

On Recent Survey of Liverworts and Hornworts (Bryophyta) of Nagaland, India

Vinay Sahu*, Ashish K. Asthana, Krishna K. Rawat

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ABSTRACT

The present paper provides an account of 61 taxa of liverworts and three hornwort species observed during recent survey of Nagaland. Out of these, 46 taxa (44 liverworts, 2 hornworts) are being reported for the first time from Nagaland. *Cephaloziella herzogiana* (Pande and Srivastava) Udar and Kumar, and *Porella caespitans* (Steph.) S. Hatt. var. *caespitans* are reported as new to North-eastern India. Family Plagiochilaceae showed dominance with 14 species, followed by Lejeuneaceae with 9 species. Genus *Plagiochila* has maximum number (14) of species, followed by *Frullania* (5). In terms of habitat, corticolous liverworts are dominant as compared to terricolous and saxicolous species. In the present study key to all the taxa of Liverworts and Hornworts are also provided here along with habitat and distribution.

Keywords: Bryophyte, Hornworts, Liverworts, Nagaland, North-East India.

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INTRODUCTION

Nagaland is the fourth smallest state (16,579 Km²) in India located in the North-Eastern region of India. It lies between 25° 10' N to 27° 40' N latitude and 93° 20' E to 95° 15' E longitude. It is bordered by Myanmar in the East, Assam in North-west and West, Arunachal Pradesh in North and Manipur towards South. The state has been divided into 16 districts. It receives seasonal rainfall in the month of May to September (1800-2500 mm) which favors the luxuriant growth of vegetation including bryophytes. The average annual temperature ranges between 18–25 °C and altitude ranges between 160 to 3841 m. State is covered by different type of forest viz. tropical, subtropical, evergreen, coniferous and temperate evergreen. The vegetation of this state is mainly Bamboo, Palms, *Pinus*, *Rhododendron*, *Quercus*, *Taxus*, etc.

The bryofloristic information of North-east region was published by various workers from time to time (Deb 1955; Govindapuri *et al.*, 2012; Singh *et al.*, 2010; Singh and Kumar, 2016; Rawat *et al.*, 2017; Rawat *et al.*, 2018; Banarjee and Srivastava, 2019; Asthana *et al.*, 2021; Sahu *et al.*, 2022; Sahu and Asthana, 2022). Various workers like Udar and Asthana (1985); Chaturvedi and Chaturvedi (2008); Nath *et al.* (2010); Bansal *et al.* (2011); Chaturvedi *et al.* (2011); Eshuo and Chaturvedi (2011a); Eshuo and Chaturvedi (2011b); Eshuo and Chaturvedi (2011c); Chaturvedi and Eshuo (2012); Eshuo *et al.* (2012); Eshuo *et al.* (2013); Eshuo (2014) and Sahu *et al.* (2022) published sporadic reports of bryophytes of Nagaland. Recently, Singh *et al.* (2016) reported about 40 taxa of liverworts and hornworts while Sahu *et al.* (2022) published an account of 121 taxa of mosses from Nagaland. The present study adds 46 more taxa (44 liverworts and 2 hornworts) in the bryophytic wealth of the State, while reports two taxa as new to north-east India. The purpose of the present study is to strengthen and update the knowledge about bryo-diversity of Nagaland.

MATERIALS AND METHODS

Plant samples were collected from 2017 to 2018 in different parts of Nagaland state, viz., Kohima – Dzukou valley, Noklak-

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Konya, Mokokchung, Kiphire - Saramati Hills, Kiphire Thanamir and Tuensang (Fig. 1). The specimens were air dried in blotting paper for 3-4 days, preserved in brown paper packets and deposited in the Bryophyte Herbarium, CSIR-National Botanical Research Institute, Lucknow (LWG). For taxonomy, identification and distribution details of various taxa, following literature was consulted: Kashyap and Chopra (1932); Amakawa (1964); Srivastava and Udar (1976); Udar and Asthana (1985); Asthana and Srivastava (1991); Sharma and Srivastava (1993); Asthana *et al.* (1995); So (2001); Srivastava and Srivastava (2002); Julsen (2006); Long (2006); Rawat and Srivastava (2007); Singh and Nath (2007); Chaturvedi and Chaturvedi (2008); Nath *et al.* (2010); Chaturvedi *et al.* (2011); Eshuo and Chaturvedi (2011a); Eshuo and Chaturvedi (2011b); Chaturvedi and Eshuo (2012); Dey and Singh (2012); Eshuo *et al.* (2012); Eshuo *et al.* (2013); Srivastava *et al.* (2013) and Eshuo (2014).

RESULT AND DISCUSSION

Key to the orders, genera and species of liverworts and hornworts of Nagaland

- 1a. Plants thallose.....2
- 1b. Plants leafy, sometimes thalloid without epidermal pores on dorsal surface.....7
- 2a. Thallus cells usually with single, large chloroplast, sporophyte horn like, bivalved, oil bodies absent, sporophyte indeterminate growth, pseudoelaters present.....3. Anthocerotales

- 2b. Thallus cells with numerous chloroplast, oil bodies present, true elaters present, rhizoids smooth or warty5.
 Marchantiales
- 3a. Thallus compact, spores yellowish.....4.
Phaeoceros
- 3b. Thallus spongy, spores dark brown, sporoderm reticuloid, unsculptured stripe along triradiate Mark.....*Anthoceros bharadwajii*
- 4a. Spores minutely papillate, triradiate rays thin studded with papillae along triradiate mark*Phaeoceros carolinianus*
- 4b. Spores with prominent hump, triradiate rays thick not studded with papillae*Phaeoceros himalayensis*
- 5a. Female receptacle sessile, on the ventral side, at the apex of thallus.....*Targionia hypophylla*
- 5b. Female receptacle stalked, on the dorsal side of the thallus.....6.*Asterella*
- 6a. Androecia present on short ventral branches....*Asterella leptophylla*
- 6b. Androecia borne closely proximal to base of arche-goniophore.....*Asterella khasyana*
- 7a. Plants thalloid, epidermal pores not present on dorsal surface.....8
- 7b. Plants leafy, leaves arranged on two or in three rows on stem surface.....12
- 8a. Thallus margins crisped, ventral scales lanceolate with numerous marginal papillae.....*Calycularia crispula*
- 8b. Thallus narrow, margins not crisped, ventral scales absent.....9.
- 9a. Hairs absent on the thallus, thallus unistratose wings absent, midrib not distinct.10. *Riccardia*
- 9b. Hairs present on the thallus margin, unistratose wing present, midrib distinct...11. *Metzgeria*
- 10a. Plants stolon present, dioecious.....*Riccardia levieri*
- 10b. Plants stolon absent, Monoecious.....*R. tenuicostata*
- 11a. Hairs present on both dorsal and ventral surface*Metzgeria pubescens*
- 11b. Hairs absent on the ventral surface and thallus tapered at apex.....*M. consanguinea*
- 12a. Leaves arranged in three rows along stem13
- 12b. Leaves arranged in two rows along stem (rarely 3 rows).....45
- 13a. Leaves anisophyllous not arranged in 3 equal rows.....14
- 13b. Leaves isophyllous, arranged in 3 equal rows.....43.
Herbertus
- 14a. Leaves entire, shallowly 2-3 dentate or lobulated at apex.....19
- 14b. Leaves deeply 3-5 lobed.....15
- 15a. Leaves asymmetrically 3-4 lobed.....16
- 15b. Leaves incubous, divided to 1/3 -1/4 of the leaf.....18.
Lepidozia
- 16a. Leaves lobed 1/5 to 2/5 of the lobe, Gemmae present.....
Tritomaria exsecta
- 16b. Leaves deeply lobed, Gemmae absent.....17.
Plicanthus
- 17a. Leaves and underleaves with numerous teeth at margin.....*Plicanthus hirtellus*
- 17b. Leaves and underleaves with occasional teeth at margin...
*P. birmensis*
- 18a. Stem 9-12 cells high in cross section, cuticle verrucose.....
Lepidozia erosa
- 18b. Stem 13-17 cells high in cross section, cuticle smooth.....
*L. reptans*
- 19a. Leaves entire or retuse or bilobed at apex.....24
- 19b. Leaves shallowly 2-3 lobed at apex.....20
- 20a. Leaves bidentate at apex, amphigastria deeply lobed with broad sinus..*Lophocolea bidentata*
- 20b. Leaves asymmetrical to symmetrical, apex usually truncate 2-3 lobed.....21. *Bazzania*
- 21a. Underleaves cellsthinwalledandhyaline.....22
- 21a. Underleaves cells thick walled and similar to leaf cells.....23
- 22a. Underleaves distant and reniform.....*Bazzania himalayana*
- 22b. Underleaves closely imbricate, quadrate to rectangulate...
*B. tridens*
- 23a. Leaves usually 2 lobed, trigones indistinct.....*B. sikkimensis*
- 23b. Leaves usually 3 lobed, trigones prominent.....*B. praerupta*
- 24a. Leaf lobule absent.....25
- 24b. Leaf lobules present.....27
- 25a. Leaf apex bidentate, or retuse, Underleaves bifid to bisbifid.....26. *Calypogeia*
- 25b. Leaf apex apiculate or rounded, Underleaves reniform, entire....*Metacalypogeia alternifolia*
- 26a. Leaf apex bidentate, Underleaves bis-bifid.....
Calypogeia lunata
- 26b. Leaf apex acute or retuse, Underleaves bifid.....*C. azurea*
- 27a. Leaf lobule ligulate or lanceolate, margin entire or dentate, perianth mouth not beaked28. *Porella*
- 27b. Leaf lobule saccate, galeate or explanate, cucullate, perianth mouth beaked....30
- 28a. Leaf lobes and lobules margin dentate.....*Porella campylophylla* var. *campylophylla*
- 28b. Leaf lobes and lobules margin entire.....29
- 29a. Leaf lobes rounded at apex, lobules large.....
Porella obtusata var. *macrloba*
- 29b. Leaf lobe apex acute to apiculate and often 1-2 small teeth.....*Porella caespitans*
- 30a. Leaf lobules galeate or explanate, cucullate, hyaline papilla absent31. *Frullania*
- 30b. Leaf lobule saccate, hyaline papilla present35
- 31a. Underleaves entire or retuse.....*Frullania retusa*
- 31b. Underleaves bifid.....32
- 32a. Leaves strongly squarrose.....*Frullania ericoides*
- 32b. Leaves not squarrose.....33
- 33a. Underleaves not so much wide, base not auriculate.....
Frullania neurota
- 33b. Underleaves wide with auriculate base.....34
- 34a. Underleaves up to 5 time as wide as the stem.....
Frullania arecae
- 34b. Underleaves not up to 5 time wide as the stem.....*Frullania nepalensis*

- 35a. Underleaves entire.....36
 35b. Underleaves bifid.....40
 36a. Plants irregularly branched37
 36b. Plants pinnately branched, lobes and underleaves dentate at margin.....*Ptychanthus striatus*
 37a. Leaf lobules with 2-4 small teeth at free margins.....38
 37b. Leaf lobules teeth at free margins absent.....39
 38a. Leaf lobes obtuse at apex, lobules with 2 small teeth at free margins..*Acrolejeunea infuscata*
 38b. Leaf lobes acute at apex, lobules with 3-4 small teeth at free margins.....*A. sandvicensis*
 39a. Lobules ¼ to 1/5 of leaf length, Perianth 6-10 keeled with smooth plicae*Spruceanthus semirepandus*
 39b. Lobules usually reduced or vestigial, Perianth 2-5 keeled with usually dentate plicae.....*Lopholejeunea subfusca*
 40a. Stem Medullary cells thick walled, hyaline papilla distal to second tooth.....*Cheilolejeunea tugida*
 40b. Stem Medullary cells thin walled, hyaline papilla proximal side of first tooth.....41
 41a. Transverse section of stem with 3 rows of small medullary cells.....*Microlejeunea indica*
 41b. Transverse section of stem with over 3 rows of small medullary cells.....42
 42a. Leaf lobule up to ¼ of leaf lobe, underleaves imbricate longer than wide.....*Lejeunea flava*
 42b. Leaf lobule 1/3 of leaf lobe, underleaves distant, wider than long.....*L. pallidevirens*
 43a. Leaf lobes apices acuminate.....*Herbertus armitanus*
 43b. Leaf lobes apex acute.....44
 44a. About 3-10 cells between sinus and vitta bifurcation point.....*H. aduncus*
 44b. About 8-29 cells between sinus and vitta bifurcation point.....*H. dicranus*
 45a. Plants delicate with flagelliform branches.....46.
Cephalozia
 45b. Plants sturdy without flagelliform branches,.....47
 46a. Leaf lobes not diverging but connivent, sinus of leaves ½ of leaf length.....*C. kashyapii*
 46b. Leaf lobes diverging, sinus of leaves more than half of leaf length.....*C. herzogiana*
 47a. Leaves postical margin inflexed and saccate forming lobule like structure, lobed bifid.....*Delavayella serrata*
 47b. Leaves not forming lobule like structure.....48
 48a. Leaves with dorsal and ventral lobe49
 48b. No differentiation in dorsal and ventral lobe, Leaf margin usually toothed52. *Plagiochila*
 49a. Dorsal lobe larger than ventral lobe, dorsal lobes caducous, ventral lobes sub quadrate*Radula obscura*
 49b. Dorsal lobe smaller than ventral lobe..... 51. *Scapania*
 51a. Ventral lobe margin irregularly dentate at apex.....
Scapania griffithii
 51b. Ventral lobe margin densely ciliate at apex..... *S. ciliata*
 52a. Leaves with vitta like cells 53
 52b. Leaves without vitta like cells 56
 53a. Leaves fragmenting.....*Plagiochila vexans*
 53b. Leaves persistent.....54
 54a. Plants with entire lamellae form paraphyllia near dorsal leaf base.....*Plagiochila arunachalensis*
 54b. Plants without paraphyllia..... 55
 55a. Leaves orbicular to orbicular-ovate, rhizoids numerous on ventral stem surface, leaves with more than 20 teeth.....
Plagiochila semidecurrens
 55b. Leaves oblong-ovate, rhizoids scanty or absent on ventral stem surface, leaves with 10-15 teeth.....
Plagiochila grollei
 56a. Leaves fragmenting.....57
 56b. Leaves persisting58
 57a. Teeth spinose..... *Plagiochila parvifolia*
 57b. Teeth ciliate.....*Plagiochila subtropica*
 58a. Plants with frequent terminal branching producing dendroid habit.....*Plagiochila fruticosa*
 58b. Plants mostly with intercalary branching.....59
 59a. Dentition ciliata.....*Plagiochila sciophila*
 59b. Dentition spinose.....60
 60a. Plants filiform.....61
 60b. Plants medium to large62
 61a. Trigones small to absent*Plagiochila corticola*
 61b. Trigones small to large, nodulose..... *Plagiochila gracilis*
 62a. Leaves asymmetrically bilobed, basal leaf cells with distinct trabeculae.....*Plagiochila trabeculata*
 62b. Leaves not bilobed, basal leaf cells without trabeculae 63
 63a. Plants with numerous rhizoids all over the surface, teeth restricted to leaf apex.....*Plagiochila secretifolia*
 63b. Rhizoids mostly on basal rhizomatous part of stem, teeth frequent on margins and apex.....64
 64a. Plants sparingly branched, leaves with numerous teeth throughout the margin, leaf propagules absent.....
Plagiochila chinensis
 64b. Plants highly branched, teeth mostly on ventral margin and apex of leaves, leaf propagules frequent.....*Plagiochila nepalensis*

Systematic Enumeration

Marchantiophyta

• Family - Allsoniaceae

***Calycularia crispula* Mitt.** J. Proc. Linn. Soc., Bot. 5:122 (1861). Range of Distribution: INDIA [Arunachal Pradesh, Himachal Pradesh, Nagaland, Sikkim, Tamil Nadu, Uttarakhand, West Bengal], Bhutan, China, Costa Rica, Myanmar, Nepal, Thailand, Taiwan, Africa, North America (Singh *et al.* 2016). *New to Nagaland*
Materials examined: INDIA -NORTH EAST- Nagaland, Kohima, Dzukou Valley, on soil, 2463m, 22/06/2017, leg. Katiyar *et al*, 306742A (LWG); Kiphire, Saramati Hills, on soil, above 2500m, 14/09/2017, leg. Harsh Singh, 306852G (LWG); Kiphire, Saramati Hills, Epiphytic, 14/09/2017, leg. Harsh Singh, 306875L, 306879A (LWG).

• Family - Aneuraceae

***Riccardia levieri* Schiffn.,** Oesterr. Bot. Z. 49: 130 (1899). Range of Distribution: INDIA [Andhra Pradesh, Assam, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Meghalaya, Manipur, Nagaland, Odisha, Tamil Nadu, Uttarakhand, West Bengal], Bhutan (Singh *et al.*, 2016; Sahu and Asthana, 2022). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Mokukchung to Tuensang, on soil, 1798m, 02/10/2018, leg. Danish Husain and A. K. Srivastava, 321267B (LWG).

***Riccardia tenuicostata* Schiffn.** Denkschr. Kaiserl. Akad. Wiss. Wien Math. Naturwiss Ki 67: 166 (1899).

Range of Distribution: INDIA [Arunachal Pradesh, Assam, Himachal Pradesh, Kerala, Meghalaya, Manipur, Nagaland – Present study, Sikkim, Tamil Nadu, Uttarakhand, West Bengal], Indonesia, Nepal, Singapore (Singh *et al.*, 2016; Sahu and Asthana, 2022). *New to Nagaland*.

Materials examined: INDIA - NORTH EAST• Nagaland, Kiphire, Saramati Hills, Epiphytic, 2500m, 14/09/2017, leg. Harsh Singh, 306872G, 306881D (LWG).

- *Family - Ayttoniaceae*

***Asterella khasyana* (Griff) Pande, K. P. Srivastava and Sultan Khan**, J. Hattori Bot. Lab. 11:8 (1954). Range of Distribution: INDIA [Assam, Himachal Pradesh, Karnataka, Kashmir, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Odisha, Punjab, Rajasthan, Sikkim, Tamil Nadu, Uttarakhand, West Bengal], Bhutan, China, Indonesia, Nepal, Pakistan, Philippines, Thailand, Africa (Singh *et al.*, 2016; Sahu and Asthana, 2022).

Materials examined: INDIA - NORTH EAST• Nagaland, Dzukou Valley, on soil, 2463m, 22/06/2017, leg. Katiyar *et al.*, 306745D (LWG), Kiphire, Saramati Hills, on rocks, above 2500m, 14/09/2017, leg. Harsh Singh, 306877B (LWG).

***Asterella leptophylla* (Mont.) Pande, K. P. Srivast. and Sultan Khan ex Grolle**, Feddes Repert. 87: 246 (1976). Range of Distribution: INDIA [Himachal Pradesh, Kashmir, Kerala, Maharashtra, Meghalaya, Nagaland, Sikkim, Tamil Nadu, Uttarakhand, West Bengal], Bhutan, China, Indonesia, Japan, Korea, Nepal, Pakistan, Philippines, Russia, Taiwan (Singh *et al.*, 2016). *New to Nagaland*.

Materials examined: INDIA - NORTH EAST• Nagaland, Konya to Tuensang, on soil, 1976m, 30/09/2018, leg. Danish Husain and A. K. Srivastava, 321246C, 321253D (LWG).

- *Family - Calypogeiaceae*

***Calypogeia azurea* Stotler et Crotz**, Taxon 32: 74 (1983). Range of Distribution: INDIA [Arunachal Pradesh, Madhya Pradesh, Meghalaya, Nagaland, Sikkim, Tamil Nadu, Tripura, Uttarakhand, West Bengal], Europe, Japan, Korea, Russia, Taiwan (Singh *et al.*, 2016). *New to Nagaland*.

Materials examined: INDIA - NORTH EAST• Nagaland, Dzukou Valley, on rocks, 2686m, 22/06/2017, leg. Katiyar *et al.*, 306762F, Kiphire, Saramati Hills, on soil, 2500m, 14/09/2017, leg. Harsh Singh, 306856G (LWG).

***Calypogeia lunata* Mitt.** J. Proc. Linn. Soc. Bot. 5:107 (1861). Range of Distribution: INDIA [Assam, Madhya Pradesh, Meghalaya, Nagaland, Sikkim, Tamil Nadu, Uttarakhand, West Bengal], Bhutan, China, Nepal (Singh *et al.*, 2016). *New to Nagaland*.

Materials examined: INDIA - NORTH EAST• Nagaland, Dzukou Valley, on soil, 2455m, 22/06/2017, leg. Katiyar *et al.*, 306739A, 306760C (LWG), Kiphire, Saramati Hills, on soil, above 2500m, 14/09/2017, leg. Harsh Singh, 306857A (LWG).

***Metacalypogeia alternifolia* (Nees) Grolle**, Oesterr. Bot. Z. 111. 185 (1964). Range of Distribution: INDIA [Arunachal Pradesh,

Himachal Pradesh, Meghalaya, Nagaland, Sikkim, Uttarakhand, West Bengal], Bhutan, China, Japan, Nepal, Sri Lanka, Taiwan (Singh *et al.*, 2016). *New to Nagaland*.

Materials examined: INDIA - NORTH EAST• Nagaland, Dzukou Valley on soil, 2463m, 22/06/2017, leg. Katiyar *et al.*, 306741F, 306746C, 306747H, 306755A (LWG).

- *Family - Cephaloziaceae*

***Cephalozia kashyapii* Udar**, Geophytology 8: 133 (1978). Range of Distribution: Endemic to INDIA [Meghalaya, Manipur, Nagaland, West Bengal]. (Singh *et al.* 2016; Sahu and Asthana 2022) *New to Nagaland*.

Materials examined: INDIA - NORTH EAST• Nagaland, Noklak, Konya; Tuensong, on soil, 1976m, 30/09/2018, leg. Danish Husain and A. K. Srivastava, 321246D (LWG).

***Cephaloziella herzogiana* (Pande and K. P. Srivastava) Udar and D. Kumar**, Geophytology 6: 45 (1976). Range of Distribution: INDIA [Madhya Pradesh, Nagaland]; Bhutan, Nepal (Singh *et al.* 2016). *New to North-East*

Materials examined: INDIA - NORTH EAST• Nagaland, Biswema Village, Dzukou Valley, on soil, 1827m, 25/06/2017, leg. Katiyar *et al.*, 306771I, Thanamir guest house, Saramati Hill, 2500m, on soil, 13/09/2017, leg. Harsh Singh, 306849C, Kiphire, Saramati Hills, Epiphytic, above 2500m, 14/09/2017, leg. Harsh Singh, 306857G, 306876I (LWG).

- *Family - Delavayellaceae*

***Delavayella serrata* Steph.**, Mem. Soc. Nat. Sci. Nat. Math. Cherbourg 29: 211 (1894). Range of Distribution: INDIA [Arunachal Pradesh, Nagaland, Sikkim, Uttarakhand, West Bengal], Bhutan, China, Nepal, Thailand (Singh *et al.*, 2016). *New to Nagaland*.

Materials examined: INDIA - NORTH EAST• Nagaland, Kiphire, Saramati Hills, Epiphytic, 2500m, leg. Harsh Singh, 306872F (LWG).

- *Family - Geocalycaceae*

***Lophocolea bidentata* (L.) Dumort.**, Recueil Observ. Jungerm. 17 (1835). Range of Distribution: INDIA [Arunachal Pradesh, Jammu and Kashmir, Kerala, Manipur, Meghalaya, Nagaland, Odisha, Sikkim, Tamil Nadu, Uttarakhand, West Bengal], Bhutan, Japan, Korea, Nepal, Russia, Taiwan, Africa, Europe, South America (Singh *et al.*, 2016). *New to Nagaland*.

Materials examined: INDIA - NORTH EAST• Nagaland, Noklak, Konya Village, on soil, 2169m, 4/02/2019, leg. Priyanka Agnihotri, 321562B, 321563B, 321564C (LWG).

- *Family - Herbertaceae*

***Herbertus aduncus* (Dicks) Gray**, Nat. Arr. Brit. Pl. 1: 705 (1821) subsp. *aduncus* Range of Distribution: INDIA [Nagaland, Sikkim], Bhutan, Canada, China, Japan, Nepal, South Korea, USA (Eshuo, 2014; Singh *et al.*, 2016).

Materials examined: INDIA - NORTH EAST• Nagaland, Kiphire, Saramati Hills, Epiphytic, 2500m, 14/09/2017, leg. Harsh Singh, 306882E (LWG).

***Herbertus arminatus* (Steph.) H. A. Mill.**, J. Hattori Bot. Lab. 28: 324 (1965). Range of Distribution: INDIA [Nagaland, Sikkim], Indonesia, Papua New Guinea, Philippines, Thailand, Vietnam (Eshuo, 2014; Singh *et al.*, 2016).

Materials examined: INDIA - NORTH EAST• Nagaland, Kiphire,

Saramati Hills, Epiphytic, 2500m, 14/09/2017, leg. Harsh Singh, 306857B (LWG).

Herbertus dicranus (Taylor ex Gottsche et al.) Trevis., Mem. Realest. Lombardo Sci., ser. 3, cl. Sci. at. 4: 397 (1877). Range of Distribution: INDIA [Arunachal Pradesh, Karnataka, Kerala, Manipur, Meghalaya, Nagaland, Sikkim, Tamil Nadu, West Bengal], Bhutan, China, Hawaii, Indonesia, Japan, Kenya, Madeira, Malaysia, Mauritius, Nepal, New Caledonia, North America, Philippines, Russia, Rwanda, Sri Lanka, Taiwan, Tanzania, Thailand, Uganda, Vietnam, Africa (Singh *et al.* 2016; Sahu and Asthana, 2022).

Materials examined: INDIA - NORTH EAST• Nagaland, Kiphire, Saramati Hills, Epiphytic 2500m, 14/09/2017, leg. Harsh Singh, 306852F, 306853A, 306854A, 306862A, 306866C, 306870D, 306873A, 306875C, 306876B, 306878C (LWG).

• Family - Jubulaceae

Frullania arecae (Spreng.) Gottsche, Mex. Leverm. 236 (1863) var. **arecae** Range of Distribution: INDIA [Karnataka, Manipur, Meghalaya, Nagaland, Sikkim, Tamil Nadu, West Bengal], Bhutan, China, Fiji, Japan, Indonesia, Malaysia, Myanmar, Nepal, New Guinea, North and South America, Pacific Island, Philippines, Sri Lanka, Taiwan, Thailand, Africa, Australia (Singh *et al.*, 2016; Sahu and Asthana, 2022).

Materials examined: INDIA - NORTH EAST• Nagaland, Dzukou Valley, on rocks, 2686m, 22/06/2017, leg. Katiyar *et al.*, 306763D, Kiphire, Thanamir guest house, Saramati Hill, 2500m, Epiphytic, leg. Harsh Singh, 306848B, Kiphire, Thanamir, 2000m, Epiphytic, leg. Harsh Singh, 306891A, Noklak from Tuensang, Epiphytic, 1499m, 1/10/2018, leg. Danish Husain and A. K. Srivastava, 321262B (LWG).

Frullania ericoides (Nees) Mont., Ann. Sci Nat. Bot. Ser.2, 12:51 (1839). Range of Distribution: INDIA [Andaman Is., Arunachal Pradesh, Assam, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tamil Nadu, Uttarakhand, West Bengal], Bhutan, China, Fiji, Hawaii, Indonesia, Japan, Korea, Malaysia, Myanmar, Nepal, Papua New Guinea, Philippines, Sri Lanka, Taiwan, Thailand, Africa, Australia, North and South America (Singh *et al.*, 2016; Sahu and Asthana, 2022).

Materials examined: INDIA - NORTH EAST• Nagaland, Kiphire, Saramati Hills, Epiphytic, 2500m, 14/09/2017, leg. Harsh Singh, 306855E (LWG).

Frullania nepalensis (Spreng.) Lehm. and Lindenb. in Lehm., Nov. Strip. Pug. 4:19 (1832). Range of Distribution: INDIA [Arunachal Pradesh, Himachal Pradesh, Manipur, Meghalaya, Nagaland, Sikkim, Tripura, Uttarakhand, West Bengal], Bhutan, China, Indonesia, Japan, Korea, Malaysia, Nepal, Papua New Guinea, Philippines, Taiwan, Thailand (Singh *et al.*, 2016). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Kiphire, Saramati Hills, Epiphytic, 2500m, 14/09/2017, leg. Harsh Singh, 306852A, 306856D, 306859C, 306862E, 306875D, 306882D (LWG).

Frullania neurota Taylor, J. Bot. 5: 400 (1846) var. **neurota** Range of Distribution: INDIA [Arunachal Pradesh, Jammu and

Kashmir, Karnataka, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tamil Nadu, Uttarakhand, West Bengal], China, Fiji, Hawaii, Indonesia, Korea, Nepal, Sri Lanka, Thailand, South America (Singh *et al.*, 2016; Sahu and Asthana, 2022). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Noklak from Tuensang, Epiphytic, 1335m, 1/10/2018, leg. Danish Husain and A. K. Srivastava 321256K (LWG).

Frullania retusa Mitt., J. Proc., Linn Soc. Bot. 5:121 (1861) var. **retusa** Range of Distribution: INDIA [Meghalaya, Mizoram, Nagaland, West Bengal], Bhutan, China, Nepal, Thailand (Singh *et al.*, 2016). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Konya to Tuensang, Epiphytic, 1754m, 30/09/2018, leg. Danish Husain and A. K. Srivastava, 321251A (LWG).

• Family - Lejeuneaceae

Acrolejeunea infuscata (Mitt.) J. Wangbis and Gradst., Bry. Div. Evol. 36 (1): 38 (2014).

Range of Distribution: INDIA [Assam, Himachal Pradesh, Meghalaya, Nagaland, Sikkim, Uttarakhand, West Bengal], Bhutan, China, Myanmar, Nepal, Philippines, Sri Lanka, Taiwan, Thailand (Singh *et al.*, 2016; Sahu and Asthana, 2022). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Biswema Village, Dzukou Valley, on rocks, 1827m, 25/06/2017, leg. Katiyar *et al.*, 306769A, Saramati Hills, Epiphytic, above 2500m, 14/09/2017, leg. Harsh Singh, 306853E, 306882H (LWG).

Acrolejeunea sandvicensis (Gottsche) J. Wang bis and Gradst., J. Wang bis and Gradst., Bry. Div. Evol. 36 (1): 39 (2014). Range of Distribution: INDIA [Assam, Arunachal Pradesh, Himachal Pradesh, Kashmir, Manipur, Nagaland, Sikkim, Tamil Nadu, Uttarakhand], Bhutan, China, Japan, Korea, Laos, Micronesia, Nepal, New Caledonia, Pakistan, Russia, Samoa, Sri Lanka, Taiwan, Thailand, Vietnam (Singh *et al.*, 2016). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, On way to Konya, Tuensang, Epiphytic, 1754m, 30/09/2018, leg. Danish Husain and A. K. Srivastava, 321251D, Noklak from Tuensang, Epiphytic, 1335m, 1/10/2018, leg. Danish Husain and A. K. Srivastava 321256I (LWG).

Cheilolejeunea turgida (Mitt.) W. Ye and R. L. Zhu, J. Bryol. 32(4): 281 (2010).

Range of Distribution: INDIA [Meghalaya, Nagaland, Sikkim, West Bengal]; Bhutan, China, Nepal, Taiwan, Thailand, Vietnam (Singh *et al.*, 2016). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Kiphire, Saramati Hills, Epiphytic, 2500m, 14/09/2017, leg. Harsh Singh, 306875M (LWG).

Lejeunea flava (Sw.) Nees, Naturgesch. Eur. Leberm. 3: 277 (1838).

Range of Distribution: INDIA [Andaman and Nicobar, Assam, Arunachal Pradesh, Himachal Pradesh, Karnataka, Kerala, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tamil Nadu, Tripura, Uttarakhand, West Bengal], Bhutan, Cambodia, China, Galapagos, Fiji, Indonesia, Japan, Korea, Laos, Malaysia, Nepal, New Caledonia, New Zealand, Papua New Guinea, Philippines, Samoa, Singapore, Sri Lanka, Taiwan, Thailand, Vietnam, Africa,

Australia, Europe, Micronesia, North and South America (Singh *et al.*, 2016). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Kiphire, Saramati Hills, Epiphytic, 2500m, 14/09/2017, leg. Harsh Singh, 306859H, 306870E, 306885E, on way Konya, Epiphytic, 1754m, 30/09/2018, leg. Danish Husain and A. K. Srivastava, 321251E, Noklak from Tuensang, Epiphytic, 1499m, 1/10/2018, leg. Danish Husain and A. K. Srivastava 321256G, 321262C (LWG).

***Lejeunea pallide-virens* S. Hatt.** J. Hattori Bot. Lab. 12: 80 (1954). Range of Distribution: INDIA [Kerala, Manipur, Nagaland], China, Japan (Singh *et al.* 2016, Sahu and Asthana 2022). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Kiphire, Saramati Hills, Epiphytic, 2500m, 14/09/2017, leg. Harsh Singh, 306878O, Kiphire, Thanamir, on soil, 2000m, 19/09/2017, leg. Harsh Singh, 306894C, Noklak from Tuensang, Epiphytic, 1499m, 1/10/2018, leg. Danish Husain and A. K. Srivastava, 321262E (LWG).

***Lopholejeunea subfusca* (Nees) Schiffn.,** Bot. Jahrb. Syst. 23: 593 (1897).

Range of Distribution: INDIA [Andaman and Nicobar Is., Arunachal Pradesh, Karnataka, Kerala, Meghalaya, Nagaland, Sikkim, Tamil Nadu, West Bengal], Bangladesh, Bhutan, Cambodia, China, Fiji, Indonesia, Japan, Korea, Malaysia, Nepal, New Caledonia, Papua New Guinea, Philippines, Samoa, Singapore, Sri Lanka, Tahiti, Taiwan, Thailand, Tonga, Vietnam, Africa, Australia, Micronesia, North America (Singh *et al.*, 2016). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Kiphire, Thanamir, Epiphytic, 2000m, 19/09/2017, leg. Harsh Singh, 306890F (LWG).

***Microlejeunea indica* (Udar et Awasthi) Y. M. Wei. and R. L. Zhu,** Phytotaxa 97(2): 63 (2013).

Range of Distribution: Endemic to INDIA [Andaman Island, Nagaland, Sikkim, West Bengal]. (Singh *et al.*, 2016; Sahu and Asthana, 2022). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Noklak from Tuensang, Epiphytic, 1499m, 1/10/2018, leg. Danish Husain and A. K. Srivastava 321262F (LWG).

***Ptychanthus striatus* (Lehm. and Lindenb.) Nees,** Naturgesch. Eur. Leberm. 3: 212 (1838).

Range of Distribution: INDIA [Andaman and Nicobar Island, Arunachal Pradesh, Assam, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tamil Nadu, Uttarakhand, West Bengal], Bhutan, China, Fiji, Indonesia, Japan, Laos, Malaysia, Nepal, New Zealand, Papua New Guinea, Philippines, Samoa, Sri Lanka, Taiwan, Thailand, Vietnam, Africa, Australia (Singh *et al.*, 2016).

Materials examined: INDIA - NORTH EAST• Nagaland, Noklak, Konya Tuensang, Epiphytic, 1754m, 30/09/2018, leg. Danish Husain and A. K. Srivastava 321255D (LWG).

***Spruceanthus semirepandus* (Nees) Verd.,** Ann. Bryol. Suppl. 4: 153 (1934).

Range of Distribution: INDIA [Arunachal Pradesh, Kerala, Meghalaya, Manipur, Nagaland, Sikkim, Tamil Nadu, Uttarakhand, West Bengal], Bhutan, Cambodia, China, Indonesia, Japan, Laos, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Taiwan, Thailand, Vietnam (Singh *et al.*, 2016). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Kiphire,

Saramati Hills, Epiphytic, 2500m, 14/09/2017, leg. Harsh Singh, 306853B, 306855D, 306859D, 306870C, 306878E, 306885C, 306886F, Noklak from Tuensang, Epiphytic, 1499m, 1/10/2018, leg. Danish Husain and A. K. Srivastava, 321262D (LWG).

• *Family - Lepidoziaceae*

***Bazzania himalayana* (Mitt.) Schiffn.,** Oesterr. Bot. Z. 49:132 (1899).

Range of Distribution: INDIA [Manipur, Meghalaya, Nagaland, Sikkim, West Bengal], Bhutan, China, Nepal, Philippines, Thailand (Eshuo and Chaturvedi, 2011; Singh *et al.*, 2016).

Materials examined: INDIA - NORTH EAST• Nagaland, Kiphire, Saramati Hills, Epiphytic, 2500m, 14/09/2017, leg. Harsh Singh, 306854C, 306859F, 306868C, 306878M, 306879E (LWG).

***Bazzania praerupta* (Reinw., Blume et Nees) Trevis.,** Mem. Realest. Lombardo Sci. Ser. 3, Cl. Sci. Mat. 4: 414 (1877).

Range of Distribution: INDIA [Arunachal Pradesh, Kerala, Meghalaya, Manipur, Nagaland, Sikkim, Uttarakhand, West Bengal], Bhutan, China, Hawaii, Japan, Malaysia, Nepal, Philippines, Sri Lanka, Taiwan, Thailand, Vietnam (Eshuo and Chaturvedi, 2011; Singh *et al.*, 2016).

Materials examined: INDIA - NORTH EAST• Nagaland, Kiphire, Saramati Hills, Epiphytic, 2500m, 14/09/2017, leg. Harsh Singh, 306876H (LWG).

***Bazzania sikkimensis* (Steph) Herzog,** Ann. Bryol. 12:78 (1939).

Range of Distribution: INDIA [Arunachal Pradesh, Assam, Madhya Pradesh, Meghalaya, Nagaland, Sikkim, Tamil Nadu, Tripura, Uttarakhand, West Bengal], Bhutan, China, Nepal, Philippines, Thailand (Eshuo and Chaturvedi, 2011; Singh *et al.*, 2016).

Materials examined: INDIA - NORTH EAST• Nagaland, Saramati Hills, Epiphytic, 2500m, 14/09/2017, leg. Harsh Singh, 306857F (LWG).

***Bazzania tridens* (Reinw., Blume et Nees) Trevis.,** Mem. Realest. Lombardo Sci., Ser. 3, Cl. Sci. Mat. 4: 415 (1877).

Range of Distribution: INDIA [Andhra Pradesh, Arunachal Pradesh, Assam, Kerala, Meghalaya, Manipur, Nagaland, Odisha, Sikkim, Tamil Nadu, Tripura, West Bengal], Australia, Bhutan, China, Indonesia, Japan, Korea, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam (Singh *et al.*, 2016; Sahu and Asthana, 2022). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Biswema Village, Dzukou Valley, on soil, 2500m, 13/09/2017, leg. Harsh Singh, 306843A (LWG).

***Lepidozia erosa* Steph.,** Sp. Hepat. 3: 621 (1909).

Range of Distribution: INDIA [Nagaland, West Bengal], Nepal (Singh *et al.* 2016). *New to Nagaland.*

Materials examined: Dzukou Valley, on soil, 2463m, 22/06/2017, leg. Katiyar et al, 306746G (LWG).

***Lepidozia reptans* (L.) Dumort.,** Recueil Observ. Jungerm. 19: (1835).

Range of Distribution: INDIA [Jammu and Kashmir, Manipur, Meghalaya, Nagaland, Sikkim, Tamil Nadu, Uttarakhand, West Bengal], Bhutan, China, Japan, Malaysia, Nepal, Pakistan, Philippines, Russia, Taiwan, Thailand, Europe, North America (Singh *et al.*, 2016). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Kiphire, Saramati Hills, on soil, 2500m, 14/09/2017, leg. Harsh Singh, 306852D, 306856B, 306875N (LWG).

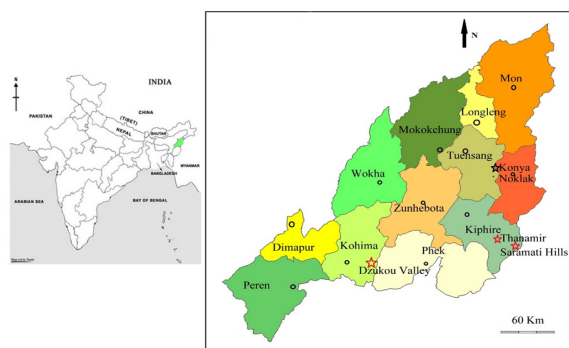


Fig. 1: Distribution of Liverworts and Hornworts in Nagaland

• Family - Lophoziaceae

Plicanthus birmensis (Steph.) R. M. Schust., Nova Hedwigia 74: 486 (2002).

Range of Distribution: INDIA [Kerala, Meghalaya, Nagaland, Tamil Nadu, Uttarakhand, West Bengal], China, Indonesia, Japan, Myanmar, Nepal, Russia, Taiwan, Thailand, Africa (Singh *et al.*, 2016; Sahu and Asthana, 2022). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Saramati Hills, Epiphytic, 2500m, 14/09/2017, leg. Harsh Singh, 306876F, 306878A (LWG).

Plicanthus hirtellus (F. Webber.) R. M. Schust. In Nova Hedwigia 74: 492 (2002).

Range of Distribution: INDIA [Arunachal Pradesh, Manipur, Meghalaya, Nagaland, Sikkim, Uttarakhand, West Bengal], Bhutan, China, Indonesia, Japan, Malaysia, Nepal, Philippines, Sri Lanka, Taiwan, Thailand, Africa, Australia, North America (Singh *et al.*, 2016). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Saramati Hills, on soil, 2500m, 14/09/2017, leg. Harsh Singh, 306856F, 306873E, 306875B (LWG).

Tritomeria exsecta (Schmid ex Schrad.) Schiffn. ex Loeske, Hedwigia 49: 13 (1909).

Range of Distribution: INDIA [Arunachal Pradesh, Nagaland, Sikkim, Uttarakhand, West Bengal], Bhutan, China, Japan, Malaysia, Nepal, Russia, Taiwan, Africa, Europe, North America (Singh *et al.*, 2016). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Dzukou Valley, on soil, 2463m, 22/06/2017, leg. Katiyar *et al.*, 306744I, 306755E (LWG).

• Family - Metzgeriaceae

Metzgeria consanguinea Schiffn., Nova Acta Acad. Caes. Leop. Carol. German. Nat. Cur. 60: 271 (1893).

Range of Distribution: INDIA [Arunachal Pradesh, Himachal Pradesh, Nagaland, Sikkim, Tamil Nadu, West Bengal], Bhutan, China, Indonesia, Japan, Papua New Guinea, Philippines, Sri Lanka, Africa, Australia, South America (Singh *et al.*, 2016; Sahu and Asthana, 2022). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Kiphire, Saramati Hills, Epiphytic, 2500m, 14/09/2017, leg. Harsh Singh, 306863D (LWG).

Metzgeria pubescens (Schrank) Raddi., Jungermannioogr. Etrusca 46 (1818).

Range of Distribution: INDIA [Arunachal Pradesh, Himachal

Pradesh, Kashmir, Manipur, Nagaland, Sikkim, Tamil Nadu, Uttarakhand, West Bengal] Bhutan, China, Hawaii, Indonesia, Japan, Korea, Malaysia, Nepal, Philippines, Russia, Taiwan, Thailand, Turkey, Europe, North America, South America (Singh *et al.*, 2016). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Dzukou Valley, on soil, 2463m, 22/06/2017, leg. Katiyar *et al.*, 306741K (LWG).

• Family - Plagiochilaceae

Plagiochila arunachalensis S. Majumdar and D. K. Singh, NeBio 6(4): 8 (2015).

Range of Distribution: Endemic to INDIA [Arunachal Pradesh, Nagaland]. (Singh *et al.*, 2016). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Kiphire, Saramati Hills, Epiphytic, 2500m, 14/09/2017, leg. Harsh Singh, 306854G, 306868F (LWG).

Plagiochila chinensis Steph., Mem. Soc. Nat. Sci. Math Cherbourg 29: 223 (1894).

Range of Distribution: INDIA [Kerala, Nagaland, Uttarakhand, West Bengal], Bhutan, China, Nepal, Pakistan, Taiwan, Thailand (Singh *et al.*, 2016). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Kiphire, Saramati Hills, 2500m, rock, 14/09/2017, leg. Harsh Singh, 306886E (LWG).

Plagiochila corticola Steph. Mem. Soc. Nat. Sci. Math Cherbourg 29: 224 (1894).

Range of Distribution: INDIA [Arunachal Pradesh, Nagaland, Sikkim, West Bengal], Bhutan, China, Nepal (Singh *et al.*, 2016). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Dzukou Valley, rock, 2686m, 22/06/2017, leg. Katiyar *et al.*, 306756G (LWG).

Plagiochila fruticosa Mitt., J. Proc. Linn. Soc. Bot. 5: 94 (1861).

Range of Distribution: INDIA [Kerala, Karnataka, Meghalaya, Nagaland, Sikkim, Tamil Nadu, Uttarakhand, West Bengal], Bhutan, China, Japan, Nepal, Taiwan, Thailand (Singh *et al.*, 2016). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Kiphire, Saramati Hills, rock, 2500m, 14/09/2017, leg. Harsh Singh, 306854F (LWG).

Plagiochila gracilis Lindenb. ex Gottsche, in Gottsche and al. Syn. Hepat. 632 (1847).

Range of Distribution: INDIA [Arunachal Pradesh, Himachal Pradesh, Meghalaya, Nagaland, Sikkim, Tamil Nadu, Uttarakhand, West Bengal], Bhutan, China, Japan, Korea, Nepal, Philippines, Sri Lanka, Taiwan, Thailand (Singh *et al.*, 2016). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Kiphire, Saramati Hills, rock, 2500m, 14/09/2017, leg. Harsh Singh, 306854E (LWG).

Plagiochila grollei Inoue, Bull. Natl. Sci. Mus., n. s. 8: 384 (1965).

Range of Distribution: INDIA [Assam, Nagaland, West Bengal], Bhutan, China, Nepal, Vietnam (Singh *et al.*, 2016). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Kiphire, Saramati Hills, Epiphytic, 2500m, 14/09/2017, leg. Harsh Singh, 306876C (LWG).

Plagiochila nepalensis Lindenb., Sp. Hepat. 93 (1840).

Range of Distribution: INDIA [Andhra Pradesh, Arunachal

Pradesh, Himachal Pradesh, Karnataka, Kerala, Manipur, Meghalaya, Nagaland, Sikkim, Tamil Nadu, Tripura, Uttarakhand, West Bengal], Bhutan, China, Japan, Myanmar, Nepal, Philippines, Taiwan, Thailand, Vietnam (Singh *et al.*, 2016; Sahu and Asthana 2022). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Kiphire, Saramati Hills, Epiphytic, 2500m, 14/09/2017, leg. Harsh Singh, 306878L (LWG).

***Plagiochila parvifolia* Lindenb.**, Sp. Hepat. 28 (1839).

Range of Distribution: INDIA [Assam, Himachal Pradesh, Kashmir, Kerala, Meghalaya, Manipur, Nagaland, Sikkim, Uttarakhand, West Bengal], Bangladesh, Bhutan, China, Indonesia, Japan, Korea, Myanmar, Nepal, Papua New Guinea, Philippines, Sri Lanka, Taiwan, Thailand, Vietnam, North America (Singh *et al.*, 2016). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Konya to Tuensang, on soil, 1976m, 30/09/2018, leg. Danish Husain and A.K. Srivastava, 321243A (LWG).

***Plagiochila sciophila* Nees ex Lindenb.**, Sp. Hepat. 100 (1840).

Range of Distribution: INDIA [Andaman and Nicobar Island, Arunachal Pradesh, Himachal Pradesh, Kerala, Meghalaya, Manipur, Nagaland, Sikkim, West Bengal, Tamil Nadu, Uttarakhand], Bhutan, China, Indonesia, Japan, Korea, Malaysia, Nepal, Pakistan, Papua New Guinea, Philippines, Samoa, Sri Lanka, Taiwan, Thailand, Vietnam, Australia (Singh *et al.*, 2016). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Dzukou Valley, on soil, 2463m, 22/06/2017, leg. Katiyar *et al.*, 306741N (LWG).

***Plagiochila secretifolia* Mitt.**, J. Proc. Linn. Soc. Bot. 5: 98 (1861).

Range of Distribution: INDIA [Nagaland, Sikkim, West Bengal], Bhutan, China, Nepal, Taiwan, Thailand, Vietnam (Singh *et al.*, 2016). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Kiphire, Saramati Hills, on soil, 2500m, 14/09/2017, leg. Harsh Singh, 306852J, 306882F (LWG).

***Plagiochila semidecurrens* (Lehm. et Lindenb) Lindenb.**, Sp. Hepat. 142 (1843).

Range of Distribution: INDIA [Arunachal Pradesh, Kerala, Karnataka, Meghalaya, Nagaland, Sikkim, Tamil Nadu, Uttarakhand West Bengal], Bhutan, China, Indonesia, Japan, Korea, Nepal, Papua New Guinea, Philippines, Taiwan, Thailand, Vietnam, North America (Singh *et al.*, 2016; Sahu and Asthana 2022). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Dzukou Valley, on rocks, 2686m, 22/06/2017, leg. Katiyar *et al.*, 306756E, Kiphire, Saramati Hills, Epiphytic, 2500m, 14/09/2017, leg. Harsh Singh, 306853D, 306855C, 306857H, 306862C, 306865C, 306868D, 306872B, 306873G, 306875F, 306876D, 306878D, 306870H (LWG).

***Plagiochila subtropica* Stephani**, Bull. Soc. Roy. Bot. Belgique 38: 46 (1899) and Sp. Hepat 2: 360 (1903).

Range of Distribution: INDIA [Arunachal Pradesh, Karnataka, Meghalaya, Nagaland, Sikkim, Tamil Nadu West Bengal], Bhutan, China, Nepal, Thailand (Singh *et al.*, 2016). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Kiphire, Saramati Hills, Epiphytic, 2500m, 14/09/2017, leg. Harsh Singh, 306875G (LWG).

***Plagiochila trabeculata* Stephani**, Bull. Herb. Boissier, Ser. 2, 3: 103 (1903) and Sp. Hepat. 2:283 (1903).

Range of Distribution: INDIA [Meghalaya, Nagaland, Tripura], China, Indonesia, Japan, Nepal, Philippines, Thailand (Singh *et al.*, 2016). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Dzukou Valley, on rocks, 2686m, 22/06/2017, leg. Katiyar *et al.*, 306756F, Kiphire, Saramati Hills, Epiphytic, 2500m, 14/09/2017, leg. Harsh Singh, 306868E, 306878K (LWG).

***Plagiochila vexans* Schiffner ex Stephani**, Sp. Hepat. 6: 237 (1921).

Range of Distribution: INDIA [Nagaland, Sikkim, West Bengal], Bhutan, China, Japan, Nepal, Taiwan (Singh *et al.*, 2016). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Dzukou Valley, on rocks, 2686m, 22/06/2017, leg. Katiyar *et al.*, 306763B (LWG).

• *Family - Porellaceae*

Porella caespitans* (Steph.) S. Hatt.**, J. Hattori Bot. Lab. 33: 57 (1970). var. ***caespitans

Range of Distribution: INDIA [Himachal Pradesh, Kashmir, Kerala, Nagaland, Uttarakhand], Bhutan, China, Nepal, Russia, Taiwan (Singh *et al.*, 2016; Gupta *et al.*, 2018).

Materials examined: INDIA - NORTH EAST• Nagaland, Dzukou Valley, on rocks, 2686m, 22/06/2017, leg. Katiyar *et al.*, 306756J (LWG).

***Porella campylophylla* (Lehm. and Lindenb.) Trevis.**, Mem. Reale Ist. Lombardo Sci. Ser.3 Cl. Sci. Mat. 4: 408 (1877) var.

campylophylla

Range of Distribution: INDIA [Arunachal Pradesh, Himachal Pradesh, Kashmir, Kerala, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tamil Nadu, Tripura, Uttarakhand, West Bengal], Bhutan, China, Myanmar, Nepal, Thailand (Singh *et al.*, 2016). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Kiphire, Saramati Hills, Epiphytic, 2500m, 14/09/2017, leg. Harsh Singh, 306874B (LWG).

***Porella obtusata* (Taylor) Trevis var. *macroloba* (Steph.) S. Hatt. and Zang.**, J. Jap. Bot. 60: 325 (1985).

Range of Distribution: INDIA [Himachal Pradesh, Jammu and Kashmir, Nagaland, Uttarakhand], China, Japan, Taiwan (Singh *et al.*, 2016; Gupta *et al.*, 2018).

Materials examined: INDIA - NORTH EAST• Nagaland, Dzukou Valley, on soil, 2463m, 22/06/2017, leg. Katiyar *et al.*, 306741M (LWG).

• *Family - Radulaceae*

***Radula obscura* Mitt.**, J. Proc. Linn. Soc. Bot. 5: 107 (1861).

Range of Distribution: INDIA [Arunachal Pradesh, Assam, Himachal Pradesh, Meghalaya, Nagaland, Sikkim, Tamil Nadu, Uttarakhand, West Bengal], China, Malaysia, Nepal, Philippines, Taiwan, Thailand (Singh *et al.*, 2016; Sahu and Asthana 2022).

Materials examined: INDIA - NORTH EAST• Nagaland, Kiphire, Saramati Hills, Epiphytic, 2500m, 14/09/2017, leg. Harsh Singh, 306856H, 306859E (LWG).

• *Family - Scapaniaceae*

***Scapania ciliata* Sande Lac.**, Ann. Mus. Bot. Lugduno-Batavi 3: 209 (1867).

Table 1: Nagaland Liverworts and Hornworts

S. N.	Families	Genus	Species
<i>Liverworts (Marchantiophyta)</i>			
1	Allisoniaceae	1	1
2	Aneuraceae	1	2
3	Aytoniaceae	1	2
4	Calypogeiaceae	2	3
5	Cephaloziaceae	2	2
6	Delaveyellaceae	1	1
7	Geocalyceae	1	1
8	Herbertaceae	1	3
9	Jubulaceae	1	5
10	Lejeuneaceae	7	9
11	Lepidoziaceae	2	6
12	Lophoziaceae	2	3
13	Metzgeriaceae	1	2
14	Plagiochilaceae	1	14
15	Porellaceae	1	3
16	Radulaceae	1	1
17	Scapaniaceae	1	2
18	Targioniaceae	1	1
<i>Hornworts (Anthocerotophyta)</i>			
19	Anthocerotaceae	1	1
20	Notothylaceae	1	2

Range of Distribution: INDIA [Nagaland, Sikkim, West Bengal], Bhutan, China, Japan, Korea, Nepal, Russia, Taiwan (Singh *et al.*, 2016). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Dzukou Valley, On rocks, 2463m, 22/06/2017, leg. Katiyar *et al.*, 306755B, Kiphire, Saramati Hills, Epiphytic, 2500m, 14/09/2017, leg. Harsh Singh, 306852E, 36856A, 306873H, 306875J, 306876A (LWG).

Scapania griffithii Schifff., Oesterr. Bot. Z. 49: 204 (1899).

Range of Distribution: INDIA [Arunachal Pradesh, Himachal Pradesh, Meghalaya, Nagaland, Sikkim, Uttarakhand, West Bengal], Bhutan, China, Nepal, Philippines, Taiwan (Eshuo *et al.*, 2012; Singh *et al.* 2016).

Materials examined: INDIA - NORTH EAST• Nagaland, Dzukou Valley, on rocks, 2686m, 22/06/2017, leg. Katiyar *et al.*, 306755F, 306756H, 306757I (LWG).

• Family - Targioniaceae

Targionia hypophylla L., Sp. Pl. 1136 (1753).

Range of Distribution: INDIA [Andhra Pradesh, Arunachal Pradesh, Assam, Gujarat, Himachal Pradesh, Jammu and Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Odisha, Rajasthan, Sikkim, Tamil Nadu, Uttarakhand, West Bengal], Afghanistan, Bhutan, China, Hawaii, Iran, Japan, Korea, Nepal, New Zealand, Pakistan, Papua New Guinea, Sri Lanka, Russia, Taiwan, Thailand, Turkey, Yemen, Africa, Australia, Europe, Micronesia, North America, South America (Singh *et al.*, 2016; Sahu and Asthana, 2022). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Dzukou Valley, Biswema Village, on soil, 2686m, 306741b, 306747D,

306748E, 306754B, 306759A, 306761F, Dzukou Valley, on soil covered rock, 2463m, 25/06/2017, leg. Katiyar *et al.*, 306773A (LWG).

Anthocerotophyta

• Family - Anthocerotaceae

Anthoceros bharadawajii Udar *et A. K. Asthana*, Proc. Indian Natl. Sci. Acad., B 51: 484 (1985).

Range of Distribution: INDIA [Arunachal Pradesh, Gujarat, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Nagaland, Rajasthan, Sikkim, Tamil Nadu, Uttarakhand, West Bengal]. (Singh *et al.*, 2016)

Materials examined: INDIA - NORTH EAST• Nagaland, Kiphire, Saramati Hills, on rock, 2500m, 14/09/2017, leg. Harsh Singh, 306879D (LWG).

Family - Notothyladaceae

Phaeoceros carolinianus (Michx) Prosk., Bull. Torrey Bot. Club. 78: 347 (1951).

Range of Distribution: INDIA [Arunachal Pradesh, Himachal Pradesh, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Nagaland, Odisha, Punjab, Rajasthan, Sikkim, Tamil Nadu, Uttar Pradesh, Uttarakhand, West Bengal], Bhutan, China, Fiji, Hawaii, Indonesia, Japan, Korea, Malaysia, Myanmar, Nepal, New Caledonia, New Zealand, Papua New Guinea, Philippines, Russia, Sri Lanka, Russia, Thailand, Yemen, Africa, Australia, Europe, Macaronesia, North America, South America (Singh *et al.* 2016). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Kiphire, Saramati Hills, on soil, 2500m, 14/09/2017, leg. Harsh Singh, 306880B, Mokukchung to Tuensang, on soil, 2084m, 2/10/2018, leg. Danish Husain and A. K. Srivastava, 321266D (LWG).

Phaeoceros himalayensis (Kashyap) Prosk. *ex Bapna and C. G. Vyas*, J. Hattori Bot. Lab. 25: 88 (1962).

Range of Distribution: INDIA [Arunachal Pradesh, Himachal Pradesh, Jammu and Kashmir, Madhya Pradesh, Maharashtra, Meghalaya, Nagaland, Rajasthan, Tamil Nadu, Uttarakhand, West Bengal], Nepal, Pakistan, Thailand (Singh *et al.*, 2016). *New to Nagaland.*

Materials examined: INDIA - NORTH EAST• Nagaland, Konya Tuensang, on soil, 1976m, 30/09/2018, leg. Danish Husain and A. K. Srivastava, 321248B (LWG).

The present study revealed the occurrence of 61 taxa of liverworts (28 genera, 18 families) and 3 species of hornworts (22 genera, 2 families) from Nagaland (Table 1).

CONCLUSION

The present study reveals *Cephaloziella herzogiana* (Pande and Srivastava) Udar and Kumar is a new addition to Himalaya, *Porella caespitans* (Steph.) S. Hatt. var. *caespitans* is new to North East, while 44 taxa have been reported first time from Nagaland. Family Plagiochilaceae with 14 species was the largest family followed by Lejeuneaceae with 9 species. Genus *Plagiochila* has the maximum number of species (14) followed by *Frullania* (5). Three Indian endemic species (*Cephalozia kasyapii*, *Microlejeunea indica*, *Plagiochila arunachalensis*) are also reported from the state. In terms of habitat, corticolous liverworts are dominant as compared to terricolous and saxicolous species.

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AUTHOR'S CONTRIBUTION

Vinay Sahu: Identification, Manuscript preparation, A. K. Asthana: manuscript editing and review, Guarantor for plant identification, K. K. Rawat: Identification of liverworts especially *Plagiochila* species, manuscript editing.

CONFLICT OF INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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