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Cover: Dorsal view of Mantis Shrimp *Cloridina ichneumon* (Fabricius, 1798) & *Gonodactylus demanii* (Henderson, 1893). © Fisheries Research Station, Junagadh Agricultural University, Sikka.



## New additions to the lichen biota of Assam from Dhubri district, northeastern India

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**Abstract:** The present study deals with the exploration of lichen diversity in Dhubri district of Assam state. A total of 42 lichen species belonging to 10 families and 16 genera were recorded, the majority of which were crustose (93%) with Graphidaceae as the dominant family. Eleven of the lichen species under eight genera are new additions to the lichen biota of Assam.

**Keywords:** Biodiversity, Brahmaputra River, Corticolous, crustose, Graphidaceae, Indo-Bangladesh border.

সংক্ষিপ্তসার: এই গৱেষণা পত্ৰখনত ভাৰতবৰ্ষৰ অসম ৰাজ্যৰ ধুবুৰী জিলাৰ পৰা ৪২ টা লাইকেন প্ৰজাতিৰ উল্লেখ কৰা হৈছে। ইয়াৰে ১১ টা লাইকেন প্ৰজাতি ৮ টা গণ আৰু ৭ টা গোত্ৰৰ অন্তৰ্গত, অসমত প্ৰথমবাৰৰ বাবে পোৱা গৈছে।

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## INTRODUCTION

Lichens are highly cosmopolitan in nature. Lichenogeographically, India is divided into eight regions (Nayaka & Asthana 2014). Among these, the Western Ghats, the eastern Himalaya and northeastern India are regarded as biodiversity hotspots both for higher plants and lower cryptogams. The physical structures as well as the climatic conditions of the region support the luxuriant growth of lichens. From the state of Assam, there is a report on lichen which covers 20 out of 34 districts (Behera et al. 2021; Gupta & Sinha 2018). However, extensive exploration of most of the districts for lichen diversity study is indispensable. Literature on lichenology from Dhubri district is very limited. Recently Gupta & Sinha (2018) reported six lichen species—*Graphis subasahinae* Nagarkar & Patw., *Lecanora alba* Lumbsch, *Lecanora helva* Stizenb., *Parmotrema saccatilibum* (Taylor) Hale, *Protoparmelia hesperia* (Kantvilas & Elix) Kantvilas, Papong & Lumbsch, and *Letrouitia flavocrocea* (Nyl.) Hafellner & Bellem—from various parts of the district. Therefore, the present study was undertaken to explore and enumerate the lichen diversity of Dhubri district. The district is situated in the extreme western part of Assam in the Indo-Bangladesh border and on the northern bank of the river Brahmaputra.

## MATERIALS & METHODS

For the present study, about 700 lichen specimens were collected from January to December 2020 from 13 different localities of Dhubri district of Assam (Figure 1). All the specimens were collected from the bark of trees, air-dried and stored in paper packets. The lichen specimens were identified morphologically, anatomically and chemically. The morphological characters were studied under stereozoom microscope Leica EZ4W. For anatomical details, thin sections of the apothecia or perithecia were mounted in water and observed under the compound microscope Leica DM 750. The presence of chemical substances was analysed by performing colour tests using K, P, and C solutions and thin layer chromatography (Orange et al. 2001). The lichen thallus was also observed under the UV cabinet. The specimens were identified following relevant literature (Nayaka 2004; Awasthi 2007; Lücking et al. 2009; Ram et al. 2009; Aptroot 2012; Sharma et al. 2012). The families of the identified species were assigned as per the literature of Lücking et al. (2016). Specimens were identified up to the species following relevant literature and updated as per the databases available for lichen taxonomy.

The identified specimens are housed in the Bodoland University Botanical Herbarium (BUBH), Department of Botany, Bodoland University. A set of voucher specimens is deposited in the herbarium of CSIR-National Botanical Research Institute, Lucknow (LWG), Uttar Pradesh, India.

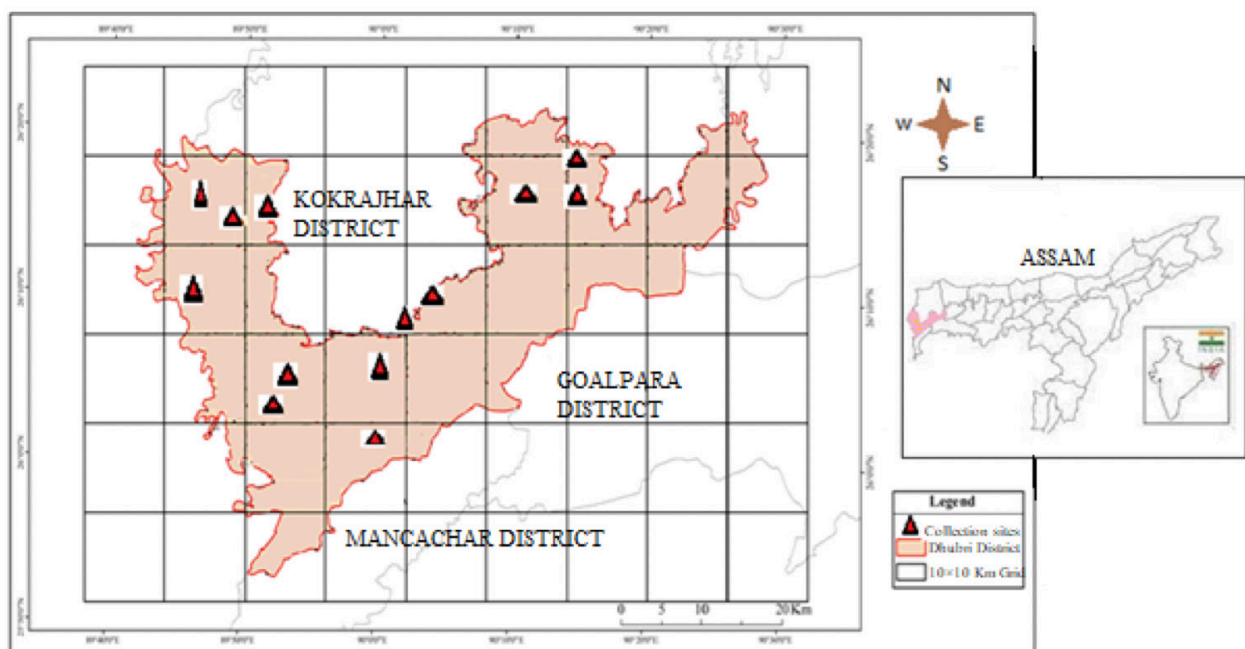


Figure 1. Map of Dhubri district, Assam showing the collection sites.

## RESULTS

The present study identified 42 lichen species under 10 families and 16 genera (Table 1). The majority of the lichen species are crustose (93%) followed by 7% foliose. Among the lichen families Graphidaceae emerged as the dominant family with 15 species, followed by Caliciaceae with nine species.

## DISCUSSION

Based on Joseph et al. (2020), the annotated checklist by Singh & Sinha (2010) and literature available on lichens for Assam state (Awasthi 1961; Rout et al. 2005, 2010, 2012; Das et al. 2013; Gupta et al. 2013; Daimari et al. 2014; Gogoi et al. 2019; Gupta & Sinha 2018; Behera et al. 2021), 11 species under eight genera and seven families are listed as new records to Assam and brief descriptions of these species are provided.

A comparative study of the six lichen species reported by Gupta & Sinha (2018) from Dhubri district with the present study reveals that only two of the species are found to be common and therefore, till date the district records a total of 46 species. However, the list may further go up with the exploration of more locations for the lichen study.

### ENUMERATION OF THE NEWLY RECORDED LICHEN SPECIES

#### Family: Arthoniaceae

***Herpothallon himalayanum*** Jagadeesh Ram & G.P. Sinha (Image 1D)

Distribution: India (West Bengal, Darjeeling district), Endemic.

Specimen examined: 2020-0169 (BUBH), India, Assam, Dhubri district, Khajurbari part 1, on the bark of *Lannea coromandelica*, 24.xii.2020, 39 m, 26.262 N, 90.179 E, coll. S. Biswas & P. Biswas.

#### Family: Caliceaceae

***Pyxine isidiophora*** (Müll. Arg.) Imshaug (Image 2H)

Distribution: India (West Bengal), Sri Lanka, Columbia.

Specimen examined: 2020-0170 (BUBH), India, Assam, Dhubri district, Debotar hasdaha part 4, on the bark of *Lannea coromandelica*, 22.xi.2020, 27.73 m, 26.050 N, 89.893 E, coll. S. Biswas & P. Biswas.

#### Family: Graphidaceae

***Allographa stictilabiata*** (Patw. & C.R. Kulk.) J. Kalb & Kalb (Image 1C)

Distribution: India (Karnataka and Maharashtra), Endemic

Specimen examined: 2020-0171 (BUBH), India, Assam, Dhubri district, Alokjhari, on the bark of *Shorea robusta*, 12.i.2020, 52.82 m, 26.253 N, 89.860 E, coll. S. Biswas & P. Biswas.

***Graphis asahinae*** Patw. & C.R. Kulk. (Image 1A)

Distribution: India (Kerala and Tamil Nadu), Brazil.

Specimen examined: 2020-0172 (BUBH), India, Assam, Dhubri district, Gopigoan part 3, on the bark of *Lannea coromandelica*, 26.xii.2020, 44.14 m, 26.257 N, 90.232 E, coll. S. Biswas & P. Biswas.

***Graphis modesta*** Zahlbr. (Image 1B)

Distribution: India (Maharashtra), Brazil, Mexico, Papua New Guinea, Seychelles.

Specimen examined: 2020-0173 (BUBH), India, Assam, Dhubri district, Rangamati part 3, on the bark of *Artocarpus heterophyllus*, 27.xi.2020, 28.84 m, 26.161 N, 90.059 E, coll. S. Biswas & P. Biswas.

#### Family: Lecanoraceae

***Lecanora leproplaca*** Zahlbr. (Image 1E)

Distribution: India (Madhya Pradesh), Australia, Brazil, Central and South America, Dominica, El Salvador, Fiji, Hawaiian Islands, Jamaica, Seychelles, South Africa, Thailand.

Specimen examined: 2020-0174 (BUBH), India, Assam, Dhubri district, Gauripur Matiabag Hawakhana, on the bark of *Michelia champaca*, 8.ii.2020, 44.82 m, 26.097 N, 89.975 E, coll. S. Biswas & P. Biswas.

#### Family: Parmeliaceae

***Parmotrema mesotropum*** (Müll. Arg.) Hale. (Image 1F)

Distribution: India (Arunachal Pradesh, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Manipur, Uttarakhand), Argentina, Brazil, Bolivia, Central & South America, China, Colombia, Costa Rica, Guyana, Mexico, Paraguay, Venezuela.

Specimen examined: 2020-0175 (BUBH), India, Assam, Dhubri district, Alomganj part 9, on the bark of *Lannea* sp., 27.xii.2020, 43.48 m, 26.135 N, 90.036 E, coll. S. Biswas & P. Biswas.

#### Family: Physciaceae

***Physcia abuensis*** D.D. Awasthi & S.R. Singh (Image 2G)

Distribution: India (Rajasthan), Endemic

Specimen examined: 2020-0176 (BUBH), India, Assam, Dhubri district, Dhubri town, on the bark of *Litchi chinensis*, 10.i.2020, 41.43 m, 26.022 N, 89.959 E, coll. S.

**Table 1. Distribution of lichen species in the study site along with their growth form.**

	Species	GF	Locations													
			1	2	3	4	5	6	7	8	9	10	11	12	13	
<b>Arthoniaceae</b>																
1	<i>Coniocarpon cinnabarinum</i> DC.	C	-	-	-	+	-	-	+	-	-	-	-	-	-	-
2	<i>Cryptothecia lunulata</i> (Zahlbr.) Makhija & Patw.	C	-	-	-	-	-	-	-	-	-	+	-	-	-	+
3	* <i>Herpothallon himalaynum</i> Jagad. Ram & G.P. Sinha	C	-	-	-	-	-	-	-	-	-	-	-	+	-	-
<b>Caliciaceae</b>																
4	<i>Cratiria lauri-cassiae</i> (Fée) Marbach	C	-	-	-	-	-	-	-	-	-	-	-	-	+	-
5	<i>Dirinaria applanata</i> (Fée) D.D. Awasthi	F	-	+	+	+	-	-	-	-	-	-	-	+	-	-
6	<i>D. consimilis</i> (Stirt.) D.D. Awasthi	F	-	-	-	-	-	-	-	-	-	-	-	-	-	+
7	<i>D. papillulifera</i> (Nyl.) D.D. Awasthi	F	-	-	-	-	-	-	+	+	-	-	+	+	-	-
8	<i>D. picta</i> (Sw.) Clem. & Shear.	F	-	+	-	-	-	-	-	-	-	-	-	+	-	-
9	<i>Pyxine cocoes</i> (Sw.) Nyl.	F	-	+	+	+	-	+	+	-	-	-	-	+	+	-
10	<i>P. coralligera</i> Malme.	F	-	-	-	-	-	-	+	-	-	-	-	-	-	-
11	* <i>P. isidiophora</i> (Müll. Arg.) Imshaug	F	-	-	-	-	-	-	+	-	-	-	-	-	-	-
12	<i>P. reticulata</i> (Vain.) Vain.	F	-	-	+	-	-	-	-	-	-	-	-	-	-	-
<b>Graphidaceae</b>																
13	* <i>Allographa stictilabiata</i> (Patw. & C.R. Kulk.) J. Kalb & Kalb.	C	+	-	-	-	-	-	-	-	-	-	-	-	-	-
14	<i>Diorygma junghuhnii</i> (Mont. & Bosch) Kalb, Staiger & Elix	C	+	-	-	-	-	-	-	-	-	-	-	-	-	-
15	<i>D. soozanum</i> (Zahlbr.) M. Nakan. & Kashiw.	C	+	-	-	-	-	-	-	-	-	-	-	-	-	-
16	<i>Graphis analoga</i> Nyl.	C	-	-	-	-	-	-	+	-	-	-	-	-	-	-
17	<i>G. arecae</i> Vain.	C	-	-	-	-	-	-	-	-	+	-	-	-	-	-
18	* <i>G. asahinae</i> Patw. & C.R. Kulk.	C	-	-	-	-	-	-	-	-	-	+	-	-	-	-
19	<i>G. furcata</i> Fée	C	+	-	-	-	-	-	-	-	-	-	-	+	-	-
20	<i>G. glaucescens</i> Fée	C	+	-	-	-	-	-	-	-	-	-	-	-	-	-
21	* <i>G. modesta</i> Zahlbr.	C	-	-	-	-	-	-	-	-	-	-	-	-	+	-
22	<i>G. pyrrocheiloides</i> Zahlbr.	C	+	-	-	-	-	-	+	-	-	-	-	-	-	-
23	<i>G. sayeri</i> Müll. Arg.	C	-	-	-	-	-	-	-	-	-	+	-	-	-	-
24	<i>G. scripta</i> (L.) Ach.	C	-	-	-	-	-	-	-	-	-	-	-	-	+	-
25	<i>G. sulphurella</i> (Zahlbr.) Lücking	C	-	-	-	-	+	-	-	-	-	-	-	-	-	-
26	<i>G. sundarbanensis</i> Jagad. Ram & G.P. Sinha	C	-	-	-	-	-	-	+	-	+	-	-	-	-	-
27	<i>G. xanthospora</i> Müll. Arg.	C	+	-	-	-	+	-	-	-	-	-	-	-	-	-
<b>Lecanoraceae</b>																
28	<i>Lecanora helva</i> Stizenb.	C	-	+	+	-	-	+	-	-	-	+	-	+	-	-
29	* <i>L. leproplaca</i> Zahlbr.	C	-	-	-	-	-	-	-	+	-	-	-	-	-	-
<b>Parmeliaceae</b>																
30	* <i>Parmotrema mesotropum</i> (Müll. Arg.) Hale	F	-	+	-	-	-	-	-	-	-	-	-	-	-	-
31	<i>P. saccatilibum</i> (Taylor) Hale	F	-	-	-	-	-	-	-	-	-	+	-	-	-	-
<b>Physciaceae</b>																
32	* <i>Physcia abuensis</i> D.D. Awasthi & S.R. Singh	F	-	-	-	-	-	-	+	-	-	-	-	-	-	-
<b>Porinaceae</b>																
33	<i>Porina suhibernica</i> Upreti	C	+	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Pyrenulaceae</b>																
34	<i>Pyrenula aggregata</i> (Fée) Fée	C	-	-	+	-	-	-	-	-	-	-	-	-	-	-
35	<i>P. aspistea</i> (Afzel. Ex Ach.) Ach.	C	-	-	-	-	-	-	-	+	-	-	-	-	-	-
36	* <i>P. mastophora</i> (Nyl.) Müll. Arg.	C	-	-	-	+	-	-	-	-	-	-	-	-	-	-
37	* <i>P. minor</i> Fée	C	-	-	-	-	-	-	-	-	-	-	-	-	-	+
38	<i>P. thelomorpha</i> Tuck.	C	-	-	-	-	-	-	-	-	-	+	-	-	-	-
39	* <i>P. welwitschii</i> (Upreti & Ajay Singh) Aptroot	C	-	-	-	-	-	-	-	-	-	+	-	-	-	-
<b>Ramalinaceae</b>																
40	<i>Bacidia medialis</i> (Tuck.) Zahlbr.	C	-	-	+	-	-	-	-	-	-	-	-	-	-	-
41	<i>B. rubella</i> (Hoffm.) A. Massal.	C	-	-	-	-	-	-	-	-	-	-	+	-	-	-
<b>Trypetheliaceae</b>																
42	<i>Trypethelium eluteriae</i> Spreng.	C	-	-	-	-	-	-	-	-	-	-	+	-	-	-

GF—Growth form | C—Crustose | F—Foliose | 1—Alokhari | 2—Alomganj part 9 | 3—Barobalurchar | 4—Bhasani goan | 5—Bidyadabri part 5 | 6—Debotar hasdaha part 4 | 7—Dhubri town | 8—Gauripur Matiabag Hawakhana | 9—Gopigoan part 3 | 10—Kismat hasdaha part 2 | 11—Khajurbari part 1 | 12—Rangamati part 3 | 13—Satrasal. (\*) denotes new records to Assam, (+) present and (–) absent.

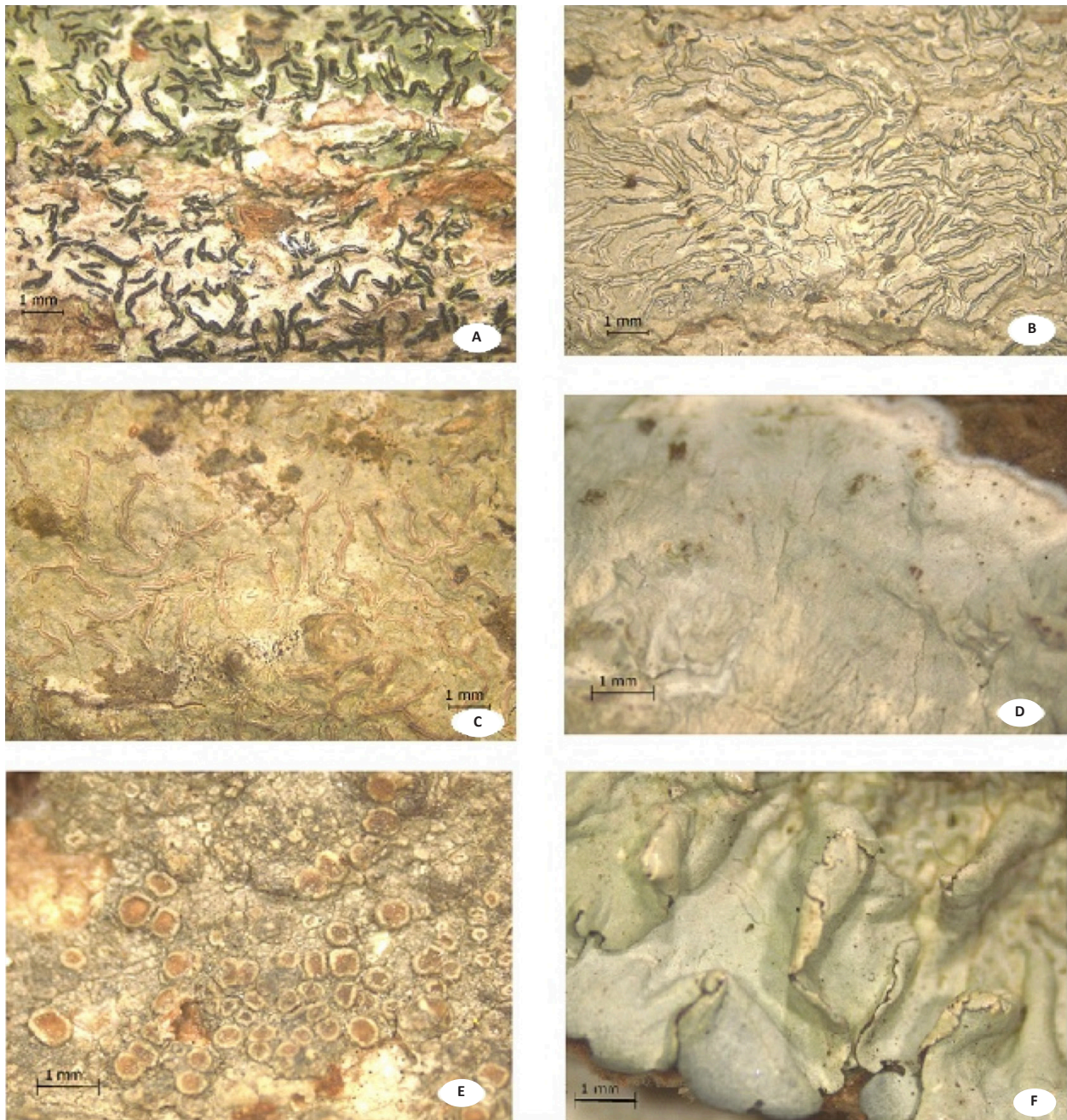


Image 1. Habits of lichen new records: A—*Graphis asahinae* Patw. & C.R. Kulk. | B—*Graphis modesta* Zahlbr. | C—*Allographa stictilabiata* (Patw. & C.R. Kulk.) J. Kalb & Kalb | D—*Herpothallon himalayana* Jagad. Ram & G.P. Sinha | E—*Lecanora leproplaca* Zahlbr. | F—*Parmotrema mesotropum* (Müll. Arg.) Hale | (Scale bar = 1mm).

Biswas & P. Biswas.

**Family: Pyrenulaceae**

***Pyrenula mastophora*** (Nyl.) Müll. Arg. (Image 2K)

Distribution: India (Tamil Nadu), Philippines

Specimen examined: 2020-0177 (BUBH), India, Assam, Dhubri district, Bhasani goan, on the bark of *Lannea coromandelica*, 26.xii.2020, 36.22 m, 26.301 N,

90.224 E, coll. S. Biswas & P. Biswas.

***Pyrenula minor*** Fée (Image 2I)

Distribution: India (Andaman and Nicobar Islands), Brazil, El Salvador, French Guiana, USA

Specimen examined: 2020-0178 (BUBH), India, Assam, Dhubri district, Satrasal, on the bark of *Lannea coromandelica*, 4.i.2020, 36.89 m, 26.131 N, 89.734 E,

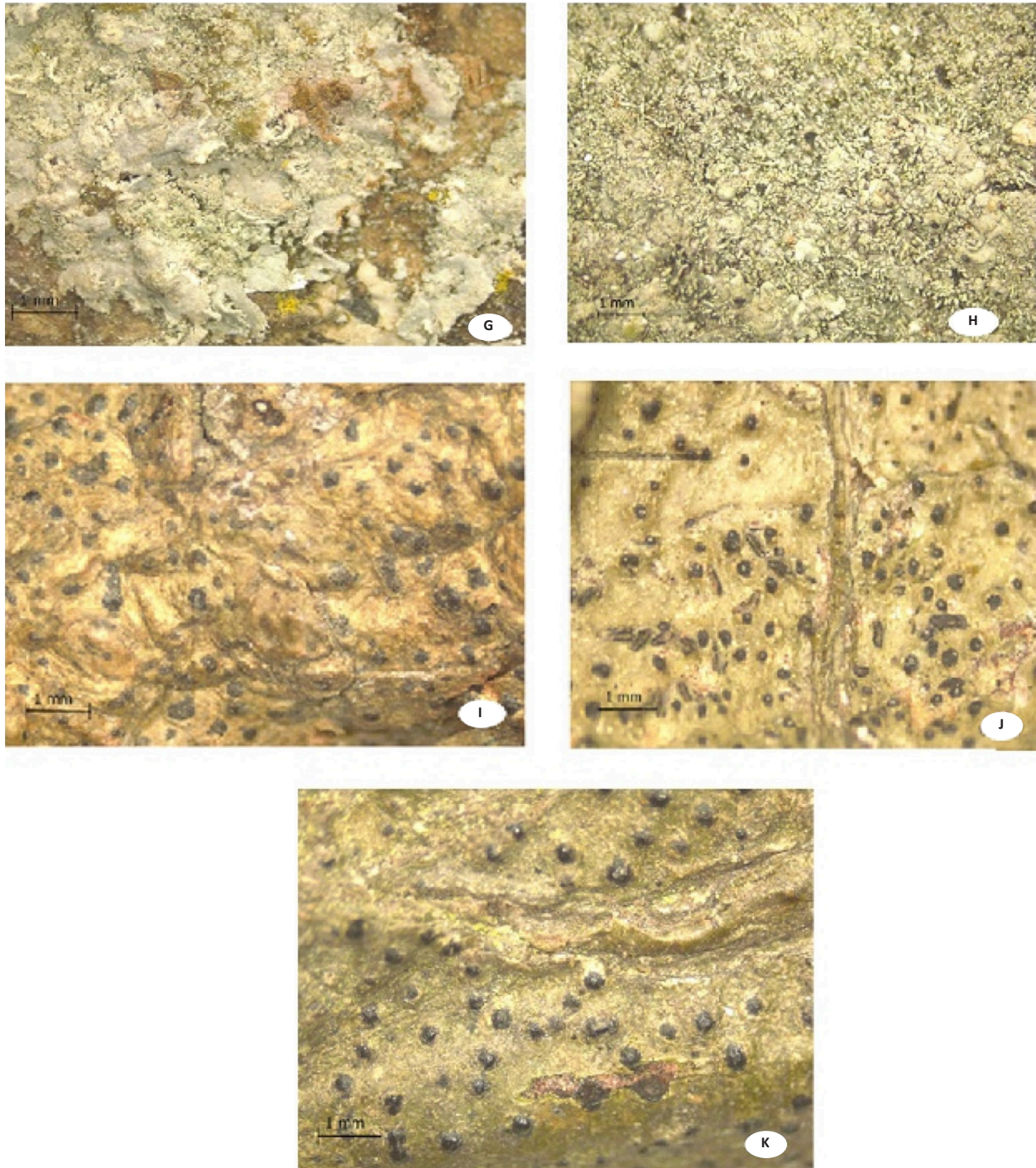


Image 2. Habits of lichen new records: G—*Phycia abuensis* D.D. Awasthi & S.R. Singh | H—*Pyxine isidiophora* (Müll. Arg.) Imshaug | I—*Pyrenula minor* Fée | J—*Pyrenula welwitschii* (Upreti & Ajay Singh) Aptroot | K—*Pyrenula mastophora* (Nyl.) Müll. Arg. | (Scale bar = 1mm).

coll. S. Biswas & P. Biswas.

***Pyrenula welwitschii*** (Upreti & Ajay Singh) Aptroot  
(Image 2J)

Distribution: India (Uttarakhand), Angola

Specimen examined: 2020-0179 (BUBH), India,

Assam, Dhubri district, Kismat hasdaha part 2, on the bark of *Lannea coromandelica*, 22.xi.2020, 37.07 m, 26.050 N, 89.893 E, coll. S. Biswas & P. Biswas.



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