

Exploration of Lichens diversity from Mizoram with addition of *Pyrenula dissimulans* (Pyrenulaceae) a new record to India

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ABSTRACT

The present paper enumerates 22 lichen species as a new addition to the lichen flora from the Mizoram state of North East India along with *Pyrenula dissimulans* (Pyrenulaceae) as the new record for Indian lichen biota. The research outcome is based on the extensive survey, collection of accession of lichens from the central part of Murlen National Park (MNP) of Mizoram, India. The listed species belonged to 15 genera in 9 families of Lichen community. In recorded lichen species crustose (57.1%) was most frequent growth form followed by fruticose (33.3%) and foliose (9.5%). The present finding also highlights inventory, detailed description and distribution of the studied lichen taxa in the protected area. Since, lichens community is also one of the key tools in bio-monitoring of the forest health. Therefore, the documentation and conservation of their species diversity will be valuable for future bio-prospection from the biodiversity rich North East Region of India.

Key words: Bio-monitoring, Documentation, Lichen, Mizoram, Protected area, *Pyrenula*

INTRODUCTION

Lichens are self-sustaining community having symbiotic relationship between fungi (mycobionts) which is the sole and typically controls the relationship and the algal partners (photobionts) which synthesizes food by photosynthesis (Ranković & Kosanić, 2015). Lichens have ability to grow in diverse natural bio-geographic conditions of biosphere on different substratum. India is one of 17 mega-biodiverse countries in the world and with 14.12% species of lichen biota of the world (Chapman, 2009, Singh & Dash, 2014). Sinha *et al.* (2018) reported the addition of 411 species to the list of Annotated Checklist 2010, the total number of lichens recorded from India as of now is 2714 species. However, in the eastern Himalayan region including Sikkim and the seven North-Eastern states of India are still very sparsely explored for lichen flora. The scientific literatures revealed that lichens exploration in the North East India was mostly began from last two decades only (Singh & Pinokiyo, 2004; Pinokiyo *et al.*, 2008; Rout *et al.*, 2010; Daimari *et al.*, 2014; Devi *et al.*, 2015; Upreti *et al.*, 2015; Singh & Singh, 2016). Further, Logesh *et al.* (2017) recorded 159 species of lichens from Mizoram NE India. Since, state of Mizoram is part of Indo-Burma biodiversity hot spot, is known for its

unique, endemic and highly rich biodiversity. As per India State of Forest report, 2015, 88.93% of the total geographical area of the state is under forest cover. But, simultaneously the state and North East region of India is losing its biodiversity due to accelerating anthropogenic activities mainly conversion of forest areas to agriculture (shifting agriculture) and development activities (Grogan *et al.*, 2012). Lichens are unique life forms which are very sensitive to anthropogenic forest disturbances (Rai *et al.*, 2011). The state has one tiger reserve, two national parks and seven wildlife sanctuary accounting for 5.88% (~1240.75 km²) of the geographical area of the State. Looking into regional and global change scenario and level of threats to biodiversity it is urgent and timely to explore the unaccounted valuable lichen flora in protected areas of Mizoram. Henceforth the present studies were undertaken to record new distributional records of lichens to the state of Mizoram.

MATERIALS AND METHODS

The Study area

The study area: Murlen National Park (MNP), Champhai district is around 220 km east of Aizawl, the capital of Mizoram, which is situated at N 23°32'42" to 23°41'36" (latitude); E 92°13'12" to 92°27'24"

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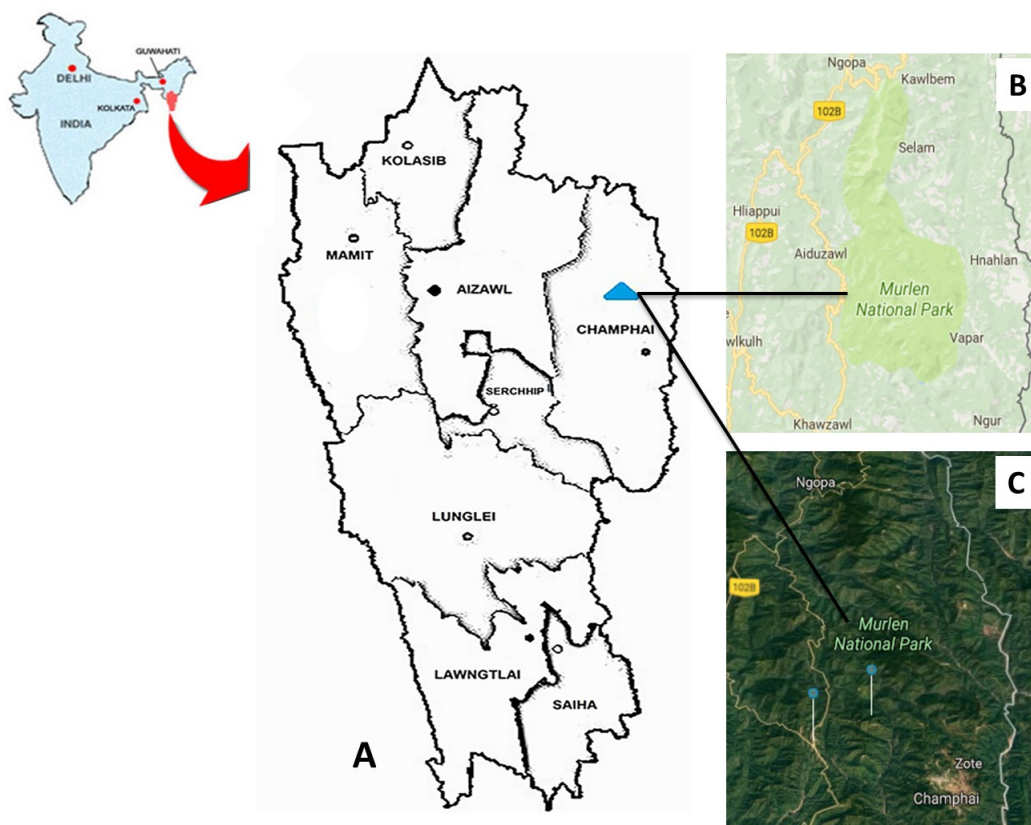


Figure 1. Overview of the study area Murlen National Park (MNP), Champhai district Mizoram, India, A. Map of Mizoram; B & C. Physical and Satellite map of MNP.

(longitude) and having an altitude of 400 m to 1897 m (Figure 1). MNP lies nearby to the Indo-Myanmar boundary and it is highly significant for its closeness to the Chin Hills. The MNP has good dense forest with high canopy cover with minimal penetration of the sunlight to forest floor (Chaudhary, 2018). The field survey was conducted for collection of lichen flora in the month of December 2017 at different altitudes of the central part of the MNP, and collected more than 110 lichen specimens. The Specimens were packed in a lichen herbarium packet with the information of altitude, date, sites of the collection along with their substratum and are deposited in the lichen herbarium of CSIR- National Botanical Research Institute, Lucknow (LWG).

Collected samples were identified on the basis of their morphology, anatomy and chemistry. The morphological features were studied with the help of Leica S8APO stereo-zoom microscope; however, the anatomical features were studied using Leica DM500 compound microscope. The sections were mounted in water for measurement of anatomical structure and later on lactophenol cotton blue was added for its preservation. The colour test were carried out on cortex and medulla with usual chemical reagents viz., aqueous potassium hydroxide (K), Steiner's stable para-phenylenediamine (p-PD) and aqueous calcium hypochlorite (C). Thin layer chromatography was performed for identification of the lichen substances in solvent system A (Toluene 180: 1-4 Dioxane 60: Acetic acid 8) following the techniques of Walker & James (1980). The specimens were identified

and authenticated with the help of available literatures (Awasthi, 1991, 2007; Nayaka, 2004; Divakar & Upreti, 2005; Sinha & Singh, 2010; Aptroot, 2012; Shukla *et al.*, 2014).

TAXONOMIC TREATMENT

Pyrenula dissimulans a new record of India (family Pyrenulaceae)

Genus *Pyrenula*

Pyrenula dissimulans (Müll. Arg.) R.C. Harris, 1995

Basionym: *Pleurothelium dissimulans* Müll. Arg., *Bot. Jb.* 6:387 (1885) (Figure 2).

Description

Thallus crustose, corticolous, yellowish, brown to buff smooth without pseudocyphellae and pigment. Ascomata -perithecia, 0.5 to 1.5mm in diameter, osteolepical, immerse in thallus upto the ostioles or upper part naked, peridium carbonized globose, slightly spreading laterally near the ostioles. Hematecium-filamentous mostly unbranched, without oil, 4 to 8 spored, ascospores-ellipsoid rounded apically, without oil, $20-45 \times 14-2 \mu\text{m}$ (Figure 2), the species has a neotropical. *Pyrenula dissimulans* is close to *Pyrenula welwitschii* (Upreti & Ajay Singh) Aptroot and *Pyrenula thelemorpha* in morphology and shape of ascospores. However *Pyrenula welwitschii* differs in having smaller size ($25-35 \mu\text{m}$) and *Pyrenula thelemorpha* has less wide ($11-15 \mu\text{m}$) size of spore.

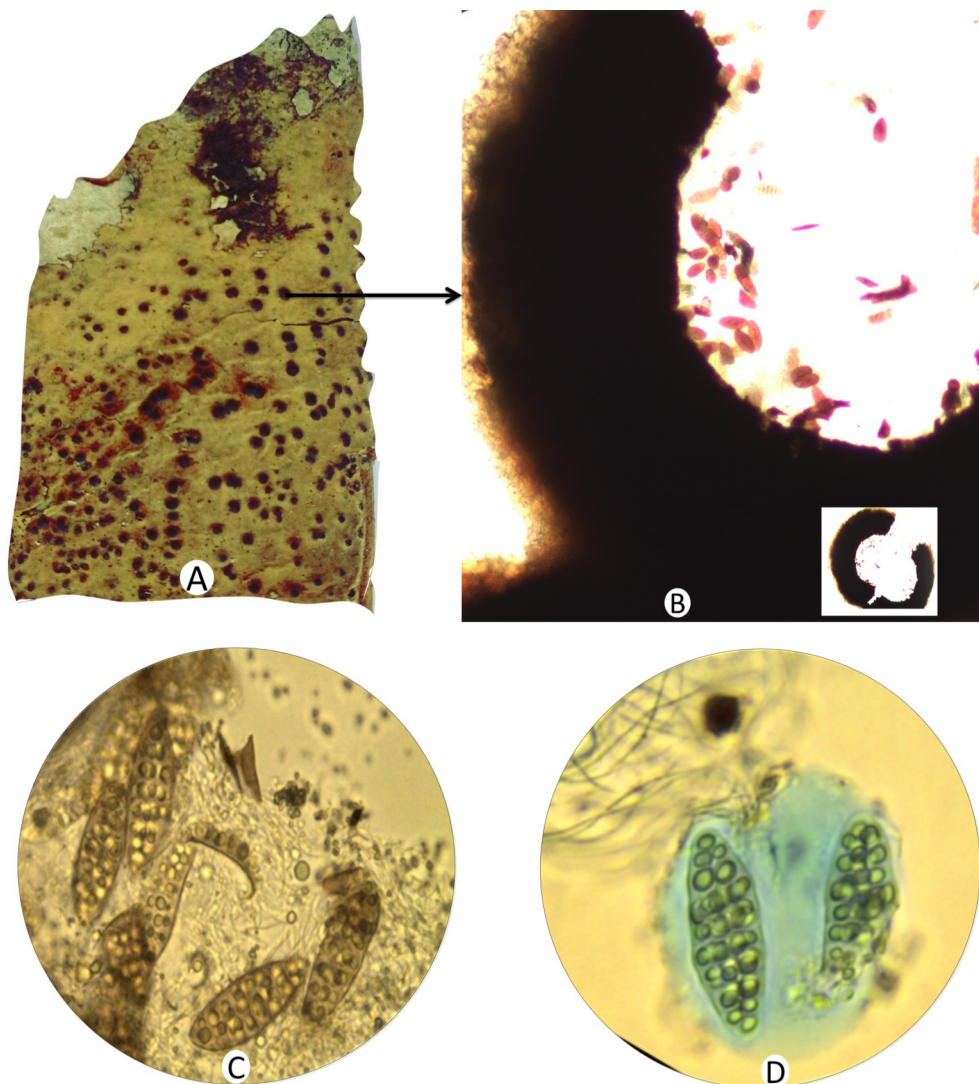


Figure 2. *Pyrenula dissimulans* (Mull. Arg.) R.C. Harris, (A). Thallus on the bark, (B). T.S. of apothecia, (C). Asci, (D). Asci with ascospores enlarges scale

Specimen examined

Murlen National Park (central), N23°38'22.3"E 93°17'44.6" and 1745 m altitude, on the bark, Nurpen Meitei Thangjam, 16-030757(LWG).

Distribution and Habitat

Earlier the species is recorded from Florida (Harris 1995). This species is a new record for India which is found as a Crustose lichens grown on the bark of trees.

Additions of lichens species new to the state of Mizoram, North East India

Family Arthoniaceae

Cryptothecia dissimilis Makhija & Patw., Biovigyanam 13(2): 44 (1987) (Figure 3A)

Distribution - *C. dissimilis* is a new report for Mizoram and is previously recorded from Andaman & Nicobar Islands and Manipur of India.

Specimen examined- India, Mizoram, Champai district, Murlen National Park (central), 1584m altitude, on the bark, Nurpen Meitei Thangjam 16-030754 (LWG).

Cryptothecia scriblitella (Nyl.) Makhija & Patw., Biovigyanam 11(1): 8 (1985) (Figure 3B)

Basionym: *Arthonia scriblitella* Nyl., Acta Soc. Sci. fenn. 7(2): 481 (1863)

Arthothelium scriblitellum (Nyl.) Zahlbr., Catalogus Lichenum Universalis 2:133 (1923)

Distribution - *C. scriblitella* is a new report for North East India including Mizoram and is previously reported from Andaman & Nicobar Islands

Specimen examined- India, Mizoram, Champai district, Murlen National Park (central), 1745 m altitude, on the bark, Nurpen Meitei Thangjam, 16-030758 (LWG).

Herpothallon granulorum Jagad. Ram & G.P. Sinha, Lichenologist 41(6): 610 (2009) (Figure 3C)

Distribution - *H. granulorum* is a new report for Mizoram and is previously reported from Meghalaya and West Bengal.

Specimen examined- India, Mizoram, Champai district, Murlen National Park (central), 1768m altitude, on the bark, Nurpen Meitei Thangjam 16-030745 (LWG).

Family Brigantiaeaceae

Brigantiaea nigra D.D. Awasthi, in Awasthi & Srivastava, Proc. Indian Acad. Sci., Pl. Sci. 99(3): 172 (1989) (Figure 3D)

Basionym: *Lopadium nigrum* (D.D. Awasthi) Kr.P. Singh & G.P. Sinha, Indian Lichens, An Annotated Checklist (Kolkata): 13 (2010).

Distribution – *B. nigra* is a new report for North East India including Mizoram and is previously recorded from Kerala.

Specimen examined– India, Mizoram, Champai district, Murlen National Park (central), 1594m altitude, on the bark, Nurpen Meitei Thangjam 16-030756 (LWG).

Family Collemataceae

Leptogium arisanense Asahina, J. Jap. Bot. 12: 250-255 (1936) (Figure 3E)

Distribution – *L. arisanense* is a new report for Mizoram and is previously known from Arunachal Pradesh, Manipur, Sikkim and West Bengal.

Specimen examined– India, Mizoram, Champai district, Murlen National Park (central), 1723m altitude, on the bark, Nurpen Meitei Thangjam 16-030725 (LWG).

Leptogium moluccanum (Pers.) Vain., Acta Soc. Fauna Flora fenn. 7 (no. 1): 223 (1890) **Basionym:** *Collema moluccanum* Gaudichaud-Beaupré, C., Pers., Botanique (Nagpur) 5:203 (1827) (Figure 3F)

Distribution – *L. moluccanum* is a new report for Mizoram and is previously recorded from Andaman & Nicobar Islands, Arunachal Pradesh, Maharashtra, Manipur, Nagaland, Tamil Nadu and West Bengal.

Specimen examined– India, Mizoram, Champai district, Murlen National Park (central), 1749m altitude, on the bark, Nurpen Meitei Thangjam 16-030744 (LWG).

Family Graphidaceae

Acanthothecis gracilis Staiger & Kalb, Mycotaxon 73: 99 (1999) (Figure 3G)

Distribution – *A. gracilis* is a new report for North East India including Mizoram and is previously recorded from Kerala, Tamil Nadu and Maharashtra.

Specimen examined– India, Mizoram, Champai district, Murlen National Park (central), 1584m altitude, on the bark, Nurpen Meitei Thangjam 16-030738 (LWG).

Family Parmeliaceae

Bulbothrix isidiza (Nyl.) Hale, Phytologia 28:480 (1974)

Basionym: *Parmelia isidiza* Nyl., Bolm Soc. broteriana, Coimbra, sér. 1 3:130 (1884) (Figure 3H)

Distribution – *B. isidiza* is a new report for Mizoram and is previously recorded from Arunachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Manipur, Meghalaya, Maharashtra, Nagaland, Sikkim, Tamil Nadu, Uttar Pradesh, Uttarakhand and West Bengal.

Specimen examined– India, Mizoram, Champai district, Murlen National Park (central), 1629m altitude, on the bark, Nurpen Meitei Thangjam 16-030720 (LWG).

Hypotrachyna awasthii Hale & Patw., Bryologist 77(4): 637 (1975) [1974]

Basionym: *Remototrachyna awasthii* (Hale & Patw.) Divakar & A. Crespo, in Divakar, Lumbsch, Ferencová, Prado & Crespo, Am. J. Bot. 97(4): 586 (2010) (Figure 3I)

Distribution – *H. awasthii* is a new report for Mizoram and is previously known from Karnataka, Kerala, Maharashtra, Manipur, Nagaland and Tamil Nadu.

Specimen examined– India, Mizoram, Champai district, Murlen National Park (central), 1765m altitude, on the bark, Nurpen Meitei Thangjam, 16-030707 (LWG).

Hypotrachyna neosingularis Divakar, Upreti & Elix, Mycotaxon 80: 355 (2001) (Figure 3J)

Distribution – *H. neosingularis* is a new report for Mizoram and is previously known from Sikkim.

Specimen examined– India, Mizoram, Champai district, Murlen National Park (central), 1743m altitude, on the bark, Nurpen Meitei Thangjam, 16-030733 (LWG).

Myelochroa subaurulenta (Nyl.) Elix & Hale, Mycotaxon 29: 241 (1987) (Figure 3K)

Distribution – *M. subaurulenta* is a new report for Mizoram and is previously recorded from Arunachal Pradesh, Kerala, Nagaland, Sikkim, Tamil Nadu, Uttarakhand and West Bengal.

Specimen examined– India, Mizoram, Champai district, Murlen National Park (central), 1628m altitude, on the bark, Nurpen Meitei Thangjam, 16-030719 (LWG).

Parmotrema latissimum (Fée) Hale, Phytologia 28: 337 (1974) (Figure 3L)

Distribution – *P. latissimum* is a new report for North East India including Mizoram and is previously recorded from Himachal Pradesh, Maharashtra and West Bengal.

Specimen examined– India, Mizoram, Champai district, Murlen National Park (central), 1734m altitude, on the bark, Nurpen Meitei Thangjam, 16-030724 (LWG).

Usnea eumitrioides Motyka, Lich. Gen. Usnea Monogr. 2(1): 322. (1937) (Figure 3M)

Distribution – *U. eumitrioides* is a new report for Mizoram and is previously recorded from Himachal Pradesh, Nagaland, Sikkim, Tamil Nadu, Uttarakhand and West Bengal.

Specimen examined– India, Mizoram, Champai district, Murlen National Park (central), 1478m altitude, on the bark, Nurpen Meitei Thangjam 16-030764 (LWG).

Usnea nipparensis Asahina, Lich. Jpn. 3: 91 (1956)

Basionym: *Usnea nipparensis* f. reagens Asahina, J. Jpn. Bot. 47: 257 (1972) (Figure 3N)

Distribution – *U. nipparensis* is a new report for Mizoram and is previously reported from Sikkim and West Bengal.

Specimen examined– India, Mizoram, Champai district, Murlen National Park (central), 1610m altitude, on the bark, Nurpen Meitei Thangjam 16-030734 (LWG).

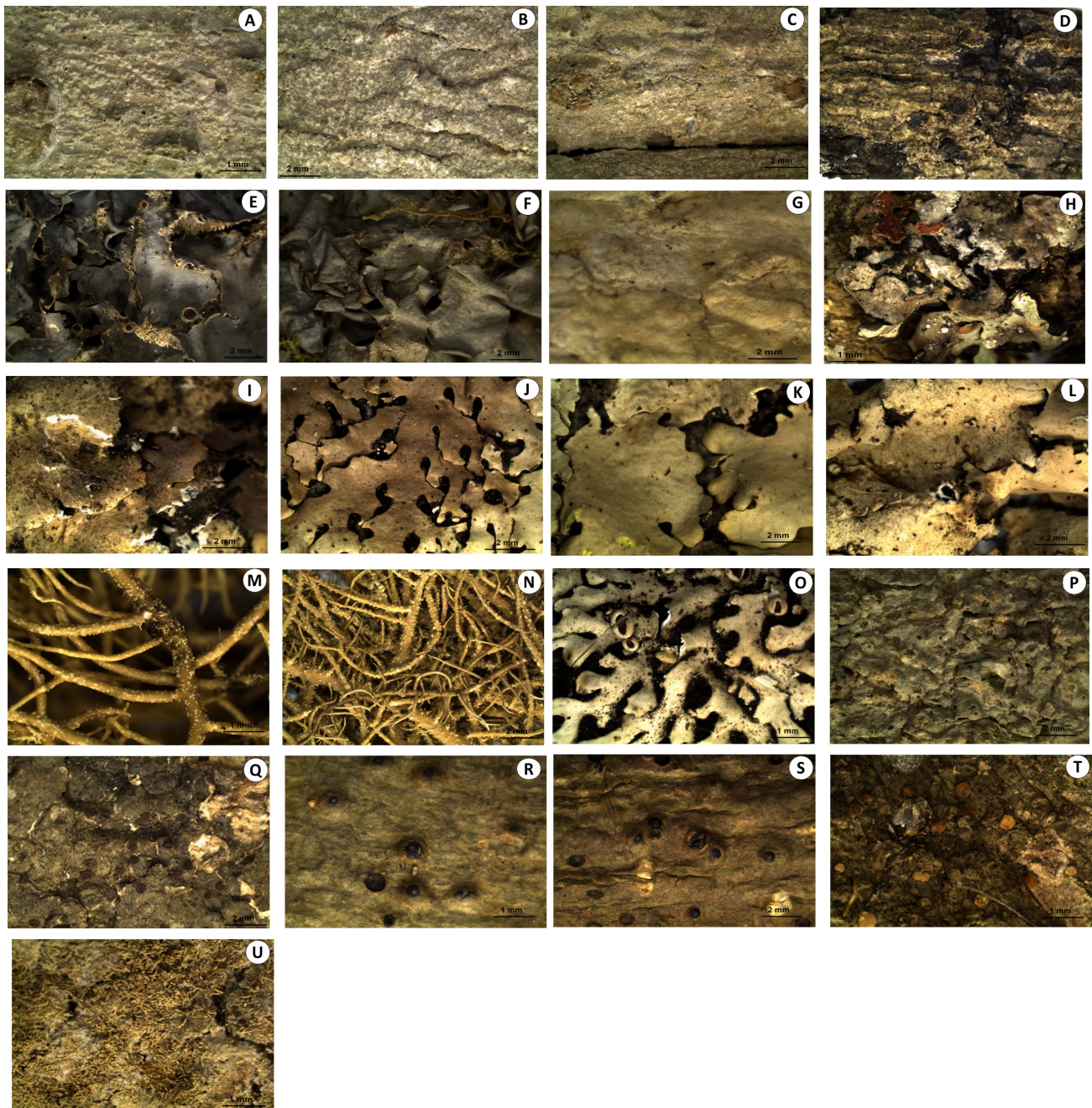


Figure 3. (A-U) Habitus A- *Cryptothecia dissimilis* Makhija & Patw., B- *Cryptothecia scriblitella* (Nyl.) Makhija & Patw., C- *Herpothallon granulosum* Jagadeesh & G.P. Singha, D- *Brigantiaea nigra* D.D. Awasthi, E- *Leptogium arisanense* Asahina, F- *Leptogium moluccanum* (Pers.) Vain., G- *Acanthothecis gracilis* Staiger & Kalb, H- *Bulbothrix isidiza* (Nyl.) Hale, I- *Hypotrachyna awasthi* Hale & Patw., J- *Hypotrachyna neosingularis* Divakar, Upreti & Elix, K- *Myelochroa subaurulenta* (Nyl.) Elix & Hale, L- *Parmotrema latissimum* (Fée) Hale, M- *Usnea eumitrioides* Motyka, N- *Usnea nipparensis* Asahina, O- *Heterodermia hypoleuca* (Muhl.) Trevis., P- *Porina internigrans* (Nyl.) Müll. Arg., Q- *Porina interstes* (Nyl.) Harm., R- *Pyrenula platystoma* (Müll. Arg.) Aptroot, S- *Pyrenula subducta* (Nyl.) Müll. Arg., T- *Biatora vernalis* (L.) Fr., U- *Phyllopsora furfuracea* Zahlbr.

Family Physciaceae

Heterodermia hypoleuca (Ach.) Trevis. Atti Soc. Ital. Nat. 11: 615 (1868) (Figure 3O)

Distribution – *H. hypoleuca* is a new report for Mizoram and is previously recorded from Jammu & Kashmir, Maharashtra, Sikkim and Tamil Nadu.

Specimen examined– India, Mizoram, Champai district, Murlen National Park (central), 1749m altitude, on the bark, Nurpen Meitei Thangjam, 16-030762 (LWG).

Family Porinaceae

Porina internigrans (Nyl.) Müll. Arg., Rep. Australas. Assoc. Advancem. Sci. 1895: 452 (1895) (Figure 3P)

Distribution – *P. internigrans* is a new report for Mizoram and is previously recorded from Andaman & Nicobar Islands, Arunachal Pradesh, Assam, Goa, Karnataka, Kerala, Meghalaya, Nagaland, Tamil Nadu and West Bengal.

Specimen examined– India, Mizoram, Champai district, Murlen National Park (central), 1667m altitude,

on the bark, Nurpen Meitei Thangjam, 16-030750 (LWG).

Porina interstes (Nyl.) Harm., Bull. Soc. Sci. Nancy, sér. 3, 12: 126 (1911) (Figure 3Q)

Distribution – *P. interstes* is a new report for Mizoram and is previously reported from Andaman & Nicobar Islands, Arunachal Pradesh, Goa, Kamataka, Madhya Pradesh, Nagaland, Orissa, Sikkim, Tamil Nadu and West Bengal.

Specimen examined– India, Mizoram, Champai district, Murlen National Park (central), 1764m altitude, on the bark, Nurpen Meitei Thangjam, 16-030701 (LWG).

Family Pyrenulaceae

Pyrenula platystoma (Müll. Arg.) Aptroot, Lichenologist 44(1): 36 (2011) (Figure 3R)

Basionym: *Anthracothecium platystomum* Müll. Arg., Revue mycol., Toulouse 10 (no. 40): 184 (1888)

Distribution – *P. platystoma* is a new report for Mizoram and is previously reported from Arunachal Pradesh, Himachal Pradesh, Sikkim, Tamil Nadu, Uttarakhand and West Bengal.

Specimen examined– India, Mizoram, Champai district, Murlen National Park (central), 1721 m altitude, on the bark, Nurpen Meitei Thangjam, 16-030717 (LWG).

Pyrenula subducta (Nyl.) Müll. Arg., Flora, Regensburg 67:666 (1884) (Figure 3S)

Distribution – *P. subducta* is a new report for Mizoram and is previously reported from Manipur and Nagaland.

Specimen examined– India, Mizoram, Champai district, Murlen National Park (central), 1745 m altitude, on the bark, Nurpen Meitei Thangjam, 16-030749 (LWG).

Family Ramalinaceae

Biatora vernalis (L.) Fr., K. svenska Vetensk-Akad. Handl., ser. 3: 271 (1822) (Figure 3T)

Distribution – *B. vernalis* is a new report for Mizoram and is previously recorded from Arunachal Pradesh and Manipur.

Specimen examined– India, Mizoram, Champai district, Murlen National Park (central), 1694m altitude, on the bark, Nurpen Meitei Thangjam, 16-030763 (LWG).

Phyllopora furfuracea (Pers.) Zahlbr., in Engler & Prantl, Nat. Pflanzenfam. 1(1):138 (1905) (Figure 3U)

Distribution – *P. furfuracea* is a new report for North East India including Mizoram and is previously known from Karnataka, Kerala and Uttarakhand.

Specimen examined– India, Mizoram, Champai district, Murlen National Park (central), 1584m altitude, on the bark, Nurpen Meitei Thangjam, 16-030742 (LWG).

Out of 22 species recorded in the present study, the lichen family Parmeliaceae showed its luxuriantly growth form with 7 species and 5 genera followed by Arthoniaceae with 3 species and 2 genera as well as Pyrenulaceae with 3 species and single genus (Figure 4). Further, Collembataceae with 2 species and single genus,

Porinaceae with 2 species with single genus, Ramalinaeaceae with 2 species with 2 genera, Brigantiaeaceae, Graphidaceae and Physciaceae were represented by single species of each genera respectively (Table 1; Fig. 3 A-U). The present finding recorded and documented a new species of *Pyrenula* for India (Fig. 2 A-C). Henceforth, this new species *P. dissimulans* will be a contribution to lichen biota of *Pyrenula* genus and the number of earlier reported will be increased by 78 for India.

DISCUSSION

The new systematic studies on lichens of Mizoram state were originated recently when Logesh *et al.* (2017) has reported 159 lichen species as new distributional records from the Mizoram, out of which 14 species were described as a new records for India. Chinlampainga *et al.* (2013) also reported 10 lichen species from Aizawl. Recently, it has been reported that 20 lichen species showing the diversity and distribution of lichens in this Indo-Burma hotspot region of Champhai district (Thangjam *et al.*, 2019). Apart from taxonomical studies, Shukla *et al.* (2011) studied the antifungal efficacy of the aqueous and acetone extracts of *Stereocaulon* sp. and *Ramalina* sp. frequently growing in the Mizoram. The lichen *Cladia aggregata* (Swartz) Nyl. (Family Cladoniaceae) has also been reported its efficacy at minimum inhibitory concentrations with different concentration in (mg/mL) of 2.72, 0.63, and 1.28 against fungi namely, *Malassezia furfur*, *M. globosa* and *M. sympodialis*, respectively (Pandey *et al.*, 2013).

The present study area having moist and tropical climate exhibit luxuriant growth of both micro lichens (crustose) and macro lichens (foliose and fruticose). The occurrence of crest forming lichen, genera *Acanthohecia*, *Biatora*, *Brigantiaea*, *Cryptothecia*, *Porina* and *Pyrenula* together with cyanolichens genera *Leptogium* clearly indicates a moist shady habitats of the study area and suitable for lichens colonization. Most of the crustose genera encountered in the study area are known for their wide distribution in tropical evergreen forest of the country (Pinokiyo *et al.*, 2008; Rout *et al.*, 2010).

The occurrence of both foliose parmelioid lichens, *Bulbothrix*, *Hypotrachyna*, *Myelochroa* together with *Usnea* species further indicates a pollution free environmental condition of the MNP.

Upreti (1990,1991) listed few species of *Pyrenula* from the region while describing *Pyrenula* species having *subducta* and *brucea* spore type. Most of reported on *Pyrenula* species were carried out from eastern Himalayan region as well as from Western Ghats of India, (Ingle *et al.*, 2018). The genus *Pyrenula* is crustose lichen mostly found in evergreen forest; which normally grows on smooth and shaded bark of the higher plants. According to the latest key (Taxonomic details) of the lichens species, there are 226 species of *Pyrenula* was reported from all over the world (Aptroot, 2012); out of this 77 species were reported from India (Ingle *et al.*, 2018) and the present record from Mizoram has raised its number to 78.

Addition of 22 species from a small region of National Park clearly indicates that the state has rich

Table 1. New records of lichen flora to state of Mizoram

Family	Genus	Species	GF	Substrata	Field No.	Location
Arthoniaceae	<i>Cryptothecia</i>	<i>Cryptothecia dissimilis</i> Makhija & Patw.	Crustose	Bark	16-030754	MNP (C)
		<i>Cryptothecia scribleriella</i> (Nyl.) Makhija & Patw.	Crustose	Bark	16-030758	MNP (C)
	<i>Herpothallon</i>	<i>Herpothallon granulatum</i> Jagadeesh	Crustose	Bark	16-030745	MNP (C)
Brigantiaceae	<i>Brigantiaea</i>	<i>Brigantiaea nigra</i> D.D. Awasthi	Crustose	Bark	16-030756	MNP (C)
Collemaaceae	<i>Leptogium</i>	<i>Leptogium arisanense</i> Asahina	Foliose	Bark	16-030725	MNP (C)
		<i>Leptogium moluccanum</i> (Pers.) Vain.	Foliose	Bark	10-030744	MNP (C)
Graphidaceae	<i>Acanthothecis</i>	<i>Acanthothecis gracilis</i> Staiger & Kalb	Crustose	Bark	16-030738	MNP (C)
Parmeliaceae	<i>Bulbothrix</i>	<i>Bulbothrix isidiza</i> (Nyl.) Hale	Foliose	Bark	16-030720	MNP (C)
	<i>Hypotrachyna</i>	<i>Hypotrachyna awasthi</i> Hale & Patw.	Foliose	Bark	16-030707	MNP (C)
	<i>Hypotrachyna</i>	<i>Hypotrachyna neosingularis</i> Divakar, Upreti & Elix	Foliose	Bark	16-030733	MNP (C)
	<i>Myelochroa</i>	<i>Myelochroa subaurulenta</i> (Nyl.) Elix & Hale	Foliose	Bark	16-030719	MNP (C)
	<i>Parmotrema</i>	<i>Parmotrema latissimum</i> (Fée) Hale	Foliose	Bark	16-030724	MNP (C)
	<i>Usnea</i>	<i>Usnea eumitrioides</i> Motyka	Fruticose	Bark	16-030764	MNP (C)
		<i>Usnea nipparensis</i> Asahina	Fruticose	Bark	16-030734	MNP (C)
Physciaceae	<i>Heterodermia</i>	<i>Heterodermia hypoleuca</i> (Ach.) Trevis.	Foliose	Bark	16-030762	MNP (C)
Porinaceae	<i>Porina</i>	<i>Porina internigrans</i> (Nyl.) Müll.Arg.	Crustose	Bark	16-030750	MNP (C)
		<i>Porina interstes</i> (Nyl.) Harm.	Crustose	Bark	16-030701	MNP (C)
Pyrenulaceae	Pyrenula	Pyrenula dissimulans (Müll. Arg.) R.C. Harris	Crustose	Bark	16-030757	MNP (C)
		<i>Pyrenula platystoma</i> (Müll. Arg.) Aptroot	Crustose	Bark	16-030717	MNP (C)
		<i>Pyrenula subducta</i> (Nyl.) Müll. Arg.	Crustose	Bark	16-030749	MNP (C)
Ramalinaceae	<i>Biatora</i>	<i>Biatora vernalis</i> (L.) Fr.	Crustose	Bark	16-030763	MNP (C)
	<i>Phyllopsora</i>	<i>Phyllopsora furfuracea</i> Zahlbr.	Crustose	Bark	16-030742	MNP (C)

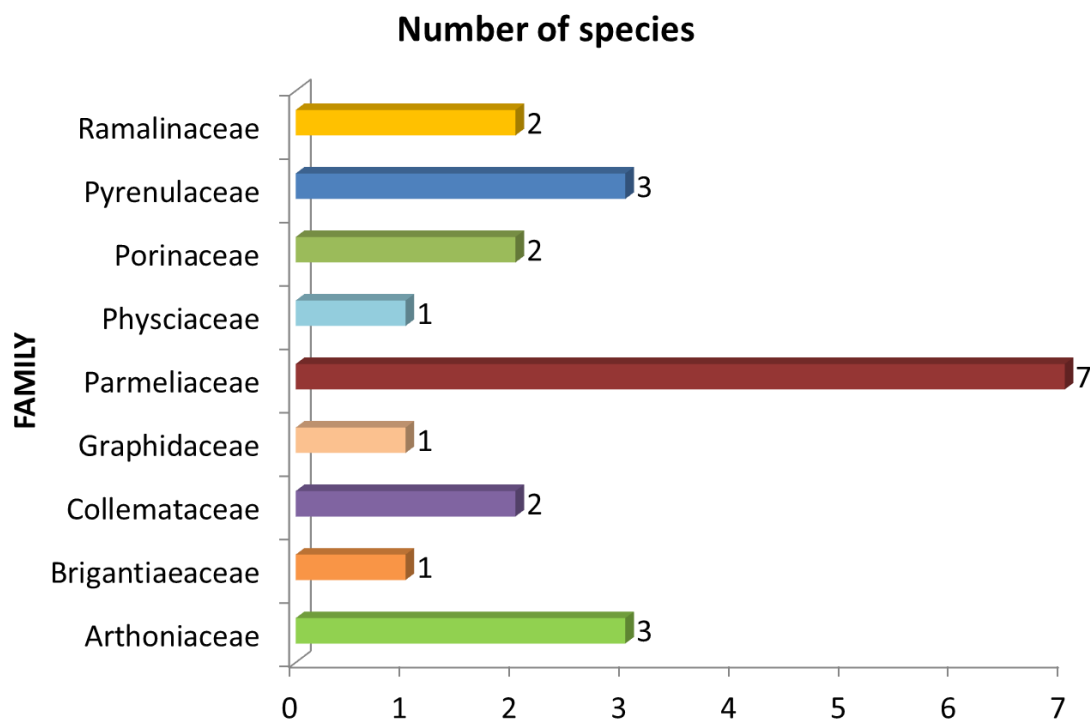


Figure 4. Distribution of lichen species in recorded family

diversity of lichens and there is need of further intensive and extensive survey and documentation in different geographical parts of Mizoram to get a clear picture of lichen diversity in the state. The future lichen exploration in the state will not only bring out some other new lichen taxa to the science but also provide a base for carrying out environmental biomonitoring and other bioprospecting studies filed of lichenology.

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