish, glossy, verrusose, corticated. Ascomata apothecia, lirellate, 0.6–1.4 mm long, simple, straight, somewhat curved, immersed to slightly raised, concolorous with thallus, disc narrow, sunken, non-pruinose. Excipulum entire, non-carbonized, convergent, orange-brown, hymenium clear, colourless, 122–145 µm high, I –, KI –, hypothecium indistinct, paraphyses simple. Asci 1–4-spored, ascospores hyaline, muriform, 70–75 × 20–23 µm, I –. Chemistry: Thallus K + yellow, C –, P + pale yellow, UV –; TLC: Stictic acid.

Distribution: India (Karnataka, Kerala).

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°47.06′, E90°16.10′, Elev. 181 m, on the bark of *Dillenia indica* in forest, 28/11/2022, 2022–1467 (BUBH); coll. Pungbili Islary.

3. *Fissurina subnitidula* (Nyl.) Staiger in Biblthca Lichenol. 85:153. 2002. *Graphis subnitidula* Nyl. in Tuckerman, Syn. Nor. Amer. Lich. 2:123. 1888.

Thallus crustose, corticolous, verrucose, slightly glossy, corticated. Ascomata apothecia, lirellate, 0.5–1.0 mm long, immersed to semi emergent, concolorous with thallus, disc narrow to broad, brown, non-pruinose. Excipulum entire, non-carbonized, brown, convergent, hymenium colourless, clear, 55–70 µm high, I –, K –, hypothecium indistinct, paraphyses simple and branched at tips. Asci 8-spored, ascospores hyaline, transversely 3-septate, 10–15 × 5–7 µm, I –. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Karnataka), Colombia, Congo, Costa Rica, El Salvador, Hong Kong, Puerto Rico, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°41.926′, E90°18.834′, Elev. 113 m, on the bark of *Elaeocarpus* sp. in forest, 08/01/2023, 2023–1469 (BUBH); coll. Pungbili Islary.

15. GRAPHIDACEAE Dumort., Comment. Bot. 69. 1822.

About 16 genera 330 species in India; 14 genera and 152 species in Assam; 10 genera and 45 species reported from the present study.

Key to the genera

1a. Ascocarp black line mazaediate in middle……...…….**10. *Schistophoron***

1b. Ascocarp not black line mazaediate in middle……..2

2a. Lirellae in stroma…..…….……..……..3

2b. Lirellae not in stroma..……..……5

3a. Ascospores hyaline…….……...……**3. *Glyphis***

3b. Ascospores brown……...…….4

4a. Ascospores transversely septate……....……...**8. *Sarcographa***

4b. Ascospores muriform…….……**9. *Sarcographina***

5a. Disc heavily pruinose……..…….…….……**2. *Diorygma***

5b. Disc non-pruinose, slightly pruinose…..……..6

6a. Excipulum carbonized……...……...…….7

6b. Excipulum not carbonized...……..…….……**5. *Hemithecium***

7a. Disc broad ……..…….……...**6. *Leiorreuma***

7b. Disc not broad, slightly broad.…….……..8

8a. Ascocarp robust……..……..……**1. *Allographa***

8b. Ascocarp not robust……..…….……...9

9a. Ascospores hyaline…….……...……**4. *Graphis***

9b. Ascospores brown……....**7. *Phaeographis***

1. *Allographa* Chevall., His. Graphid. 3:4. 1824.

1. *Allographa myolensis* (Aptroot) Lücking & Kalb in Herzogia 31:553. 2018. *Graphis myolensis* Aptroot in Lichenologist 41:437. 2009. (Plate 40B)

Thallus crustose, corticolous, whitish grey. Ascomata apothecia, lirellate, prominent, with basal to lateral thalline margin. Labia entire, non-pruinose, elongate to irregularly branched (*hossei*-morph), disc concealed. Excipulum laterally carbonized, hymenium

clear. Asci 2-spored, ascospores hyaline, muriform, 45–65 × 13–17 µm. Chemistry: Thallus K + pale yellow, C –, P + slightly orange-yellow, UV –; TLC: no substances detected.

Distribution: Australia, Papua New Guinea.

Species examined: INDIA– Assam, Kokrajhar district, **Labanyapur**, N26°47.896′, E90°18.731′, Elev. 178 m, on the bark of *Tetrameles nudiflora* in forest, 10/112021, 2021–0291 (BUBH); **Saralpara**, N26°51.124′, E90°16.350′, Elev. 262 m, on the bark of *Tetrameles nudiflora* in forest, 14/03/2023, 2023–1514 (BUBH); coll. Pungbili Islary.

2. *Diorygma* Eschw., Sys. Lich. 25. 1824.

Key to the species

1a. Disc with red-pruinose…….**3. *D. roseopruinosetum***
1b. Disc with white-pruinose…….....2

2a. Ascospores 82–88 × 26–30 µm……..…….....……..**1. *D. heiroglyphicum***
2b. Ascospores >100 µm long……...…….……....3

3a. Hymenium completely I + blue-violet……...……..**2. *D. junghuhnii***
3b. Hymenium weakly I + blue-violet……...……..**4. *D. soozanum***

1. *Diorygma hieroglyphicum* (Pers.) Staiger & Kalb in Symb. Bot. upsal. 34(1):151. 2004. *Opegrapha hieroglyphica* Pers. in Ann. Wetter. Gesellsch. Ges. Naturk. 2(1):16. 1810.

Thallus crustose, corticolous, whitish grey, rough, cracked. Photobiont layer and medulla with calcium oxalate crystals. Ascomata apothecia, lirellate, numerous, branched, immersed, disc slightly exposed, thick, white-pruinose. Excipulum divergent, poorly developed, weakly carbonized, epithecium colourless, hymenium clear and colourless, I + weakly blue, paraphyses simple, anastomosing at tip. Asci clavate, 1-spored, ascospores hyaline, muriform, 80–89 × 25–30 µm, I + blue. Chemistry: Thallus K + yellow, C –, P + yellow, UV –; TLC: Norstictic and stictic acid.

Distribution: India (Andaman & Nicobar Islands, Assam, Kerala, Maharashtra), Australia, Brazil, Cambodia, Cameroon, Costa Rica, Fiji, Indonesia, Malaysia, Martinique, Nepal, New Caledonia, Papua New Guinea, Philippines, Réunion, Singapore, Society Island, Sri Lanka, Thailand, Tanzania, Trinidad & Tobago, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.361′, E90°16.740′, Elev. 169 m, on the bark of *Elaeocarpus sp.* on road side, 10/10/2020, 2020–0436 (BUBH); N26°47.13′, E90°16.11′, Elev. 211 m, on the bark of *Tetrameles nudiflora* on road side, 28/12/2022, 65082 (LWG); **Saralpara**, N26°51.000′, E90°15.952′, Elev. 262 m, on the bark of *Tetrameles nudiflora* on road side, 18/07/2023, 65081 (LWG); coll. Pungbili Islary.

2. *Diorygma junghuhnii* (Mont. & Bosch) Kalb, Staiger & Elix in Symb. Bot. Upsal. 34(1):157. 2004. *Graphis junghuhnii* Mont. & Bosch in Junghuhn & Miquel, Plant. Jungh. Enum. Plant. 4:471. 1856.

Thallus crustose, corticolous, ecorticated, whitish grey, smooth to rough, slightly farinose, partly with small warts with fine cracks. Photobiont and medulla layer with calcium oxalate crystals. Ascomata apothecia, lirelliform, irregularly branched, immersed in thallus, whitish powdery, disc surrounded by entire, wide, covered by thick white pruinose. Excipulum slightly divergent, completely non-carbonized, poorly developed, hymenium clear and colourless, I + blue-violet, hypothecium colourless to yellowish brown, paraphyses simple. Asci clavate to cylindrical, 2-spored, ascospores ellipsoid-oblong, hyaline, muriform, 85–120 × 22–40 µm, I + violet. Chemistry: Thallus K + yellow turning red, C –, P + orange, UV –; TLC: Norstictic acid.

Distribution: India (Andaman & Nicobar Islands, Assam, Karnataka, Kerala, Maharashtra, Manipur, Meghalaya, Nagaland, Sikkim, Tamil Nadu), Australia, Brazil, China, Fiji, Guatemala, Indonesia, Jawa, Nepal, New Caledonia, Paraguay, Philippines, Solomon Islands, Tahiti, Thailand, USA, Vanuatu.

Species examined: INDIA– Assam, Kokrajhar district, **Saralpara**, N26°51.008′, E90°14.608′, Elev. 172 m, on the bark of *Macaranga denticulata* in forest, 05/01/2021, 63295 (LWG); N26°51.289′, E90°15.756′, Elev. 286 m, on the bark of *Elaeocarpus* sp. in forest, 05/03/2023, 65085 (LWG); **Labanyapur**, N26°47.900′, E90°18.778′, Elev. 183

m, on the bark of *Tetrameles nudiflora* in forest, 10/11/2021, 65084 (LWG); coll. Pungbili Islary.

3. *Diorygma roseopruinosetum* Papong, Lücking & Parnmen in Phytotaxa 189(1):207. 2014.

Thallus crustose, corticolous, whitish grey to dull grey, corticated. Ascomata lirellae, immersed to emergent, simple to branched, disc exposed, wide, covered by red-pruinose. Excipulum well developed, non-carbonized, hymenium clear and colourless, I + bluish-violet, paraphyses simple. Asci clavate to cylindrical, 1-spored, ascospores ellipsoid-oblong, hyaline, muriform, 110–118 × 34–40 µm. Chemistry: Thallus K + yellow turning red, C –, P + orange, UV –; TLC: Norstictic acid.

Distribution: New Caledonia.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°41.915′, E90°18.823′, Elev. 112 m, on the bark of *Elaeocarpus* sp. on road side, 08/01/2023, 2023–1578 (BUBH); N26°46.361′, E90°16.740′, Elev. 148 m, on the bark of *Elaeocarpus* sp. in forest, 10/10/2020, 2020–0357 (BUBH); **Saralpara**, N26°51.293′, E90°15.755′, Elev. 283 m, on the bark of *Magnolia champaca* on road side, 05/03/2023, 65086 (LWG), 2023–(BUBH); coll. Pungbili Islary.

4. *Diorygma soozanum* (Zahlbr.) Nakan. & Kashiw. in Bull. Nat. Sci. Mus. Tok. B 29(2):86. 2003. *Graphina soozana* Zahlbr. in Feddes Repert. Spec. Nov. Regni Veg. 31:215. 1993.

Thallus crustose, corticolous, creamy white to pale grey, smooth, not detached from the substrate. Photobiont layer and medulla with small crystals. Ascomata apothecia, lirellate, numerous, oval to oblong, branched, disc covered by white-pruinose. Excipulum non-carbonized, divergent, poorly developed, hymenium colourless, clear, I + violet blue in lateral part. Asci 1-spored, ascospores hyaline, muriform, lumina in equal size, 110–128 × 32–40 µm. Chemistry: Thallus K + yellow turning red, C –, P + yellow, UV –; TLC: Norstictic acid.

Distribution: India (Arunachal Pradesh, Assam, Nagaland, Tripura), China, Japan, Taiwan.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°41.914′, E90°18.825′, Elev. 107 m, on the bark of *Elaeocarpus* sp. in forest, 08/01/2023, 65087 (LWG); N26°40.45′, E90°17.47′, Elev. 240 m, on the bark of *Elaeocarpus* sp. in forest, 03/01/2023, 65089 (LWG); N26°42.453′, E90°17.824′, Elev. 105 m, on the bark of *Tetrameles nudiflora* in forest, 08/01/2023, 65090 (LWG); **Labanyapur**, N26°47.912′, E90°18.770′, Elev. 182 m, on the bark of *citrus* sp. in village, 10/11/2021, 65088 (LWG); coll. Pungbili Islary.

3. *Glyphis* Ach., Syn. Method. Lich. 106. 1814.

Key to the species

1a. Stromata black-cabonaceous, 2–6 mm diam. Ascomata narrow, radiating, branched and compact, 2–6 mm long, 0.1 mm wide, disc caesio-pruinose. Ascospores 5–9-septate, 26–43 × 8–10 µm..……...……..**3. *G. duriuscula***

1b. Stromata grey to greyish-white……...…….2

2a. Apothecia round to oblong-elongate, branched and radiate. Ascospores transversely 6–11-septate, 26–50 × 8–10 µm……...…..…….**1. *G. cicatricosa***

2b. Apothecia linear-elongate, branched and confluent. Ascospores transversely 5–9-septate, 26–46 × 8–10 µm...……..**2. *G. confluens***

1. *Glyphis cicatricosa* Ach., Syn. Method. Lich. 107. 1814.

Thallus crustose, corticolous, yellowish brown, smooth, corticated. Photobiont layer and medulla with calcium oxalate crystals. Ascomata apothecia, lirellate, rounded to oblong, in stroma, stromata white to greyish white-pruinose, K –, disc brown, concave, with brown-pruinose, margin black. Excipulum completely carbonized, thickened at base, epithecium brown, hymenium clear, colourless, hypothecium colourless, paraphyses simple to branched. Asci clavate, 8-spored, ascospores hyaline, transversely 5–8-septate, 30–40 × 7–9 µm, I + violet blue, lumina lens-shaped. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Andaman & Nicobar Islands, Assam, Goa, Karnataka, Kerala, Sikkim, Tamil Nadu, West Bengal), Argentina, Australia, Brazil, Colombia, Dominican

Republic, Ecuador, Fiji, French Guiana, Guadeloupe, Guinea, Guyana, Hawaii, Jamaica, Japan, Mexico, Nepal, New Caledonia, New Zealand, Portugal, Réunion, Saint Kitts & Nevis, Sri Lanka, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°47.08′, E90°16.17′, Elev. 158 m, on the bark of *Elaeocarpus* sp. in forest, 28/11/2022, 2022–1012 (BUBH); N26°46.286′, E90°16.813′, Elev. 158 m, on the bark of *Garcinia* sp. in forest, 10/10/2020, 2020–1187 (BUBH); coll. Pungbili Islary.

2. *Glyphis confluens* Zenker in Pharm. Waarenk. 1(3):163. 1827.

Thallus crustose, corticolous, yellowish brown, corticated. Photobiont layer and medulla with calcium oxalate crystals. Ascomata apothecia, linear-elongate, branched, confluent, irregularly dilated, in stroma. Stromata grey to greyish white-pruinose, disc exposed. Excipulum brown-black, paraphyses simple. Asci 8-spored, ascospores hyaline, transversely 7–9-septate, lumina lens-shaped, 26–46 × 7–9 µm, apices acute, Chemistry: Thallus K + orange yellow, C –, P + brownish yellow, UV –; TLC: Zeorin.

Distribution: India (Andaman & Nicobar Islands, Karnataka, Kerala, Orissa, Sikkim, Tamil Nadu), Brazil, French Guiana, Guyana, Puerto Rico, Saint Lucia, Sri Lanka, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°43.46′, E90°17.40′, Elev. 237 m altitude, on the bark of *Trema orientale* on road side, 02/04/2023, 2023–1553 (BUBH); coll. Pungbili Islary.

3. *Glyphis duriuscula* Stirt. in Proc. Roy. Phil. Soc. Glasgow 13:189. 1882.

Thallus crustose, corticolous, pale yellow. Ascomata apothecia, in stroma, black-carbonized, narrow, radiating, branched and compact, acute at ends, disc caesio-pruinose. Excipulum brown, paraphyses simple and free. Asci 8-spored, ascospores hyaline, elongate-ellipsoid, transversely 5–9-septate, 26–45 × 7–10 µm, I + violet blue, lumina lens-shaped. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Assam, Nagaland, West Bengal).

Species examined: INDIA– Assam, Kokrajhar district, **Labanyapur**, N26°46.204′, E90°19.436′, Elev. 161 m, on the bark of *Areca catechu* in village, 09/05/2021, 2021–0325 (BUBH); N26°45.27′, E90°18.16′, Elev. 147 m, on the bark of *Aglaia spectabilis* in forest, 19/12/2022, 2022–1340 (BUBH); coll. Pungbili Islary.

4. *Graphis* Adans., Fam. Plant. 2:11. 1763.

Key to the species

1a. Excipulum striate……..2
1b. Excipulum entire……..3

2a. Ascospores muriform…….…...**14. *G. subintermedians***
2b. Ascospores transversely septate...…….……**15. *G. tenella***

3a. Hymenium inspersed……...…….……**8. *G. handelii***
3b. Hymenium clear…….…….……4

4a. Ascospores muriform……...5
4b. Ascospores transversely septate……...……8

5a. Excipulum apically carbonized……**9. *G. japonica***
5b. Excipulum laterally carbonized……...6

6a. Substances absent……...……**11. *G. nanodes***
6b. Substances present……...7

7a. Norstictic acid……..…….**5. *G. copelandii***
7b. Stictic acid……...……..……**13. *G. renschiana***

8a. Excipulum apically carbonized...…….……..**7. *G. glaucescens***
8b. Excipulum laterally to completely carbonized……...…….……9

9a. Excipulum laterally carbonized.…...……...……...10
9b. Excipulum completely carbonized……...…….…....14

10a. Substances absent……..……..……..…**12. *G. pinicola***
10b. Substances present……...…….11

11a. Disc exposed…….12
11b. Disc concealed……..13

12a. Lirellae *coarctata*-morph…….……..……**4. *G. capilllacea***
12b. Lirellae *dendrogramma*-morph...…….…….**2. *G. argentea***

12a. Disc non-pruinose……...…….**1. *G. ajarekarii***
12b. Disc white-pruinose…….....……..……..…**10. *G. longispora***

14a. Lirellae elongate and irregularly branched (*lineola*-morph)..…...…….**3. *G. assimilis***
14b. Lirellae very short and unbranched (*nuda*-morph)……..…..…..….**6. *G. emersa***

1. *Graphis ajarekarii* Patw. & Kulk. in Norw. J. Bot. 26(1):45. 1979.

Thallus crustose, corticolous, olive green. Ascomata apothecia, lirellate semi-immersed to erumpent, with lateral thalline margin, labia non-pruinose, disc concealed. Labia entire, excipulum laterally carbonized, hymenium clear. Asci 8-spored, ascospores hyaline, transversely 7–8-septate, 32–38 × 7–9 µm. Chemistry: Thallus K + yellow turning red, C –, P + yellow, UV –; TLC: Norstictic and stictic acid.

Distribution: India (Assam, Karnataka, Kerala, Maharashtra, Tamil Nadu).
Species examined: INDIA– Assam, Kokrajhar, **Ultapani**, N26°46.210′, E90°14.565′, Elev. 171 m, on the bark of *Ficus* sp. in forest, 02/04/2022, 2022–0409 (BUBH); coll. Pungbili Islary.

2. *Graphis argentea* Makhija & Adaw. in Mycotaxon 91:372. 2005.

Thallus crustose, corticolous, whitish grey, corticated. Ascomata apothecia, lirellate, erumpent, with lateral thalline margin, elongate to very long and irregularly to radiately branched (*dendrogramma*-morph), disc exposed, white-pruinose. Labia entire, excipulum laterally carbonized, hymenium clear. Asci 8-spored, ascospores hyaline, transversely 5–7-septate, 21–24 × 4–6 µm. Chemistry: Thallus K + yellow, C –, P + yellow, UV –; TLC: Constictic, Norstictic and salazinic acid.

Distribution: India (Andaman & Nicobar Islands, Assam).
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.279′, E90°14.301′, Elev. 207 m, on the bark of *Ficus* sp. in forest, 2022–0536 (BUBH); coll. Pungbili Islary.

3. *Graphis assimilis* Nyl. in Bull. Soc. Linn. ser. 2, 2:109. 1867.

Thallus crustose, corticolous, whitish grey. Ascomata apothecia, lirellate immersed to erumpent, with lateral to apically thin complete thalline margin, labia non-pruinose, disc concealed, elongate and irregularly branched (*lineola*-morph). Labia entire, excipulum completely carbonized, hymenium clear. Asci 8-spored, ascospores hyaline, transversely 6–8-septate, 21–25 × 7–9 µm. Chemistry: Thallus K + yellow turning red, C –, P + yellow, UV –; TLC: Norstictic acid.

Distribution: India (Assam, Kerala, Meghalaya, Nagaland), Australia, Brazil, Chile, Colombia, Costa Rica, Dominica, Indonesia, Japan, New Caledonia, New Zealand, Puerto Rico, Saint Lucia, Trinidad & Tobago, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Labanyapur**, N26°46.204′′, E90°19.437′, Elev. 161 m, on the bark of *Areca catechu* in village, 25/01/2021, 2021–1240 (BUBH); coll. Pungbili Islary.

4. *Graphis capillacea* Stirt. in Proc. Roy. Phil. Soc. Glasgow 11:315. 1878.

Thallus crustose, corticolous, whitish grey, smooth to roughened, corticated. Ascomata apothecia, lirellate, immersed to erumpent, with lateral thalline margin, stellately branched (*coarctata*-morph), disc exposed, white-pruinose. Labia entire, excipulum laterally carbonized, hymenium clear. Asci 8-spored, ascospores hyaline, oblong-ovoid, transversely 6–9-septate, 26–35 × 7–9 µm. Chemistry: Thallus K + yellow turning red, C –, P + yellow, UV –; TLC: Atranorin, norstictic, salazinic and stictic acid.

Distribution: India (Assam, Kerala, Nagaland, Tamil Nadu, West Bengal), Brazil.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°45.27′, E90°18.16′, Elev. 147 m, on the bark of *Aglaia spectabilis* in forest, 19/12/2022, 2022–1358 (BUBH); N26°46.327′, E90°14.478′, Elev. 155 m, on the bark of *Ficus* sp. in forest, 02/04/2022, 2022–0407 (BUBH); N26°46.211′, E90°14.322′, Elev. 158 m, on the bark of *Ficus* sp. in forest, 02/04/2022, 2022–1437 (BUBH); N26°46.218′, E90°14.458′ Elev. 167 m, on the bark of *Ficus* sp. in forest, 02/04/2022, 2022–1438 (BUBH); coll. Pungbili Islary.

5. *Graphis copelandii* Vain. in Ann. Acad. Sci. Fenn. ser. A, 15(6):207. 1921. (Plate 42A)

Thallus crustose, corticolous, greenish yellow to yellowish grey, corticated. Ascomata apothecia, lirellate, immersed to erumpent, with lateral thalline margin, elongate and irregularly branched (*deserpens*-morph), disc exposed, non-pruinose. Labia entire, excipulum laterally carbonized, hymenium clear. Asci 2-spored, ascospores hyaline, muriform, 47–55 × 21–24 µm. Chemistry: Thallus K + yellow turning red, C –, P + yellow, UV – or whitish; TLC: Norstictic acid.

Distribution: India (Assam, Karnataka), Brazil, Philippines.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.508′, E90°14.286′, Elev. 204 m, on the bark of *Ficus* sp. in forest 02/04/2022, 2022–0522 (BUBH); coll. Pungbili Islary.

6. *Graphis emersa* Müll. Arg. in Hedwigia 32(2):132. 1893. (Plate 42B)

Thallus crustose, corticolous, greenish white, corticated, smooth. Ascomata apothecia, lirellate, prominent, lacking thalline margin, very short and unbranched (*nuda*-morph), disc concealed, non-pruinose. Labia entire, excipulum completely carbonized, hymenium clear. Asci 8-spored, ascospores hyaline, transversely 7–10-septate, 24–37 × 6–9 µm. Chemistry: Thallus K + yellow turning red, C –, P + yellow, UV –; TLC: Norstictic acid.

Distribution: Australia, Brazil, Costa Rica, El Salvador, France, Mexico, Papua New Guinea, Queensland, Réunion.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.416′, E90°14.281′, Elev. 174 m, on the bark of *Ficus* sp. in forest, 02/04/2022, 2022–0524 (BUBH); coll. Pungbili Islary.

7. *Graphis glaucescens* Fée, Essai La Crypt. 36. 1824.

Thallus crustose, corticolous, whitish grey, ecorticated. Ascomata apothecia, lirellate immersed to erumpent, with lateral thalline margin, labia white-pruinose, elongate and irregularly branched (*glaucescens*-morph). Labia entire, excipulum apically carbonized, hymenium clear. Asci 8-spored, ascospores hyaline, transversely 8–9-septate, 36–45 × 8–10 µm. Chemistry: Thallus K –, C –, P + slightly yellowish orange, UV –; TLC: no substances detected.

Distribution: India (Andaman & Nicobar Islands, Arunachal Pradesh, Assam, Kerala, Tamil Nadu, Uttarakhand, West Bengal-plains), Australia, Brazil, Colombia, Costa Rica, Dominica, Ecuador, Guyana, Indonesia, Mexico, New Caledonia, Papua New Guinea, Paraguay, Philippines, Seychelles, Singapore, Solomon Islands, Thailand.

Species examined: INDIA– Assam, Kokrajhar district, **Labanyapur**, N26°46.304″, E90°19.321′, Elev. 162 m, on the bark of *Areca catechu* in village, 25/01/2021, 2021–1242 (BUBH); coll. Pungbili Islary.

8. *Graphis handelii* Zahlbr. in Brotherus *et al*., Sym. Sinic. 3:44. 1930.

Thallus crustose, corticolous, whitish. Ascomata apothecia, lirellate erumpent, with lateral thalline margin, labia non-pruinose, disc exposed, short to elongate and sparsely to irregularly branched (*handelii*-morph). Labia entire, excipulum laterally carbonized, hymenium inspersed. Asci 8-spored, ascospores hyaline, transversely 6–8-septate, 24–33 × 7–9 µm. Chemistry: Thallus K + yellow turning red, C –, P + yellow, UV –; TLC: Norstictic acid.

Distribution: India (Assam, West Bengal-plains), Australia, Brazil, China, Costa Rica, Cuba, Democratic Republic, El Salvador, Hawaii, Indonesia, Japan, New Caledonia, Paraguay, Réunion, Togo, Uruguay, USA, Venezuela.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.451′, E90°14.382′, Elev. 147 m, on the bark of *Ficus* sp. in forest, 02/04/2022, 2022–0411 (BUBH); N26°46.397′, E90°14.448′, Elev. 168 m, on the bark of *Ficus* sp. in forest, 02/04/2022, 2022–0410 (BUBH); N26°46.530′, E90°14.456′, Elev. 173 m, on the bark of *Ficus* sp. in forest, 02/04/2022, 2022–0406 (BUBH); N26°46.59′, E90°16.30′, Elev. 178 m, on the bark of *Stereospermum chelonoides* in forest, 28/11/2022, 2022–1013 (BUBH); N26°46.408′, E90°14.202′, Elev. 178 m, on the bark of *Ficus* sp. in forest, 02/04/2022, 2022–0408 (BUBH); **Labanyapur**, N26°46.096′, E90°19.508′, Elev. 167 m, on the bark of *Citrus* sp. in village, 25/01/2021, 2020–1238 (BUBH); N26°46.204″, E90°19.437′, Elev. 161 m, on the bark of *Areca catechu* in village, 25/01/2021, 2021–0238 (BUBH); N26°46.326′, E90°19.234′, Elev. 160 m, on the bark of *Areca catechu* in village, 25/01/2021, 2021–1239 (BUBH); coll. Pungbili Islary.

9. *Graphis japonica* (Müll. Arg.) Archer & Lücking in Lichenologist 41(4):437. 2009. *Graphina japonica* Müll. Arg. in Flora 74(1):113. 1891.

Thallus crustose, corticolous, olive green, smooth, glossy with carbonized margin. Ascomata apothecia, lirellate, erumpent with thick lateral to complete thalline margin (*subserpentina*-morph). Labia entire, excipulum laterally carbonized, hymenium clear. Asci 2-spored, ascospores hyaline, muriform, 73–84 × 22–28 µm. Chemistry: Thallus K + yellow, C –, P –, UV –; TLC: Constictic and stictic acid.

Distribution: India (Arunachal Pradesh, Darjeeling, Sikkim, Uttar Pradesh), Brazil, China, El Salvador, Japan, Papua New Guinea, Philippines, Vietnam.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.378′, E90°17.148′, Elev. 163 m, on the bark of *Syzygium formosum* in forest, 22/07/2020, 2020–1231 (BUBH); N26°45′47.92″, E90°17′03.30″, Elev. 172 m, on the bark of *Syzygium formosum* in forest, 22/12/2019, 2019–1232 (BUBH); N26°41′05.57″, E90°18′33.05″, Elev. 164 m, on the bark of *Semecarpus anacardium* in forest, 04/03/2020, 2020–1233 (BUBH); N26°46.352′, E90°16.760′, Elev. 159 m, on the bark of *Ilex odorata* in forest, 10/10/2020, 63298 (LWG), 2020–1234 (BUBH); N26°46.303′, E90°17.023′, Elev. 165 m, on the bark of *Macaranga denticulata* in forest, 10/10/2020, 2020–1236 (BUBH); N26°46′05.57″, E90°18′33.05″, Elev. 172 m, on the bark of *Semecarpus anacardium* in forest, 04/03/2020, 2020–1235 (BUBH); N26°46.483′, E90°14.231′, Elev. 164 m, on the bark of *Ficus* sp. in forest, 02/04/2022, 2022–0663 (BUBH); N26°47.06′, E90°16.00′, Elev. 181 m, on the bark of *Ficus* sp. in forest, 28/11/2022, 2022–1014 (BUBH); N26°42.330′, E090°17.00′, Elev. 109 m, on the bark of *Elaeocarpus* sp. in forest, 08/01/2023, 2023–1399 (BUBH); N26°46.406′, E90°14.534′, Elev. 164 m, on the bark of *Ficus* sp. in forest, 02/04/2022, 2022–0657 (BUBH); **Saralpara**, N26°50.055′, E90°15.732′, Elev. 238 m, on the bark of *Magnolia champaca* on road side, 05/03/2023, 65091 (LWG); coll. Pungbili Islary.

10. *Graphis longispora* Awasthi & Singh in Norw. J. Bot. 24(1):3. 1977. (Plate 42C)

Thallus crustose, corticolous, smooth to uneven, grey, corticated. Ascomata apothecia, lirellate, immersed to erumpent, with lateral thalline margin, elongate to irregularly branched (*subserpentina*-morph), disc concealed, white-pruinose. Labia entire,

excipulum laterally carbonized, hymenium clear. Asci 8-spored, ascospores hyaline, transversely 9–13-septate, 47–56 × 9–12 µm. Chemistry: Thallus K + yellow turning red, C –, P + yellow, UV –; TLC: Norstictic and salazinic acid.

Distribution: India (Meghalaya, Nagaland).
Species examined: INDIA– Assam, Kokrajhar district, **Saralpara**, N26°51.294′, E90°15.754′, Elev. 280 m, on the bark of *Magnolia champaca* on road side, 05/03/2023, 65092 (LWG); N26°50.354′, E90°16.203′, Elev. 248 m, on the bark of *Magnolia champaca* on road side, 05/03/2023, 2023–1604 (BUBH); coll. Pungbili Islary.

11. *Graphis nanodes* Vain. in Ann Acad. Sci. Fenn. ser. A, 15(6):209. 1921. (Plate 42D)

Thallus crustose, corticolous, greyish white. Ascomata apothecia, lirellate, erumpent, with lateral thalline margin. Labia entire, non-pruinose, short to elongate (*lineola*-morph), rarely branched, disc concealed. Excipulum laterally carbonized, hymenium clear. Asci 2-spored, ascospores hyaline, muriform, 37–45 × 13–17 µm. Chemistry: Thallus K –, C –, P + slightly orange, UV –; TLC: no substances detected.

Distribution: India (Arunachal Pradesh, Tamil Nadu), Brazil, Colombia, Fiji, Jamaica, Papua New Guinea, Papua New Guinea, Philippines, Saint Lucia.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°47.06′, E90°16.00′, Elev. 181 m, on the bark of *Ficus sp*., in forest, 28/11/2022, 2022–1359 (BUBH); **Labanyapur**, N26°47.884′, E90°18.699′, Elev. 179 m, on the bark of *Magnolia hodgsonii* in forest, 10/11/2021, 2021–0280 (BUBH); N26°47.910′, E90°18.708′, Elev. 182 m, on the bark of *Tetrameles nudiflora* in forest, 10/11/2021, 2021–0335 (BUBH); coll. Pungbili Islary.

12. *Graphis pinicola* Zahlbr. in Brotherus *et al*., Symb. Sinic. 3:43. 1930.

Thallus crustose, corticolous, white to grey, corticated. Ascomata apothecia, lirellate, erumpent, straight or curved, short to elongate and sparsely to irregularly branched, with abruptly slopping thalline margin (*lineola*-morph), disc concealed, non-pruinose. Labia entire, excipulum laterally carbonized, hymenium clear. Asci 8-spored, ascospores hyaline, transversely 6–7-septate, 25–35 × 10–12 µm. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Assam, Tamil Nadu), Brazil, China, Colombia, El Salvador, Guyana, Mexico, Papua New Guinea, Réunion, USA, Venezuela.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.518′, E90°14.165′, Elev. 164 m, on the bark of *Ficus* sp. in forest, 02/04/2022, 2022–1439 (BUBH); N26°46.448′, E90°13.580′, Elev. 165 m, on the bark of *Ficus* sp. in forest, 02/04/2022, 2022–1435 (BUBH); coll. Pungbili Islary.

13. *Graphis renschiana* (Müll. Arg.) Stizenb. in Ber. Tät. Naturw. Ges. 184. 1891. *Graphina renschiana* Müll. Arg. in Flora 68(28):512. 1885.

Thallus crustose, corticolous, grey. Ascomata apothecia, lirellae, erumpent to prominent, with lateral thalline margin, elongate and irregularly branched (*deserpens*-morph). Labia entire, excipulum laterally carbonized, hymenium clear. Asci 8-spored, ascospores muriform, 20–33 × 8–12 µm. Chemistry: Thallus K + yellow, C –, P + slightly orange, UV –; TLC: Stictic acid.

Distribution: India (Andaman & Nicobar Islands, Arunachal Pradesh, Assam), China, Costa Rica, French Guiana, Guyana, Madagascar, Papua New Guinea, Puerto Rico.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°45′48.09″, E90°17′03.36″, Elev. 178 m, on the bark of *Ficus* sp. in forest, 21/12/2019, 63300 (LWG), coll. Pungbili Islary.

14. *Graphis subintermedians* Hale ex Lücking in Lichenologist 41(4):440. 2009.

(Plate 42E)

Thallus crustose, corticolous, yellowish grey. Ascomata apothecia, lirellate, erumpent to prominent, with basal to lateral thalline margin, short to elongate and sparsely branched (*striatula*-morph), non-pruinose, disc concealed. Labia striate, excipulum laterally carbonized, hymenium clear, paraphyses branched. Asci 2-spored, ascospores hyaline, muriform, 60–92 × 19–21 µm. Chemistry: Thallus K + yellowish, C –, P + slightly orange yellow, UV –; TLC: no substances detected.

Distribution: French Guiana, Papua New Guinea, Sabah.

Species examined: INDIA– Assam, Kokrajhar district, **Labanyapur**, N26°47.885′, E90°18.688′, Elev. 178 m altitude, on the bark of *Magnolia hodgsonii* in forest, 10/11/2021, 2021–1237 (BUBH); coll. Pungbili Islary.

15. *Graphis tenella* Ach., Syn. Method. Lich. 81. 1814.

Thallus crustose, corticolous, whitish, shiny, corticated. Ascomata apothecia, lirellate, erumpent, with lateral thalline margin, short and sparsely branched (*tenella*-morph), disc exposed, non-pruinose. Labia striate, excipulum laterally carbonized, hymenium clear. Asci 8-spored, ascospores hyaline, transversely 8–10-septate, 18–31 × 6–9 µm. Chemistry: Thallus K + pale yellow, C –, P + brownish yellow, UV –; TLC: no substances detected.

Distribution: India (Andaman & Nicobar Islands, Manipur, Sikkim, Tamil Nadu), Argentina, Australia, Brazil, Colombia, Costa Rica, Ecuador, Guinea, Guyana, Hawaii, Indonesia, Jamaica, Japan, Marshall Islands, New Caledonia, New Zealand, Nicaragua, Papua New Guinea, Philippines, Singapore, Socotra, Thailand, USA, Zanzibar.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.462′ E90°14.132′, Elev. 205 m, on the bark of *Ficus* sp. in forest, 02/04/2022, 2022–0535 (BUBH); N26°46.384′, E90°13.587′, Elev. 218 m, on the bark of *Ficus* sp. in forest, 216 m altitude, 02/04/2022, 2022–0530 (BUBH); N26°46.542′, E90°13.576′, Elev. 208 m, on the bark of *Ficus* sp. in forest, 02/04/2022, 2022–0531 (BUBH); N26°46.313′, E90°14.181′, Elev. 169 m, on the bark of *Ficus* sp. in forest, 02/04/2022, 2022–1436 (BUBH); coll. Pungbili Islary.

5. *Hemithecium* Trevis., Spighe Paglie. 12. 1853.

Key to the species

1a. Thallus with isidiate……**6. *H. isidiatum***
1b. Thallus not with isidiate……...….2

2a. Ascospores > 100 µm long……...……..…3
2a. Ascospores < 100 µm long…….…...5

3a. Ascospores muriform, 130–190 × 30–55 µm. Ascomata emergent, 1–9 mm long. Excipulum 3–5 striate. Salazinic acid present.……**11. *H. salacinilabiatum***

3b. Ascospores transversely septate……...……4

4a. Ascomata simple to branched, 6–15 mm long. Excipulum non-carbonized. Ascospores 10–25-transversely septate, 45–122 × 8–12 µm. Constictic, norstictic and stictic acid……..…….....……....……**7. *H. nagalandium***

4b. Ascomata sparsely branched, 2–12 mm long. Excipulum dark blackish brown or slightly carbonized at the tips, 3–4 striate. Ascospores transversely 13–21-septate, 50–112 × 7–14 µm. Constictic, norstictic and stictic acid present.....**1. *H. amboliense***

5a. Ascospores > 50 µm long…….……...……..6

5b. Ascospores < 50 µm long.……...……...……...9

6a. Salazinic acid present. Ascomata immersed to slightly raised, 1–4 mm long. Excipulum woody brown. Ascospores 63–88 × 6–8 µm. Constictic, salazinic and stictic acid present.....……..…….…….....**12. *H. scariosum***

6b. Salazinic acid absent……7

7a. Only norstictic acid present, ascomata 1–9 mm long. Excipulum internally striate, sometimes slightly carbonized at the apex. Ascospores 25–56 × 7–8 µm……..……...…….....**9. *H. norsticticum***

7b. Other substances present with norstictic acid…….....8

8a. Ascomata simple to branched, 5–10 mm long. Excipulum 2–4 internal striate. Ascospores 25–75 × 10–12 µm. Constictic, norstictic and stictic acid present …….……..……...……...……**3. *H. aphanes***

8b. Ascomata simple to dendroidally branched. Excipulum entire to indistinctly striate. Ascospores 30–55 × 6–9 µm. Constictic, norstictic and stictic acid present ……..…..……..……..……**8. *H. nakanishianum***

9a. Protocetraric acid present. Ascomata immersed, simple to branched, 0.5–6.0 mm long. Ascospores 9–12-septate, 29–42 × 4–6 µm. Constictic and stictic acid present……....……..……..……**5. *H. fulvescens***

9b. Protocetraric acid absent……10

10a. Norstictic acid present……...……...……11

10b. Norstictic acid absent……...…12

11a. Ascomata delicate, simple to radially or irregularly branched, 0.5–1.5 mm long. Ascospores 17–25 × 3–4 µm. Consalazinic, norstictic and stictic acid present…….……...…...…….....**10. *H. pulchellum***

11b. Ascomata simple, triradiate, or irregularly branched. Ascospores 33–46 × 6–8 µm. Norstictic and stictic acid present...……..…..……**4. *H. balaghatense***

12a. Ascomata 1–13 mm long, simple to branched. Ascospores 21–33 × 3–4 µm. Constictic and stictic acid present.…….……..……..…..**2. *H. aphaneomicrosporum***

12b. Ascomata 1–5 mm long, mostly simple. Ascospores 30–42 × 7–10 µm. Constictic and stictic acid present……..…….……**13. *H. verrucosum***

1. *Hemithecium amboliense* Makhija & Dube in Mycotaxon 93:367. 2005. (Plate 43A)

Thallus crustose, corticolous, green to whitish grey, glossy, corticated. Photobiont layer and medulla with dense crystals. Ascomata apothecia, lirellate, 4–12 mm long, semi-emergent to distinctly emergent, sparsely branched, disc exposed. Excipulum dark blackish brown to slightly carbonized at the tips, 3–4 striate, hymenium clear, paraphyses simple. Asci 8-spored, ascospores hyaline, transversely 13–18-septate, 82–109 × 8–13 µm. Chemistry: Thallus K + yellow turning red, C –, P + yellow, UV –; TLC: Norstictic and stictic acid.

Distribution: India (Maharashtra).

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°43.183′, E90°17.535′, Elev. 127 m, on the bark of *Magnolia hodgsonii* in forest, 08/01/2023, 2023–1407 (BUBH); N26°43.210′, E90°17.856′, Elev. 125 m, on the bark of *Magnolia hodgsonii* in forest, 08/01/2023, 2023–1415 (BUBH); N26°45.36′, E90°18.17′, Elev. 144 m, on the bark of *Magnolia hodgsonii* in forest, 19/12/2022, 2022–1332 (BUBH); N26°46.00′, E90°18.23′, Elev. 140 m, on the bark of *Magnolia champaca* in forest, 16/12/2022, 2022–1322 (BUBH); N26°45.07′, E90°18.09′, Elev. 140 m, on the bark of *Ilex odorata* in forest, 19/12/2022, 2022–1349 (BUBH); N26°45.39′, E90°18.21′, Elev. 135 m, on the bark of *Magnolia champaca* in forest, 19/12/2022, 2022–1334 (BUBH);

N26°45.49′, E90°18.19′, Elev. 129 m, on the bark of *Tetrameles nudiflora* in forest, 16/12/2022, 2022–1324 (BUBH); N26°45.45′, E90°18.21′, Elev. 136 m, on the bark of *Wrightia arborea* in forest, 16/12/2022, 2022–1355 (BUBH); N26°45.16′, E90°18.12′, Elev. 140 m, on the bark of *Mesua ferrea* in forest, 19/12/2022, 2022–1356 (BUBH); N26°45.52′, E90°18.24′, Elev. 140 m, on the bark of *Aglaia spectabilis* in forest, 16/12/2022, 2022–1357 (BUBH); N26°45.27′, E90°18.16′, 147 m altitude, on the bark of *Aglaia spectabilis* in forest, 19/12/2022, 2022–1352 (BUBH); N26°45.54′, E90°18.23′, Elev. 145 m, on the bark of *Magnolia champaca* in forest, 16/12/2022, 2022–1327 (BUBH); N26°45.00′, E90°18.16′, Elev. 142 m, on the bark of *Magnolia hodgsonii* in forest, 19/12/2022, 2022–1341 (BUBH); N26°40.42′, E90°17.45′, Elev. 124 m, on the bark of *Elaeocarpus* sp. in forest, 03/01/2023, 2023–1426 (BUBH); N26°43.201′, E90°18.181′, Elev. 129 m, on the bark of *Magnolia hodgsonii* in forest, 08/01/2023, 2023–1406 (BUBH); coll. Pungbili Islary.

2. *Hemithecium aphaneomicrosporum* Makhija & Adaw. in Mycotaxon 91:348. 2005. (Plate 43B)

Thallus crustose, corticolous, grey, smooth, corticated. Photobiont layer and medulla with dense crystals. Ascomata apothecia, lirellate, 3.0–7.0 mm long, semi-emergent to emergent, simple and branched. Excipulum entire, brown, hymenium clear, paraphyses simple. Asci 8-spored, ascospores hyaline, transversely 6–9-septate, 22–45 × 4–6 µm. Chemistry: Thallus K + yellow, C –, P + yellow, UV –; TLC: Constictic and stictic acid.

Distribution: India (Andaman & Nicobar Islands, Arunachal Pradesh). Fiji, Thailand.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°45′55.74″, E90°17′30.01″, Elev. 176 m, on the bark of *Stereospermum chelonoides* in forest, 26/02/2020, 63307 (LWG), 2020–0190 (BUBH); coll. Pungbili Islary.

3. *Hemithecium aphanes* (Mont. & Bosch) Nakan. & Kashiw. in Bull. Nat. Sci. Mus. Tok. B, 29(2):88. 2003. *Graphis aphanes* Mont. & Bosch in Junghuhn, Plant. Jungh. Enum. Plant. 4:474. 1856. (Plate 43C)

Thallus crustose, corticolous, yellowish grey, smooth. Ascomata apothecia, lirellate, 0.6–15.0 mm long, branched, erumpent, disc exposed. Excipulum entire, brown, hymenium clear, paraphyses simple. Asci 4-spored, ascospores hyaline, transversely 16–22-septate,

70–85 × 7–11 µm. Chemistry: Thallus K + yellow, C –, P + yellow, UV –; TLC: Constictic, stictic and norstitic acid.

Distribution: India (Andaman & Nicobar Islands, Arunachal Pradesh, Karnataka, Kerala, Maharashtra), Australia, Bonnin Island, Fiji, Indonesia, Japan, Jawa, Malaysia, Réunion, Solomon Islands, Thailand.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46′03.41″, E90°18′33.25″, Elev. 183 m, on the bark of *Syzygium formosum* in forest, 04/03/2020, 2020–0191(BUBH); N26°45′55.25″, E90°17′28.19″, Elev. 189 m, 26/02/2020, on the bark of *Mesua ferrea* in forest, 2020–0184 (BUBH); N26°42.454′, E90°17.846′, Elev. 108 m, on the bark of *Elaeocarpus* sp. in forest, 08/01/2023, 2023–1396 (BUBH); N26°40.43′, E90°17.44′, Elev. 123 m, on the bark of *Elaeocarpus* sp. in forest, 03/01/2023, 2023–1402 (BUBH); **Labanyapur**, N26°47.887′, E90°18.724, Elev. 183 m, on the bark of *Magnolia hodgsonii* in forest, 10/11/2021, 63302 (LWG), 2021–0292 (BUBH); coll. Pungbili Islary.

4. *Hemithecium balaghatense* Adaw. & Makhija in Mycotaxon 92:388. 2005.

Thallus crustose, corticolous, whitish grey to yellowish grey, smooth to verruculose. Ascomata apothecia, lirellate, immersed, simple to irregularly branched, covered by thalline layer, disc exposed. Excipulum entire, brown, hymenium clear, paraphyses simple. Asci 8-spored, ascospores hyaline, transversely 9–11-septate, 27–29 × 5–7 µm. Chemistry: Thallus K + yellow, C –, P + slightly yellowish, UV –; TLC: Norstictic and stictic acid.

Distribution: India (Madhya Pradesh).

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°45′48.31″, E90°17′04.08″, Elev. 153 m, on the bark of *Syzygium formosum* in forest, 22/12/2019, 63305 (LWG), 2019–0181 (BUBH); N26°47.00′, E90°16.34′, Elev. 182 m, on the bark of *Stereospermum chelonoides* in forest, 28/11/2022, 2022–1009 (BUBH); N26°46.39′, E90°16.37′, Elev. 180 m, on the bark of *Magnolia hodgsonii* in forest, 28/11/2022, 2022–1366 (BUBH); **Labanyapur**, N26°47.925′, E90°18.988′, Elev. 175 m, on the bark of *Magnolia hodgsonii* in forest, 10/11/2021, 2021–0336 (BUBH); coll. Pungbili Islary.

5. *Hemithecium fulvescens* Adaw. & Makhija in Mycotaxon 92:389. 2005. (Plate 43D)

Thallus crustose, corticolous, greyish white, corticated. Photobiont layer and medulla with dense crystals. Ascomata apothecia, lirellate, 1–6 mm long, immersed, simple to branched, disc exposed. Excipulum entire, brown, hymenium clear. Asci 8-spored, ascospores hyaline, transversely 10–12-septate, 31–45 × 8–10 µm. Chemistry: Thallus K + yellow turning red, C –, P + yellow, UV –; TLC: Norstictic and Protocetraric acid.

Distribution: India (Karnataka).

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.59′, E90°16.33′, Elev. 169 m, on the bark of *Stereospermum chelonoides* in forest, 28/11/2022, 2022–1004 (BUBH); N26°47.09′, E90°16.34′, Elev. 178 m, on the bark of *Mallotus nudiflorus* in forest, 28/11/2022, 2022–1003 (BUBH); N26°47.07′, E90°16.10′, Elev. 177 m, on the bark of *Ficus* sp. in forest, 28/11/2022, 2022–1005 (BUBH); N26°47.14′, E90°16.09′, Elev. 185 m, on the bark of *Tetrameles nudiflora* in forest, 28/11/2022, 2022–1017 (BUBH); coll. Pungbili Islary.

6. *Hemithecium isidiatum* Upreti & Dubey in Lichenologist 43(5):483. 2011.

Thallus crustose, corticolous, grey, smooth to verrucose, glossy, with black margin, isidiate, spreading on thallus, concolorous, simple to coralloid branched, easily detachable, 0.2–0.3 mm diam. and 0.2–1.5 mm high. Ascomata apothecia, lirellate, grey, emergent, simple and branched, long, disc exposed to concealed. Excipulum pale yellowish to brown, hymenium clear, hypothecium pale yellow, epihymenium dark brown. Ascospores not seen. Chemistry: Thallus K + reddish, C –, P + yellow, UV –; TLC: Salazinic acid.

Distribution: India (Arunachal Pradesh).

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.176′, E90°17.371′, Elev. 149 m altitude, on the bark of *Semecarpus anacardium* in forest, 14/07/2020, 2020–0182 (BUBH); N26°45′59.85″, E90°17′41.89″, Elev. 152 m altitude, on the bark of *Syzygium formosum* in forest, 13/12/2019, 2019–0194 (BUBH); 2020–0182 (BUBH); N26°46′02.37″, E90°17′33.66″, Elev. 160 m, on the bark of *Syzygium formosum* in forest, 26/02/2020, 63301 (LWG); coll. Pungbili Islary.

7. *Hemithecium nagalandicum* (Singh & Sinha) Adaw. & Makhija in Mycotaxon 92:390. 2005. *Graphis nagalandica* Singh & Sinha, Lich. Flor. Nagal. 95. 1994.

Thallus crustose, corticolous, yellow to yellowish grey. Photobiont layer and medulla with dense crystals. Ascomata apothecia, lirellate, 7–15 mm long, semi-emergent to distinctly emergent, simple to branched, with subverrucose margin, heavily crenate, disc exposed. Excipulum non-carbonized, hymenium clear. Asci 8-spored, ascospores hyaline, transversely 15–21-septate, 65–120 × 8–12 µm. Chemistry: Thallus K + yellow turning red, C –, P + yellow, UV –; TLC: Norstictic and stictic acid.

Distribution: India (Assam, Nagaland).

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°47.06′, E90°16.10′, Elev. 182 m, on the bark of *Dillenia indica* in forest, 28/11/2022, 2022–1360 (BUBH); N26°45.04′, E90°18.08′, Elev. 139 m, on the bark of *Magnolia hodgsonii* in forest, 19/12/2022, 2022–1371 (BUBH); coll. Pungbili Islary.

8. *Hemithecium nakanishianum* (Patw. & Kulk.) Makhija & Dube in Mycotaxon 93:370. 2005. *Graphis nakanishiana* Patw. & Kulk. in Norw. J. Bot. 26(1):46. 1979.

Thallus crustose, corticolous, whitish green, smooth. Photobiont layer and medulla with dense crystals. Ascomata apothecia, lirellate, 2.0–6.0 mm long, simple to dendroidally branched, disc exposed. Excipulum entire to indistinctly striate, brown, paraphyses simple, hymenium clear. Asci 4-spored, ascospores hyaline, transversely 12–18-septate, 59–62 × 6–9 µm. Chemistry: Thallus K + yellow turning red, C –, P + orange, UV –; TLC: Norstictic and stictic acid.

Distribution: India (Arunachal Pradesh, Assam, Karnataka, Kerala, Maharashtra, Nagaland, Sikkim, Tamil Nadu, West Bengal), Australia.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46′11.62″, E90°17′23.07″, Elev. 189 m, on the bark of *Elaeocarpus* sp. in forest, 21/12/2019, 2019–0187 (BUBH); N26°46.172′, E90°16.936′, Elev. 167 m, on the bark of *Elaeocarpus* sp. in forest, 03/10/2020, 2020–0189 (BUBH); N26°47.06′, E90°16.00″, Elev. 181 m, on the bark of *Dillenia indica* in forest, 28/11/2022, 2022–1367 (BUBH); N26°45.32′, E90°18.15′, Elev. 141 m, on the bark of *Ilex odorata* in forest, 19/12/2022, 2022–1364

(BUBH); **Labanyapur** N26°47.885′, E90°18.688′, Elev. 178 m, on the bark of *Magnolia hodgsonii* in forest, 10/11/2021, 63303 (LWG), 2021–0432 (BUBH); N26°47.979′, E90°19.177′, Elev. 192 m, on the bark of *Magnolia hodgsonii* in forest, 10/11/2021, 2021–0532 (BUBH); coll. Pungbili Islary.

9. *Hemithecium norsticticum* Makhija & Dube in Mycotaxon 93:371. 2005. (Plate 43E)

Thallus crustose, corticolous, greenish white, smooth, corticated. Photobiont layer and medulla with dense crystals. Ascomata apothecia, lirellate, 2–9 mm long, concolorous, semi-immersed to erumpent, branched, disc slightly exposed. Excipulum internally striate, slightly carbonized at the apex, hymenium clear, paraphyses simple. Asci 8-spored, ascospores hyaline, transversely 10–13-septate, 47–60 × 7–8 µm. Chemistry: Thallus K + yellow turning red, C –, P + yellow, UV – or whitish flourish; TLC: Norstictic and protocetraric acid.

Distribution: India (Maharashtra).
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°47.09′, E90°16.34′, Elev. 188 m, on the bark of *Mallotus nudiflorus* in forest 28/11/2022, 2022–1010 (BUBH); coll. Pungbili Islary.

10. *Hemithecium pulchellum* Makhija & Adaw. in Mycotaxon 91: 350. 2005. (Plate 43F)

Thallus crustose, corticolous, yellowish white, smooth. Photobiont layer and medulla with dense crystals. Ascomata apothecia, lirellate, erumpent, 0.5–1.5 mm long, delicate, simple to radially or irregularly branched. Excipulum non-striate, entire, brown, hymenium clear, paraphyses simple. Asci 8-spored, ascospores hyaline, transversely 5–6-septate, 17–24 × 3–4 µm. Chemistry: Thallus K + yellow turning red, C –, P + yellow, UV –; TLC: Norstictic and stictic acid.

Distribution: India (Andaman & Nicobar Islands).
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°47.878′, E90°18.684′, Elev. 178 m, on the bark of *Magnolia hodgsonii* in forest, 10/11/2021, 2021–0338 (BUBH); coll. Pungbili Islary.

11. *Hemithecium salacinilabiatum* (Patw. & Kulk.) Chitale & Makhija in Mycotaxon 108:88. 2009. *Graphina salacinilabiata* Patw. & Kulk. in Biovigyanam 5(1): 6. 1979.

Thallus crustose, corticolous, olive green, smooth to verruculose, glossy. Photobiont layer and medulla with dense crystals. Ascomata apothecia, lirellate, 2.0–4.0 mm long, simple and branched, covered by thalline layer, disc exposed. Labia 2–4 striate, excipulum non-carbonized, hymenium clear. Asci 1-spored, ascospores hyaline, muriform, 165–197 × 65–72 µm. Chemistry: Thallus K + brownish yellow, C –, P + slightly yellow, UV –; TLC: Salazinic acid.

Distribution: India (Kerala, Karnataka, Maharashtra).
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46′01.70″, E90°18′33.74, Elev. 247 m, on the bark of *Syzygium formosum* in forest, 04/03/2020, 63308 (LWG), 2020–0192 (BUBH); **Saralpara**, N26°51.009′, E90°14.619′, Elev. 233 m, *Ficus* sp. in forest, 05/01/2021, 2021–0097 (BUBH); coll. Pungbili Islary.

12. *Hemithecium scariosum* Makhija & Adaw. in Mycotaxon 91:350. 2005.

Thallus crustose, corticolous, grey, smooth, glossy. Photobiont layer and medulla with dense crystals. Ascomata apothecia, lirellate, 1.0–4.0 mm long, immersed to slightly raised, covered by thalline layer, disc exposed. Excipulum entire, woody brown, hymenium clear. Asci 4-spored, ascospores hyaline, transversely13–18-septate, 60–86 × 8–10 µm. Chemistry: Thallus K + brownish yellow, C –, P + yellow, UV –; TLC: Constictic, salazinic and stictic acid.

Distribution: India (Andaman & Nicobar Islands, Assam).
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°45′59.95″, E90°17′42.40′, Elev. 167 m, on the bark of *Semecarpus anacardium* in forest, 13/12/2019, 63306 (LWG), 2019–0193 (BUBH); coll. Pungbili Islary.

13. *Hemithecium verrucosum* Sharma & Khadilkar in Lichenologist 44(3):361. 2012.

Thallus crustose, corticolous, grey, corticated, Photobiont layer and medulla with dense crystals. Ascomata apothecia, lirellae, 1–5 mm long, simple. Excipulum entire, brown, hymenium clear. Asci 8-spored, ascospores hyaline, transversely12–15-septate, 30–42 ×

8–10 µm. Chemistry: Thallus K + brownish yellow, C –, P + yellow, UV –; TLC: Constictic, norstictic and stictic acid.

Distribution: India (Karnataka).

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°45.37′, E90°18.19′, Elev. 142 m, on the bark of *Aglaia spectabilis* in forest, 19/12/2022, 2022–1404 (BUBH); **Labanyapur**, N26°47.979′, E90°19.177′, Elev. 192 m, on the bark of *Magnolia hodgsonii* in forest, 10/11/2021, 2021–0658 (BUBH); N26°46.232, E90°16.939′, Elev. 187 m, on the bark of *Ilex odorata* in forest, 03/10/2020, 2020–1361 (BUBH); coll. Pungbili Islary.

6. *Leiorreuma* Eschw., Sys. Lich. 25. 1824.

1. *Leiorreuma exaltatum* (Mont. & Bosch) Staiger in Biblthca Lichenol. 85:298. 2002. *Lecanactis exaltata* Mont. & Bosch in Montagne, Syll. Gen. Spec. Plant. Crypt. 351. 1856.

Thallus crustose, corticolous, olive green to grey green, hard, verrucose. Ascomata apothecia, lirellate, numerous, sessile, mostly scattered, scarcely aggregate, simple to infrequently branched, 2–4 × 1–2 mm, disc exposed, black, covered with white-pruinose. Excipulum carbonized, hymenium colourless, inspersed with oil droplets, epihymenium distinct, brown, subhymenium indistinct. Asci clavate, 8-spored, I –, ascospores hyaline, fusiform with round to subacute ends, transversely 8–10-septate, 30–42 × 6–8 µm, I –. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Andaman & Nicobar Islands, Manipur, Nagaland), Australia, Brazil, Chile, Chinese Taipei, Costa Rica, Dominica, Fiji, Hawaii, Indonesia, Japan, Jawa, Malaysia, Mexico, New Zealand, Papua New Guinea, Philippines, Solomon Islands, Thailand, Vanuatu.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.232′, E90°14.179′, Elev. 183 m, on the bark of *Ficus* sp. in forest, 02/04/2022, 2022–1623 (BUBH), coll. Pungbili Islary.

7. *Phaeographis* Müll. Arg. in Flora 65(21):336. 1882.

Key to the species

1a. Norstictic acid present. Ascomata straight to curved, flexuous, branched, non-pruinose, disc exposed……...……...**1. *P. dendritica***

1b. Substances absent……...…….2

2a. Disc non-pruinose. Excipulum blackish brown in upper part, brown below, and thin in basal part….……...……...……**2. *P. endophaeiza***

2b. Disc white-pruinose. Excipulum blackish brown...……**3. *P. firmula***

1. *Phaeographis dendritica* (Ach.) Müll. Arg. in Flora 65(24):382. 1882. *Opegrapha dendritica* Ach., Suppl. Method. Lich. 31. 1803.

Thallus crustose, corticolous, yellow to brownish yellow, smooth to slightly rough and wrinkled, corticated. Ascomata apothecia, lirellate, partly immersed, long and wide, 1–5 × 0.2–0.4 mm, straight to curved, flexuous, branched, non-pruinose, disc exposed. Excipulum brown to slightly carbonized, hymenium colourless, inspersed, hypothecium thin, brownish black, paraphyses branched. Asci 8-spored, ascospores brown, oblong to ellipsoid, transversely 3–5-septate, 15–27 × 5–9 µm. Chemistry: Thallus K + yellow turning red, C –, P + yellow, UV –; TLC: Norstictic acid.

Distribution: India (Arunachal Pradesh, Assam, West Bengal), Brazil, Colombia, Denmark, France, Germany, Japan, Netherlands, Northern Ireland, Poland, Portugal, Spain.

Species examined: INDIA– Assam, Kokrajhar district, **Labanyapur**, N26°47.900′, E90°18.778′, Elev. 183 m, on the bark of *Tetrameles nudiflora* in forest, 10/11/2021, 65112 (LWG), 2021–1607 (BUBH); coll. Pungbili Islary.

2. *Phaeographis endophaeiza* (Stirt.) Zahlbr., Cat. Lich. 2:371. 1923. *Graphis endophaeiza* Stirt. in Proc. Roy. Phil. Soc. Glasgow 10:159. 1877.

Thallus crustose, corticolous, olivaceous-green, corticated. Ascomata apothecia, lirellate, simple to branched, sublobulate, 1.5 mm long, disc black, non-pruinose, labia uniformly thick, tapering towards base. Excipulum dimidiate, blackish brown in upper part, brown below, and thin in basal part, paraphyses simple. Asci 8-spored, ascospores brown,

transversely 3-septate, 18–24 × 7–10 µm. Chemistry: Thallus K + red, C –, P –, UV –, TLC: no substances detected.

Distribution: India (Arunachal Pradesh, Kerala, Tamil Nadu), Sri Lanka.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°43.46′, E90°17.40′, Elev. 237 m, on the bark of *Trema orientale* in forest, 02/04/2023, 65113 (LWG), 2023–1609 (BUBH); coll. Pungbili Islary.

3. *Phaeographis firmula* (Stirt.) Singh & Singh in Lichenologist 49(5):531. 2017. *Graphis firmula* Stirt. in Proc. Roy. Phil. Soc. Glasgow 13:186. 1880.

Thallus crustose, corticolous, olive yellow to olivaceous grey, corticated. Ascomata apothecia, lirellate, 0.3–3.0 mm long, simple to branched, disc white-pruinose. Excipulum blackish brown, paraphyses simple. Asci 8-spored, ascospores brown, 22–32 × 7–10 µm. Chemistry: Thallus K + red, C –, P + light yellow, UV –; TLC: no substances detected.

Distribution: India (Assam).
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°47.08′, E90°16.17′, Elev. 158 m, on the bark of *Trema orientale* in forest, 28/11/2022, 2022–1605 (BUBH); N26°40.43′, E90°17.44′, Elev. 123 m, on the bark of *Elaeocarpus* sp. in forest, 03/01/2023, 2023–1624 (BUBH); coll. Pungbili Islary.

8. *Sarcographa* Fée, Essai Les Crypt. 58. 1825.

Key to the species

1a. Excipulum complete, olivaceous-brown. Asci thickened at apex, 8-spored, ascospores transversely 3–5-septate, 14–23 × 6–10 µm. Stictic acid…..……....**1. *S. labyrinthica***
1b. Excipulum much thickened at base, attenuate basally, apically brown black. Asci thickened at apex, 6-spored, ascospores transversely 3–septate, 13–16 × 6–7 µm. Secondary substances absent…….……**2. *S. tricosa***

1. *Sarcographa labyrinthica* (Ach.) Müll. Arg. in Mem. Soc. Phy. Hist. Nat. 29(8):62. 1887. *Glyphis labyrinthica* Ach., Syn. Method. Lich. 107. 1814.

Thallus crustose, corticolous, olive green. Ascomata apothecia, in stroma with pruinose, intricate anastomising. Excipulum complete, olivaceous-brown, paraphyses simple, hypothecium colourless. Asci thickened at apex, 8-spored, ascospores brown, transversely 3–5-septate, 14–23 × 6–10 µm, lumina globular to lens-shaped. Chemistry: Thallus K + reddish, C –, P –, UV –; TLC: Stictic acid.

Distribution: India (Andaman & Nicobar Islands, Arunachal Pradesh, Assam, Karnataka, Kerala), Africa, Argentina, Australia, Brazil, Colombia, Costa Rica, Ecuador, Europe, French Guiana, Gabon, Indonesia, Malaysia, Myanmar, Philippines, Sri Lanka, South America, Thailand, Trinidad & Tobago.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°45′58.07″, E90°17′30.04″, Elev. 166 m, on the bark of *Ilex odorata* in forest, 13/12/2019, 63354 (LWG), 2019–0339 (BUBH); coll. Pungbili Islary.

2. *Sarcographa tricosa* (Ach.) Müll. Arg. in Mem. Soc. Phys. Hist. Nat. 29(8):63. 1887. *Graphis tricosa* Ach., Lich. Univ. 674. 1810.

Thallus crustose, corticolous, olive green with black margin. Ascomata apothecia, in stroma with pruinose, branched, disc concealed. Excipulum much thickened at base, attenuate basally, apically brown black, hypothecium colourless, paraphyses simple. Asci thickened at apex, 6-spored, ascospores light brown, transversely 3-septate, 13–16 × 6–7 µm, lumina globular to lens-shaped. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Arunachal Pradesh, Assam, West Bengal), Colombia, Costa Rica, Ecuador, Fiji, French Guiana, Guyana, Indonesia, Jamaica, Japan, Sri Lanka, Thailand, USA, Venezuela.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.429′, E90°17.440′, Elev. 184 m, 14/07/2020, on the bark of *Elaeocarpus* sp. in forest, 63353 (LWG), 2020–0329 (BUBH); N26°46.172′, E90°17.368′, Elev. 128 m, on the bark of *Liana* sp. in forest, 14/07/2020, 2020–1612 (BUBH); coll. Pungbili Islary.

9. *Sarcographina* Müll. Arg. in Flora 70:425. 1887.

Key to the species

1a. Ascospores 25–35 × 8–12 µm, with 5–8-transverse and 1–2-vertical septa except terminally. Constictic and stictic acid.……**1. *S. glyphiza***

1b. Ascospores 18–25 × 8–10 µm, with 5–7-transverse and 1–2-vertical septa in median region. Secondary substances absent.……..……...**2. *S. subtorquescens***

1. *Sarcographina glyphiza* (Nyl.) Singh & Awasthi in Bull. Bot. Surv. Ind. 20(1-4):139. 1978. *Graphis glyphiza* Nyl. in Ann. Sci. Nat. 19:374. 1863.

Thallus crustose, corticolous, olive yellow to olivaceous grey, corticated. Ascomata apothecia, lirellate, simple to branched, sunken in stroma. Excipulum brown-black, paraphyses simple and free. Ascospores brown, muriform, elongate to fusiform, 25–35 × 8–12 µm with 5–8-transverse and 1–2-vertical septa except terminally. Chemistry: Thallus K + reddish, C –, P + orange, UV –; TLC: Constictic and stictic acid.

Distribution: India (Assam, Kerala, Nagaland), China, Hong Kong, Papua New Guinea, Singapore, Sri Lanka, Thailand.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.286′, E90°16.813′, Elev. 176 m, on the bark of *Garcinia* sp. in forest, 10/10/2020, 2020–1613 (BUBH); coll. Pungbili Islary.

2. *Sarcographina subtorquescens* (Nyl.) Zahlb. ex Islary *et al*., Stud. Fung. 7(5):3. 2022. *Glyphis subtorquescens* Nyl. in Acta Soc. Sci. Fenn. 26(10):23. 1900.

Thallus crustose, corticolous, green, corticated. Ascomata apothecia, lirellate, sunken in stroma with white-pruinose, intricate, deformed, disc exposed, plane to concave. Excipulum brown to black, paraphyses simple and free. Asci thickened at apices, 6-spored, ascospores brown, muriform with 5–7-transverse and 1–2-vertical septa in median region, elongate to fusiform, 18–25 × 8–10 µm. Chemistry: Thallus K + pale yellow, C –, P + yellowish, UV –; TLC: no substances detected.

Distribution: India (Assam).

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.184′, E90°18.240′, Elev. 172 m, on the bark of *Elaeocarpus* sp. in forest, 25/12/2020, 63352 (LWG), 2020–0340 (BUBH); coll. Pungbili Islary.

10. *Schistophoron* Stirt. in Rep. Trans. Glasgow Soc. Fld. Nat. 4:165. 1876.

1. *Schistophoron tenue* Stirt. in Rep. Trans. Glasgow Soc. Fld. Nat. 4:165. 1876.

Thallus crustose, corticolous, whitish grey. Ascomata apothecia, sessile, round to elongate, 0.5–3 × 0.5–0.7 mm, constricted at base, a black line mazaedium well developed in middle, margin thick. Ascospores pale to dark brown, transversely 3-septate, 14–20 × 6–8 µm. Chemistry: Thallus K + red, C + yellow, P + orange yellow, UV –; TLC: Norstictic and stictic acid.

Distribution: India (Andhra Pradesh, Assam, Orissa, Tamil Nadu), Africa, Argentina, Costa Rica, Bolivia, Côte d'Ivoire, Ecuador, Mexico, Nigeria, Peru, Thailand, USA.
Species examined: INDIA– Assam, Kokrajhar district, **Labanyapur**, N26°47.887′, E90°18.724′, Elev. 183 m altitude, on the bark of *Magnolia hodgsonii* in forest, 10/11/2021, 65119 (LWG), 2021–1602 (BUBH); coll. Pungbili Islary.

16. THELOTREMATACEAE Stizenb. in Ber. Tät. St. Gall. nature. Ges. 167. 1862.

About 5 genera and 48 species in India; 3 genera and 13 species in India; 3 genera and 6 species reported from the present study.

Key to the genera

1a. Periphysoids present……..……..……..…2
1b. Periphysoids absent……..……..……**2. *Leucodecton***

2a. Ascomata chroodiscoid……..……**1. *Chapsa***
2b. Ascomata thelotremoid……..……..**3. *Thelotrema***

1. *Chapsa* Massal. in Atti Ins. Veneto Sci. ser. 3, 5:257. 1860.

Key to the species

1a. Ascospores 30–60 × 12–20 µm. Ascomatal margin fused……...**1. *C. discoides***
1b. Ascospores 80–125 × 20–30 µm. Ascomatal margin recurved……**2. *C. patens***

1. *Chapsa discoides* (Stirt.) Lücking in Phytotaxa 55:35. 2012. *Graphis discoides* Stirt. in Proc. Roy. Phil. Soc. Glasgow 13:187. 1882.

Thallus crustose, corticolous, greenish yellow, smooth, ecorticated. Photobiont layer and medulla with calcium oxalate crystals. Ascomata apothecia, erumpent to semi-emergent, angular-rounded, 0.3–0.45 mm diam., with chroodiscoid, disc exposed, brown, white-pruinose, margin erect to recurved with white-pruinose. Columella absent, excipulum colourless, fused to free, hymenium colourless, paraphyses simple, apically moniliform, periphysoids present. Asci 8-spored, ascospores hyaline, ellipsoid, muriform, 35–56 × 12–18 µm. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Assam, West Bengal), Brazil, Colombia, Costa Rica.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.077′, E90°17.080′, Elev. 182 m, on the bark of *Ilex odorata* in forest, 24/11/2020, 65077 (LWG), 2020–1585 (BUBH); coll. Pungbili Islary.

2. *Chapsa patens* (Nyl.) Frisch in Biblthca Lichenol. 92:111. 2006. *Thelotrema patens* Nyl. in Acta Soc. Sci. Fenn. 26(10):17. 1900.

Thallus crustose, corticolous, grey, ecorticated, dark olivaceous grey to dark grey or blackish. Photobiont and medulla layer with calcium oxalate crystals. Ascomata apothecia, immersed, rounded to slightly angular with raised, lobed and recurved margins, disc white-pruinose. Columella absent, excipulum colourless, paraphyses simple, apically moniliform, periphysoids present. Asci 1-spored, ascospores hyaline, muriform, 90–120 × 20–30 µm. Chemistry: Thallus K + brownish yellow, C –, P + yellowish, UV –; TLC: no substances detected.

Distribution: India (Assam, West Bengal), Brazil, Cameroon, China, Cuba, Mexico, Philippines, Fiji, Sri Lanka, Thailand.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°45.897′, E90°16.698′, Elev. 170 m, on the bark of *Syzygium formosum* in forest, 06/02/2021, 2021–0091 (BUBH); **Labanyapur**, N26°47.896′, E90°18.731′, Elev. 178 m, *Tetrameles nudiflora* in forest, 10/11/2021, 2021–0285 (BUBH); coll. Pungbili Islary.

2. *Leucodecton* Massal. in Atti Ins. Veneto Sci. ser. 3, 5:325. 1860.

1. *Leucodecton occultum* (Eschw.) Frisch in Biblthca Lichenol. 92:157. 2006. *Thelotrema occultum* Eschw. in Martius *et al*., Flora Bras. Enum. Plant. 1(1):174. 1833. (Plate 44C)

Thallus crustose, corticolous, fissured, yellowish grey, corticated. Ascomata apothecia, immersed to slightly emergent. Excipulum free, hymenium clear and colourless, periphysoids absent. Asci 8-spored, ascospores small, brown, submuriform to muriform, 5–9 × 1–5 septate, thick wall, 20–34 × 10–15 µm. Chemistry: Thallus K + yellow turning red, C –, P + yellow, UV –; TLC: Norstictic acid.

Distribution: India (Andaman & Nicobar Islands, Andhra Pradesh, Assam, Kerala, Madhya Pradesh, Orissa, West Bengal), Angola, Australia, Brazil, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Fiji, Mexico, New Caledonia, Philippines, Singapore, Sri Lanka, Tanzania, USA, Vanuatu, Vietnam.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.523′, E90°16.880′, Elev. 179 m, on the bark of *Tetrameles nudiflora* on road side, 29/01/2023, 65099 (LWG); **Labanyapur**, N26°47.896′, E90°18.731′, Elev.178 m, *Tetrameles nudiflora* in forest, 10/11/2021, 2021–1597 (BUBH); coll. Pungbili Islary.

3. Thelotrema Ach., Method. Lich. 130. 1803.

Key to the species

1a. Ascospores transversely 21–23-septate, 101–150 × 12–17 µm. Constictic acid present……..……...……..**3. *T. porinoides***

1b. Ascospores muriform……...……2

2a. Norstictic acid present. Ascospores 22–28 × 9–14 µm…..……..**1. *T. canarense***

2b. Substances absent. Ascospores 65–83 × 17–27 µm…….....**2. *T. lepadinum***

1. *Thelotrema canarense* Patw. & Kulk. in Norw. J. Bot. 24:128. 1977. (Plate 50C)

Thallus crustose, corticolous, thin, smooth, whitish grey, corticated. Photobiont layer and medulla with calcium oxalate crystals. Ascomata thelotremoid apothecia, solitary, opening broader, immersed, lepadinoid, with pruinose, 0.3–0.6 mm diam., disc 0.08–0.2 mm wide pore, margin entire, gap in between of double margin. Columella absent,

excipulum colourless, hymenium clear, periphysoids present, paraphyses simple. Asci 8-spored, ascospores hyaline, muriform, 22–28 × 9–14 µm. Chemistry: Thallus K + yellow turning red, C –, P + olive yellow, UV –; TLC: constictic and norstictic acid.

Distribution: India (Karnataka), France, Tanzania, Thailand.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°47.13′, E90°16.11′, Elev. 171 m, on the bark of *Tetrameles nudiflora* in forest, 28/11/2022, 2022–1002 (BUBH); coll. Pungbili Islary.

2. *Thelotrema lepadinum* (Ach.) Ach., Method. Lich. 132. 1803. *Lichen lepadinus* Ach., Lich. Svec. Prodr. 30. 1799. (Plate 50D)

Thallus crustose, corticolous, greenish grey to olive green with black-carbonized margin, smooth to uneven, with irregular, compact cortex. Photobiont layer with calcium oxalate crystals. Ascomata thelotremoid apothecia, prominent, rounded, 0.5–1.2 mm diam., disc 0.3–0.5 mm wide pore, pale brown, white-pruinose, margin entire, pale brown, undulate, gap in between of double margin. Columella absent, excipulum colourless, hymenium clear, periphysoids present, paraphyses simple. Asci 4-spored, ascospores muriform, hyaline, 65–83 × 17–27 µm. Chemistry: Thallus K + brownish yellow, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Karnataka, Kerala, Eastern Himalaya, Tamil Nadu), Costa Rica, Canada, Denmark, France, Latvia, Netherlands, Norway, Poland, Sweden, United Kingdom of Great Britain & Northern Ireland, USA.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.042′, E90°17.094′, Elev. 183 m, on the bark of *Ilex odorata* in forest, 24/11/2020, 2020–0095 (BUBH); coll. Pungbili Islary.

3. *Thelotrema porinoides* Mont. & Bosch in Junghuhn & Miquel, Plant. Jungh. Enum. Plant. 4:484. 1856. (Plate 50E)

Thallus crustose, corticolous, greenish grey to olive grey, with black carbonized margin, smooth to uneven, with irregular, compact cortex. Photobiont layer with calcium oxalate crystals. Ascomata thelotremoid apothecia, prominent, rounded, 0.8−2.0 mm diam., disc 0.2–0.5 mm wide pore, white-pruinose, proper margin entire, gap in between of double

margin. Columella absent, excipulum colourless, hymenium clear, periphysoids present, paraphyses simple. Asci 8-spored, ascospores oblong, hyaline, transversely 21–23-septate, with thick septa and lumina rounded, 101–150 × 12–17 µm, I + violet blue (Amyloid). Chemistry: Thallus K + brownish yellow, C –, P + yellowish, UV –; TLC: Constictic acid.

Distribution: India (Andaman & Nicobar Islands, Tamil Nadu), Australia, Costa Rica, Fiji, French Guiana, Indonesia, Jawa, Malaysia, New Zealand, Papua New Guinea, Philippines, Réunion, South Africa, Sri Lanka, Thailand, USA, Venezuela.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.087′, E90°17.113′, Elev. 147 m on the bark of *Liana* sp. in forest, 24/11/2020, 63355 (LWG), 2020–0096 (BUBH); coll. Pungbili Islary.

17. COENOGONIACEAE Stizenb., Ber. Tät. St. Gall. Naturw. 140. 1862.

1 genus and 11 species in India; 1 genus and 4 species from Assam; 1 genus and 1 species reported from the present study.

1. *Coenogonium* in Esenbeck, Hor. Phy. Berol. 120. 1820.

1. *Coenogonium degeneri* (Kalb & Vêzda) Kalb & Lücking, Fung. Divers. 23:297. 2006. *Dimerella degeneri* Kalb & Vêzda in Folia Geobot. Phytotax. 15(3):310. 1980.

Thallus crustose, corticolous, smooth, yellowish green, rimose-verruculose, lacking prothallus and isidia. Ascomata apothecia, biatorine, 0.3–0.5 mm diam., disc pale yellow, margin beige, paler than disc, pycnidia absent. Excipulum colourless, lacking algal cells in basal excipulum, hymenium colourless, 80–100 µm high, hypothecium colourless to pale, paraphyses simple. Asci 8-spored, 50–55 × 5–7 µm, ascospores hyaline, biseriate, 1-septate, oval-shaped, 10–14 × 4–5 µm. Chemistry: Thallus K + brown, C –, P + yellow, UV –; TLC: no substances detected.

Distribution: USA.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°42.452′, E90°17.830′, Elev. 107 m, on the bark of *Castanopsis indica* in forest, 08/01/2023, 2023–1416 (BUBH); coll. Pungbili Islary.

18. TRICHOTHELIACEAE Bitter & Schill. in Hedwigia 67:273. 1927.

About 3 genera and 76 species in India; 2 genera and 15 species in Assam; 2 genera and 13 species reported from the present study.

Key to the genera

1a. Ascospores transversely septate or submuriform……..…..…….……**2. *Porina***
1b. Ascospores muriform……..……..……..……**1. *Clathroporina***

1. *Clathroporina anoptella* (Stirt.) Zahlbr., Cat. Lich. Univ. 1:415. 1922. *Verrucaria anoptella* Stirt. in Proc. Roy. Phil. Soc. Glasgow 13:190. 1882.

Thallus crustose, corticolous, greenish grey, with carbonized margin, corticated. Ascomata perithecia, 0.8–1.8 mm wide diam., solitary, covered by thalline layer, ostiole straight point-like. Peridium dark brown, hymenium inspersed with oil globules, paraphyses simple and free. Asci 8-spored, I + vinose, ascospores oblong to fusiform, hyaline, muriform, 137–187 × 28–36 µm, easily breaks in the middle. Chemistry: Thallus K + yellow, C –, P + pale yellow, UV –; TLC: no substances detected.

Distribution: India (Arunachal Pradesh, Assam, Uttarakhand), Indonesia, Papua New Guinea.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.117′, E90°18.359′, Elev. 181 m, on the bark of *Elaeocarpus* sp. in forest, 25/12/2020, 2020–0250 (BUBH); N26°46.072′, E90°18.190′, Elev. 167 m, on the bark of *Semecarpus anacardium* in forest, 05/12/2020, 63293 (LWG), 2020–0251 (BUBH); coll. Pungbili Islary.

2. *Porina* Müll. Arg. in Flora 66(20):320. 1883.

Key to the species

1a. Asci with ring structure…….....**1. *P. ahlesiana***
1b. Asci without ring structure……...2

2a. Ascospores submuriform to muriform……...…….…..3
2b. Ascospores transversely septate……...……4

3a. Ascospores with 9–12-transverse septa and 1–2-longitudinal or diagonal septa, 52–90 × 13–20 µm……...……**10. *P. nuculastrum***

3b. Ascospores with 12–20 transverse septa, and 2–4-longitudinal septa, 45–88 × 15–36 µm…….……..……**4. *P. eminentior***

4a. Ascospores 11–16-septate……5

4b. Ascospores 5–11-septate……..6

5a. Excipulum pale yellowish orange, involucrellum brown, hymenium studded with crystals…..……**3. *P. belanospora***

5b. Excipulum dark orange brown, involucrellum apical-dimidiate, incurving toward and spreading beneath excipulum…..……...……**13. *P. subhibernica***

6a. Asci 6-spored, Ascomata 0.5–1.2 mm diam……**2. *P. atroperiostiola***

6b. Asci 8-spored, ascospores 17–85 µm long……7

7a. Ascospores less than 30 µm long, transversely 3–7-septate, 17–24 × 3–5 µm.....**9. *P. mastoidella***

7b. Ascospores more than 30 µm long.....8

8a. Ostioles K +reddish.....**8. *P. mastoidea***

8b. Ostioles K –.....9

9a. Ascospores > 60 µm long.....10

9b. Ascospores < 60 µm long.....11

10a. Ascospores 78–85 × 15–18 µm…….....**7. *P. luteopallens***

10b. Ascospores 62–85 × 11–16 µm.....**12. *P. subcutanea***

11a. Ascospores transversely 7-septate, 50–56 × 14–18 µm.....**6. *P. internigrans***

11b. Ascospores transversely 5–9-septate.....12

12a. Ascospores 36–46 × 4–6 µm.....**5. *P. interestes***

12b. Ascospores 41–56 × 3–5 µm.....**11. *P. platystoma***

1. *Porina ahlesiana* (Körb.) Zahlbr., Cat. Lich. Univ. 8:99. 1932. *Segestrella ahlesiana* Körb., Parerga Lichenol. 4:324. 1865.

Thallus crustose, corticolous, thin, greenish grey, corticated, continuous or less cracked. Ascomata perithecia, 0.5–1.5 mm diam., erumpent, covered by thalline layer, ostiole grey, ostiolar rim black. Excipulum yellow, involucrellum dark brown to black, paraphyses branched. Asci truncated with a ring structure in apex, 8-spored, ascospores hyaline, oblong to fusiform, 6–7-septate, 30–55 × 6–12 µm. Chemistry: Thallus K + orange, C –, P + light orange, UV –; TLC: unknown substances present.

Distribution: Canada, Germany, Hungary, Italy, New Zealand, Northern Ireland, Norway, Romania, Spain, Sweden.
Species examined: INDIA– Assam, Kokrajhar district, **Labanyapur**, N26°47.979′, E90°19.177′, Elev. 192 m, on the bark of *Magnolia hodgsonii* in forest, 10/11/2021, 2021–1186 (BUBH); coll. Pungbili Islary.

2. *Porina atroperiostiola* Makhija, Adaw. & Patw. in J. Econ. Taxon. Bot. 18(3):530. 1995.

Thallus crustose, corticolous, greenish, corticated. Ascomata perithecia, 0.5–1.2 mm diam., globose, completely covered by thallus, ostiole distinct, brown to black. Peridium colourless, centrum globose, excipulum pale yellow. Asci 6-spored, ascospores hyaline, oblong to fusiform, transversely 5–8 septate, 62–72 × 10–13 µm. Chemistry: Thallus K + slightly yellow, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Arunachal Pradesh, Karnataka, Maharashtra, Tamil Nadu).
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.178′, E90°16.695′, Elev. 185 m, on the bark of *Elaeocarpus* sp. in forest, 16/10/2020, 63340 (LWG), 2020–1285 (BUBH); coll. Pungbili Islary.

3. *Porina belanospora* (Nyl.) Müll. Arg. in Bot. Jb. Sys. 6:400. 1885.

Thallus crustose, corticolous, smooth, green, glossy, indeterminate, corticated. Ascomata perithecia, minute, immersed to slightly emergent, 0.2–0.3 mm diam., not constricted at the base. Ostiole pale brown, depressed, ostiolar rim light brown to mostly black. Excipulum pale yellowish-orange, involucrellum brown, hymenium studded with crystals. Asci 8-spored, ascospores hyaline, transversely 11–15 septate, 61–69 × 4–6 µm. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Andaman & Nicobar Islands, Arunachal Pradesh, Assam), Colombia.

Species examined: INDIA– Assam, Kokrajhar district, **Saralpara**, N26°50.988′, E90°14.356′, Elev. 254 m, *Elaeocarpus* sp. in forest, 05/01/2021, 63334 (LWG), 2021–1279 (BUBH); coll. Pungbili Islary.

4. *Porina eminentior* (Nyl.) McCarthy in Lichenologist 32(1):42. 2000. *Thelenella eminentior* Nyl. in Ann. Sci. Nat. ser. 4, 15:54. 1861.

Thallus crustose, corticolous, greenish grey, verruculose, corticated. Ascomata perithecia, covered by thalline layer, ostiole and ostiolar region dark brown to black, periostiolar region concolorous with thallus. Involucrellum apical to dimidiate, internally golden yellow to orange brown, externally colourless to pale yellow brown. Asci elongate to fusiform, 180–250 × 28–45 µm, ascospores ellipsoid, hyaline, submuriform to muriform, with 12–20-transverse septa, each lumina 2–4-longitudinal septa, 45–88 × 15–36 µm. Chemistry: K + brownish orange, C –, P + pale orange, UV –; TLC: no substances detected.

Distribution: India (Meghalaya), Australia, Brazil, Colombia, France, Papua New Guinea, Vanuatu.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°49.23′, E90°17.37′, Elev. 256 m, on the bark of *Tetrameles nudiflora* on road side, 02/04/2023, 2023–1567 (BUBH); coll. Pungbili Islary.

5. *Porina interstes* (Nyl.) Harm. in Bull. Séanc. Soc. Nancy, ser. 3, 12: 126. 1911. Verrucaria interstes Nyl. in Bull. Soc. Linn. Normandie ser. 2, 2:123. 1867.

Thallus crustose, corticolous, ecorticated, green, greenish grey, somewhat shiny. Ascomata perithecia, globose-semiglobose, brown-black, 0.4–0.8 mm diam., ostiole black, K –. Peridium brownish black, paraphyses simple. Asci 8-spores, ascospores transversely 5–9-septate, hyaline, fusiform, 36–46 × 4–6 µm. Chemistry: Thallus K + orange yellow, C –, P + yellow, UV –; TLC: no substances detected.

Distribution: India (Andaman & Nicobar Islands, Arunachal Pradesh, Assam, Goa, Karnataka, Madhya Pradesh, Nagaland, Orissa, Sikkim, Tamil Nadu, West Bengal), Brazil, Ecuador, French Guiana, Guinea, Mexico, Peru.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46′05.57″, E90°18′33.05″, Elev. 164 m, on the bark of *Semecarpus anacardium* in forest, 04/03/2020, 63337 (LWG), 2020–1284 (BUBH); N26°46′05.67″, E90°18′31.51″, Elev. 168 m, on the bark of *Semecarpus anacardium* in forest, 04/03/2020, 2020–1282 (BUBH); N26°46.524′, E90°13.501′, Elev. 173 m, on the bark of *Ficus* sp. in forest, 02/04/2022, 2022–1189 (BUBU); N26°46.49′, E90°16.30′, Elev. 187 m, on the bark of *Magnolia hodgsonii* in forest, 28/11/2022, 2022–1190 (BUBH); N26°45.45′, E90°18.19′, Elev. 147 m, on the bark of *Tetrameles nudiflora* in forest, 16/12/2022, 2022–1317 (BUBH); N26°45.49′, E90°18.15′, Elev. 143 m, on the bark of *Holarrhena* sp. in forest, 16/12/2022, 2022–1314 (BUBH); N26°45.29′, E90°18.16′, Elev. 143 m, on the bark of *Wrightia arborea* in forest, 19/12/2022, 2022–1362 (BUBH); N26°45.27′, E90°18.16′, Elev. 147 m, on the bark of *Aglaia spectabilis* in forest, 19/12/2022, 2022–1323 (BUBH); N26°45.00′, E90°18.13′, Elev. 142 m, on the bark of *Tetrameles nudiflora* in forest, 19/12/2022, 2022–1353 (BUBH); N26°45.10′, E90°18.09′, Elev. 142 m, on the bark of *Holarrhena* sp. in forest, 19/12/2022, 2022–1335 (BUBH); N26°43.224′, E90°17.594′, Elev. 124 m, on the bark of *Magnolia hodgsonii* in forest, 08/01/2023, 2023–1440 (BUBH); **Labanyapur**, N26°48.392′, E90°18.444′, Elev. 187 m, on the bark of *Magnolia hodgsonii* in forest, 29/01/2023, 2023–1536 (BUBH); **Saralpara**, N26°51.021′, E90°14.680′, Elev. 260 m, on the bark of *Tetrameles nudiflora* in forest, 05/01/2021, 2021–1283 (BUBH); coll. Pungbili Islary.

6. *Porina internigrans* (Nyl.) Müll. Arg. in Rep. Six Meet. Austral. Assoc. Advanc. Sci. 452. 1895. *Verrucaria mastoidea* (Massal.) Trevis., Conspect. Verruc. 8. 1860.

Thallus crustose, corticolous, greenish grey to yellowish orange, smooth to minutely verrucose, shiny, ecorticated. Ascomata perithecia, subglobose to hemispherical, brown-black, 0.7–1.4 mm diam., ostiole black, prominent, shiny. Asci 8-spored, ascospores hyaline, fusiform or needle-shaped, transversely 7-septate, 50–56 × 14–17 μm. Chemistry: Thallus K + reddish, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Andaman & Nicobar Islands, Arunachal Pradesh, Assam, Goa, Karnataka, Kerala, Meghalaya, Nagaland, Tamil Nadu, West Bengal), Australia, Brazil, Colombia, Costa Rica, El Salvador, Fiji, French Guiana, Guyana, Indonesia, New Caledonia, Papua New Guinea, Singapore, Solomon Islands, Thailand, Vanuatu, Vietnam.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°45.965′, E90°17.119′, Elev. 171 m , on the bark of *Semecarpus anacardium* in forest, 27/10/2020, 63338 (LWG), 2020–1278 (BUBH); N26°46.353′, E90°16.756′, Elev. 165 m, on the bark of *Elaeocarpus* sp. in forest, 10/10/2020, 2020–1280 (BUBH); N26°45.52′, E90°18.23′, Elev. 142 m, on the bark of *Magnolia champaca* in forest, 16/12/2022, 2022–1311 (BUBH); N26°45.45′, E90°18.21′, Elev. 136 m, on the bark of *Wrightia arborea* in forest, 16/12/2022, 2022–1325 (BUBH); N26°45.00′, E90°18.16′, Elev. 142 m, on the bark of *Magnolia hodgsonii* in forest, 19/12/2022, 2022–1330 (BUBH); N26°45.07′, E90°18.09′, Elev. 140 m, on the bark of *Ilex odorata* in forest, 19/12/2022, 2022–1331 (BUBH); N26°45.00′, E90°18.12′, Elev. 138 m, on the bark of *Tetrameles nudiflora* in forest, 19/12/2022, 2022–1339 (BUBH); N26°43.47′, E90°18.08′, Elev. 294 m, on the bark of *Aglaia spectabilis* in forest, 02/04/2023, 2023–1573 (BUBH); N26°44.26′, E90°18.23′, Elev. 268 m, on the bark of *Magnolia champaca* in forest, 02/04/2023, 2023–1563 (BUBH); coll. Pungbili Islary.

7. *Porina luteopallens* (Nyl.) Zahlbr., Cat. Lich. Univ. 1:392. 1922. *Verrucaria luteopallens* Nyl. in Acta Soc. Sci. Fenn. 26(10):23. 1900.

Thallus crustose, corticolous, greenish grey, corticated. Ascomata perithecia, subglobose, ostiole black. Peridium globose, involucrellum dark brown and orange yellow within, hymenium colourless, paraphyses simple. Asci 8-spored, ascospores hyaline, fusiform, transversely 9–11-septate, 78–85 × 15–18 µm. Chemistry: Thallus K + reddish, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Arunachal Pradesh, Assam), Sri Lanka.
Species examined: INDIA– Assam, Kokrajhar district, **Saralpara**, N26°50.968′, E90°14.355′, Elev. 258 m, on the bark of *Ficus* sp. in forest, 05/01/2021, 63360 (LWG), 2021–0099 (BUBH); coll. Pungbili Islary.

8. *Porina mastoidea* Fée, Essai La Crypt. 82. 1825.

Thallus crustose, corticolous, green, smooth. Ascomata perithecia hemispherical, completely covered by thalline layer, ostiole apical, brown, dot-like, K + reddish, 0.1–0.4 mm diam. Peridium dimidiate, centrum globose, excipulum golden yellow, involucrellum dark yellowish brown and golden yellow within, paraphysis simple. Asci 8-spored, ascospores hyaline, fusiform, transversely 5–7-septate, 34–50 × 5–7 µm. Chemistry: Thallus K + purple, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Andaman & Nicobar Islands, Assam), Argentina, Australia, Bahamas, Bhutan, Brazil, Colombia, Costa Rica, Cuba, French Polynesia, Guyana, New Caledonia, Nicaragua, Panama, Papua New Guinea, Paraguay, Portugal, Puerto Rico, Réunion, Seychelles, Solomon Islands, Spain, Thailand, Uruguay, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°45.44′, E90°18.16′, Elev. 137 m, on the bark of *Terminalia* sp. on road side, 16/12/2022, 2022–1363 (BUBH); **Labanyapur**, N26°48.418′, E90°18.413′, Elev. 180 m, *Holarrhena* sp., on the bark of in forest, 29/01/2023, 2023–1551 (BUBH); coll. Pungbili Islary.

9. *Porina mastoidella* (Ny.) Müll. Arg. in Bot. Jb. Sys. Pflanz. 6:401. 1885. ***Verrucaria mastoidella*** Nyl. in Flora 50:8. 1867.

Thallus crustose, corticolous, olive green to greenish grey, ecorticated. Ascomata perithecia, brownish black, hemispherical, solitary, ostiole apical. Excipulum K + red, involucrellum brown, hymenium inspersed, paraphyses simple. Asci 8-spored, ascospores hyaline, fusiform, transversely 5–7-septate, 17–24 × 4–5 µm. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Arunachal Pradesh, Assam, West Bengal), Australia, Brazil, Chinese Taipei, Christmas Islands, Cuba, Solomon Islands, South Africa, Taiwan, Tanzania, Vanuatu.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.212′, E90°16.683′, Elev. 167 m, on the bark of *Elaeocarpus* sp. in forest, 16/10/2020, 63335 (LWG); N26°45.50′, E90°18.21′, Elev. 139 m, on the bark of *Tetrameles nudiflora* in forest, 16/12/2022, 2022–1319 (BUBH); coll. Pungbili Islary.

10. *Porina nuculastrum* (Müll. Arg.) Harris, More Flor. Lich. 174. 1995. *Clathroporina nuculastrum* Müll. Arg. in Flora 67(32):618. 1884. (Plate 49A)

Thallus crustose, corticolous, green to grey-green, corticated. Ascomata perithecia, 0.6–1.3 mm diam., erumpent, covered by thalline layer, ostiole grey brown, ostiolar rim dark brown to black. Excipulum pale brown to yellowish brown, involucrellum orange brown to brown. Asci elongate to fusiform, 180–230 × 32–48 µm, ascospores hyaline, ellipsoid to fusiform, submuriform to muriform, with 9–12-transverse septa, each lumina with 1–2-longitudinal or diagonal septa, 52–90 × 13–20 µm. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Assam), Australia, Brazil, China, Colombia, Costa Rica, Guyana, Hong Kong, Papua New Guinea, USA, Venezuela.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°45.52′, E90°18.24′, Elev. 140 m, on the bark of *Aglaia spectabilis* in forest, 16/12/2022, 2022–1329 (BUBH); N26°45.32′, E90°18.15′, Elev. 141 m, on the bark of *Ilex odorata* in forest, 19/12/2022, 2022–1342 (BUBH); N26°43.199′, E90°17.535′, Elev. 127 m, on the bark of *Magnolia hodgsonii* in forest, 08/01/2023, 2023–1445 (BUBH); N26°41.906′, E90°18.824′, Elev. 106 m, on the bark of *Elaeocarpus* sp. in forest, 08/01/2023, 2023–1443 (BUBH); coll. Pungbili Islary.

11. *Porina platystoma* Müll. Arg. in Bull. Herb. Boissier 3:326. 1895.

Thallus crustose, corticolous, greenish grey, corticated. Ascomata perithecia, 0.5–1.5 mm diam., sub-globose, completely covered by thallus, ostiole brown to black. Involucrellum apical to dimidiate, pale to medium orange-brown, centrum globose, excipulum pale yellow to brown. Asci 8-spored, ascospores hyaline, needle-shaped, transversely 6–8-septate, 41–56 × 3–5 µm. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Karnataka, Maharashtra, Meghalaya), Angola, Australia, Brazil, Christmas Island, Costa Rica, Ecuador, Guatemala, Mexico, Nicaragua, Taiwan, Tanzania.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.269′, E90°16.956′, Elev. 166 m, on the bark of *Semecarpus anacardium* in forest, 10/10/2020, 63339 (LWG), 2020–1286 (BUBH); coll. Pungbili Islary.

12. *Porina subcutanea* Ach. Syn., Method. Lich. 113. 1814.

Thallus crustose, corticolous, corticated, green with black margin, shiny. Photobiont layer and medulla with dense crystals. Ascomata perithecia, subglobose, 0.3–1.0 mm diam., completely covered by thallus, ostiole black, K –. Involucrellum incurving toward the excipulum, black at top, centrum globose, excipulum pale yellow, paraphyses simple and slightly wavy. Asci 8-spored, ascospores hyaline, oblong to ellipsoid, transversely 6–10-septate, 62–77 × 11–16 µm. Chemistry: Thallus K + yellowish, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Andaman & Nicobar Islands, Arunachal Pradesh, Goa, Karnataka, Kerala, Manipur, Sikkim, Tamil Nadu, West Bengal), Nepal, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.054′, E90°17.081′, Elev. 142 m, on the bark of *Ilex odorata* in forest, 24/11/2020, 63336 (LWG), 2020–0242 (BUBH); N26°46.274′, E90°16.812′, Elev. 167 m, on the bark of *Elaeocarpus* sp. in forest, 10/10/2020, 2020–1276 (BUBH); N26°46.173′, E90°18.217′, Elev. 179 m, on the bark of *Castanopsis indica* in forest, 05/12/2020, 2020–1277 (BUBH); N26°46.054′, E90°17.081′, Elev. 176 m, on the bark of *Castanopsis indica* 24/11/2020, 2020–1275 (BUBH); N26°45.52′, E90°18.23′, Elev. 141 m, on the bark of *Magnolia champaca* in forest, 16/12/2022, 2022–1312 (BUBH); N26°42.455′, E90°17.816′, Elev. 108 m, on the bark of *Elaeocarpus* sp., in forest, 08/01/2023, 2023–1441 (BUBH); **Labanyapur**, N26°48.319′, E90°18.430′, Elev. 197 m, on the bark of *Stereospermum chelonoides* on road side, 29/01/2023, 2023–1550 (BUBH); **Saralpara**, N26°51.051′, E90°16.442′, Elev. 260 m, on the bark of *Tetrameles nudiflora* on road side, 14/03/2023, 2023–1526 (BUBH); coll. Pungbili Islary.

13. *Porina subhibernica* Upreti in Bryologist 97(1):76. 1994.

Thallus crustose, corticolous, greenish-grey, smooth. Ascomata perithecia, solitary or 2–3 aggregated, globose-subglobose, completely covered by thalline layer, ostiole plane,

brown-black, K –. Involucrellum apical-dimidiate, incurving toward and spreading beneath excipulum, excipulum dark orange-brown, peridium yellow, paraphyses simple. Asci cylindrical, biseriate, 8-spored, ascospores fusiform, straight to curved, hyaline, transversely 13–16-septate, 55–68 × 4–6 µm. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Arunachal Pradesh, Assam, Goa, Karnataka, Kerala, Madhya Pradesh, Sikkim, Tamil Nadu).

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°45.50′, E90°18.22′, Elev. 143 m, on the bark of *Magnolia champaca* on road side, 19/12/2022, 2022–1348 (BUBH); N26°40.44′, E90°17.42′, Elev. 121 m, on the bark of *Elaeocarpus* sp. in forest, 03/01/2023, 2023–1424 (BUBH); N26°42.454′, E90°17.852′, Elev. 110 m altitude, on the bark of *Elaeocarpus* sp. in forest, 08/01/2023, 2023–1414 (BUBH); coll. Pungbili Islary.

19. CLADONIACEAE Zenker in Pharm. Waarenk. 1(3):124. 1829.

About 6 genera and 88 species in India; 3 genera and 8 species in Assam; 1 genus and 1 species reported from the present study.

1. *Cladonia* Browne, Civ. Nat. His. Jamaic. 81. 1756.

1. *Cladonia subradiata* (Vain.) Sandst. in Abh. Naturw. Ver. Brem. 25:230. 1922. *Cladonia fimbriata* var. *subradiata* Vain. in Acta Soc. Fauna Flora Fenn. 10:338. 1894.

Thallus fruticose, corticolous, primary thallus small, greenish brown on upper side, white cottony on lower side. Podetia greenish, to 18 mm tall, 0.4–1.0 mm thick at base, simple to sparingly branched. Scyphose when mature, scyphi scarcely distinct, to 2 mm wide, corticated in inner side, brown hymenial disc on margins. Podetial surface corticated and with large squamules at base, upwards granulose sorediate or with isidiod granules and microsquamules. Podetia K –, P + orange-red. Chemistry: Thallus K –, C –, P + orange-red. UV –; TLC: Fumarprotocetraric acid.

Distribution: India (Assam, Tamil Nadu), Africa, Argentina, Asia, Australia, Brazil, Chile, Colombia, Costa Rica, Cuba, Guyana, Haiti, Mexico, New Caledonia, Kenya, New

Zealand, North and South America, Paraguay, Portugal, Puerto Rico, Saint Lucia, Suriname, Tanzania, Trinidad & Tobago, Uganda, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46′03.00″, E90°17′33.58″, Elev. 181 m, on the bark of *Syzygium formosum* in forest, 13/12/2019, 63366 (LWG), 2019–0345 (BUBH); coll. Pungbili Islary.

20. HAEMATOMMATACEAE Hafellner in Nova Hedwigia 79:281. 1984.

About 1 genus and 4 species in India; 1 genus and 2 species in Assam; 1 genus and 1 species reported from the present study.

1. *Haematomma* Massal., Ric. Auton. Lich. Crost. 32. 1852.

1. *Haematomma africanum* (J. Steiner) Dodge in Nova Hedwigia 38:39. 1971. *Haematomma puniceum* var. *africanum* Steiner in Bull. Herb. Boissier ser. 2, 7:641. 1907. (Plate 42F)

Thallus crustose, corticolous, esorediate. Ascomata apothecia, lecanorine, sessile to immersed in thallus, disc orange-red, epihymenium brownish-yellow, with haematommone, K + violet later epihymenium becomes colourless with no crystal form, hymenium and hypothecium colourless, paraphyses branched. Asci clavate, 8-spored, ascospores hyaline, fusiform to acicular, thin walled, transversely 9–19-septate, 54–88 × 4–7 µm. Chemistry: Thallus K + yellow, C –, P + orange yellow, UV –; TLC: Atranorin.

Distribution: Australia, Brazil, China, Chinese Taipei, Colombia, Costa Rica, Cuba, El Salvador, Guadeloupe, Guatemala, Jamaica, Malaysia, New Caledonia, Panama, Puerto Rico, Réunion, South Africa, Papua New Guinea, Paraguay, Singapore, Sri Lanka, Venezuela.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.209′, E90°14.112′, Elev. 167 m, on the bark of *Ficus* sp. in forest, 02/04/2022, 2022–0655 (BUBH); **Labanyapur**, N26°47.897′, E90°18.781′, Elev. 178 m, on the bark of *Tetrameles nudiflora* in forest, 10/11/2021, 2021–0656 (BUBH); coll. Pungbili Islary.

21. LECANORACEAE Körb., Sys. Lich. Germ. 104. 1855.

About 6 genera and 109 species in India; 2 genera and 19 species; 1 genus and 3 species reported from the present study.

1. *Lecanora* Ach. in Luyken, Tent. His. Lich. Gen. 90. 1809.

Key to the species

1a. Amphithecium without crystals. Asci > 8-spored. Secondary substances absent……..**2. *L. sambuci***

1b. Amphithecium with small and large crystals. Asci 4-spored. Secondary substances present…..……..……..2

2a. Amphithecium with large crystals. Epihymenial pigment dissolving in K. 2'-*O*-methylperlatolic and usnic acid present…...……..……....**1. *L. achroa***

2b. Amphithecium with small and large crystals. Epihymenial pigment not dissolving in K. Atranorin and zeorin present…..……..…….**3. *L. tropica***

1. *Lecanora achroa* Nyl. in J. Bot. 14:263. 1876.

Thallus crustose, corticolous, grey, esorediate, corticated. Ascomata apothecia, upto 1.0 mm diam., sessile, lecanorine, disc orange brown, plane to convex, non-pruinose. Amphithecium with large crystals, hymenium colourless, hypothecium colourless to pale yellow, epihymenial pigment dissolving in K. Asci clavate, 8-spored, ascospores hyaline, simple, 6–9 × 1–3 µm. Chemistry: Thallus K + yellow, C –, P + yellow, UV –; TLC: 2'-*O*-methylperlatolic and usnic acid.

Distribution: India (Assam, Himachal Pradesh, Manipur, Sikkim, Uttar Pradesh), Antarctica, Australia, Bolivia, Brazil, Cayman Islands, Chile, Chinese Taipei, Colombia, Costa Rica, Cuba, Dominican Republic, Fiji, Haiti, Indian Ocean Islands, Jamaica, Mexico, New Zealand, Papua New Guinea, Rodrigues, Seychelles, South Pacific regions, Thailand, Uruguay, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Saralpara**, N26°50.895′, E90°15.451′, Elev. 275 m, on the bark of *Magnolia champaca* on road side, 05/03/2023, 2023–1513 (BUBH); N26°49.953′, E90°15.604′, Elev. 234 m, on the bark of *Magnolia champaca* on road side, 05/03/2023, 2023–1499; coll. Pungbili Islary.

2. *Lecanora sambuci* (Pers.) Nyl., Lich. Scand. Prodr. 168. 1861. *Lichen sambuci* Pers. in Usteri, Ann. Bot. 1:26. 1794.

Thallus crustose, corticolous, olive grey, smooth, corticated. Ascomata apothecia, sessile, lecanorine, 0.2–0.7 mm diam., disc non-pruinose, dark brown. Amphithecium lacking crystals, hypothecium colourless to pale yellowish. Asci > 8-spored, ascospores hyaline, simple, 10–12 × 6–8 µm. Chemistry: Thallus K + pale yellow, C –, P + olive yellow, UV –; TLC: no substances detected.

Distribution: India (Manipur, Uttarakhand), Canada, Czechia, Estonia, France, Germany, Netherlands, Northern Ireland, Russian Federation, Sambucus nigra, Spain, Sweden, Switzerland.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°47.697′, E90°17.809′, Elev. 191 m, on the bark of *Tetrameles nudiflora* in forest, 02/04/2023, 2023–1548 (BUBH); coll. Pungbili Islary.

3. *Lecanora tropica* Zahlbr., Cat. Lich. Univ. 5:589. 1928.

Thallus crustose, corticolous, greyish white, esorediate, rough, verruculose to verrucose, corticated. Ascomata apothecia, lecanorine, upto 2.0 mm diam., disc pale to dark red brown, non-pruinose, plane to concave, margin thick, verrucose to verruculose. Amphithecium with small and large crystals, hymenium colourless, hypothecium colourless to pale yellow, epihymenial pigment not dissolving in K. Asci clavate, 8-spored, ascospores hyaline, simple, 8–13 × 5–8 µm. Chemistry: Thallus K + yellow, C –, P + pale yellow, UV –; TLC: Atranorin and zeorin.

Distribution: India (Assam, Himachal Pradesh, Karnataka, Madhya Pradesh, Orissa, Sikkim, Tamil Nadu, Uttar Pradesh, Uttarakhand, West Bengal), Australia, Brazil, Chinese Taipei, Colombia, Costa Rica, Fiji, Japan, Kenya, Nepal, New Caledonia, Nicaragua, Papua New Guinea, Seychelles, Thailand, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Saralpara**, N26°51.293′, E90°15.755′, Elev. 283 m, on the bark of *Magnolia champaca* on road side, 05/03/2023, 2023–1580 (BUBH); coll. Pungbili Islary.

22. MALMIDEACEAE Kalb, Rivas Plata & Lumbsch in Biblthca Lichenol. 106:150. 2011.

About 1 genus and 12 species in India; 1 genus and 6 species in Assam; 1 genus and 21 species reported from the present study.

1. *Malmidea* Kalb, Rivas Plata & Lumbsch in Biblthca Lichenol. 106:150. 2011.

Key to the species

1a. Verrucae becoming sorediate. Medulla and soredia yellow-orange, K + red. Apothecial disc grey-brown, margin cream to yellow, thick….……**1. *M. atlantica***

1b. Verrucae becoming esorediate…….2

2a. Apothecia with thalline excipulum…..……**7. *M duplomarginata***

2b. Apothecia without thalline excipulum.…….3

3a. Apothecial margin with medullary layer.……..4

3b. Apothecial margin without medullary layer……11

4a. Medulla of thallus and verrucae white.…….5

4b. Medulla of thallus or verrucae yellowish to orange or red.……..……9

5a. Apothecial margin entire. Excipulum with greyish granules.……..……...…….6

5b. Apothecial margin papillose. Excipulum yellowish or ochraceous-yellow granules....8

6a. Thallus verrucae conspicuous. Medulla K + orange….……..…..**6. *M. coralliformis***

6b. Thallus verrucae finer……...……...…….....7

7a. Asci 4-spored. Medulla of thallus verrucae K + greenish to orange-yellow..... **17. *M. psychotrioides***

7b. Asci 6–8-spored. Medulla of thallus verrucae K + yellow…….....**19. *M. subgranifera***

8a. Medulla of thallus and verrucae K + yellowish. Medullary portion of excipulum K + lemon yellow to greenish…….....……**4. *M. bakeri***

8b. Medulla of thallus and verrucae K + deep orange. Medullary portion of excipulum K + orange-yellow……...…….……..…**21. *M. variabilis***

9a. Ascospores smaller (10–14 × 5–8 µm). Medulla K + orange to orange-red, medulla of thallus verrucae sulphur yellow…….…....**2. *M. aurigera***

9b. Ascospores larger (12–25 × 7–15 µm)……...…….10

10a. Apothecial disc dark brown to blackish. Medulla of thallus verrucae yellowish to peach coloured, K + orange.……..……..….**9. *M. granifera***

10b. Apothecial disc orange brown or dark brown to blackish. Medulla of thallus and verrucae orange yellow……..**18. *M. subaurigera***

11a. Hypothecium pale…….12

11b. Hypothecium dark brown to brown black……....16

12a. Apothecial disc brown, margin pale to dark brown, blackish……..**8. *M. fuscella***

12b. Apothecial disc brownish grey, beige, or yellowish to orange……...……..13

13a. Disc pale orange yellow to orange……...……...**3. *M. bacidinoides***

13b. Disc beige, brown grey…….…….……..14

14a. Apothecial margin thick, prominent, paler than disc.....**10. *M. gyalectoides***

14b. Apothecial margin thin, same colour as disc or darker……...……...15

15a. Thallus rugulose. Apothecial margin yellowish brown, apically blackish, disc beige…….....……...……...……...**12. *M. leptoloma***

15b. Thallus smooth. Apothecial margin whitish grey to dark brownish grey, disc brown grey…….…...……..…**15. *M. perplexa***

16a. Medulla partly or completely pale yellow, orange, red, K + orange, purple.....17

16b. Medulla white, K –…...……19

17a. Thallus verrucae. Apothecial disc brown, margin grey. Medulla of thallus white and medulla of verrucae pale yellow, K + orange.....**14. *M. papillosa***

17b. Thallus smooth…….18

18a. Apothecial margin black. Ascospores 10–14 × 4–6 µm.....…**13. *M. nigromarginata***

18b. Apothecial margin brownish grey. Ascospores 10–16 × 6–9 µm...…....**16. *M. piperis***

19a. Ascospores larger (20–25 × 10–14 µm). Apothecial disc grey brown to black brown, margin pale to dark brown...……..……..……..……**11. *M. hypomelaena***

19b. Ascospores smaller (9–17 × 5–8 µm)...…….……...…...20

20a. Thallus smooth to wrinkled or slightly verrucose. Apothecial disc blackish, margin thin, dark grey……..……..……..**5. *M. cinereonigrella***

20b. Thallus granulose, green to green-grey. Apothecial disc dark brown, margin black. ……...……...…….……...**20. *M. tratiana***

1. *Malmidea atlantica* (Caceres & Lücking) Cáceres & Kalb in Biblthca Lichenol. 106:164. 2011. *Malcolmiella atlantica* Cáceres & Lücking in Lib. Botani. 22:101. 2007.

Thallus crustose, corticolous, verrucose, greyish. Ascomata apothecia, round, solitary. Medulla yellow, irregular and farinose soredia, both medulla and soralia turning K + orange-red. Excipulum lemon yellowish granules K + golden yellow, hymenium colourless, hypothecium K + reddish brown. Asci 8-spored, ascospores 12–14 × 6–9 µm. Chemistry: Thallus K + yellowish, C + slightly yellowish, P + yellow, UV –; TLC: no substances detected.

Distribution: India (Andaman & Nicobar Islands, Assam), Brazil.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.270′, E90°17.005′, 176 m, on the bark of *Elaeocarpus* sp. in forest, 03/10/2020, 63315 (LWG); coll. Pungbili Islary.

2. *Malmidea aurigera* (Fée) Kalb, Rivas Plata & Lumbsch in Biblthca Lichenol. 106:153. 2011. *Lecidea aurigera* Fée, Essai La Crypt. 106. 1824.

Thallus crustose, corticolous, whitish grey, corticated. Ascomata apothecia, disc brown, margin with continuous medullary layer. Medulla of thallus K + orange to orange-red, medulla of verrucae sulphur yellow. Hymenium colourless, hypothecium brown to brown black. Asci 8-spored, ascospores hyaline, simple, 10–14 × 5–7 µm. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: Nicaragua, Peru.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°42.454′, E90°17.852′, Elev. 110 m, on the bark of *Elaeocarpus* sp. in forest, 08/01/2023, 65100 (LWG); coll. Pungbili Islary.

3. *Malmidea bacidinoides* (Lücking) Kalb & Lücking in Biblthca Lichenol. 106:164. 2011. *Malcolmiella bacidinoides* Lücking in Flora Neotrop. Monogr. 103:626. 2008. (Plate 45A)

Thallus crustose, corticolous, greenish grey, ecorticated, without soredia or isidia. Ascomata apothecia, round without thalline excipulum, disc pale orange yellow to orange, margin entire, pale yellow to chamois, lacking medullary layer. Medulla of thallus and verrucae pale yellow. Excipulum pale to colourless, K + greyish granules, epihymenium pale to colourless, hymenium colourless, hypothecium pale, paraphyses simple. Asci 8-spored, ascospores simple, hyaline, thick wall, 9–13 × 3–5 µm. Chemistry: Thallus K + orange yellow, C + pale yellow, P + olive yellow, UV –; TLC: Atranorin.

Distribution: Brazil, Ecuador, French Guiana, Guyana, Thailand.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.074′, E90°18.134′, Elev. 175 m, on the bark of *Vatica lanceaefolia* in forest, 05/12/2020, 2020–0515 (BUBH); N26°46.258′, E90°16.987′, Elev. 148 m, on the bark of *Holarrhena* sp. in forest, 03/10/2020, 65101 (LWG), 2020–0516 (BUBH); **Labanyapur**, N26°47.885′, E90°18.704′, Elev. 177 m, on the bark of *Holarrhena* sp. in forest, 10/11/2021, 2021–0514 (BUBH); coll. Pungbili Islary.

4. *Malmidea bakeri* (Vain.) Kalb, Rivas Plata & Lumbsch in Biblthca Lichenol. 106:154. 2011. *Lecidea bakeri* Vain. in Ann. Acad. Sci. Fenn. ser. A, 15(6):128. 1921. (Plate 45B)

Thallus crustose, corticolous, lacking isidia or soredia, greenish white, with black carbonized margin. Ascomata apothecia, round, without thalline excipulum, disc grey brown to dark black, margin entire, thick, cream to dark grey, with medullary layer throughout. Medulla of thallus and verrucae K + yellowish, medullary portion of excipulum K + lemon yellow to greenish. Excipulum with yellowish or ochraceous-yellow granules, epihymenium indistinct. Asci 8-spored, ascospores simple, hyaline, thick wall, 11–13 × 7–9 µm. Chemistry: Thallus K + yellowish, C + slightly yellowish, P + yellow, UV –; TLC: no substances detected.

Distribution: India (Uttar Pradesh), Myanmar, Thailand.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.212′, E90°16.683′, Elev. 182 m, on the bark of *Elaeocarpus* sp. in forest, 16/10/2020, 63320 (LWG), 2020–0180 (BUBH); coll. Pungbili Islary.

5. *Malmidea cinereonigrella* (Vain.) Kalb in Biblthca Lichenol. 106:165 2011. *Lecidea cinereonigrella* Vain. in Dansk Bot. Ark. 4(11):23. 1926. (Plate 45D)

Thallus crustose, corticolous, yellowish white, smooth and slightly verrucose, without isidia and soredia, corticated. Ascomata apothecia, rounded, without thalline excipulum, disc dark brown to black, margin thin, dark grey, lacking medullary layer. Medulla of thallus white, K –. Excipulum and epihymenium colourless to pale, hymenium colourless, K + greyish granules, hypothecium dark brown, paraphyses simple. Asci 8-spored, ascospores simple, hyaline, thick wall, 10–16 × 6–8 µm. Chemistry: K + yellow, C –, P + yellowish orange, UV –; TLC: no substances detected.

Distribution: Nicaragua.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°47.06′, E90°16.00′, Elev. 181 m, on the bark of *Ficus* sp. in forest, 28/11/2022, 2022–1011 (BUBH); coll. Pungbili Islary.

6. *Malmidea coralliformis* Kalb in Biblthca Lichenol.106:157. 2011. (Plate 45C)

Thallus crustose, corticolous, dull grey, verrucae conspicuous, often confluent. Ascomata apothecia, round without thalline excipulum, disc black, margin entire, thick, cream to grey, with medullary layer throughout. Medulla of thallus and verrucae white, K + yellowish orange. Excipulum with greyish granules, colourless, hymenium colourless to pale, epihymenium indistinct, hypothecium yellowish brown. Asci 8-spored, ascospores simple, hyaline, thick wall, 10–16 × 6–9 µm. Chemistry: Thallus K + yellow, C + pale yellow, P + orange yellow, UV –; TLC: no substances detected.

Distribution: Thailand.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.312′, E90°14.154′, Elev. 182 m, on the bark of *Ficus* sp. on road side, 02/04/2022, 2022–0413 (BUBH); coll. Pungbili Islary.

7. *Malmidea duplomarginata* (Papong & Kalb) Kalb & Papong in Biblthca Lichenol. 106:165. 2011. *Malcolmiella duplomarginata* Papong & Kalb in Mycotaxon 110:116. 2009. (Plate 45E)

Thallus crustose, corticolous, green, corticated. Ascomata apothecia, round, with continuous thalline excipulum, disc dark brown-black, margin with medullary layer throughout. Medulla of verrucae lemon yellow, K + orange yellow. Excipulum with greyish granules, epihymenium indistinct, hymenium colourless to pale, hypothecium dark brown. Asci 8-spored, ascospores hyaline, simple, thick wall, 20–24 × 10–14 µm. Chemistry: Thallus K + yellow, C –, P + orange, UV –; TLC: Atranorin.

Distribution: India (Andaman & Nicobar Islands, Goa), Colombia, Sri Lanka, Thailand.
Species examined: INDIA– Assam, Kokrajhar district, **Saralpara**, N26°50.054′, E90°15.73′, Elev. 237 m, on the bark of *Magnolia champaca* on road side, 05/03/2023, 65102 (LWG); N26°50.350′, E90°16.208′, Elev. 250 m, on the bark of *Magnolia champaca* on road side, 05/03/2023, 2023–1589 (BUBH); N26°50.066′, E90°15.736′, Elev. 241 m, on the bark of *Magnolia champaca* on road side, 05/03/2023, 65103 (LWG); N26°50.051′, E90°16.449′, Elev. 260 m, on the bark of *Magnolia champaca* on road side, 14/03/2023, 65104 (LWG); coll. Pungbili Islary.

8. *Malmidea fuscella* (Müll. Arg.) Kalb & Lücking, in Biblthca Lichenol. 106:165. 2011. *Lecidea fuscella* Müll. Arg. in Flora 64:519. 1881. (Plate 45F)

Thallus crustose, corticolous, greenish grey, without isidia or soredia, smooth. Ascomata apothecia, round, without thalline excipulum, disc brown, margin pale to dark brown or blackish, lacking medullary layer. Asci 8-spored, ascospores simple, hyaline, thick wall, 11–13 × 6–8 µm. Chemistry: Thallus K + brownish yellow, C + pale, P + slightly orange yellow, UV –; TLC: no substances detected.

Distribution: India (Sikkim), Argentina, Brazil, Colombia, Paraguay.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.225′, E90°14.223′, Elev. 181 m, on the bark of *Ficus* sp. in forest, 02/04/2022, 2022–0521 (BUBH); N26°45.32′, E90°18.15′, Elev. 141 m, on the bark of *Ilex odorata* in forest, 19/12/2022, 2022–1351 (BUBH); N26°45.49′, E90°18.18′, Elev. 144 m, on the bark of

Wrightia arborea in forest, 16/12/2022, 2022–1417 (BUBH); N26°45.54′, E90°18.23′, Elev. 145 m, on the bark of *Magnolia champaca* in forest, 16/12/2022, 2022–1418 (BUBH); N26°45.15′, E90°18.12′, Elev. 145 m, on the bark of *Mesua ferrea* in forest, 19/12/2022, 2022–1347 (BUBH); **Labanyapur**, N26°47.936′, E90°19.351′, Elev. 176 m, on the bark of *Magnolia hodgsonii* in forest, 10/11/2021, 2021–0416 (BUBH); N26°48.413′, E90°18.417′, 188 m, on the bark of *Magnolia hodgsonii* in forest, 29/01/2023, 2023–1462 (BUBH); N26°48.366′, E90°18.449′, 185 m, on the bark of *Stereospermum chelonoides* on road side, 29/01/2023, 2023–1535 (BUBH); **Saralpara**, N26°51.029′, E90°16.443′, Elev. 263 m, on the bark of *Tetrameles nudiflora* in forest, 14/03/2023, 2023–1525 (BUBH); coll. Pungbili Islary.

9. *Malmidea granifera* (Ach.) Kalb, Rivas Plata and Lumbsch in Biblthca Lichenol. 106:165. 2011. *Lecanora granifera* Ach., Syn. Method. Lich. 163. 1814.

Thallus crustose, corticolous, whitish, verrucae without isidiate and sorediate, with black carbonized margin. Ascomata apothecia, round, without thalline excipulum, disc pale and dark brown to black, margin, entire, thick, cream to whitish. Medulla of thalline verrucae yellowish, K + orange, medulla of excipulum K + intensely yellow to orange. Excipulum brown, epihymenium colourless to pale brownish, hypothecium dark brown to brown black. Asci 8-spored, ascospores simple, hyaline, thick wall, 10–15 × 6–9 µm. Chemistry: Thallus K + yellowish, C + light yellow, P + yellowish, UV –; TLC: no substances detected.

Distribution: India (Arunachal Pradesh, Assam, Goa, Jammu & Kashmir, Madhya Pradesh, Manipur, Tamil Nadu, Uttarakhand, West Bengal), Australia, Costa Rica, Ecuador, Guinea, New Caledonia, Sri Lanka, Thailand.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.075′, E90°18.244′, Elev. 171 m, on the bark of *Vatica lanceaefolia* in forest, 25/12/2020, 63318 (LWG), 2020–1230 (BUBH); coll. Pungbili Islary.

10. *Malmidea gyalectoides* (Vain.) Kalb & Lücking in Biblthca Lichenol. 106:165. 2011. *Lecidea gyalectoides* Vain. in Hiern *et al*., Cat. Afr. Plant. 2(2):423. 1901. (Plate 46A)

Thallus crustose, corticolous, dark-green, without isidia and soredia. Ascomata apothecia, without thalline excipulum, disc beige, margin entire, thick, prominent when young, paler than disc, lacking medullary layer. Medulla pale yellow, K –. Excipulum colourless, K + greyish granules, epihymenium pale to colourless, hypothecium pale, paraphyses simple. Asci 8-spored, ascospores simple, hyaline, thick wall, 9–12 × 3–4 µm. Chemistry: Thallus K + orange yellow, C + pale yellow, P + olive yellow, UV –; TLC: Atranorin.

Distribution: Brazil, Colombia, Guyana, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.074′, E90°18.134′, Elev. 189 m, on the bark of *Vatica lanceaefolia* in forest, 05/12/2020, 65105 (LWG); N26°45.01′, E90°18.10′, Elev. 138 m, on the bark of *Aglaia spectabilis* in forest, 19/12/2022, 2022–1343 (BUBH); N26°45.37′, E90°18.19′, Elev. 142 m, on the bark of *Aglaia spectabilis* in forest, 19/12/2022, 2022–1344 (BUBH); N26°45.52′, E90°18.24′, Elev. 140 m, on the bark of *Aglaia spectabilis* in forest, 16/12/2022, 2022–1315 (BUBH); N26°45.00′, E90°18.13′, Elev. 141 m, on the bark of *Terminalia* sp. in forest, 19/12/2022, 2022–1345 (BUBH); N26°44.07′, E90°18.10′, Elev. 250 m, on the bark of *Aglaia spectabilis* on road side, 02/04/2023, 2023–1557 (BUBH); **Saralpara**, N26°50.964′, E90°14.360′, Elev. 259 m, on the bark of *Tetrameles nudiflora* in forest, 05/01/2021, 65106 (LWG), 2021–0517 (BUBH); **Labanyapur**, N26°48.812′, E90°18.187′, Elev. 201 m, on the bark of *Magnolia hodgsonii* in forest, 29/01/2023, 2023–1461 (BUBH); coll. Pungbili Islary.

11. ***Malmidea hypomelaena*** (Nyl.) Kalb & Lücking in Biblthca Lichenol. 106:165. 2011. *Lecidea hypomelaena* Nyl. in Ann. Sci. Nat. ser. 4, 11:223. 1859. (Plate 46B)

Thallus crustose, corticolous, without isidia or soredia, olivaceous to brownish green. Ascomata apothecia, round, without thalline excipulum, disc dark brown to black, margin pale to dark brown, lacking medullary layer throughout. Medulla of thallus white K –. Excipulum with light greenish granules, hypothecium dark brown. Asci 8-spored, ascospores simple, hyaline, thick wall, 16–20 × 8–11 µm. Chemistry: Thallus K + yellowish brown, C + slightly yellow, P + light yellowish, UV –; TLC: no substances detected.

Distribution: India (Tamil Nadu), Colombia, China.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.236′, E90°16.932′, Elev. 179 m, on the bark of *Neolamarckia cadamba* in forest, 03/10/2020, 63317 (LWG), 2020–0341 (BUBH); coll. Pungbili Islary.

12. *Malmidea leptoloma* (Müll. Arg.) Kalb & Lücking in Biblthca Lichenol. 106:165. 2011. *Lecidea leptoloma* Müll. Arg. in Flora 64(32):518. 1881. (Plate 46C)

Thallus crustose, corticolous, greenish grey, rugulose, ecorticated, without isidia and soredia. Ascomata apothecia, round, without thalline excipulum, disc beige, margin thin, yellowish brown to apically blackish, lacking medullary layer. Medulla of thallus colourless, K + pale yellow. Excipulum colourless to pale, K + greyish granules, epihymenium pale to colourless, hymenium colourless, hypothecium pale. Asci 8-spored, ascospores hyaline, simple, thick wall, 9–13 × 5–7 µm. Chemistry: Thallus K –, C –, P – , UV –; TLC: no substances detected.

Distribution: Australia, Brazil, Colombia, El Salvador, French Guiana, Guyana, Mexico, Singapore, Solomon Islands, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46′04.64″, E90°17′33.67″, Elev. 213 m, on the bark of *Semecarpus anacardium* in forest, 13/12/2019, 65107 (LWG); N26°45′47.36″, E90°17′02.72″, Elev. 245 m, on the bark of *Vatica lanceaefolia* in forest, 22/12/2019, 65108 (LWG); N26°45.44′, E90°18.15′, Elev. 127 m, on the bark of *Garcinia* sp. in forest, 16/12/2022, 2022–1423 (BUBH); N26°46.274′, E90°16.814′, Elev. 207 m, on the bark of *Cinnamomum cecidodaphne*, 10/10/2020, 65109 (LWG); coll. Pungbili Islary.

13. *Malmidea nigromarginata* (Malme) Lücking & Breuss in Lichenologist 47(1):19. 2015. *Lecidea nigromarginata* Malme in Ark. Bot. 28A(7):6, 25. 1936.

Thallus crustose, corticolous, green, smooth, without isidia and soredia. Ascomata apothecia, round, without thalline excipulum, disc black, margin black, lacking medullary layer throughout. Medulla pale yellow, K + orange. Excipulum lacking red crystals, K –, hypothecium dark brown to black. Asci 8-spored, ascospores narrower, simple, hyaline, thick wall, 9–12 × 3–5 µm. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Assam), Nicaragua.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°40.44′, E90°17.43′, Elev. 126 m, on the bark of *Elaeocarpus* sp. in forest, 03/01/2023, 2023–1420 (BUBH); N26°44.07′, E90°18.10′, Elev. 250 m, on the bark of *Aglaia spectabilis* on road side, 02/04/2023, 2023–1552 (BUBH); **Labanyapur**, N26°47.885′, E90°18.688′, Elev. 178 m, on the bark of *Magnolia hodgsonii* in forest, 10/11/2021, 2021–0412 (BUBH); coll. Pungbili Islary.

14. *Malmidea papillosa* Weerakoon & Aptroot in Crypt. Mycol. 35(1):60. 2014.

Thallus crustose, corticolous, without isidia or soredia, greyish green with black carbonized margin. Ascomata apothecia, round, without thalline excipulum, disc brown to black, margin grey, lacking medullary layer throughout. Medulla of thallus and verrucae pale yellow K + orange yellow. Excipulum with greyish granules, epihymenium indistinct, hymenium colourless to pale, hypothecium dark brown to black. Asci 8-spored, ascospores simple, hyaline, thick wall, 14–16 × 7–9 µm. Chemistry: Thallus K + orange yellow, C + light yellow, P + yellowish orange, UV –; TLC: no substances detected.

Distribution: India (Assam), Sri Lanka.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.312′, E90°17.158', Elev. 158 m, on the bark of *Semecarpus anacardium* in forest, 26/07/2020, 63314 (LWG), 2020–1228 (BUBH); N26°43.47′, E90°18.08′, Elev. 294 m, on the bark of *Aglaia spectabilis* on road side, 02/04/2023, 2023–1574 (BUBH); N26°45.32′, E90°18.22′, Elev. 231 m, on the bark of *Mesua ferrea* in forest, 02/04/2023, 2023–1575 (BUBH); **Labanyapur**, N26°47.88′, E90°18.683′, Elev. 184 m, on the bark of *Magnolia hodgsonii* in forest, 10/11/2021, 2021–0405 (BUBH); N26°47.912′, E90°18.770′, Elev. 182 m, on the bark of *Castanopsis indica* in forest, 10/11/2021, 2021–0525 (BUBH); N26°47.879′, E90°18.683′, Elev. 184 m, on the bark of *Magnolia hodgsonii* in forest, 10/11/2021, 2021–1020 (BUBH); coll. Pungbili Islary.

15. *Malmidea perplexa* Kalb in Biblthca Lichenol. 106:160. 2011. (Plate 46D)

Thallus crustose, corticolous, yellowish grey, without isidia and soredia. Ascomata apothecia, round, without thalline excipulum, disc grey brown, margin lacking medullary

layer, entire, thin, persistent, dark brownish grey, darker than disc. Medulla pale yellow to yellow. Excipulum with granules, K + greenish lemon yellow, hymenium colourless, epihymenium indistinct, hypothecium pale. Asci 8-spored, ascospores simple, hyaline, thick wall, 9–12 × 5–6 µm. Chemistry: Thallus K + yellowish, C + pale yellow, P + slightly orange yellow, UV –; TLV: no substances detected.

Distribution: Brazil, Thailand.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.441′, E90°13.415′, Elev. 192 m, on the bark of *Ficus* sp. in forest 02/04/2022, 2022–0414 (BUBH); **Labanyapur**, N26°48.434′, E90°18.400′, Elev. 184 m, on the bark of *Magnolia hodgsonii* in forest, 29/01/2023, 2023–1476 (BUBH); coll. Pungbili Islary.

16. *Malmidea piperis* (Spreng.) Kalb, Rivas Plata & Lumbsch in Biblthca Lichenol. 106:165. 2011. *Lecanora piperis* Spreng. in Kungl. Svenska Vetenskap. Hand. ser. 3, 41:49. 1820.

Thallus crustose, corticolous, greenish grey, without isidia and soredia, smooth. Ascomata apothecia, without thalline excipulum, disc black, margin brownish grey, lacking medullary layer. Medulla pale yellow, K + orange. Excipulum lacking red crystals, K –, hypothecium dark brown, hymenium colourless. Asci 8-spored, ascospores hyaline, thick wall, 13–14 × 5–6 µm. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Assam, Sikkim), Australia, Bolivia, Brazil, Colombia, Netherland, Paraguay, Peru.
Species examined: INDIA– Assam, Kokrajhar district, **Labanyapur**, N26°47.881′, E90°18.687′, Elev. 178 m, on the bark of *Magnolia hodgsonii* in forest, 10/11/2021, 2021–0428 (BUBH); coll. Pungbili Islary.

17. *Malmidea psychotrioides* (Kalb & Lücking) Kalb, Rivas Plata & Lumbsch in Biblthca Lichenol. 106:165. 2011. *Malcolmiella psychotrioides* Kalb & Lücking in Bot. Jb. 122(1): 42. 2000. (Plate 46E)

Thallus crustose, corticolous, dark grey, verrucae finer without isidia and soredia. Ascomata apothecia, round, without thalline excipulum, disc dark brown to black, margin

entire, thick, whitish cream, with medullary layer throughout. Medulla of thalline verrucae whitish, K + orange yellow. Excipulum with greyish granules, epihymenium indistinct with pale, hypothecium pale to olivaceous brown. Asci 4-spored, ascospores simple, hyaline, thick wall, 10–12 × 5–7 µm. Chemistry: Thallus K + yellow, C + pale yellow, P + pale yellow, UV –; TLC: no substances detected.

Distribution: India (Rajasthan), Brazil, Costa Rica, French Guiana.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46′10.24″, E90°17′23.47″, Elev. 182 m, on the bark of *Semecarpus anacardium* in forest, 21/12/2019, 63311 (LWG), 2019–0197 (BUBH); coll. Pungbili Islary.

18. *Malmidea subaurigera* (Vain.) Kalb, Rivas Plata & Lumbsch in Biblthca Lichenol. 106:161. 2011. *Lecidea subaurigera* Vain. in Ann. Acad. Sci. Fenn. ser. A, 15(6):120. 1921. (Plate 46F)

Thallus crustose, corticolous, whitish green, without isidia or soredia. Ascomata apothecia, round, without thalline excipulum, disc dark brown to black, margin entire, thick, black, with medullary layer throughout. Medulla of thallus and verrucae orange to yellow. Excipulum with granules K + orange-yellowish to greenish lemon yellow, hypothecium dark brown to black. Asci 8-spored, ascospores simple, hyaline, thick wall, 12–16 × 8–11 µm. Chemistry: Thallus K –, C –, P + pale yellow, UV –; TLC: no substances detected.

Distribution: India (Andaman & Nicobar Islands), Philippines.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46′04.65″, E90°18′33.12″, Elev. 173 m, on the bark of *Elaeocarpus* sp. in forest, 04/03/2020, 63319 (LWG), 2020–1226 (BUBH); N26°43.31′, E90°18.07′, Elev. 282 m, on the bark of *Aglaia spectabilis* on road side, 02/04/2023, 65110 (LWG); coll. Pungbili Islary.

19. *Malmidea subgranifera* (Kalb & Elix) Kalb & Elix in Biblthca Lichenol. 106:166. 2011. *Malcolmiella subgranifera* Kalb & Elix in Lich. Neotrop. Fasc. 13:12. 2001. (Plate 47A)

Thallus crustose, corticolous, grey with black carbonized margin, verrucae finer without isidia and soredia. Ascomata apothecia, round, without thalline excipulum, disc dark

brown to black, margin entire, thick, grey with medullary layer throughout. Medulla K + yellow. Excipulum with greyish granules, epihymenium indistinct and pale brown, hypothecium dark olivaceous brown. Asci 8-spored, ascospores simple hyaline, thick wall, 9–14 × 6–9 µm. Chemistry: Thallus K + pale yellow, C + yellowish, P + pale yellow, UV –; TLC: no substances detected.

Distribution: Australia, Cuba.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°45′48.31″, E90°17′04.08″, Elev. 171 m, on the bark of *Syzygium formosum* in forest, 22/12/2019, 63313 (LWG), 2019–0195 (BUBH); N26°45′50.80″, E90°17′16.66″, Elev.172 m, on the bark of *Ilex odorata* in forest, 26/02/2020, 2020–1227 (BUBH); N26°46.399′, E90°13.502′, Elev. 170 m, on the bark of *Ficus* sp. in forest, 02/04/2022, 2022–0402 (BUBH); coll. Pungbili Islary.

20. *Malmidea tratiana* Kalb & Mongk. in Phytotaxa 42:44. 2012. (Plate 47B)

Thallus crustose, corticolous, without isidia and soredia, granulose and smooth in parts, green to greenish grey with black carbonized margin. Ascomata apothecia, round, without thalline excipulum, disc dark brown, margin thick, black, lacking medullary layer. Medulla white, K –. Excipulum with light greenish granules, epihymenium distinct, hypothecium dark brown to black. Asci 8-spored, ascospores simple, hyaline, thick wall, 9–12 × 4–6 µm. Chemistry: Thallus K –, C –, P + pale yellow, UV –; TLC: no substances detected.

Distribution: New Caledonia, Thailand.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.49′, E90°16.30′, Elev. 176 m, on the bark of *Magnolia hodgsonii* in forest, 28/11/2022, 2022–1007 (BUBH); N26°45.27′, E90°18.16′, Elev. 147 m, on the bark of *Aglaia spectabilis* in forest, 19/12/2022, 2022–1336 (BUBH); N26°43.47′, E90°18.08′, Elev. 294 m, on the bark of *Aglaia spectabilis* on road side, 02/04/2023, 2023–1572 (BUBH); N26°45.28′, E90°18.19′, Elev. 225 m, on the bark of *Tetrameles nudiflora* on road side, 02/04/2023, 2023–1569 (BUBH); **Labanyapur**, N26°47.910′, E90°18.980′, Elev. 174 m, on the bark of *Macaranga denticulata* on road side, 10/11/2021, 2021–0333 (BUBH); coll. Pungbili Islary.

21. ***Malmidea variabilis*** Kalb in Biblthca Lichenol. 106:162. 2011.

Thallus crustose, corticolous, green, without isidia or soredia. Ascomata apothecia, round, without thalline excipulum, disc grey brown to dark brown, margin thick, cream to dark grey, with medullary layer throughout. Medulla of thallus and verrucae K + deep orange, medullary portion of excipulum K + orange yellow. Excipulum with yellowish to ochraceous-yellow granules, epihymenium indistinct, hypothecium dark brown to black. Asci 8-spored, ascospores simple, hyaline, thick wall, 9–14 × 6–9 µm. Chemistry: Thallus K + pale yellow, C + light yellow, P + orange yellow, UV –; TLC: no substances detected.

Distribution: India (Assam), Thailand.

Specimen examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.303′, E90°17.023′, Elev. 160 m, on the bark of *Macaranga denticulata* in forest, 10/10/2020, 63316 (LWG), 2020–1229 (BUBH); coll. Pungbili Islary

23. PARMELIACEAE Berchtold & Presl, O Přirozenosti rostlin aneb Rostlinář 1: 273. 1820.

About 9 genera and 318 species in India; 9 genera and 24 species in Assam; 4 genera and 9 species reported from the present study.

Key to the genera

1a. Thallus with spongiostratum……..……**1.** ***Anzia***
1b. Thallus not with spongiostratum…….……2

2a. Thallus lobes with bulbate cilia…….……**2.** ***Bulbothrix***
2b. Thallus lacks bulbate cilia……...…….....3

4a. Medulla white……**4.** ***Parmotrema***
4b. Medulla yellow-orange to ochraceous……**3.** ***Myelochroa***

1. ***Anzia*** Stizenb. in Flora 44:393. 1861.

1. ***Anzia ornatoides*** Yoshim. in Biblthca Lichenol. 58:459. 1995. (Plate 40C)

Thallus foliose, corticolous, smooth, dorsiventral, lobulate, heteromerous, lower side spongy with thick reticulate anastomosing, corticated only on upper side. Isidia simple, concolorous, 1.0–5.0 mm long, spreading on thallus. Medulla white and solid, P –, K –, C –, KC –. Ascomata apothecia, laminal, 1.0–3.0 mm wide, disc brown, widened when maturity, margin pale yellow. Excipulum colourless to pale yellow, epihymenium pale yellow, hypothecium colourless. Asci multi-spored, ascospores hyaline, transversely 6–10-sepate, 32–44 × 2–4 µm. Chemistry: Thallus K + brownish yellow, C –, P + slightly yellow, UV –; TLC: Lobaric and stictic acid.

Distribution: India (Arunachal Pradesh), Papua New Guinea.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.194′, E90°15.535′, Elev. 182 m, on the bark of *Mangifera sylvatica* in forest, 25/12/2020, 2020–1625 (BUBH); N26°46.583′, E90°17.234′, Elev. 157 m, on the bark of *Semecarpus anacardium* in forest, 06/02/2021, 2021–1626 (BUBH); N26°46.260′, E90°15.543′, Elev. 162 m, on the bark of *Mesua ferrea* in forest, 10/11/2021, 2021–1627 (BUBH); N26°46.530′, E90°15.307′, Elev. 172 m, on the bark of *Mesua ferrea* in forest, 10/11/2021, 2021–1628 (BUBH); N26°46.565′, E90°17.441′, Elev. 163 m, on the bark of *Mesua ferrea* in forest, 09/05/2021, 2021–1629 (BUBH); N26°46.223′, E90°18.367′, Elev. 153 m, on the bark of *Semecarpus anacardium* in forest, 05/12/2020, 2020–1630 (BUBH); N26°47.131′, E90°17.210′, Elev. 165 m, on the bark of *Mangifera sylvatica* in forest, 24/11/2020, 2020–1631 (BUBH); N26°47.317′, E90°17.395′, Elev. 161 m, on the bark of *Semecarpus anacardium* in forest, 02/02/2022, 2022–1632 (BUBH); N26°45.460′, E90°18.531′, Elev. 158 m, on the bark of *Mangifera sylvatica* in forest, 02/02/2022, 2022–1633 (BUBH); N26°47.478′, E90°18.784′, Elev. 163 m, on the bark of *Ilex odorata* in forest, 02/02/2022, 2022–1634 (BUBH); N26°46.474′, E90°15.492′, Elev. 172 m, on the bark of *Ilex odorata* in forest, 02/04/2022, 2022–1635 (BUBH); N26°47.791′, E90°16.584′, Elev. 157 m, on the bark of *Mangifera sylvatica* in forest, 02/04/2022, 2022–1636 (BUBH); N26°45.439′, E90°15.502′, Elev. 156 m, on the bark of *Ilex odorata* in forest, 28/11/2022, 2022–1637 (BUBH); N26°45.496′, E90°15.327′, Elev. 172 m, on the bark of *Mangifera sylvatica* in forest, 28/11/2022, 2022–1638 (BUBH); N26°46.387′, E90°15.121′, Elev. 172 m, on the bark of *Mangifera sylvatica* in forest, 16/12/2022, 2022–1639 (BUBH); N26°47.759′, E90°15.244′, Elev. 187 m, on the bark of *Ilex odorata* in forest, 19/12/2022, 2022–1640 (BUBH); N26°46.098′, E90°17.098′, Elev.

196 m, on the bark of *Mangifera sylvatica* in forest, 24/11/2022, 63364 (LWG), 2022–0101 (BUBH); coll. Pungbili Islary.

2. *Bulbothrix* Hale in Phytologia 28(5):479. 1974.

1. *Bulbothrix isidiza* (Nyl.) Hale in Phytologia 28(5):480. 1974. *Parmelia isidiza* Nyl. in Bol. Soc. Broter. 3:130. 1884.

Thallus foliose, corticolous, adnate, upto 8 cm across, lobes 8 mm wide, sparse, bulbate cilia in margins, upper side sometimes faintly maculae, with dense simple to coralloid isidia, lower side pale brown o brown. Medulla white, K + yellow turning red, C –, KC –, P + orange-red. Apothecia not seen. Chemistry: Thallus K + yellow, C –, P + orange, UV –; TLC: Atranorin and salazinic acid.

Distribution: India (Arunachal Pradesh, Assam, Karnataka, Kerala, Madhya Pradesh, Manipur, Meghalaya, Maharashtra, Nagaland, Sikkim, Tamil Nadu, Uttar Pradesh, Uttarakhand, West Bengal), Africa, Australia, China, Congo, Japan, Madagascar, Nepal, Papua New Guinea, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.603′, E90°16.837′, Elev. 178 m, 29/01/2023, on the bark of *Stereospermum chelonoides* in forest, 2023–1470 (BUBH); N26°46.240′, E90°16.860′, Elev. 181 m, 29/01/2023, on the bark of *Pterospermum acerifolium* in forest, 2023–1465 (BUBH); **Saralpara**, N26°51.105′, E90°16.320′, Elev. 258 m, on the bark of *Tetrameles nudiflora* on road side, 14/03/2023, 2023–1588 (BUBH); N26°50.780′, E90°16.516′, Elev. 260 m, on the bark of *Terminalia* sp. on road side, 14/03/2023, 65075 (LWG); coll. Pungbili Islary.

3. *Myelochroa* (Asahina) Elix. & Hale in Mycotaxon 29:240. 1987.

1. *Myelochroa aurulenta* (Tuck.) Elix & Hale in Mycotaxon 29:240. 1987. *Parmelia aurulenta* Tuck. in Amer. J. Sci. & Art. ser. 2, 25:424. 1858.

Thallus foliose, corticolous, adnate, heteromerous, corticated on both sides, to 9 cm across, upper side grey, lacking pseudocyphellae, lobes 4–5 mm wide, cilia in axils, upper side yellowish grey to darker, pustulate, pustules bursting open to produce soredia, soredia granular, lower side black, rhizines simple. Medulla yellow beneath soredia, K –

, C –, KC –, P –. Apothecia not seen. Chemistry: Thallus K + yellow, C –, P + orange, UV –; TLC: Sacalonic acid and zeorin.

Distribution: India (Arunachal Pradesh, Assam, Himachal Pradesh, Kerala, Madhya Pradesh, Manipur, Nagaland, Sikkim, Tamil Nadu, Uttarakhand, West Bengal), Africa, Alabama, Australia, Bhutan, Canada, China, Iran, Japan, Madagascar, Russian Federation, Papua New Guinea, South Carolina, Thailand, USA, Virginia.

Species examined: INDIA– Assam, Kokrajhar district, **Saralpara**, N26°50.066′, E90°15.736′, Elev. 241 m, on the bark of *Magnolia champaca* on road side, 05/03/2023, 2023–1591 (BUBH); coll. Pungbili Islary.

4. *Parmotrema* Massal. in Atti Inst. Veneto ser. 3, 5:248. 1860.

Key to the species

1a. Lobes margin ciliate, soralia marginal to submarginal…...……..**4. *P. reticulatum***
1b. Lobes margin lacking ciliate……2

2a. Medulla P + orange……..……..**1. *P. crinitoides***
2b. Medulla P –..……..……...……...…….3

3a. Medulla with lecanoric acid……...…….……..3
3b. Medulla with other substances present…….4

3a. Isidia thick, inflated, irregular, coarsely branched...……**3. *P. pseudotinctorum***
3b. Isidia cylindrical, filiform, dense……..……..**5. *P. tinctorum***

4a. Medulla KC –…...…….**2. *P. praesorediosum***
4b. Medulla KC + …….……..……..**6. *P. tsavoense***

1. *Parmotrema crinitoides* Wei, Enum. Lich. Chi. 177. 1991.

Thallus foliose, corticolous, to 7 cm across, lobes to 7 mm wide, heteromerous, upper side whitish grey, marginal area of lower side brown, centrally black, corticated on both sides, eciliate, isidia simple to coralloid, ezhizinate. Medulla white, K + yellow, C –, P +

orange. Apothecia not seen. Chemistry: Thallus K + yellow, C –, P + yellow, UV –; TLC: Atranorin and lecanoric acid.

Distribution: India (Assam, Kerala), Australia, China, Norfolk Island.
Species examined: INDIA– Assam, Kokrajhar district, **Labanyapur**, N26°47.912′, E90°18.770′, Elev. 182 m, on the bark of *Ficus* sp. in forest, 10/11/2021, 2021–0431 (BUBH); N26°47.910′, E90°18.768′, Elev. 182 m, on the bark of *Tetrameles nudiflora* on road side, 10/11/2021, 2021–0293 (BUBH); N26°46.386′, E90°13.345′, Elev. 182 m, on the bark of *Ficus* sp. in forest, 02/04/2022, 2022–0420 (BUBH); coll. Pungbili Islary.

2. *Parmotrema praesorediosum* (Nyl.) Hale in Phytologia 28(4):338. 1974. *Parmelia praesorediosa* Nyl., Sert. Lich. Trop. Labu. Singap. 18. 1891.

Thallus foliose, corticolous, greenish grey, corticated on both sides, smooth, adnate, lobes 5–8 mm wide, eciliate, upper side grey to darker, emaculate, soralia usually marginal linear or crescent-shaped, soredia granular, lower side centrally black, narrow marginal zone lighter tan, nude. Medulla white, K –, C –, KC –, P –, P –. Apothecia not seen. Chemistry: Thallus K + yellow, C –, P + orange yellow, UV –; TLC: Atranorin.

Distribution: India (Andhra Pradesh, Assam, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Nagaland, Orissa, Rajasthan, Tamil Nadu, Uttarakhand, Uttar Pradesh, West Bengal)**,** Argentina, Australia, Barbados, Brazil, Chinese Taipei, Colombia, Costa Rica, Fiji, French Guiana, Grenada, Honduras, Jamaica, Japan, Korea, Mexico, New Caledonia, Papua New Guinea, Puerto Rico, Réunion, Suriname, Thailand, Uganda, USA.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°45′59.36″, E90°17′39.53″, Elev. 170 m, on the bark of *Semecarpus anacardium* in forest, 13/12/2019, 2019–0354 (BUBH); **Labanyapur**, N26°46.603′, E90°16.837′, Elev. 178 m, on the bark of *Stereospermum chelonoides* on road side, 29/01/2023, 2023–1464 (BUBH); **Saralpara**, N26°50.886′, E90°15.439′, Elev. 277 m, on the bark of *Areca catechu* in village, 05/03/2023, 2023–1508 (BUBH); coll. Pungbili Islary.

3. *Parmotrema pseudotinctorum* (Abbayes) Hale in Phytologia 28(4):338. 1974. *Parmelia pseudotinctorum* Abbayes in Bull. Inst. Franc. Afr. Noir. 13(4):973. 1951.

Thallus foliose, corticolous, grey, upto 6 mm across, lobes 2–5 mm wide, eciliate, isidia thick, irregularly inflated, branched, lower side centrally black, wide marginal zone brownish, nude. Medulla white, K –, C + blood red, KC + red, P –. Apothecia not seen. Chemistry: Thallus K + yellow, P + yellowish, C –, UV –; TLC: Atranorin and lecanoric acid.

Distribution: India (Uttarakhand), Argentina, Australia, Brazil, Côte d'Ivoire, Nepal, Portugal, Spain, Thailand, Uganda.
Species examined: INDIA– Assam, Kokrajhar district, **Labanyapur**, N26°47.909′, E90°18.746′, Elev. 179 m, on the bark of *Magnolia hodgsonii* in forest, 10/11/2021, 2021–0337 (BUBH); coll. Pungbili Islary.

4. *Parmotrema reticulatum* (Taylor) Choisy in Bull. Mens. Soc. Linn. Lyon 21:148. 1952. *Parmelia reticulata* Taylor in Mackay, Flora Hibern. 2:148. 1836. (Plate 48F)

Thallus foliose, corticolous, grey, lobes 5–10 mm wide, ciliate, upper side grey to darker, densely white maculate, maculae eventually reticulately fissured, soralia either capitate on short lacinules of palmate lobes or marginal to submarginal on rounded or involute lobes, lower side centrally black, rhizinate upto the margin. Medulla white, K + yellow turning red, C –, P + orange-red. Apothecia not seen. Chemistry: Thallus K + reddish brown, C –, P + orange yellow, UV –; TLC: Atranorin and salazinic acid.

Distribution: India (Arunachal Pradesh, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Manipur, Maharashtra, Meghalaya, Nagaland, Sikkim, Tamil Nadu, Uttarakhand, West Bengal), Australia, Bhutan, France, Nepal, Sri Lanka, United Kingdom of Great Britain & Northern Ireland.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°45′59.04″, E90°17′31.54″, Elev. 190 m, on the bark of *Semecarpus anacardium* in forest, 13/12/2019, 2019–0278 (BUBH); coll. Pungbili Islary.

5. *Parmotrema tinctorum* (Despr. Ex Nyl.) Hale in Phytologia 28(4):339. 1974. *Parmelia tinctorum* Despr. ex Nyl. in Flora 55:547. 1872.

Thallus foliose, corticolous, grey to darker, loosely adnate, upto 7–15 cm across, lobes 10–25 mm wide, eciliate, emaculate, isidia cylindrical to filiform dense, lower side

centrally black, wide marginal zone tan to brown, nude. Medulla white, K –, C + red, KC + red, P –. Apothecia not seen. Chemistry: Thallus K + yellow, C –, P + orange, UV –; TLC: Atranorin and lecanoric acid.

Distribution: India (Andhra Pradesh, Arunachal Pradesh, Assam, Chhattisgarh, Himachal Pradesh, Jammu & Kashmir, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Nagaland, Orissa, Rajasthan, Sikkim, Tamil Nadu, Uttarakhand, West Bengal), Australia, Bhutan, China, Indonesia, New Zealand, Africa, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Labanyapur**, N26°47.672′, E90°18.885′, Elev. 181 m, on the bark of *Tetrameles nudiflora* in forest, 10/11/2021, 2021–0288 (BUBH); **Saralpara**, N26°49.956′, E90°15.513′, Elev. 242 m, on the bark of *Magnolia champaca* on road side, 05/03/2023, 2023–1507 (BUBH); coll. Pungbili Islary.

6. *Parmotrema tsavoense* (Krog & Swinscow) Krog & Swinscow in Lichenologist 15(2):130. 1983. *Parmelia tsavoensis* Krog & Swinscow in Bull. Br. Mus. Nat. His. Bot. 9(3):220. 1981.

Thallus foliose, corticolous, lobes 2–3 mm wide, eciliate, black rimmed, upper side grey, emaculate, dactyls short, claviform, apically breaking, not producing soredia, lower side centrally black, narrow marginal zone brown, nude. Medulla white, K –, C –, KC + rose, P –. Apothecia not seen. Chemistry: Thallus K + yellow, C –, P + orange, UV –; TLC: Atranorin and lecanoric acid.

Distribution: India (Assam, Kerala), East Africa, Kenya.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.538′, E90°13.318′, Elev. 177 m, on the bark of *Ficus* sp. in forest, 02/04/2022, 2022–0418 (BUBH); N26°47.08′, E90°16.17′, Elev. 158 m, on the bark of *Elaeocarpus* sp. in forest, 28/11/2022, 2022–1188 (BUBH); **Labanyapur**, N26°46.304′, E90°19.321′, Elev. 162 m, on the bark of *Areca catechu* in village, 25/01/2021, 2021–0298 (BUBH); **Saralpara**, N26°50.886′, E90°15.438′, Elev. 278 m, on the bark of *Areca catechu* in village, 05/03/2023, 2023–1504 (BUBH); coll. Pungbili Islary.

24. PILOCARPACEAE Zahlbr. in Engler *et al*., Nat. Pflanz. 1:116. 1905.

About 12 genera and 40 species in India; 3 genera and 5 species in Assam; 1 genus and 1 species reported from the present study.

1. *Eugeniella ortizii* (Lücking) Lücking, Sérus. & Kalb in Flora Neotrop. Monogr. 103:715. 2008. *Byssoloma ortizii* Lücking in Nova Hedwigia 52(3–4):299. 1991.

Thallus crustose, corticolous, smooth, yellowish grey, corticated. Ascomata apothecia, round, without thalline excipulum, disc pale yellow to brownish, margin entire, lacking medullary layer, beige, apically brown. Excipulum pale to colourless, hymenium colourless, epihymenium and hypothecium pale to colourless. Ascospores hyaline, transversely 5-septate, 17–26 × 2–5 µm. Chemistry: Thallus K + olive yellow, C –, P + brownish yellow, UV –; TLC: no substances detected.

Distribution: Brazil, Colombia, Costa Rica, Dominica.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°42.453′, E90°17.824′, Elev. 105 m, on the bark of *Magnolia hodgsonii* in forest, 08/01/2023, 2023–1446 (BUBH); N26°40.911′, E90°17.825′, Elev. 107 m, on the bark of *Semecarpus anacardium* in forest, 08/01/2023, 2023–1413 (BUBH); coll. Pungbili Islary.

25. RAMALINACEAE Agardh, Aphor. Bot. 93. 1821.

About 12 genera and 103 species in India; 6 genera and 25 species in Assam; 3 genera and 7 species reported from the present study.

Key to the genera

1a. Thallus crustose……**1. *Bacidia***
1b. Thallus squamulose……..……2

2a. Prothallus present……**3. *Phyllopsora***
2b. Prothallus absent…….……**2. *Crocynia***

1. *Bacidia* De Not. in Gior. Bot. Ital. 2:189. 1846.

Key to the species

1a. Ascospores transversely 1–4-septate, 14–19 × 34 µm. Apothecial disc pale yellow to orange……..…….**2. *B. incongruens***

1b. Ascospores transversely 6–15-septate……..……2

2a. Ascospores 9–15-septate, 40–62 µm long. Epithecium K + violet……....**1. *B. alutacea***

2b. Ascospores 6–15-septate, 40–70 µm long. Epithecium K –…...……...…..**3. *B. rubella***

1. *Bacidia alutacea* (Kremp.) Zahlbr., Cat. Lich. Univ. 4:174. 1926. *Lecidea alutacea Kremp*. in Flora 61:519. 1878.

Thallus crustose, corticolous, yellowish brown, corticated. Ascomata apothecia, rounded, biatorine, disc dark brown, margin brown black. Excipulum colourless to pale, hymenium 70–80 µm high, epithecium K + violet, hypothecium pale yellow, paraphyses simple to branched. Asci 8-spored, ascospores acicular, hyaline, acicular, transversely 9–15-septate, 40–62 × 3–4 µm. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Assam, Sikkim, Tamil Nadu), Argentina, Australia, Brazil, Mexico, USA, Uruguay.

Species examined: INDIA– Assam, Kokrajhar district, **Saralpara**, N25°51.021′, E90°14.680′, Elev. 260 m, on the bark of *Tetrameles nudiflora* in forest, 05/01/2021, 63289 (LWG); coll. Pungbili Islary.

2. *Bacidia incongruens* (Stirt.) Zahlbr., Cat. Lich. Univers. 4:208. 1926. *Lecidea incongruens* Stirt. in Proc. Roy. Phil. Soc. Glasgow 11:314. 1879. (Plate 41B)

Thallus crustose, corticolous, grey, effuse, thin. Ascomata apothecia, constricted at base, rather minute, disc plane, pale yellow to orange, non-pruinose, margin distinct, entire, thin, pale yellow to yellow. Excipulum and epithecium colourless, K –, hymenium 44–52 µm thick, I + blue, hypothecium colourless, K –, paraphyses simple, articulate, apices capitate. Asci 8-spored, ascospores fusiform, transversely 1–4- septate, 14–19 × 34 µm. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Karnataka, Tamil Nadu, West Bengal).

Species examined: INDIA– Assam, Kokrajhar district, **Saralpara**, N26°51.021′, E90°14.619′, Elev. 260 m, 05/01/2021, on the bark of *Elaeocarpus* sp. in forest, 2021–0331 (BUBH); coll. Pungbili Islary.

3. *Bacidia rubella* (Hoffm.) Massal., Ric. Auton. Lich. Crost. 118. 1852. *Verrucaria rubella* Hoffm. In Hoffm & Palm, Deutsch. Flora Bot. Tasche. 174. 1795.

Thallus crustose, corticolous, brownish grey, effuse, thin. Ascomata apothecia, sparse to dense, constricted at base, yellowish grey to brown, turning reddish brown to black, non-pruinose, disc initially plane with margin at the same level, later much convex and margin excluded. Excipulum colourless to pale yellow, K –, epithecium pale brown, K –, hymenium 60–110 µm high, I + deep blue, hypothecium colourless to pale yellow, K –, paraphyses simple to branched, thickened and brown at apices. Asci 8-spored, ascospores acicular, transversely 6–15-septate, 40–70 × 2–4 µm. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Assam, Himachal Pradesh, Madhya Pradesh, Sikkim, Sweden, Tamil Nadu, Uttarakhand, West Bengal), Canada, France, Hungary, Germany, Latvia, Lithuania, Nepal, Netherlands, Norway, Succica, Sweden, United Kingdom of Great Britain & Northern Ireland, USA, Ukraine.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°45′57.57″, E90°17′33.55″, Elev. 158 m, on the bark of *Magnolia hodgsonii* in forest, 26/02/2020, 63290 (LWG), 2020–0330 (BUBH); coll. Pungbili Islary.

2. *Crocynia* (Ach.) Massal. in Atti Ins. Veneto ser. 3, 5: 251 (1860)

Key to the species

1a. Stictic acid absent……...**1. *C. gossypina***
1b. Stictic acid present……**2. *C. pyxinoides***

1. *Crocynia gossypina* (Sw.) Massal. in Atti Inst. Veneto Sci. ser. 3, 5:252. 1860. *Lichen gossypinus* Sw. in Sw. *et al*., Nova Gen. & Sp. Plant. 146. 1788.

Thallus squamulose, corticolous, greenish grey, spongy, adnate, subcrenate-imbricate, subplacodioid-effigurate. Hyphae rugulose, loosely intertwined, simple to irregularly

branched, septate, embedded with gonidia. Ascomata apothecia, lecanorine, disc brown to black, plane to convex, 0.3–0.6 mm diam. Hymenium colourless, epithecium pale brown, hypothecium brown. Asci 8-spored, ascospores simple, ellipsoid to oblong, 4–6 × 2 µm. Chemistry: Thallus K + pale yellow, C –, P –, UV –; TLC: Atranorin.

Distribution: India (Kerala), Australia, Brazil, Colombia, Congo, Costa Rica, Cuba, France, French Guiana, Guyana, Jamaica, Japan, New Caledonia, Sri Lanka, Suriname, Papua New Guinea, USA, Venezuela.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°45.894′, E90°16.992′, Elev. 178 m, on the bark of *Syzygium formosum* in forest, 16/10/2020, 2020–1611 (BUBH); coll. Pungbili Islary.

2. *Crocynia pyxinoides* Nyl., Sert. Lich. Trop. Labu. Singap. 37. 1891.

Thallus squamulose, corticolous, greyish white, spongy. Apothecia not seen. Chemistry: Thallus K + yellow, C –, P + orange, UV –; TLC: Atranorin and stictic acid.

Distribution: Bolivia, Brazil, Colombia, Costa Rica, Cuba, Guatemala, Guyana, Haiti, Liberia, Peru, Thailand, Trinidad & Tobago, USA, Zimbabwe.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46′11.05″, E90°17′23.48″, Elev. 173 m, on the bark of *Machilus gamblei* in forest, 22/12/2019, 2019–1615 (BUBH); N26°46.060′, E90°17.249′, Elev. 188 m, on the bark of *Magnolia hodgsonii* in forest, 26/07/2020, 65080 (LWG); coll. Pungbili Islary.

3. *Phyllopsora* Müll. Arg. in Bull. Herb. Boissier 2:11, 45. 1894.

Key to the species

1a. Thallus isidiate, squamules 0.3–1.5 mm wide..…….....**1. *P. corallina***
1b. Thallus without isidiate, squamules 0.1–0.3 mm wide…..……..**2. *P. manipurensis***

1. *Phyllopsora corallina* (Eschw.) Müll. Arg. in Bot. Jb. Sys. Pflanz. 20:264. 1894. *Lecidea corallina* (Eschw.) in Martius, Flora Bras. Enum. Plant. 1(1):256. 1833.

Thallus squamulose, corticolous, isidiate cylindrical. Ascomata apothecia, up to 1.5 mm diam., disc plane to convex, brown, margin slightly raised. Pycnidia common, yellow to

brown, immersed in thallus, conidia rod-shaped, straight 6–15 × 1–2 µm. Excipulum colourless, epihymenium hyaline, hymenium colourless, hypothecium colourless to pale brown. Ascospores hyaline, narrowly ellipsoid, 4–8 × 1–2 µm. Chemistry: Thallus K + yellow, C –, P –, UV –; TLC: Atranorin.

Distribution: India (Assam, Uttarakhand), Africa, Australia, Brazil, China, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Guatemala, Guyana, Honduras, New Zealand, Papua New Guinea, Peru, Seychelles, Thailand, USA, Vietnam, Venezuela.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°45.819′, E90°16.847′, Elev. 171 m altitude, *Glochidion zeylanicum* in forest, 27/10/2020, 63367 (LWG), 2020–0100 (BUBH); N26°45.909′, E90°16.993′, Elev. 168 m altitude, dead wood in forest, 16/10/2020, 2020–0098 (BUBH); **Saralpara**, N26°50.061′, E90°15.741′, 245 m altitude, *Magnolia champaca* on road side, 05/03/2023, 2023–1603 (BUBH); coll. Pungbili Islary.

2. *Phyllopsora manipurensis* (Müll. Arg.) Müll. Arg. in Bull. Soc. Roy. Bot. 32(1):132. 1893. *Psora manipurensis* Müll. Arg. in J. Linn. Soc. 29:219. 1893.

Thallus squamulose, corticolous, squamules yellowish to greenish, 0.1–0.3 mm wide, without isidiate and sorediate, prothallus white, hypothecium dark brown. Apothecia not seen. Chemistry: Thallus K –, C –, P –, UV –; TLC: Atranorin and triterpenes.

Distribution: India (Goa, Karnataka, Maharashtra, Madhya Pradesh, Manipur, Meghalaya, Odisha, Sikkim, Uttarakhand).

Species examined: INDIA– Assam, Kokrajhar district, **Saralpara**, N26°49.929′, E90°15.565′, Elev. 242 m, on the bark of *Magnolia champaca* on road side, 05/03/2023, 2023–1583 (BUBH); N26°50.982′, E90°15.696′, Elev. 259 m, on the bark of *Magnolia champaca* on road side, 14/03/2023, 65115 (LWG); coll. Pungbili Islary.

26. LOPADIACEAE Hafellner in Nova Hedwigia 79:300. 1984.

About 1 genus and 9 species in India; no records in Assam; 1 genus and 2 species reported from the present study.

1. *Lopadium* Körb., Sys. Lich. Germ. 210. 1855.

Key to the species

1a. Asci 8-spored, 120–136 × 28–33 µm……..…….……..……**1. *L. coorgianum***
1b. Asci 2-spored, 72–95 × 13–26 µm……...……..**2. *L. vulpinum***

1. *Lopadium coorgianum* Patw. & Makhija in Ind. J. Bot. 4(1):22. 1981. (Plate 44E)

Thallus crustose, corticolous, greyish green to yellowish, smooth. Ascomata apothecia, solitary, 0.4–1.0 mm diam., disc plane, convex, black, sometimes aggregated. Excipulum black, hymenium hyaline, 100–150 µm in height, hypothecium pale brown, epithecium thick. Asci cylindrical to clavate, 8-spored, 120–136 × 28–33 µm, ascospores hyaline, ellipsoid, muriform, with 8–10-transverse septa, and 1–2- vertical septa, 48–50 × 16–19 µm. Chemistry: Thallus K + orange turning red, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Karnataka).
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.262′, E90°15.293′, Elev. 178 m, on the bark of *Ficus* sp. in Forest, 02/04/2022, 2022–0526 (BUBH); N26°46.480′, E90°17.454′, Elev. 174 m, on the bark of *Gmelina arborea* on road side, 29/01/2023, 2023–1549 (BUBH); coll. Pungbili Islary.

2. *Lopadium vulpinum* (Tuck ex Nyl.) Zahlbr., Cat. Lich. Univ. 4:316. 1926. *Lecidea vulpina* Tuck ex Nyl. in Annl. Sci. Nat. ser. 4, 19:354. 1863. (Plate 44F)

Thallus crustose, corticolous, greyish grey to yellowish, blackish brown hypothallus at periphery. Ascomata apothecia, solitary, sessile, adnate, not constricted at base, disc black, non-pruinose. Excipulum moderately thickened, hymenium hyaline, K + purple and I + blue, epithecium yellowish brown, hypothecium brown, paraphyses sparsely branched. Asci cylindrical clavate, pedicellate, 2-spored, 72–95 × 13–26 µm, ascospores hyaline, muriform, with 5–9-transverse septa and 1–3-vertical septa, 23–44 × 12–20 µm. Chemistry: Thallus K + orange turning red, C –, P –, UV–; TLC: no substances detected.

Distribution: India (Andaman & Nicobar Islands, Karnataka, Manipur, Nagaland, Tamil Nadu), Brazil, Philippines, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°45.27′, E90°18.16′, Elev. 176 m, on the bark of *Aglaia spectabilis* in forest, 19/12/2022, 2022–1498 (BUBH); coll. Pungbili Islary.

27. LEPROCAULACEAE Lendemer & Hodk. in Mycologia 105(4):1007. 2013.

About 1 genus and 5 species in India; 1 genus and 1 species in Assam; 1 genus and 1 species reported from the present study.

1. *Leprocaulon* Nyl. in Bull. Soc. Bot. 25(5):352. 1879.

Key to the species

1a. Thallus granular, margin diffuse, without lobes and medulla, soredia abundant fine to medium and clumped together, older thallus forming a lower necral layer of gelatinized granules. Atranorin, pannarin, zeorin……..……...**1. *L. adhaerens***

1b. Primary thallus not seen, pseudopodetia attached by rooting base, upwards android branched, branches flattened or dorsiventral, in one plane, soft, fragile, greyish white to yellow-brown, phyllocladial granules on ultimate branchlets, often dissolute into powdery particles. Atranorin and protocetraric acid…….....**2. *L. arbuscula***

1. *Leprocaulon adhaerens* (Knudsen, Elix & Lendemer) Lendemer & Hodk. in Mycologia 105(4):1007. 2013. *Lepraria adhaerens* Knudsen, Elix & Lendemer in Opusc. Philolich. 4:5. 2007.

Thallus fruticose, corticolous, grey, granular, margin diffuse, without lobes and medulla, soredia abundant fine to medium 40–100 µm diam. and clumped together, older thallus forming a lower necral layer of gelatinized granules, projecting hyphae absent but frequently with thin colourless hyphae acting as anchors or rhizines. Chemistry: Thallus K –, C –, KC –, P + orange, UV –; TLC: Atranorin, pannarin, zeorin.

Distribution: India (Himachal Pradesh, Kerala, Madhya Pradesh, Uttarakhand), Canada, Peru, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.180′, E90°18.245′, Elev. 168 m, on the bark of *Ilex odorata* in forest, 25/12/2020, 65097 (LWG), 2020–1595 (BUBH); coll. Pungbili Islary.

2. *Leprocaulon arbuscula* (Nyl.) Nyl., Lich. Ins. Guin. 34. 1889. *Stereocaulon nanum* subsp. *arbuscula* Nyl., Syn. Method. Lich. 1(2):253. 1860.

Thallus fruticose, corticolous, grey, primary thallus not seen, pseudopodetia attached by rooting base, upwards dendroid branched, branches dorsiventral or flattened in one plane, fragile, soft, greyish white to yellow brown, phyllocladial granules on ultimate branchlets, often dissolute into powdery particles. Pseudopodetia anatomically differentiated into central axis of longitudinally compact hyphae. An outer mantle composed of loose intricate hyphae. Photobiont on pseudopodetium surface or in powder granules encased by hyphae. Chemistry: Thallus K –, C –, P + red, UV –; TLC: Atranorin and protocetraric acid.

Distribution: India (Himachal Pradesh, Sikkim, Uttarakhand), Australia, Bhutan, Bolivia, Brazil, China, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Indonesia, Japan, Kenya, Korea, Nepal, New Zealand, Papua New Guinea, Solomon Islands, Thailand, Vietnam, Venezuela.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°47.228′, E90°17.193′, Elev. 183 m, on the bark of *Syzygium formosum* in forest, 04/06/2023, 65098 (LWG), 2023–1587 (BUBH); coll. Pungbili Islary.

28. COCCOCARPIACEAE Henssen in Sys. Ascom. 5:314. 1986.

About 1 genus and 8 species in India; 1 genus and 3 species in Assam; 1 genus and 3 species reported from the present study.

1. *Coccocarpia* Pers. in Freycinet *et al*., Voy. Aut. Du Mon. 4:206. 1826.

Key to the species

1a. Thallus isidiate……...……..……2
1b. Thallus lacking isidiate……...…….**1. *C. erythroxyli***

2a. Isidia simple to coralloid branched.……..……..**2. *C. palmicola***
2b. Isidia flattened, microphylline to squamiform…….**3. *C. pellita***

1. *Coccocarpia erythroxyli* (Spreng.) Swinscow & Krog in Norw. J. Bot. 23:254. 1976. *Lecidea erythroxyli* Spreng. in Kungl. Svenska Vetenskap. Hand. ser. 3, 41:47. 1820.

Thallus foliose, corticolous, adnate, orbicular, dorsiventral, heteromerous, corticated on both sides, dichotomously lobate, upper side leaden-grey to bluish grey, smooth with transverse concentric ridges, lacking isidia, lower side creamy to brown black, densely rhizinate, creamy to brown black, projecting from base. Medulla white. Ascomata apothecia, laminal, biatorine, disc reddish brown to black. Asci 8-spored, unitunicate, ascospores simple, hyaline, ellipsoid to fusiform, 7–9 × 3–6 µm. Chemistry: Thallus K – , C –, P + slightly orange yellow, UV –; TLC: no substances detected.

Distribution: India (Andaman and Nicobar Islands, Arunachal Pradesh, Assam, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Nagaland, Sikkim, Tamil Nadu, Uttarakhand, West Bengal), Australia, Brazil, Bhutan, Central, North and South America, Canada, China, Chile, Chinese Taipei, Cuba, Ecuador, Ethiopia, French Polynesia, Germany, Guadeloupe, Honduras, Indonesia, Jamaica, Japan, Kenya, Korea, Malaysia, Martinique, Mexico, Myanmar, Nepal, New Caledonia, New Zealand, Peru, Portugal, Puerto Rico, Spain, Sri Lanka, Rwanda, Réunion, Tanzania, Uganda, Venezuela.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.303′, E90°17.023′, Elev. 178 m, on the bark of *Macaranga denticulata* in forest, 10/10/2020, 2020–0252 (BUBH); coll. Pungbili Islary.

2. *Coccocarpia palmicola* (Spreng.) Arv. & Galloway in Bot. Noti 132(2):242. 1979. *Lecidea palmicola* Spreng. in Kungl. Svenska Vetenskap. Hand. ser. 3, 41:46. 1820.

Thallus foliose, corticolous, adnate, 6–15 cm across, lobes 1–6 mm wide, heteromerous, corticated on both sides, upper side lead grey, with transverse concentric ridges, isidia simple to coralloid branched, lacking pseudocyphellae and soredia, lower side pale brown to black, densely black rhizinate projecting beyond lobe margin. Medulla colourless to yellowish. Apothecia not seen. Chemistry: Thallus K + yellowish, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Andaman & Nicobar Islands, Arunachal Pradesh, Assam, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Nagaland, Sikkim, Tamil Nadu, Uttarakhand, West Bengal), Bhutan, Brazil, Canada, China, Colombia, Dominica, French Polynesia, Guyana, Japan, French Guiana, Malaysia, Mauritius, New Zealand, USA, Vietnam.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°47.700′, E90°17.833′, Elev. 187 m, on the bark of *Tetrameles nudiflora* on road side, 02/04/2023, 2023–1558 (BUBH); **Saralpara**, N26°51.025′, E90°16.443′, Elev. 262 m, on the bark of *Tetrameles nudiflora* in forest, 14/03/2023, 2023–1511 (BUBH); N26°50.780′, E90°16.516′, Elev. 260 m, on the bark of *Tetrameles nudiflora* on road side, 14/03/2023, 65078 (LWG); coll. Pungbili Islary.

3. *Coccocarpia pellita* (Ach.) Müll. Arg. in Flora 65:320. 1882. *Parmelia pellita* Ach., Lich. Univ. 468. 1810.

Thallus foliose, corticolous, adnate, orbicular, dorsiventral, heteromerous, corticated on both sides, dichotomously lobate, upper side leaden-grey, bluish grey to brownish black, smooth with transverse concentric ridges, with isidia flattened, microphylline to squamiform, lower side creamy to brown black, densely black rhizinate, projecting beyond lobe margins. Medulla white. Ascomata apothecia, laminal, biatorine, disc yellowish brown to black. Asci 8-spored, unitunicate, ascospores hyaline, simple, fusiform, 7–12 × 2–5 µm. Chemistry: Thallus K + light yellow, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Andaman & Nicobar Islands, Arunachal Pradesh, Assam, Himachal Pradesh, Karnataka, Kerala, Manipur, Meghalaya, Nagaland, Sikkim, Tamil Nadu, Uttarakhand, West Bengal), Australia, Barbados, Bhutan, Brazil, China, Chinese Taipei, Colombia, Costa Rica, Cuba, Dominica, Ecuador, French Polynesia, Grenada, Guyana, Haiti, Indonesia, Jamaica, Kenya, Malaysia, Mauritius, Mexico, Nepal, New Zealand, Norfolk Island, Papua New Guinea, Peru, Philippines, Puerto Rico, Réunion, Saint Lucia, Singapore, Seychelles, Sri Lanka, Thailand, Trinidad & Tobago, Uganda, Venezuela.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46′00.00″, E90°17′36.93″, Elev. 183 m, on the bark of *Ilex odorata* in forest, 13/12/2019, 2019–1296 (BUBH); N26°45′50.03″, E90°17′05.42″, Elev. 183 m, on the bark of *Semecarpus*

anacardium in forest, 22/12/2019, 2019–1307 (BUBH); N26°46′08.39″, E90°17′21.61″, Elev. 179 m, on the bark of *Ilex odorata* in forest, 22/12/2019, 2019–1304 (BUBH); N26°46′00.21″, E90°17′33.42″, Elev. 179 m, on the bark of *Syzygium formosum* in forest, 13/12/2019, 2019–1302 (BUBH); N26°46.252″, E90°16.872″, Elev. 162 m, on the bark of *Syzygium formosum* in forest, 10/10/2020, 2020–0276 (BUBH); N26°46.087′, E90°17.113′, Elev. 147 m, on the bark of *Liana* sp. in forest, 24/11/2020, 63362 (LWG); N26°46.019′, E90°17.475′, Elev. 178 m, on the bark of *Vatica lanceaefolia* in forest, 05/12/2020, 2020–1306 (BUBH); N26°46.353′, E90°16.751′, Elev. 177 m, on the bark of *Mangifera sylvatica* in forest, 10/10/2020, 2020–1305 (BUBH); N26°45′46.59″, E90°16′55.02″, Elev. 187 m, on the bark of *Ficus* sp. in forest, 26/02/2020, 2020–1300 (BUBH); N26°46.212′, E090°17.136′, Elev. 172 m, on the bark of *Syzygium formosum* in forest, 26/07/2020, 2020–0353 (BUBH); N26°46.089′, E90°16.830′, Elev. 176 m, on the bark of *Semecarpus anacardium* in forest, 16/10/2020, 2020–1297 (BUBH); N26°46.382′, E90°17.149′, Elev. 185 m, on the bark of *Stereospermum chelonoides* in forest, 22/07/2020, 2020–1295 (BUBH); N26°46.087′, E90°17.113′, Elev. 147 m, on the bark of *Liana* sp. in forest, 24/11/2020, 2020–1303 (BUBH); **Saralpara**, N26°49.929′, E90°15.565′, Elev. 242 m, on the bark of *Magnolia champaca* on road side, 05/03/2023, 65079 (LWG); coll. Pungbili Islary.

29. COLLEMATACEAE Zenker in Goebel & Kunze, Pharm. Waarenk. 1(3):124. 1827.

About 3 genera and 73 species in India; 2 genera and 7 species in Assam; 1 genus and 3 species reported from the present study.

1. *Leptogium* (Ach.) Gray, Nat. Arr. Brit. Plant. 1:400. 1821.

Key to species

1a. Isidia present with squamiform……...……..……....**2. *L. denticulatum***
1b. Isidia absent…….……2

2a. Ascospores transversely septate……...……**1. *L. brebissonii***
2b. Ascospores muriform……..……...……**3. *L. ulvaceum***

1. *Leptogium brebissonii* Mont. in Barker-Webb & Berthelot, Hist. Nat. Iles Canar. 3(2):130. 1840.

Thallus foliose, corticolous, olive-grey to black, thin, wrinkled, homoiomerous, corticated on both sides in a single layered, lacking tomentum on lower side. Apothecia constricted at base, to 1.5 mm in diam. Asci 8-spored, ascospores hyaline, fusiform, transversely 5–7-septate, apices acuminate, 32–35 × 5–7 µm. Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Tamil Nadu), Australia, Brazil, Canary Island, Europe, France, Iceland, Kenya, Nepal, Northern Ireland, Portugal, South Africa, Spain, Tanzania, USA.
Species examined: INDIA– Assam, Kokrajhar district, **Saralpara**, N26°49.946′, E90°15.558′, Elev. 244 m, on the bark of *Magnolia champaca* on road side, 05/03/2023, 2023–1502 (BUBH); coll. Pungbili Islary.

2. *Leptogium denticulatum* Nyl. in Ann. Sci. Nat. ser. 5, 7:302. 1867.

Thallus foliose, corticolous, adnate, upper side lead grey to darker grey, lower side paler and etomentose, wrinkled slightly, lacking sorediate, isidia squamiform, lobes orbicular, 2–7 mm wide, margins isidiate. Apothecia not seen. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Andaman & Nicobar Islands, Arunachal Pradesh, Goa, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Nagaland, Sikkim, Darjeeling, Tamil Nadu, West Bengal), Argentina, Australia, Bermuda, Brazil, Bhutan, Chile, Colombia, Dominica, Grenada, Jamaica, Malaysia, Martinique, Mexico, New Caledonia, New Zealand, Norfolk Island, Portugal, Puerto Rico, Saint Lucia, Spain, Taiwan, Thailand, Trinidad & Tobago, USA, Vietnam.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.262′, E90°16.847′, Elev. 157 m, on the bark of *Semecarpus anacardium* in forest, 10/10/2020, 63361 (LWG), 2020–0289 (BUBH); **Labanyapur**, N26°47.910′, E90°18.768′, on the bark of *Tetrameles nudiflora* in forest, Elev. 182 m, 10/11/2021, 2021–0662 (BUBH); coll. Pungbili Islary.

3. *Leptogium ulvaceum* (Pers.) Vain. in Ann. Acad. Sci. Fenn. ser. A, 15(6):38. 1921. *Collema ulvacea* Pers. in Freycinet *et al*., Voy. Aut. Du Mon. 4:203. 1826. (Plate 44A)

Thallus foliose, corticolous, loosely adnate, lead grey, corticated on both sides, lacking isidia or soredia, lobes orbicular. Ascomata apothecia, laminal, vertically stipe on the thallus, disc pale yellow, 0.6–1.8 mm wide. Epihymenium colourless to pale yellow, hymenium colourless, clear, 120–140 µm high, hypothecium colourless to pale yellow, paraphyses simple. Asci 8-spored, ascospores hyaline, muriform, 30–36 × 10–12 µm. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Arunachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Nagaland, Tamil Nadu), Argentina, Colombia, Congo, El Salvador, Jamaica, Malaysia, Philippines, South East Asia, USA, Vietnam.
Species examined: INDIA– Assam, Kokrajhar district, **Saralpara**, N26°51.009′ E90°14.588′, Elev. 257 m, on the bark of *Ficus* sp. in forest, 05/01/2021, 63368 (LWG), 2021–0290 (BUBH); coll. Pungbili Islary.

30. PANNARIACEAE Tuck. Gen. Lich. 12. 1872.

About 5 genera and 25 species in India; no records in Assam; 1 genus and 1 species reported from the present study.

1. *Parmeliella* Müll. Arg. in Mém. Soc. Phy. His. Nat. 16(2):376. 1862.

1. *Parmeliella cinerata* (Zahlbr.) Jørg. in Bryologist 106(1):121. 2003. *Pannaria cinerata* Zahlbr. in Ark. Bot. 31A(1):72. 1944. (Plate 48E)

Thallus foliose, corticolous, grey, smooth to slightly glossy, rosettiform, up to 3 cm across, lobes minute to large, heteromerous, corticated only on upper side, lacking isidia or soredia, lower side black, tomentose, rhizinate. Prothallus prominent, black. Apothecia not seen. Chemistry: Thallus K –, C –, P –, UV –; TLC: no substances detected.

Distribution: Borneo, Java, Japan, Hawaii, Indonesia, Malaysia, Réunion, Sri Lanka.
Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46.114′, E90°18.345′, Elev. 150 m, on the bark of *Syzygium formosum* in forest, 25/12/2020, 63365 (LWG), 2020–0332 **(**BUBH); coll. Pungbili Islary.

31. BRIGANTIAEACEAE Hafellner & Bellem. in Nova Hedwigia 35:246. 1982.

About 2 genera and 9 species in India; 2 genera and 5 species in Assam; 1 genus and 2 species reported from the present study.

1. *Letrouitia* Hafellner & Bellem. in Nova Hedwigia 35 (2 & 3):281. 1982.

Key to the species

1a. Ascospores transversely 7–10-septate, with 1–3-vertical septa…....**1. *L. transgressa***
1b. Ascospores multicelled-muriform……...…….....**2. *L. vulpina***

1. *Letrouitia transgressa* (Malme) Hafellner & Bellem. in Nova Hedwigia 35(4):710. 1981. *Bombyliospora domingensis* f. *transgressa* Malme in Ark. Bot. 18(12):5. 1923.

Thallus crustose, corticolous, greenish yellow, lacking isidia. Ascomata apothecia, sessile, constricted at base, disc yellow orange to brownish orange, margin prominent, pale orange, lighter than disc. Excipulum biatorine, K + purple or blue-violet, paraphyses slightly branched and anastomosing. Asci with inner apical apparatus and inner wall layers, non-amyloid, 8-spored, ascospores colourless, transversely 7–10-septate, with lens-shaped lumina, with 1–3-vertical septa in some lumina, 25–53 × 10–15µm. Chemistry: Thallus K + violet-purple, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Andhra Pradesh, Arunachal Pradesh, Assam, Karnataka, Madhya Pradesh, Nagaland, Uttar Pradesh and West Bengal-hills), Australia, Brazil, China, Colombia, Costa Rica, Nepal, New Caledonia, Papua New Guinea, South America, Thailand.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°46′08.80″, E90°17′20.86″, Elev. 172 m, on the bark of *Holarrhena* sp. in forest, 21/12/2019, 63309 (LWG), 2021–0344 (BUBH); N26°47.885′, E90°18.704′, Elev. 177 m, on the bark of *Holarrhena* sp. in forest, 10/11/2021, 2021–0537 (BUBH); N26°40.52′, E90°17.38′, Elev. 120 m, on the bark of *Elaeocarpus* sp., 03/01/2023, 2023–1419 (BUBH); N26°46.59′, E90°16.30′, Elev. 178 m, on the bark of *Stereospermum chelonoides* in forest, 28/11/2022, 2022–1001 (BUBH); N26°40.44′, E90°17.42′, Elev. 121 m, on the bark of *Elaeocarpus* sp. in forest, 03/01/2023, 2023–1421 (BUBH); N26°43.47′, E90°18.08′, Elev. 294 m, on

the bark of *Aglaia spectabilis* in forest, 02/04/2023, 2023–1576 (BUBH); **Labanyapur**, N26°47.928′, E90°19.523′, Elev. 178 m, on the bark of *Magnolia hodgsonii* in forest, 10/11/2021, 2021–0523 (BUBH); coll. Pungbili Islary.

2. *Letrouitia vulpina* (Tuck ex Nyl.) Hafellner & Bellem. in Nova Hedwigia 35 (2 & 3):281. 1981. *Lecidea vulpina* Tuck ex Nyl. in Ann. Sci. Nat. ser. 4, 19:354. 1863.

(Plate 44B)

Thallus crustose, corticolous, greenish yellow. Ascomata apothecia, biatorine, disc black, margin yellow-orange. Excipulum yellow, hymenium and hypothecium colourless to pale yellow, paraphyses branched. Asci 2-spored, ascospores hyaline, ellipsoidal, multicelled-muriform, thin wall, 26–52 × 13–20 µm. Chemistry: Thallus K + violet-purple, C –, P + yellowish brown, UV –; TLC: no substances detected.

Distribution: India (Andaman & Nicobar Islands, Karnataka, Mangalore, Manipur, Nagaland, Tamil Nadu), Australia, Brazil, Costa Rica, Cuba, France, French Guiana, Jamaica, New Caledonia, Philippines, Réunion, Trinidad & Tobago, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°49.34′, E90°17.41′, Elev. 251 m, on the bark of *Magnolia hodgsonii* in forest, 02/04/2023, 2023–1559 (BUBH); N26°49.352′, E90°17.867′, Elev. 225 m, on the bark of *Holarrhena* sp. in forest, 29/01/2023, 2023–1474 (BUBH); coll. Pungbili Islary.

32. TELOSCHISTACEAE Zahlbr. in Engler, Syl. Edn 2, 45. 1898.

About 9 genera and 95 species in India; 3 genera 5 species in Assam; 1 genus and 1 species reported from the present study.

1. *Caloplaca* Fr., Lich. Arct. Eur. Groenland. 118. 1860.

1. *Caloplaca bassiae* (Ach.) Zahlbr., Cat. Lich. Univ. 7:78. 1930. *Lepraria bassiae* Ach., Method. Lich. 5. 1803.

Thallus crustose, corticolous, thin, yellow, isidiate, isidia numerous, yellow, simple to coralloid, prothallus black. Pycnidia immersed, medulla white. Apothecia not seen. Chemistry: K + purple, C –, P –, UV –; TLC: Green spot at 5–6.

Distribution: India (Andaman & Nicobar Islands, Arunachal Pradesh, Assam, Himachal Pradesh, Jammu & Kashmir, Madhya Pradesh, Orissa, Rajasthan, Sikkim, Tamil Nadu,

Uttar Pradesh), Australia, Bangladesh, Brazil, China, Costa Rica, Cuba, Ecuador, Fiji, French Guiana, Gambia, Kenya, Madagascar, Mauritius, Paraguay, Philippines, Seychelles, Sri Lanka, USA.

Species examined: INDIA– Assam, Kokrajhar district, **Ultapani**, N26°41.918′, E90°18.825′, Elev. 129 m, on the bark of *Elaeocarpus* sp. in forest, 08/01/2023, 65076 (LWG), 2023–1590 (BUBH); coll. Pungbili Islary.

4.4 Analysis of lichen diversity

The lichen community is also represented by good diversity of *Hemithecium*, *Ocellularia*, and *Porina*. Ten of the lichen species viz. *Dirinaria aegialita*, *D. applanata*, *Heterodermia diademata*, *Malmidea fuscella*, *M. gyalectoides*, *Parmotrema praesorediosum*, *P. tsavoense*, *Porina interestes*, *P. subcutanea*, and *Pyxine cocoes* were commonly found in all the three localities. All the collected specimens of Cryptothecia were found to be sterile. Diversity of lichen in Ultapani was highest followed by Labanyapur and Saralpara (Fig. 4.4).

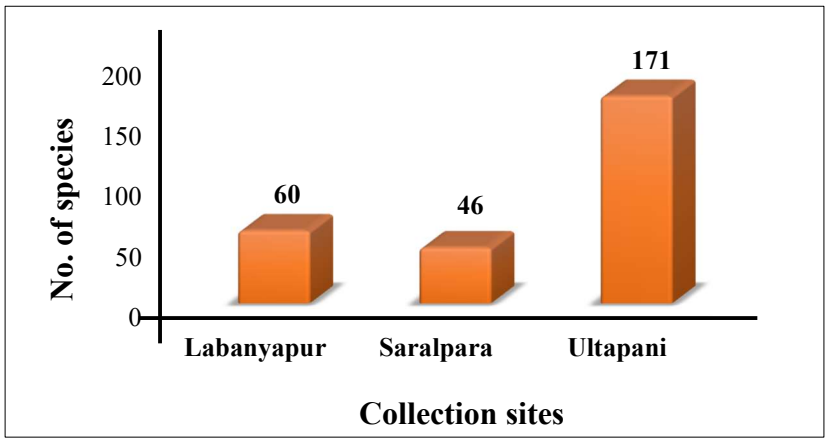

Fig. 4.4. Lichen diversity of UFR

4.5 Interesting facts

4.5.1 New findings

The species, *Agonimia bryophilopsis* was initially reported to be terricolous lichen (growing on soil) from Finland, Europe (Breuss, 2019). However, this species is discovered for the first time growing on the bark of a tree (corticolous lichen) in the present study.

4.5.2 New additional records to India

A total of 27 lichen species are being reported for the first time from Indian continent (See also Islary *et al*., 2022a; 2022b) (Table 4.3).

Table 4.3. New distributional records of lichen to India discovered in UFR

Sl No.	Taxa	Family	Substratum
1	*Agonimia bryophilopsis*	Verrucariaceae	*Tetrameles nudiflora*
2	*Allographa myolensis*	Graphidaceae	*Tetrameles nudiflora*
3	*Aptrootia elatior*	Trypetheliaceae	*Holarrhena* sp.
4	*Astrothelium rubrocrystallinum*	Trypetheliaceae	*Trema orientale*
5	*Bathelium carolinianum*	Trypetheliaceae	*Trema orientale*, *Wrightia arborea*
6	*Coenogonium degeneri*	Coenogoniaceae	*Castanopsis indica*
7	*Eugeniella ortizii*	Pilocarpaceae	*Magnolia hodgsonii*, *Semecarpus anacardium*
8	*Graphis emersa*	Graphidaceae	*Ficus* sp.
9	*G. subintermedians*	Graphidaceae	*Magnolia hodgsonii*

10	*Haematomma africanum*	Haematommataceae	*Ficus* sp., *Tetrameles nudiflora*
11	*Malmidea bacidinoides*	Malmideaceae	*Holarrhena* sp., *Vatica lanceaefolia*
12	*M. cinereonigrella*	Malmideaceae	*Ficus* sp.
13	*M. coralliformis*	Malmideaceae	*Ficus* sp.
14	*M. gyalectoides*	Malmideaceae	*Aglaia spectabilis*, *Magnolia hodgsonii*, *Terminalia* sp., *Tetrameles nudiflora*, *Vatica lanceaefolia*
15	*M. leptoloma*	Malmideaceae	*Cinnamomum cecidodaphne*, *Garcinia* sp., *Semecarpus anacardium*, *Vatica lanceaefolia*
16	*M. perplexa*	Malmideaceae	*Ficus* sp., *Magnolia hodgsonii*
17	*M. subgranifera*	Malmideaceae	*Ficus* sp., *Ilex odorata*, *Syzygium formosum*
18	*M. tratiana*	Malmideaceae	*Aglaia spectabilis*, *Macaranga denticulata*, *Magnolia hodgsonii*, *Tetrameles nudiflora*
19	*Myriotrema classicum*	Diploschistaceae	*Magnolia champaca*

20	*Ocellularia calvescens*	Diploschistaceae	*Macaranga denticulata*
21	*Parmeliella cinerata*	Pannariaceae	*Syzygium formosum*
22	*Pyrenula albothallina*	Pyrenulaceae	*Aglaia spectabilis*, *Ficus* sp.
23	*P. microtheca*	Pyrenulaceae	*Ilex odorata*
24	*Porina ahlesiana*	Trichotheliaceae	*Magnolia hodgsonii*
25	*Rhabdodiscus subcavatus*	Diploschistaceae	*Machilus gamblei*
26	*Sclerophyton desertorum*	Opegraphaceae	*Tetrameles nudiflora*
27	*Trypethelium xanthoplatystomum*	Trypetheliaceae	*Wrightia arborea*

4.5.3 New distributional records to Assam

The number of 78 species of lichen are being reported as new additional records for the state, including first record of 12 genera out of 69 genera, *Agonimia*, *Anzia*, *Aptrootia*, *Bactrospora*, *Crocynia*, *Eugeniella*, *Lithothelium*, *Myriostigma*, *Nadvornikia*, *Parmeliella*, *Rhabdodiscus* and *Sclerophyton* from the present study (See also Islary *et al*., 2021, 2022a) (Table 4.4).

Table 4.4. New distributional records of lichen to Assam discovered in UFR

Sl No.	Taxa	Families	Substratum
1	*Anzia ornatoides*	Parmeliaceae	*Ilex odorata*, *Mangifera sylvatica*, *Mesua ferrea*, *Semecarpus anacardium*
2	*Arthopyrenia claviformis*	Arthopyreniaceae	*Ficus* sp.
3	*Astrothelium cinereorosellum*	Trypetheliaceae	*Trema orientale*
4	*Bactrospora arthonioides*	Incertae sedis under Arthoniales	*Syzygium formosum*
5	*B. metabola*	Incertae sedis under Arthoniales	*Ilex odorata*
6	*Buellia curtisii*	Caliciaceae	*Tetrameles nudiflora*
7	*B. tincta*	Caliciaceae	*Ficus* sp., *Macaranga denticulata*
8	*Crocynia gossypina*	Ramalinaceae	*Syzygium formosum*
9	*C. pyxinoides*	Ramalinaceae	*Machilus gamblei* *Magnolia hodgsonii*

10	*Dichosporidium boschianum*	Roccellaceae	*Citrus* sp.
11	*Diorygma roseopruinatum*	Graphidaceae	*Elaeocarpus* sp., *Magnolia champaca*
12	*Fissurina rugosa*	Fissurinaceae	*Macaranga denticulata*
13	*F. simplex*	Fissurinaceae	*Dillenia indica*
14	*F. subnitidula*	Fissurinaceae	*Elaeocarpus* sp.
15	*Graphis copelandii*	Graphidaceae	*Ficus* sp.
16	*G. japonica*	Graphidaceae	*Elaeocarpus* sp., *Ficus* sp., *Ilex odorata*, *Macaranga denticulata*, *Magnolia champaca*, *Semecarpus anacardium*, *Syzygium formosum*,
17	*G. longispora*	Graphidaceae	*Magnolia champaca*
18	*G. nanodes*	Graphidaceae	Ficus *sp*., *Magnolia hodgsonii*, *Tetrameles nudiflora*
19	*Hemithecium amboliense*	Graphidaceae	*Aglaia spectabilis*, *Elaeocarpus* sp., *Ilex odorata*, *Magnolia champaca*, *M. hodgsonii*, *Mesua ferrea*, *Tetrameles nudiflora*, *Wrightia arborea*

20	*H. aphaneomicrosporum*	Graphidaceae	*Stereospermum chelonoides*
21	*H. aphanes*	Graphidaceae	*Elaeocarpus* sp., *Magnolia hodgsonii*, *Mesua ferrea*, *Syzygium formosum*,
22	*H. balaghatense*	Graphidaceae	*Magnolia hodgsonii*, *Stereospermum chelonoides*, *Syzygium formosum*
23	*H. fulvescens*	Graphidaceae	*Mallotus nudiflorus*, *Stereospermum chelonoides*, *Tetrameles nudiflora*
24	*H. isidiatum*	Graphidaceae	*Semecarpus anacardium*, *Syzygium formosum*
25	*H. norstictum*	Graphidaceae	*Mallotus nudiflorus*
26	*H. pulchellum*	Graphidaceae	*Magnolia hodgsonii*
27	*H. salacinilabiatum*	Graphidaceae	*Ficus* sp., *Syzygium formosum*
28	*H. verrucosum*	Graphidaceae	*Aglaia spectabilis*, *Ilex odorata*, *Magnolia hodgsonii*
29	*Herpothallon albidum*	Arthoniaceae	*Ilex odorata*, *Semecarpus anacardium*, *Syzygium formosum*

30	*Heterodermia comosa*	Physciaceae	*Elaeocarpus* sp., *Magnolia champaca*
31	*H. dissecta*	Physciaceae	*Tetrameles nudiflora*
32	*Lecanora sambuci*	Lecanoraceae	*Tetrameles nudiflora*
33	*Leiorreuma exaltatum*	Graphidaceae	*Ficus* sp.
34	*Leprocaulon adhaerens*	Leprocaulaceae	*Ilex odorata*
35	*L. arbuscula*	Leprocaulaceae	*Syzygium formosum*
36	*Leptogium brebissonii*	Collemataceae	*Magnolia champaca*
37	*L. denticulatum*	Collemataceae	*Semecarpus anacardium*, *Tetrameles nudiflora*
38	*L. ulvaceum*	Collemataceae	*Ficus* sp.
39	*Letrouitia vulpina*	Brigantiaeaceae	*Holarrhena* sp., *Magnolia hodgsonii*
40	*Lithothelium obtectum*	Pyrenulaceae	*Stereospermum chelonoides*
41	*Lopadium coorgianum*	Lopadiaceae	*Ficus* sp., *Gmelina arborea*
42	*L. vulpinum*	Lopadiaceae	*Aglaia spectabilis*

43	*Malmidea bakeri*	Malmideaceae	*Elaeocarpus* sp.
44	*M. duplomarginata*	Malmideaceae	*Magnolia champaca*
45	*M. fuscella*	Malmideaceae	*Ficus* sp., *Ilex odorata*, *Magnolia champaca*, *Mesua ferrea*, *Stereospermum chelonoides*, *Tetrameles nudiflora*, *Wrightia arborea*
46	*M. hypomelaena*	Malmideaceae	*Neolamarckia cadamba*
47	*M. psychotrioides*	Malmideaceae	*Semecarpus anacardium*
48	*M. subaurigera*	Malmideaceae	*Aglaia spectabilis*, *Elaeocarpus* sp.
49	*Myriostigma candidum*	Arthoniaceae	*Syzygium formosum*
50	*Myriotrema olivaceum*	Diploschistaceae	*Syzygium formosum*
51	*Nadvornikia hawaiensis*	Diploschistaceae	*Mesua ferrea*
52	*Ocellularia andamanica*	Diploschistaceae	*Cinnamomum glaucescens*, *Garcinia* sp.

53	*O. diacida*	Diploschistaceae	*Areca catechu*, *Machilus gamblei*, *Magnolia hodgsonii*, *Magnolia* sp., *Mesua ferrea*, *Semecarpus anacardium*
54	*O. terebrata*	Diploschistaceae	*Semecarpus anacardium*
55	*O. thelotremoides*	Diploschistaceae	*Syzygium* sp.
56	*O. violacea*	Diploschistaceae	*Ilex odorata*
57	*O. wandoorensis*	Diploschistaceae	*Terminalia* sp.
58	*Parmotrema pseudotinctorum*	Parmeliaceae	*Magnolia hodgsonii*
59	*P. reticulatum*	Parmeliaceae	*Semecarpus anacardium*
60	*Phyllopsora manipurensis*	Ramalinaceae	*Magnolia champaca*
61	*Physcia stellaris*	Physciaceae	*Elaeocarpus* sp., *Magnolia champaca*
62	*Porina atroperiostiola*	Trichotheliaceae	*Elaeocarpus* sp.
63	*P. eminentior*	Trichotheliaceae	*Tetrameles nudiflora*
64	*P. platystoma*	Trichotheliaceae	*Semecarpus anacardium*

65	*P. subcutanea*	Trichotheliaceae	*Elaeocarpus* sp., *Ilex odorata*, *Magnolia champaca*, *Stereospermum chelonoides*, *Tetrameles nudiflora*
66	*Pseudopyrenula subvelata*	Trypetheliaceae	*Ficus* sp.
67	*Pyrenula maravalensis*	Pyrenulaceae	*Syzygium formosum*
68	*P. minor*	Pyrenulaceae	*Holarrhena* sp.
69	*P. punctella*	Pyrenulaceae	*Elaeocarpus* sp., *Magnolia champaca*, *Wrightia arborea*
70	*Pyxine cylindrica*	Caliciaceae	*Morus alba*
71	*P. endochrysina*	Caliciaceae	*Tetrameles nudiflora*
72	*Rhabdodiscus asiaticus*	Diploschistaceae	*Elaeocarpus* sp., *Ficus* sp., *Neolamarckia cadamba*, *Semecarpus anacardium*
73	*R. epitrypus*	Diploschistaceae	*Elaeocarpus* sp., *Semecarpus anacardium*
74	*R. indicus*	Diploschistaceae	*Aglaia spectabilis*
75	*R. marivelensis*	Diploschistaceae	*Ilex odorata*

76	*Thelotrema canarense*	Thelotremataceae	*Tetrameles nudiflora*
77	*T. lepadinum*	Thelotremataceae	*Ilex odorata*
78	*T. porinoides*	Thelotremataceae	*Liana* sp.

4.5.4 New distributional taxa to BTR

Out of 217 taxa, 172 species are reported for the first time from the BTR region identified in UFR on the present study (Table 4.5).

Table 4.5. New distributional records of lichen taxa to the BTR region discovered in UFR

Sl No.	Taxa	Families
1	*Agonimia bryophilopsis*	Verrucariaceae
2	*Allographa myolensis*	Graphidaceae
3	*Anthracothecium prasinum*	Pyrenulaceae
4	*Anzia ornatoides*	Parmeliaceae
5	*Aptrootia elatior*	Trypetheliaceae
6	*Arthothelium abnorme*	Arthoniaceae
7	*Arthopyrenia claviformis*	Arthopyreniaceae
8	*Astrothelium cinereorosellum*	Trypetheliaceae
9	*A. rubrocrystallinum*	Trypetheliaceae

10	*Bacidia alutacea*	Ramalinaceae
11	*B. incongruens*	Ramalinaceae
12	*Bactrospora arthonioides*	Incertae sedis under Arthoniales
13	*B. metabola*	Incertae sedis under Arthoniales
14	*Bathelium carolinianum*	Trypetheliaceae
15	*Buellia curtisii*	Caliciaceae
16	*B. morehensis*	Caliciaceae
17	*B. tincta*	Caliciaceae
18	*Chapsa discoides*	Thelotremataceae
19	*C. patens*	Thelotremataceae
20	*Chiodecton leptosporum*	Roccellaceae
21	*Clathroporina anoptella*	Trichotheliaceae
22	*Chrysothrix chlorina*	Chrysotrichaceae
23	*Cladonia subradiata*	Cladoniaceae
24	*Coccocarpia erythroxyli*	Coccocarpiaceae

25	*C. palmicola*	Coccocarpiaceae
26	*C. pellita*	Coccocarpiaceae
27	*Coenogonium degeneri*	Coenogoniaceae
28	*Crocynia gossypina*	Ramalinaceae
29	*C. pyxinoides*	Ramalinaceae
30	*Dichosporidium boschianum*	Roccellaceae
31	*Crypthonia albida*	Arthoniaceae
32	*Diorygma roseopruinatum*	Graphidaceae
33	*Dirinaria confluens*	Caliciaceae
34	*Eugeniella ortizii*	Pilocarpaceae
35	*Fissurina rugosa*	Fissurinaceae
36	*F. simplex*	Fissurinaceae
37	*F. subnitidula*	Fissurinaceae
38	*Graphis ajarekarii*	Graphidaceae
39	*G. argentea*	Graphidaceae
40	*G. assimilis*	Graphidaceae

41	*G. copelandii*	Graphidaceae
42	*G. emersa*	Graphidaceae
43	*G. japonica*	Graphidaceae
44	*G. longispora*	Graphidaceae
45	*G. nanodes*	Graphidaceae
46	*G. subintermedians*	Graphidaceae
47	*G. tenella*	Graphidaceae
48	*Haematomma africanum*	Graphidaceae
49	*Hemithecium amboliense*	Graphidaceae
50	*H. aphaneomicrosporum*	Graphidaceae
51	*H. aphane*s	Graphidaceae
52	*H. balaghatense*	Graphidaceae
53	*H. fulvescens*	Graphidaceae
54	*H. isidiatum*	Graphidaceae
55	*H. nagalandicum*	Graphidaceae
56	*H. nakanishianum*	Graphidaceae

57	*H. norsticticum*	Graphidaceae
58	*H. pulchellum*	Graphidaceae
59	*H. salacinilabiatum*	Graphidaceae
60	*H. scariosum*	Graphidaceae
61	*H. verrucosum*	Graphidaceae
62	*Herpothallon albidum*	Arthoniaceae
63	*H. granulare*	Arthoniaceae
64	*H. isidiatum*	Arthoniaceae
65	*Heterodermia albidiflava*	Physciaceae
66	*H. comosa*	Physciaceae
67	*H. dissecta*	Physciaceae
68	*H. incana*	Physciaceae
69	*Lecanora achroa*	Lecanoraceae
70	*L. sambuci*	Lecanoraceae
71	*Leiorreuma exaltatum*	Graphidaceae
72	*Leprocaulon adhaerens*	Leprocaulaceae

73	*L. arbuscula*	Leprocaulaceae
74	*Leptogium brebissonii*	Collemataceae
75	*L. denticulatum*	Collemataceae
76	*L. ulvaceum*	Collemataceae
77	*Letrouitia vulpina*	Brigantiaeaceae
78	*Leucodecton occultum*	Thelotremataceae
79	*Lithothelium obtectum*	Pyrenulaceae
80	*Lopadium coorgianum*	Lopadiaceae
81	*L. vulpinum*	Lopadiaceae
82	*Malmidea atlantica*	Malmideaceae
83	*M. aurigera*	Malmideaceae
84	*M. bacidinoides*	Malmideaceae
85	*M. bakeri*	Malmideaceae
86	*M. cinereonigrella*	Malmideaceae
87	*M. coralliformis*	Malmideaceae
88	*M. duplomarginata*	Malmideaceae

89	*M. fuscella*	Malmideaceae
90	*M. granifera*	Malmideaceae
91	*M. gyalectoides*	Malmideaceae
92	*M. hypomelaena*	Malmideaceae
93	*M. leptoloma*	Malmideaceae
94	*M. nigromarginata*	Malmideaceae
95	*M. papillosa*	Malmideaceae
96	*M. perplexa*	Malmideaceae
97	*M. psychotrioides*	Malmideaceae
98	*M. subaurigera*	Malmideaceae
99	*M. subgranifera*	Malmideaceae
100	*M. tratiana*	Malmideaceae
101	*M. variabilis*	Malmideaceae
102	*Marcelaria benguelensis*	Trypetheliaceae
103	*Myelochroa aurulenta*	Parmeliaceae
104	*Myriostigma candidum*	Arthoniaceae

105	*Myriotrema classicum*	Diploschistaceae
106	*M. olivaceum*	Diploschistaceae
107	*Nadvornikia hawaiensis*	Diploschistaceae
108	*Ocellularia andamanica*	Diploschistaceae
109	*O. calvescens*	Diploschistaceae
110	*O. conformis*	Diploschistaceae
111	*O. diacida*	Diploschistaceae
112	*O. garoana*	Diploschistaceae
113	*O. neopertusariiformis*	Diploschistaceae
114	*O. subgranulosa*	Diploschistaceae
115	*O. terebrata*	Diploschistaceae
116	*O. thelotremoides*	Diploschistaceae
117	*O. upretii*	Diploschistaceae
118	*O. violacea*	Diploschistaceae
119	*O. wandoorensis*	Diploschistaceae
120	*Parmeliella cinerata*	Pannariaceae

121	*Parmotrema pseudotinctorum*	Parmeliaceae
122	*P. reticulatum*	Parmeliaceae
123	*Phaeographis dendritica*	Graphidaceae
124	*P. endophaeiza*	Graphidaceae
125	*P. firmula*	Graphidaceae
126	*Phaeophyscia endococcina*	Physciaceae
127	*Phyllopsora corallina*	Ramalinaceae
128	*P. manipurensis*	Ramalinaceae
129	*Physcia stellaris*	Physciaceae
130	*Porina ahlesiana*	Trichotheliaceae
131	*P. atroperiostiola*	Trichotheliaceae
132	*P. eminentior*	Trichotheliaceae
133	*P. luteopallens*	Trichotheliaceae
134	*P. mastoidella*	Trichotheliaceae
135	*P. nuculastrum*	Trichotheliaceae
136	*P. platystoma*	Trichotheliaceae

137	*P. subcutanea*	Trichotheliaceae
138	*Pseudopyrenula subvelata*	Trypetheliaceae
139	*Pyrenula albothallina*	Pyrenulaceae
140	*P. approximans*	Pyrenulaceae
141	*P. aspistea*	Pyrenulaceae
142	*P. leucotrypa*	Pyrenulaceae
143	*P. mamillana*	Pyrenulaceae
144	*P. maravalensis*	Pyrenulaceae
145	*P. microtheca*	Pyrenulaceae
146	*P. minor*	Pyrenulaceae
147	*P. oculata*	Pyrenulaceae
148	*P. punctella*	Pyrenulaceae
149	*P. scutata*	Pyrenulaceae
150	*Pyxine coralligera*	Caliciaceae
151	*P. cylindrica*	Caliciaceae
152	*P. endochrysina*	Caliciaceae

153	*P. meissnerina*	Caliciaceae
154	*P. retirugella*	Caliciaceae
155	*Rhabdodiscus asiaticus*	Diploschistaceae
156	*R. epitrypus*	Diploschistaceae
157	*R. fissus*	Diploschistaceae
158	*R. indicus*	Diploschistaceae
159	*R. marivelensis*	Diploschistaceae
160	*R. subcavatus*	Diploschistaceae
161	*Sarcographina glyphiza*	Graphidaceae
162	*S. subtorquescens*	Graphidaceae
163	*Schistophoron tenue*	Graphidaceae
164	*Sclerophyton desertorum*	Opegraphaceae
165	*Thelotrema canarense*	Thelotremataceae
166	*T. lepadinum*	Thelotremataceae
167	*T. porinoides*	Thelotremataceae
168	*Trypethelium eluteriae*	Trypetheliaceae

	169	*T. xanthoplatystomum*	Trypetheliaceae
	170	*Zwackhia bonplandii*	Lecanographaceae
	171	*Z. prosodea*	Lecanographaceae
	172	*Z. viridis*	Lecanographaceae

4.5.5 Endemic taxa

A total of 27 species were found to be restricted in their distribution (Table 4.6).

Table 4.6. Endemic species to India with substratum and their distribution discovered in UFR

Sl No.	Taxa	Substratum	Distribution	Reference
1	*Arthopyrenia claviformis*	*Ficus* sp.	Arunachal Pradesh, Kerala, Tamil Nadu	Singh and Sinha (2010)
2	*Bacidia incongruens*	*Elaeocarpus* sp.	Karnataka, Tamil Nadu, West Bengal	Singh and Sinha (2010)
3	*Buellia morehensis*	*Areca catechu*	Assam, Manipur	Singh and Sinha (2010)

4	*Fissurina simplex*	*Dillenia indica*	Karnataka, Kerala	Present study
5	*Glyphis duriuscula*	*Areca catechu*, *Aglaia spectabilis*	Assam, Nagaland, West Bengal	Singh and Sinha (2010)
6	*Graphis ajarekarii*	*Ficus* sp.	Assam, Karnataka, Kerala, Maharashtra, Tamil Nadu	Singh and Sinha (2010)
7	*G. argentea*	*Ficus* sp.	Andaman & Nicobar Islands, Assam	Singh and Sinha (2010)
8	*G. longispora*	*Magnolia champaca*	Meghalaya, Nagaland	Singh and Sinha (2010)
9	*Hemithecium amboliense*	*Aglaia spectabilis*, *Elaeocarpus* sp., *Ilex odorata*, *Magnolia champaca*, *M. hodgsonii*, *Mesua ferrea*, *Tetrameles nudiflora*, *Wrightia arborea*	Maharashtra	Singh and Sinha (2010)

10	*H. balaghatense*	*Magnolia hodgsonii*, *Stereospermum chelonoides*, *Syzygium formosum*	Madhya Pradesh	Singh and Sinha (2010)
11	*H. fulvescens*	*Mallotus nudiflorus*, *Stereospermum chelonoides*, *Tetrameles nudiflora*	Karnataka	Singh and Sinha (2010)
12	*H. isidiatum*	*Semecarpus anacardium*, *Syzygium formosum*	Arunachal Pradesh	Singh and Sinha (2010)
13	*H. nagalandicum*	*Dillenia indica*, *Magnolia hodgsonii*	Assam, Nagaland	Singh and Sinha (2010)
14	*H. norstictum*	*Mallotus nudiflorus*	Maharashtra	Singh and Sinha (2010)
15	*H. pulchellum*	*Magnolia hodgsonii*	Andaman & Nicobar Islands	Singh and Sinha (2010)
16	*H. salacinilabiatum*	*Ficus* sp., *Syzygium formosum*	Kerala, Karnataka, Maharashtra	Singh and Sinha (2010)

17	*H. scariosum*	*Semecarpus anacardium*	Andaman & Nicobar Islands, Assam	Singh and Sinha (2010)
18	*H. verrucosum*	*Aglaia spectabilis*, *Ilex odorata*, *Magnolia hodgsonii*	Karnataka	Present study
19	*Heterodermia albidiflava*	*Magnolia champaca*	Assam, Himachal Pradesh, Madhya Pradesh, Sikkim, West Bengal	Singh and Sinha (2010)
20	*Lopadium coorgianum*	*Ficus* sp., *Gmelina arborea*	Karnataka	Singh and Sinha (2010)
21	*Ocellularia upretii*	*Ilex odorata*, *Neolamarckia cadamba*, *Syzygium formosum*, *Vatica lanceaefolia*	Assam, Karnataka	Present study
22	*O. wandoorensis*	*Terminalia* sp.	Andaman & Nicobar Islands	Present study
23	*Phaeographis firmula*	*Elaeocarpus* sp., *Trema orientale*	Assam	Present study

24	*Phyllopsora manipurensis*	*Magnolia champaca*	Goa, Karnataka, Maharashtra, Madhya Pradesh, Manipur, Meghalaya, Odisha, Sikkim, Uttarakhand	Singh and Sinha (2010)
25	*Porina atroperiostiola*	*Elaeocarpus* sp.	Arunachal Pradesh, Karnataka, Maharashtra, Tamil Nadu	Singh and Sinha (2010)
26	*P. subhibernica*	*Elaeocarpus* sp., *Magnolia champaca*	Arunachal Pradesh, Assam, Goa, Karnataka, Kerala, Madhya Pradesh, Sikkim, Tamil Nadu	Singh and Sinha (2010)
27	*Rhabdodiscus indicus*	*Aglaia spectabilis*	Arunachal Pradesh	Present study

4.6 Ecological parameters

4.6.1 Frequency

The frequency of the lichen species ranges from 33.33–100%. Of all the species encountered, the 10 species viz. *Dirinaria aegialita*, *D. applanata*, *Heterodermia diademata*, *Malmidea fuscella*, *M. gyalectoides*, *Parmotrema praesorediosum*, *P.*

tsavoense, *Porina interestes*, *P. subcutanea*, *Pyxine cocoes* had 100% of frequency showing their wide range of distribution (Table 4.2).

4.6.2 Relative abundance

A range of 0.0019–0.0324 was observed in the relative abundance of lichen species. The lichen species, *Anzia ornatoides* showed highest relative abundance. Other abundant species were *Anthracothecium macrosporum*, *Coccocarpia pellita*, *Dirinaria applanata*, *Graphis japonica*, *Hemithecium amboliense*, *Malmidea fuscella*, *Ocellularia diacida*, *O. neopertusariiformis*, *Porina interestes* (Table 4.2).

4.7 Discussion

4.7.1 Analysis

Several lichen species from the new records (Table 4.3) such as *Agonimia bryophilopsis*, *Allographa myolensis*, *Aptrootia elatior*, *Astrothelium rubrocrystallinum*, *Coenogonium degeneri*, *Graphis emersa*, *G. subintermedians*, *Malmidea cinereonigrella*, *M. coralliformis*, *Myriotrema classicum*, *Ocellularia calvescens*, *Parmeliella cinerata*, *Pyrenula approximans*, *P. microtheca*, *Porina ahlesiana*, *Rhabdodiscus subcavatus*, *Sclerophyton desertorum*, *Trypethelium xanthoplatystomum* have been reported to be host specific from the region. Remaining species are found in more than a tree species.

The endemic species viz. *Arthopyrenia claviformis*, *Bacidia incongruens*, *Buellia morehensis*, *Fissurina simplex*, *Graphis ajarekarii*, *G. argentea*, *G. longispora*, *Hemithecium norsticticum*, *H. pulchellum*, *H. scariosum*, *Heterodermia albidiflava*, *Ocellularia wandoorensis*, *Phyllopsora manipurensis*, *Porina atroperiostiola*, and *Rhabdodiscus indicus* have been reported to be host specific in UFR. Among the state, Karnataka shows the highest number of endemic taxa (11) followed by Assam with 10 species (Table 4.6 & Fig. 4.5).

The greatest number of lichen growth is supported by the plant species *Elaeocarpus* sp. and *Tetrameles nudiflora* that supports 44 species individually. *Ficus* sp., which supports 39 taxa, is followed by *Semecarpus anacardium*, which supports 32 taxa, *Magnolia*

champaca, which supports 31 taxa, *Ilex odorata*, and *Magnolia hodgsonii*, which supports 30 taxa separately.

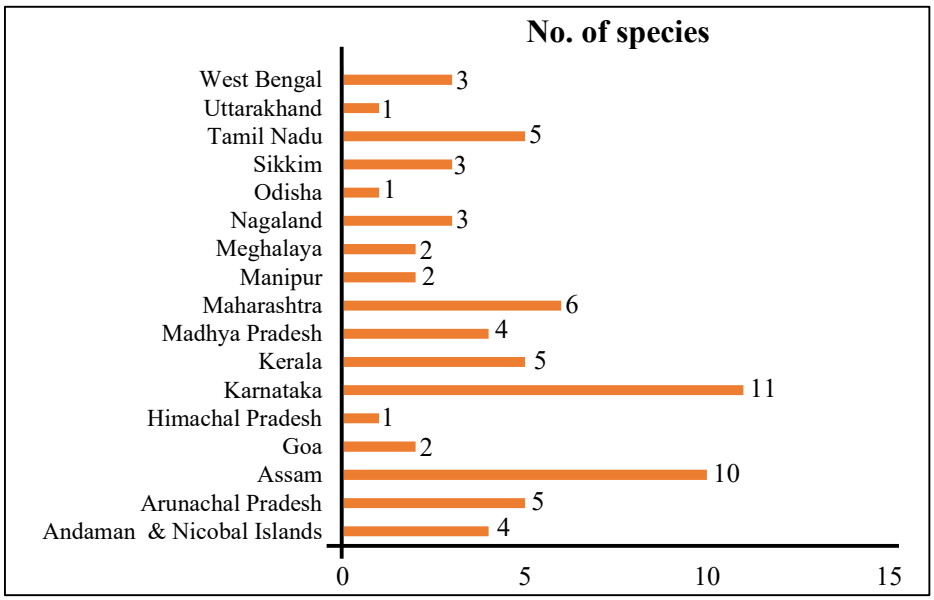

Fig. 4.5. Number of endemic species found in different states of India

4.7.2 Comparison of lichen families of UFR with lichens of Assam

The lichen families of UFR are compared with the Assam's lichen biota (Table 4.7).

Table 4.7. Comparison of lichen families of UFR with lichen biota of Assam

Sl No.	Families	Ultapani Forest Range		Lichen biota of Assam (Gogoi *et al.*, 2022)	
		Genera	Species	Genera	Species
1	Arthoniaceae	9	52	6	8
2	Arthopyreniaceae	1	4	1	1
3	Brigantiaeaceae	2	5	1	2

4	Caliciaceae	8	29	3	13
5	Cladoniaceae	3	8	1	1
6	Chrysothricaceae	1	2	1	2
7	Coccocarpiaceae	1	3	1	4
8	Coenogoniaceae	1	4	1	1
9	Collemataceae	2	7	1	3
10	Diploschistaceae	9	22	4	22
11	Fissurinaceae	2	15	1	3
12	Graphidaceae	14	152	10	45
13	Haematommataceae	1	2	1	1
14	Incertae sedis under Arthoniales	1	2	1	2
15	Lecanoraceae	2	19	1	3
16	Lecanographaceae	3	7	1	3
17	Lopadiaceae	0	0	1	2
18	Malmideaceae	1	6	1	21

19	Opegraphaceae	1	7	1	1
20	Pannariaceae	0	0	1	1
21	Parmeliaceae	9	24	4	9
22	Pilocarpaceae	3	5	1	1
23	Physciaceae	6	14	3	8
24	Pyrenulaceae	3	81	3	19
25	Ramalinaceae	6	25	3	7
26	Roccellaceae	8	13	2	2
27	Teloschistaceae	3	5	1	1
28	Thelotremataceae	3	13	3	6
29	Trichotheliaceae	2	15	2	13
30	Trypetheliaceae	7	25	5	8
31	Verrucariaceae	0	0	1	1

4.7.3 Lichen species used by ethnic groups

Various ethnic groups in India have historically utilised certain lichen species for medicinal purposes, while others are exploited for commercial purposes (Upreti *et al*.,

2005; Rout *et al*., 2010). List of the lichen species provides the used for various purpose by different ethnic groups of India, were discovered in UFR (Table 4.8 & 4.9).

Table 4.8. List of lichen species used by ethnic groups and their usages discovered in UFR

Sl No.	Taxa	Ethnic group	Uses
1	*Heterodermia diademata*	Nepalese of Sikkim	Applied to wounds to prevent wetting and infection
2	*Leptogium denticulatum*	Adi of Arunachal Pradesh	As vegetables and like soup made by boiling
3	*Parmotrema tinctorum*	Bhaiga, Bhil, Bhilala, Gond, Korka, Muria of Madhya Pradesh	As a flavouring and spice for meat and vegetables

Table 4.9. Commercial lichen species used as spice in different states of India found in UFR

Sl No.	Taxa	States
1	*Heterodermia diademata*	Uttaranchal, Uttar Pradesh, Sikkim
2	*Myelochroa aurulenta*	Uttaranchal, Uttar Pradesh
3	*Parmotrema praesorediosum*	Karnataka, Tamil Nadu
4	*Parmotrema tinctorum*	Uttaranchal, Uttar Pradesh, Maharashtra, Karnataka, Tamil Nadu, Madhya Pradesh, Andaman Islands

4.7.4 Affinities with other countries

The analysis of lichen biota of Ultapani Forest Range reveals affinities with the **Indo-Japan** represented by *Anthracothecium macrosporum*, *A. prasinum*, *Bulbothrix isidiza*, *Chapsa patens*, *Chiodecton leptosporum*, *Chrysothrix candelaris*, *Coccocarpia erythroxyli*, *C. Palmicola*, *C. pellita*, *Coniocarpon cinnabarinum*, *Crocynia gossypina*, *Dichosporidium boschianum*, *Diorygma soozanum*, *Dirinaria aegialita*, *D. applanata*, *D. consimilis*, *Glyphis cicatricosa*, *Graphis assimilis*, *G. handelii*, *G. japonica*, *G. tenella*, *Haematomma africanum*, *Heterodermia diademata*, *H. dissecta*, *Lecanora achroa*, *L. tropica*, *Leptogium denticulatum*, *Malmidea granifera*, *Myelochroa aurulenta*, *Ocellularia andamanica*, *Parmotrema praesorediosum*, *P. reticulatum*, *P. tinctorum*, *Phaeographis dendritica*, *Phyllopsora corallina*, *Physcia stellaris*, *Porina eminentior*, *P. internigrans*, *P. mastoidea*, *Pyrenula aspistea*, *P. punctella*, *P. quassiaecola*, *P. subelliptica*, *Pyxine cocoes*, *P. endochrysina*, *P. meissnerina*, *Rhabdodiscus fissus*, *Sarcographa tricosa*, *Thelotrema lepadinum*, *T. porinoides*, and *Trypethelium eluteriae*.

Few species showed similarities with the **Indo-Bhutan** and is represented by *Chrysothrix candelaris*, *Coccocarpia erythroxyli*, *C. Palmicola*, *C. pellita*, *Haematomma africanum*, *Heterodermia comosa*, *H. diademata*, *H. dissecta*, *H. speciosa*, *Leprocaulon arbuscula*, *Leptogium denticulatum*, *Myelochroa aurulenta*, *Parmotrema praesorediosum*, and *P. tinctorum*.

Four species showed affinities to **Indo-China** are *Heterodermia speciosa*, *Leptogium brebissonii*, *Phaeophyscia endococcina*, and *Physcia stellaris*.

Likewise, some species are similar to **Indo-Myanmar** regions are *Coccocarpia erythroxyli*, *C. Palmicola*, *Dirinaria aegialita*, *D. consimilis*, *Glyphis cicatricosa*, *Malmidea bakeri*, *P. mamillana*, *Sarcographa labyrinthica*, *Trypethelium eluteriae*, and *Zwackhia prosodea*.

4.7.5 Present status and future threats of UFR

The study area, Ultapani Forest Range is being seriously affected by various anthropogenic activities. Significant alterations in forest ecosystem are mostly brought about by human activities. These activities are being witnessed since 2009 and is definitely at their peak right now. Some of the major factors causing treats to the forest ecosystem are deforestration, illegal tree felling, fishing, poaching, grazing, and encroachment.

Deforestration is one of the major problems in the study area. It is done by the forest encroachers for settlement as well as agricultural purposes (Plate 5). There is steep rise in encroachment due to migration and increase in population as seen from the past 10 years. Mostly the forests on its northern side as well as the road side have been cleared. They burn down the wood dominated areas to clear it swiftly (Plate 6). The encroached area, number of encroached villages, forest cover reduction and number of increasing populations of UFR are given in table 4.10.

Table 4.10. Encroached area, number of encroached villages, forest cover reduction and number of increasing populations of UFR (Source: Haltugaon Forest Division, Kokrajhar)

UFR (225 sq. kms.)	**Newly encroached area**	**Number of encroached villages**	**Forest cover reduction**	**Increasing population**	
				2016	**2023**
	3831.43 Ha	86	17%	3900	11377

Among the tree species, *Shorea robusta* are the ones to be highly chopped down resulting in drastic decline in its population. Certain other significant trees include *Aglaia spectabilis*, *Magnolia champaca*, *Lagerstroemia parviflora*, and *Phoebe bottanica* which are cut down by the inhabitants of this area to meet their daily necessities.

At the periphery of the forest range, grazing of cattles were regularly observed. Deforestration has further enhance their accessibility to the deep forest. Illegal hunting or capturing of wild animals were also commonly carried out. However, due to the initiatives taken up by the local NGOs in collaboration with the forest department such activities have been minimized.

Due to the excessive deforestration and encroachment, the elephants living in the forests are forced to come out of it to the mainland frequently, behaving more aggressively, harming the people, damaging crops, and houses of forest villagers and encroachers.

Illegal fishing by applying electric shock as well as chemical poisoning can be seen during the survey within the forest. This activity has negative impact on the aquatic flora and fauna leading to their decrease in population as well as diversity. Besides these, use of chemical herbicides and chemical fertilizers by the forest encroachers for cultivation has led to loss of several herbaceous plants.

If such activities are not regulated, it would not take much time for the entire forest to culminate. This will ultimately lead to ecological imbalance. Lichens, being one of the important components of the forest ecosystem is also negatively impacted as loss of habitat is one of the major threats to lichen diversity. Lichens play a major role in maintaining the ecological balance of a forest area. It is very sensitive to atmospheric pollution and provides informations on the quality of the environment. Additionally, it plays a major role in the nitrogen cycle by fixing atmospheric nitrogen, assisting in the creation of soil, and enhancing the quality of soil that is necessary for plant growth. As its growth rate is very slow (few mm in a year), it is very difficult to recover lichen, once it disappears from the environment. Although the villagers and encroachers are now more aware of the importance of biodiversity and their conservation through various awareness programs conducted by the NGOs, however the greater community are not at all aware about the significance of the lichens.

Foliose lichen such as *Parmotrema tinctorum*, *P. tsavoense*, *Pyxine cocoes* and *Heterodermia diademata* which are commonly used as model species in pollution monitoring are found in abundance in the forest range. But in the present conditions of forest area after 3 to 4 years, these species are likely to disappear from the region. Special mention to be made is that, three species of fruticose lichen are found in the study area which otherwise are known to inhabit regions of higher elevations with cleaner environment. So, existence of this group of lichen speaks a lot about the health of the forest. Lichen taxa under Diploschistaceae, Graphidaceae and Malmideaceae prefers to grow luxuriantly on smooth bark trees in the semi-evergreen and deciduous forests.

4.7.6 Conservation strategies

UFR is represented by rich diversity of flora and fauna. The region is renowned for having a wide variety of orchids. Swarm of butterflies and golden langur were commonly seen

by the road side of the forest during the survey. The present study reveals that the forest range is also rich in lichen diversity. Lichen, like other plants, is also facing various threats from both natural and anthropogenic activities. Lack of appropriate substratum is the primary cause for decrease in lichen diversity. Therefore, its conservation is crucial as it is essential for maintaining the ecological balance, biodiversity, enabling future research and development. Lichens are usually ignored when conservation strategies are designed for any forest reserve. Therefore, an ecosystem approach of biodiversity conservation leads to unproductive results if this inconspicuous and vital organism is not taken into consideration.

The goal of conservation biology is to preserve self-sustaining populations of uncommon and threatened species. This task can be accomplished by the combination of strategies targeting focal species and habitat conservation. It is utmost important to preserve well this biodiversity rich area for the sustenance of next generation and maintainance of relationships.

The government should take initiatives to educate the local people and encroachers about the importance of forest and its conservation. More awareness programmes involving the local people or forest dwellers need to be organize to disseminate the significance of forest cover and the necessity to conserve forest wealth. Sufficient forest staff should be provided and implementation of the forest protection acts should be strictly followed.

Plate 5

A – Remains of the tree felling within forest, B - Human settlement after deforestration

Plate 6

A - Clearance of the forest, B - Remains of the burn down trees