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10.11609/jott.2025.17.11.27787-28010

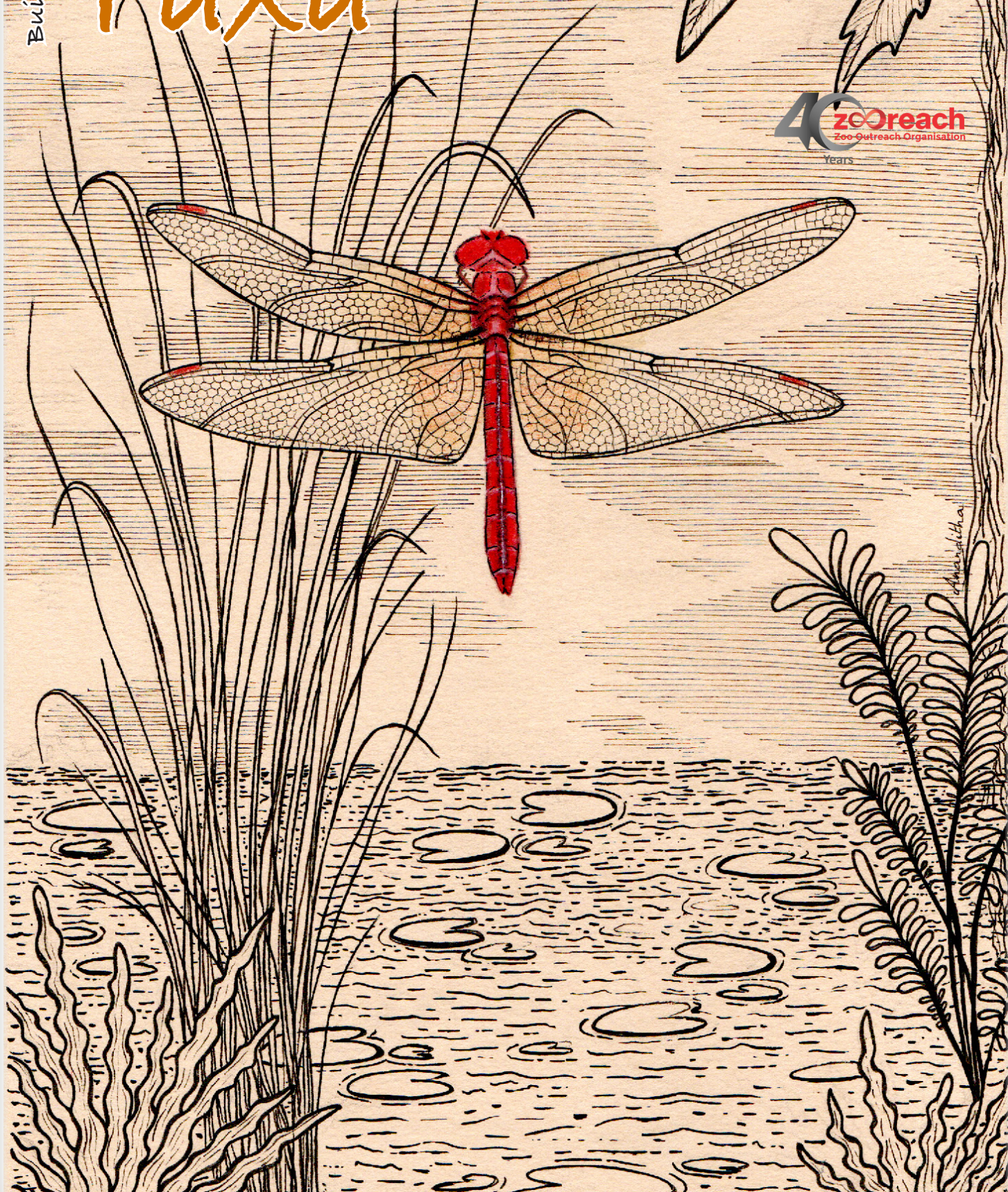
www.threatenedtaxa.org

26 November 2025 (Online & Print)

17(11): 27787-28010

ISSN 0974-7907 (Online)

ISSN 0974-7893 (Print)





ISSN 0974-7907 (Online); ISSN 0974-7893 (Print)

Publisher
Wildlife Information Liaison Development Society
www.wild.zooreach.org

Host
Zoo Outreach Organization
www.zooreach.org

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continued on the back inside cover

Cover: A male Scarlet Skimmer perching on vegetation by the banks of a waterbody. Ink and watercolour illustration by Ananditha Pascal.



Morpho-taxonomic studies on the genus *Fissidens* Hedw. (Bryophyta: Fissidentaceae) in Senapati District, Manipur, India

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Abstract: The present study on the moss flora of Senapati District, Manipur, revealed 11 species of the genus *Fissidens*: *F. anomalus* Mont., *F. bryoides* Hedw., *F. crenulatus* Mitt., *F. ceylonensis* Dozy & Molk., *F. crispulus* var. *robinsonii* (Broth.) Z.Iwats. & Z.H.Li, *F. diversifolius* Mitt., *F. elongatus* Mitt., *F. ganguleei* Nork., *F. nobilis* Griff., *F. pulchellus* Mitt., and *F. viridulus* (Sw.) Wahlenb., belonging to the family Fissidentaceae (Bryophyta). Of these, six species—*F. crenulatus*, *F. crispulus* var. *robinsonii*, *F. diversifolius*, *F. elongatus*, *F. pulchellus*, and *F. viridulus*—were reported for the first time from the state of Manipur, northeastern India. Detailed morpho-taxonomic description, colour photomicrographs, and an artificial key were provided for easy identification.

Keywords: Costa, dentation, diversity, leaf border, limbidium, morphology, moss flora, new addition, northeastern India, peristome.

Maola: Senapati District, Manipur leino ezhovu shiipa hrii vano modo ye kopho lino *Fissidens* otta chiirakalio (11) phahiko neloe, siikhrumai ozhu khrosii, *F. anomalus* Mont., *F. bryoides* Hedw., *F. crenulatus* Mitt., *F. ceylonensis* Dozy & Molk., *F. diversifolius* Mitt., *F. elongatus* Mitt., *F. ganguleei* Nork., *F. nobilis* Griff., *F. pulchellus* Mitt., *F. crispulus* var. *robinsonii* (Broth.) Z.Iwats & Z.H.Li, ye *F. viridulus* (Sw.) Wahlenb. khruhi koe. Hi thopfihi Fissidentaceae tikocho family lihi bue. *Fissidens* chiirakalio (11) hilino otta choro (6) phahi India arii chiipra, Manipur state jiha li-a kariso mosiiprawe. Siikhrumei ozhu sii *F. crenulatus*, *F. diversifolius*, *F. elongatus*, *F. pulchellus*, *F. crispulus* var. *robinsonii* ye *F. viridulus* hikhu hie. Shiipa khromeihi siimakriilo koru duno kohrii okhrezhie khru, ozho kalar photomicrographs ea otta kozhiipra kahi, hivano molowo siimakriilo koru moshu mozii khruhia akhrupie riitho hitheo.

Editor: D.K. Singh, Botanical Survey of India, Lucknow, India.

Date of publication: 26 November 2025 (online & print)

Citation: Kaini, K. & K. Eshuo (2025). Morpho-taxonomic studies on the genus *Fissidens* Hedw. (Bryophyta: Fissidentaceae) in Senapati District, Manipur, India. *Journal of Threatened Taxa* 17(11): 27787–27796. <https://doi.org/10.11609/jott.9871.17.11.27787-27796>

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Funding: None.

Competing interests: The authors declare no competing interests.

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Author contributions: KK: Carried out the field surveys, specimen collection, photography, preservation, visualisation, deposition of herbarium specimens and drafted the manuscript. KE: Conceptualised the study design, helps in the identification of specimens, photo plate preparation, supervises the research work and revision of the manuscript. Both authors read and agreed to the final manuscript.

Acknowledgements: The authors express gratitude to the Department of Botany, Dhanamanjuri University, for providing research programs and facilities that enabled the success of this paper. KK conveys profound gratitude to the National Fellowship Scheme for ST (NFST) student, bearing Award No. 202324-NFST-MAN-00919, Ministry of Tribal Affairs, Government of India, for the financial assistance provided, which was instrumental in supporting this research undertaking. The authors would like to thank Mr. Kholi Adahrii for the invaluable encouragement and assistance throughout the field.



INTRODUCTION

The taxonomic classification of the family Fissidentaceae has experienced multiple paradigmatic shifts over the years and its infrageneric classification has been attempted by many bryologists like Brotherus (1901, 1924), Norkett (1969), Bruggeman-Nannenga (1978), Pursell (1988), Pursell & Bruggeman-Nannenga (2004), Suzuki & Iwatsuki (2007), and Suzuki et al. (2018). The most accepted classification given by Pursell & Bruggeman-Nannenga (2004) recognized four subgenera—*Aloma* Kindb., *Fissidens* Hedw., *Octodicerus* (Brid.) Broth., and *Pachyfissidens* (Müll.Hal.) Kindb.—based on taxonomically important characters like peristome type, costa type, and number of files of exothelial cells. The most recent classification given by Suzuki et al. (2018) was based on combined molecular and morphological evidence, and they recognized three subgenera—*Fissidens*, *Neoamblyothallia* (Broth.) Tad.Suzuki & Z.Iwats., and *Pachyfissidens*. This refined taxonomical classification was supported by an intricate analysis of gametophyte morphology, the detailed structural composition of peristome dentition, and cytotaxonomic evidence with a focus on reproductive traits.

Manipur, known for its stunning landscapes and vibrant cultural heritage, is situated in the northeastern part of India and lies between 23.830°–25.681° N and 93.051°–94.780° E, having a geographical area of 22,327 km². The state epitomizes ecological diversity and biological richness, marked by the juxtaposition of its rugged peripheral hill ranges and expansive inner plains. Despite being known for its ecological wealth, there still remains a notable paucity of research dedicated to bryophytes of the state. Earlier research on bryophytes of Manipur was done by Biswas & Calder (1936), Deb (1954), Lal (1979), Singh & Kishor (2009), Singh et al. (2010), Govindaparyi et al. (2012), Govindaparyi (2014), Devi et al. (2019), and Asthana et al. (2021). Senapati District is situated in the northern side of Manipur and is characterized by its striking topographical contrasts, featuring rugged hills that tower over narrow, low valleys. This dynamic landscape fosters a diverse ecosystem, where the intertwining terrains create habitats teeming with ecological richness and natural beauty. The exploration of lower plant flora remains in its nascent stage, largely hindered by the challenging, rugged terrain of most areas, rendering them inaccessible to researchers and significantly limiting comprehensive studies.

The present morpho-taxonomic investigation on the genus *Fissidens* Hedw. (Fissidentaceae) of Senapati District, Manipur revealed the occurrence of 11 species—*F. anomalus* Mont., *F. bryoides* Hedw., *F. crenulatus* Mitt., *F. ceylonensis* Dozy & Molk., *F. crispulus* var. *robinsonii* (Broth.) Z.Iwats. & Z.H.Li, *F. diversifolius* Mitt., *F. elongatus* Mitt., *F. ganguleei* Nork., *F. nobilis* Griff., *F. pulchellus* Mitt., and *F. viridulus* (Sw.) Wahlenb. Review of available literature like Gangulee (1971), Nath et al. (2011), Asthana & Srivastava (2015), Manjula & Manju (2020), Sreenath & Rao (2020), revealed that six species—*F. crenulatus*, *F. crispulus* var. *robinsonii*, *F. diversifolius*, *F. elongatus*, *F. pulchellus*, and *F. viridulus*, were found to be new additions to the moss flora of Manipur. Detailed taxonomic description, colour photomicrographs, and an artificial key are provided for easy identification.

MATERIALS AND METHODS

The plant specimens were collected from various localities in Senapati District. The collected specimens were kept temporarily in zip-locked polythene bags for morphological and anatomical studies. Dried specimens were soaked in water for 2–5 min to stretch out the plant body fully, and morphological characters were observed under Hoverlabs Stereozoom microscope (HV-ZOOM-IV TR); macro-photographs and micro-photographs were taken from Hoverlabs trinocular microscope along with image viewing and processing software called 'Image View' to measure object sizes. The air-dried moss specimens were preserved in a standard herbarium packet (6×4 in) of brown paper. The specimens were deposited in the cryptogamic herbarium of Dhanamanjuri University (DMH), Manipur, for future reference.

1. *Fissidens anomalus* Mont., Ann. Sci. Nat. Bot. Ser. 2, 17: 252. 1842; Gangulee, Mosses E. India Fasc. 2: 555. 1971. (Image 1a–f)

Plant small, light green in fresh and brownish-green when dry, branched, up to 3.5 cm long and 0.5 cm wide. Leaves in 17–20 pairs, 3.0–3.5 mm long, 0.5–0.7 mm wide, broader at base; upper leaves larger than the lower, ligulate, apex acute, dorsal lamina short decurrent; sheathing lamina unequal or open sheathing covering 1/2 of the leaf, margin crenulate-dentate at the apical area with differentiated border. Leaf cells, quadrate hexagonal, at apical area, 6–10 × 2–8 µm, median cell, 3–9 × 4–9 µm and basal cell 10–28 × 5–12 µm. Costa is gradually diminishing below the tip.

Taxonomic treatment

Key to the species of *Fissidens* of Senapati District, Manipur

- 1a. Limbidium present 2
 1b. Limbidium absent 6
 2a. Limbidium entirely present on all lamina 3
 2b. Limbidium limited to specific lamina 4
 3a. Nerve ending below apex *F. viridulus*
 3b. Nerve percurrent or excurrent *F. bryoides*
 4a. Semi-limbidium on sheathing lamini; lamina cells smooth *F. diversifolius*
 4b. Semi-limbidium on leaf lamini; lamina cells papillate 5
 5a. Leaf cells with single mamillate or coarse papillae *F. crenulatus*
 5b. Leaf cells multi papillate *F. ceylonensis*
 6a. Leaf margin crenulate or denticulate 7
 6b. Leaf margin having differentiated border 9
 7a. Leaf cells round and smooth *F. gangulee*
 7b. Leaf cells papillose 8
 8a. Leaf cells rounded hexagonal with one conical papilla on each cell *F. crispulus* var. *robinsonii*
 8b. Leaf cells quadrate hexagonal with one or two conical papilla on each cell *F. pulchellus*
 9a. Leaf lanceolate, margin regularly toothed *F. elongatus*
 9b. Leaf ligulate, margin irregularly toothed 10
 10a. Leaves 17-20 pairs, sheathing lamini 1/2 and unequal, leaf curled towards stem when dried ... *F. anomalous*
 10b. Leaves 15 pairs, sheathing lamini 1/3 and unequal, leaf not much curled when dried *F. nobilis*

Habitat: Plants found growing as corticolous or epiphyllous together with other mosses.

Range: China, India, Indonesia, Myanmar, Philippines, Thailand, and Vietnam.

Distribution in India: Kerala, Madhya Pradesh, Manipur (present report), Meghalaya, Sikkim, Tamil Nadu, Uttarakhand, and West Bengal.

Specimen examined: India: Manipur, Senapati District, Liyai Khullen Village, 1800 m, 17.ix.2024, K.K00329.

2. *Fissidens bryoides* Hedw., Sp. Musc. Frond. 153. 1801; Gangulee, Mosses E. India Fasc. 2: 469. 1971. (Image 1g–k)

Plant small, dark green to brownish-green, not much curled up when dry, branched in some older parts, up to 4.0–4.5 mm long, 2.1–2.5 mm broad with leaves. Rhizoids present on the base of the stems. Leaves in 7–8 pairs, 1.0–1.5 mm long, 0.3–0.4 mm wide, acute to cuspidate, sometimes acuminate, oblong ligulate; uniformly wide from its base to the apex, narrows into a tapering point at the apex; costa strong, mostly percurrent to shortly excurrent, light yellowish-brown, diminishing below the tip, margin limbate, serrulate to denticulate at leaf apices, lamini rather equal or closed sheathing covering 1/2 of the leaf length. Limbidium present entirely, one to two cell-layered on the dorsal lamina; two to four cell-

layered on the sheathing lamina; leaf cells smooth, cells around the costa are slightly larger.

Habitat: Plants found growing on rocks (saxicolous), in shaded and moist places in close association with liverworts like *Cephalozia* sp.

Range: Africa, Brazil, Canada, Chile, China, Costa Rica, Greenland, Hawaii Island, India, Indonesia, Iraq, Japan, Libya, Mexico, Mongolia, Philippines, Sri Lanka, and United States.

Distribution in India: Andhra Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Maharashtra, Manipur, Meghalaya, Odisha, Rajasthan, Tamil Nadu, Uttarakhand, and West Bengal.

Specimen examined: India: Manipur, Senapati District, Pudunamai Village, 1600–1800 m, 16.ix.2024, K.K00285.

3. *Fissidens crenulatus* Mitt., J. Proc. Linn. Soc., Bot., Suppl. 1(2): 140. 1859; Gangulee, Mosses E. India Fasc. 2:504. 1971. (Images 1l–p)

Plant small, monoicous, stems reddish-brown, curled up when dry, fertile shoots 4.5–5.0 mm long and 0.6–0.8 mm wide with leaves. Leaves 8–9 pairs, 0.9–1 mm long, 0.3–0.4 mm wide, oblong-ligulate to oblong lanceolate, wider near base, apex acute, margins serrulate; sheathing lamina 3/4 of the leaf length, equal

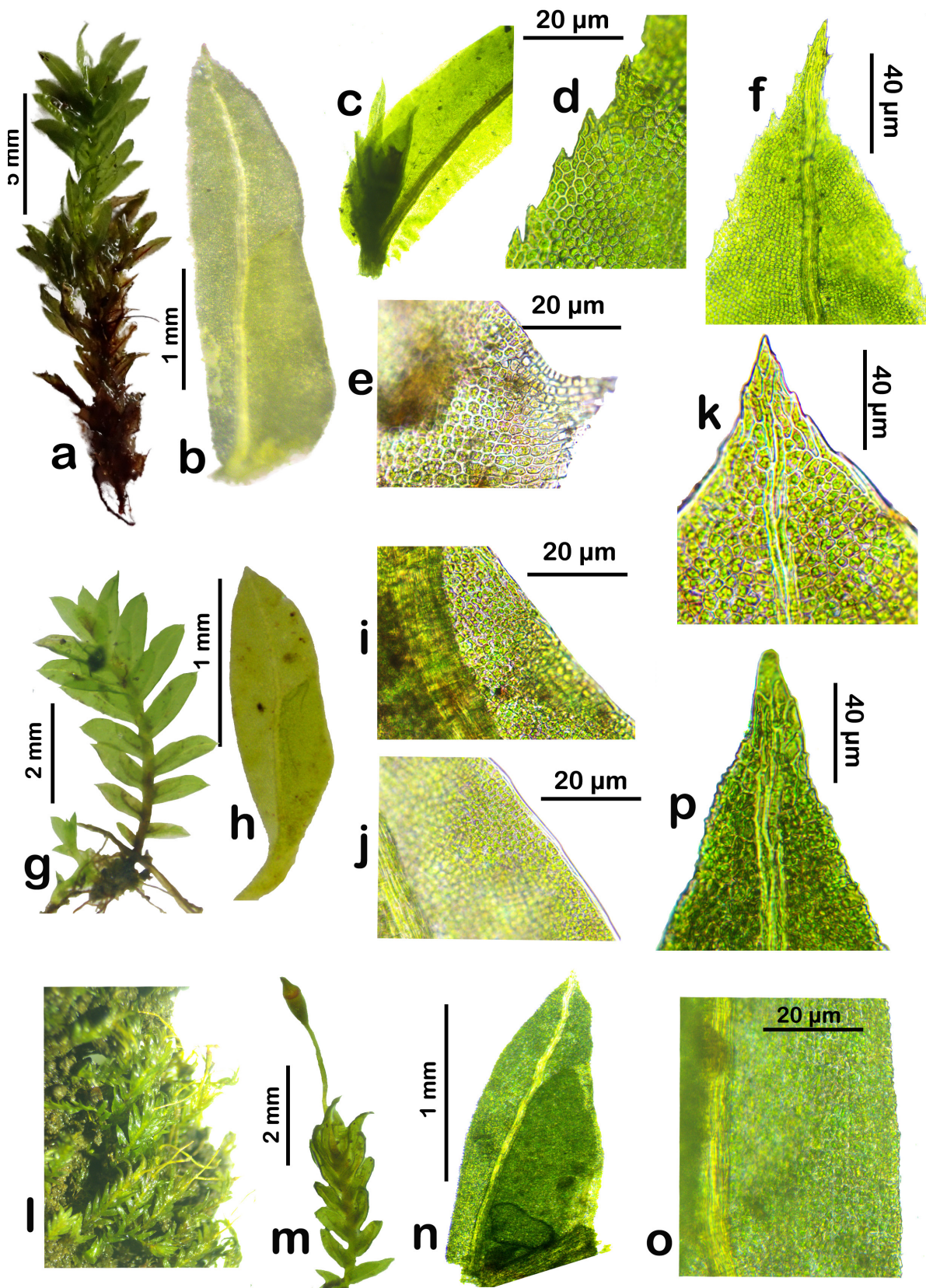


Image 1. *Fissidens anomalus* Mont. (a–f): a—plant body | b—leaf | c—leaf base | d—leaf marginal cells | e—leaf basal cells | f—leaf apex. *Fissidens bryoides* Hedw. (g–k): g—plant body | h—Leaf | i—leaf basal cells | j—leaf marginal cells | k—leaf apex. *Fissidens crenulatus* Mitt. (l–p): l—habitat photo | m—plant body | n—leaf | o—leaf marginal cells | p—leaf apex. © Kholi Kaini.

in mature leaves; leaf cells mamilllose. Costa excurrent, light brown, wider at the base. Semi-limbium ends below the apex in some leaves, smooth, simple, in two rows, sheathing lamina completely bordered, cells cartilaginous, in a single row in the apical part, in three rows at the basal area.

Habitat: The plants found growing on moist soil in shaded trails in association with other mosses.

Range: China, India, Indonesia, Japan, Malaysia, Myanmar, Nepal, New Guinea, Philippines, and Vietnam.

Distribution in India: Andhra Pradesh, Assam, Karnataka, Kerala, Manipur – present report, Meghalaya, Odisha, Tamil Nadu, Uttar Pradesh, and West Bengal.

Specimen examined: India: Manipur, Senapati District, Ekhra (Tadubi), 1625–1650 m, 16.ix.2024, K.K00281.

4. *Fissidens ceylonensis* Dozy & Molk., Musc. Frond. Archip. Ind. 7. 1844; Gangulee, Mosses E. India Fasc. 2:511. 1971. (Image 2a–f)

Plants are small, terrestrial, yellowish-green, leaves folded and curled, pressed to the stem when dry, stems rust-like, fertile shoots 2.5–4.0 mm long, 0.6–0.9 mm wide with leaves. Leaves in 6–8 pairs, oblong-lanceolate, 0.8–0.9 mm long, 0.2–0.3 mm wide, broadest at base, apiculate from a broad base, apex acute to widely acute; sheathing lamina mostly equal. Semi-limbium is poorly developed, in 1–3 rows, absent, or reduced in sterile plants. Costa percurrent, ending just below the leaf tip. Seta, bent abruptly or erect, brown, 3–5 mm long. Capsule, erect, ovoid, brown, 0.6 mm long and 0.3 mm wide. Spores, green to translucent, 7.2–11.3 µm in diameter.

Habitat: The plants are found growing on soil in shaded, steep banks in association with liverworts.

Range: India, Indonesia, Malaysia, Nepal, New Zealand, Philippines, Thailand, and Vietnam

Distribution in India: Andhra Pradesh, Assam, Bihar, Kerala, Madhya Pradesh, Manipur (present report), Odisha, Sikkim, Tamil Nadu, Uttarakhand, Uttar Pradesh, and West Bengal

Specimen examined: India: Manipur, Senapati District, Ekhra (Tadubi Village), 1625–1650 m, 16.ix.2024, K.K00281.

5. *Fissidens diversifolius* Mitt., J. Proc. Linn. Soc., Bot., Suppl. 1(2): 140. 1859; Gangulee, Mosses E. India Fasc. 2: 492. 1971. (Image 2g–k)

Plant small, dioicous, unbranched, bright green when fresh and dark green on dry specimens, stem orange-brown, 4–5 mm long and 1.2–1.4 mm broad with

leaves. Leaves in 6–8 pairs, lanceolate, slightly twisted when dry, 0.8–1 mm long, 0.3 mm broad, broader at base, acute at apex; sheathing lamina 1/3 of the leaf length, usually equal, dorsal lamina narrow down and ends at nerve base semi-limbium, simple, smooth, in 1–5 rows of elongated pellucid, smooth cells completely bordering the sheathing lamina. Costa terminating below the leaf tip.

Habitat: The plants found growing in a moist, red laterite rocky soil in association with some liverworts like *Solenostoma* sp. and moss like *Pogonatum* sp.

Range: Bhutan, India, Japan, Myanmar, and Nepal.

Distribution in India: Assam, Arunachal Pradesh, Bihar, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Manipur (present report), Odisha, Tamil Nadu, and West Bengal.

Specimen examined: India: Manipur, Senapati District, Elai waterfall, 1600–1900 m, 28.ix.2024, K.K00367.

6. *Fissidens elongatus* Mitt., J. Proc. Linn. Soc. Bot., Suppl. 1(2): 139. 1859; Gangulee, Mosses E. India Fasc. 2: 561. 1971. (Image 2l–q)

Plants are large, sturdy, dark green in both fresh and dry conditions, stems are branched, 6.0–6.5 cm long, 2.5–2.7 mm wide, with leaves. Leaves in 53–102 pairs, lanceolate, acuminate at apex, 2.7–3.0 mm long, 0.4–0.5 mm wide; sheathing lamina 1/2 the leaf length, unequal, dorsal lamina, wedge shaped to round at the base, meeting the stem at the leaf attachment; leaf cells at the apical area irregular, slightly mamilllose, marginal cells slightly crenulate, regularly arranged. Costa percurrent, slightly lighter in shade than the leaf.

Habitat: The plants found thriving on rocky substrates under persistent dripping water.

Range of Distribution: Japan and India.

Distribution in India: Andhra Pradesh, Assam, Arunachal Pradesh, Bihar, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Manipur (present report), Meghalaya, Odisha, Tamil Nadu, and West Bengal.

Specimen examined: India: Manipur, Senapati District, Willong Village, 1258–1682 m, 16.xii.2023, K.K00175.

7. *Fissidens ganguleei* Nork. in Gangulee, Mosses E. India Fasc. 2: 527. 1971. (Image 3a–f)

Plants are small, bright green to pale yellowish-green, 7.0–7.5 mm long, 1.5–2.0 mm wide, with leaves, branched or unbranched. Leaves in 14–16 pairs, oblong-lanceolate, slightly curled or crumpled when dry, 1.5–2.0 mm long, 0.2–0.3 mm wide, acute at apex, slightly

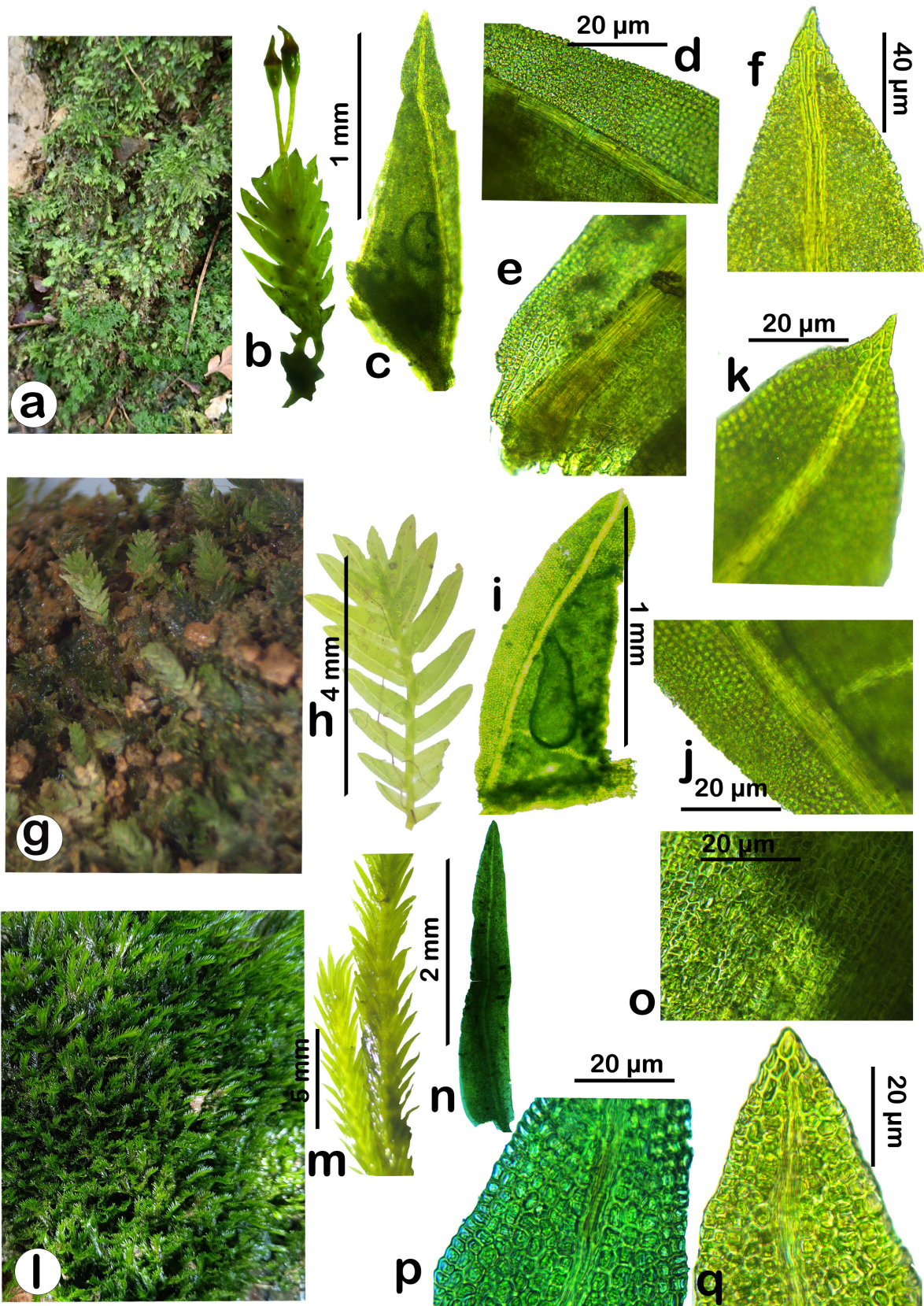


Image 2. *Fissidens ceylonensis* Dozy & Molke. (a–f): a—habitat photo | b—plant body | c—leaf | d—leaf marginal cells | e—Leaf basal cells | f—leaf apex. *Fissidens diversifolius* Mitt. (g–k): g—habitat photo | h—plant body | i—leaf | j—leaf marginal cells | k—leaf apex. *Fissidens elongatus* Mitt. (l–q): l—habitat photo | m—plant body | n—leaf | o—leaf basal cells | p—leaf marginal cells | q—leaf apex. © Kholi Kaini.

broad at the basal part; leaf margin slightly crenulate or serrate; sheathing lamina, unequal, 1/3 of the leaf, dorsal lamina base slightly decurrent; leaf cells quadrate to rounded hexagonal; cells in sheathing lamina similar to those of apical and dorsal lamina.

Habitat: The plants grow on moist soil and rocks, in shaded areas associated with mosses and liverworts.

Range: Bangladesh, China, India, Indonesia, Japan, Korea, Nepal, and Vietnam.

Distribution in India: Andhra Pradesh, Karnataka, Kerala, Manipur (present report), Tamil Nadu, Telangana, and West Bengal.

Specimen examined: India: Manipur, Senapati District, Khonem Thana Village, 1000–1173 m, 30.ix.2024, K.K00377.

8. *Fissidens nobilis* Griff., Calcutta. J. Nat. Hist. 2: 505. 1842; Gangulee, Mosses E. India Fasc. 2: 550. 1971. (Image 3g–l)

Plants are large, brownish-green in both fresh and dry conditions, leaves not much curled when dry; the shoot is 3.8–5.0 cm long and 10–11 mm wide with leaves. Leaves in 15 pairs, ligulate, 6–7 mm long, 1.4–1.5 mm wide, 2 cell-layered, 3–4 layers at margin; border well-defined, double serrated, without limbidium, apex symmetrical, margin toothed; sheathing lamina 1/3, unequal, detachable, broader at base. Perichaetal leaf is shorter and narrower.

Habitat: The plants found growing on rocks in dark-shaded areas in association with thallose liverworts.

Range: China, India, Japan, Korea, Nepal, Philippines, Thailand, Vietnam.

Distribution in India: Andhra Pradesh, Assam, Karnataka, Kerala, Madhya Pradesh, Manipur, Meghalaya, Odisha, Sikkim, Tamil Nadu, and West Bengal.

Specimen examined: India: Manipur, Senapati District, Koziirri (Maopundung Village), 1437–1921 m, 01.x.2024, K.K00409.

9. *Fissidens pulchellus* Mitt., J. Proc. Linn. Soc., Bot., Suppl. 1(2): 140. 1859; Gangulee, Mosses E. India Fasc. 2: 524. 1971. (Image 3m–r)

Plant medium to large, bright green when fresh, dull brownish-green in herbarium, stem orange-grey, shoots 1.0–1.5 cm long, 2.0–2.3 mm wide with leaves. Leaves in 25–27 pairs, oblong-lanceolate, curled when dry, 1.0–1.5 mm long, 0.25–0.29 mm wide, borders sharp, distinctly denticulate margins; cells quadrate-hexagonal, with one or two conical papillae on each cell. Sheathing

lamina 2/3 of the leaf, unequal or rarely equal, dorsal lamina base slightly decurrent. Costa excurrent or sometimes percurrent ending into a short apiculus, diminishing below the apex.

Habitat: The plants found thriving on a thin layer of soil overlaying rocky substratum, nestled within the shade of other rocks.

Range: India, Nepal.

Distribution in India: Andhra Pradesh, Arunachal Pradesh, Bihar, Karnataka, Kerala, Madhya Pradesh, Manipur (present report), Meghalaya, Odisha, Tamil Nadu, Uttarakhand, and West Bengal.

Specimen examined: India, Manipur, Senapati District, Koziirri (Maopundung Village), 1437–1921 m, 01.x.2024, K.K00405.

10. *Fissidens crispulus* var. *robinsonii* (Broth.) Z. Iwats. & Z.H.Li, Moss Fl. China 2:26. 2001. Gangulee, Mosses E. India Fasc. 2: 534. 1971. (Image 4a–e).

Plants are small, yellowish-green, unbranched, twisted when dry, shoots 6.5–7.0 mm long and 2.1–2.3 mm wide with leaves. Leaves in 10–12 pairs, ligulate-lanceolate, narrow, acuminate with spiny tip, 2.5–2.7 mm long, 0.4–0.5 mm wide, apical margin, crenulated, cells rounded hexagonal, thin-walled, each with mamilllose to conical papillae but not obscure, irregular; sheathing lamina more than 1/2 of the leaf length, unequal, crispate with incurved hook-like tips when dry; dorsal lamina base rounded, decurrent to base in single layer cells. Costa prominent, excurrent with spiny aristate apiculus. Limbidium and border, absent. Perichaetal leaves are longer than other leaves.

Habitat: The plants thrive on damp, living tree trunks, situated near water sources in association with other mosses. The place of collection is predominantly shaded throughout the year, profiting from minimal human disturbance.

Range: China, India, and Philippines.

Distribution in India: Andaman & Nicobar Islands, Andhra Pradesh, Goa, Karnataka, Kerala, Maharashtra, and Manipur (present report).

Specimen examined: India: Manipur, Senapati District, Koziirri (Maopundung Village), 1437–1921 m, 01.x.2024, K.K00389.

11. *Fissidens viridulus* (Sw.) Wahlenb., Fl. Lapp: 334. 1812; Gangulee, Mosses E. India Fasc. 2: 464. 1971. (Image 4f–j)

Plant small, pale green, stems unbranched, usually single, shoots 4–5 mm long, 1.5 mm wide, with leaves. Leaves in 5–7 pairs, ovate-lanceolate to elliptical

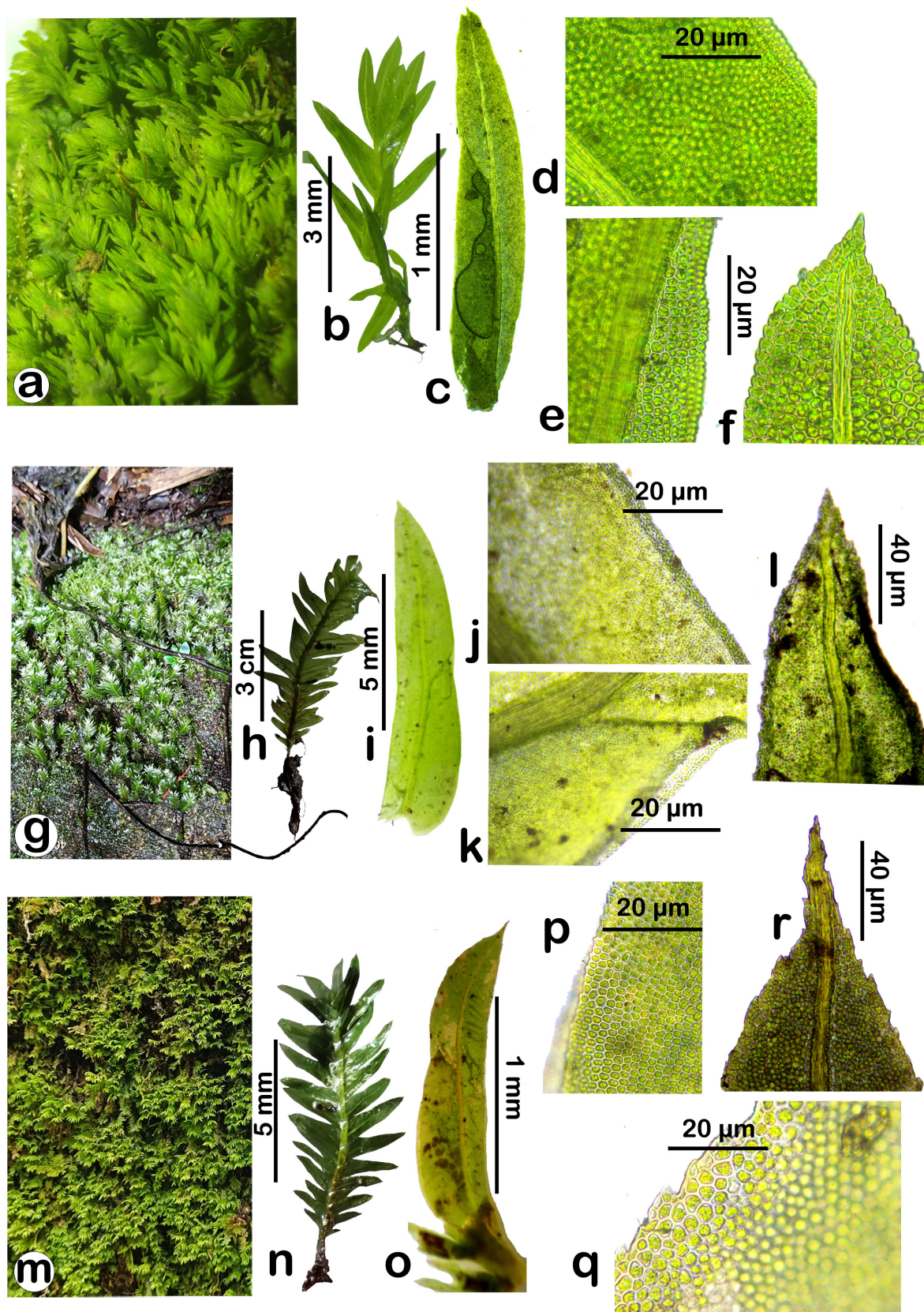


Image 3. *Fissidens ganguleei* Norkett ex Gangulee. (a–f): a—habitat photo | b—plant body | c—leaf | d—leaf marginal cells | e—leaf basal cells | f—leaf apex. *Fissidens nobilis* Griff. (g–l): g—habitat photo | h—plant body | i—leaf | j–k leaf marginal cells | l—leaf apex. *Fissidens pulchellus* Mitt. (m–s): m—habitat photo | n—plant body | o—leaf | p–q—Leaf marginal cells | s—leaf apex. © Kholi Kaini.

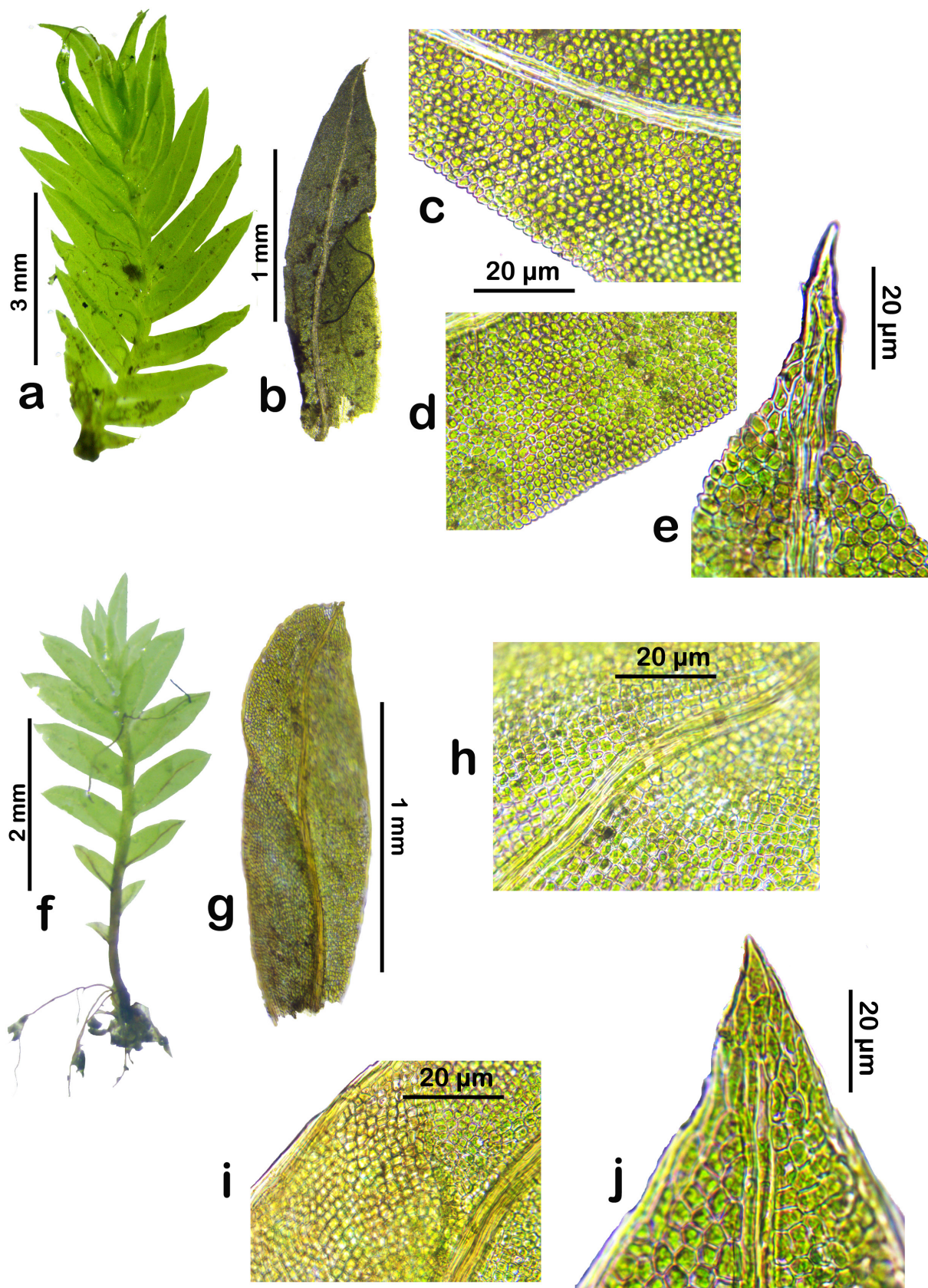


Image 4. *Fissidens crispilus* var. *robinsonii* (Broth.) Z.Iwats. & Z.H.Li (a-e): a—plant body | b—leaf | c-d—Leaf marginal cells | e—leaf apex. *Fissidens viridulus* (Sw.) Wahlenb. (f-j): f—plant body | g—leaf | h—leaf cells | i—leaf marginal cells | j—leaf apex. ©Kholi Kaini.

lanceolate, apex apiculate to acute, widest at the middle, 0.7–1.2 mm long, 0.3–0.5 mm wide, margin smooth, entire with clearly defined border except at the apex, lamina cells unistratose, smooth; sheathing lamina 2/3 of the leaves, equal; cells similar to those of the apical and dorsal lamina. Costa ending below the apex, apical cells single-layered. Limbium narrow, elongated, unistratose, all-around leaf except below the apex.

Habitat: The plants are found growing on the soil together with mosses, *Pogonatum* sp.

Range: Australia, China, India, Nepal, Russia, Africa, Europe, and North America.

Distribution in India: Assam, Manipur (present report), Karnataka, Sikkim, Uttarakhand.

Specimen examined: India: Manipur, Senapati District, Ekhra (Kalinamai Village), 1625–1650 m, 16.ix.2024, K.K00326.

CONCLUSIONS

The present investigation on the genus *Fissidens* of Senapati District of Manipur revealed the occurrence of 11 species, chiefly found in three habitats: terricolous, saxicolous, and corticolous. The species were identified based on the presence or absence of limbium, costa length, leaf margin cells, and marginal dentation, papillae of leaf cells, and differentiation of leaf border. Five species—*F. viridulus*, *F. bryoides*, *F. diversifolius*, *F. crenulatus*, and *F. ceylonensis* exhibit the presence of limbium, which were further categorized based on the extent of its presence, i.e. present throughout or limited to a specific area. Six species—*F. ganguleei*, *F. crispulus* var. *robinsoni*, *F. pulchellus*, *F. elongatus*, *F. anomalous*, and *F. nobilis* are characterized by the absence of limbium, which are further differentiated based on the dentation of leaf margin, distinctive leaf border, and presence or absence of leaf cell papillae. These species fall under six sections of the genus *Fissidens*—sect. *Fissidens* (*F. bryoides*, *F. viridulus*), sect. *Semilimbium* Müll.Hal. (*F. diversifolius*, *F. crenulatus*, *F. ceylonensis*), sect. *Crenularia* Müll.Hal. (*F. pulchellus*), sect. *Aloma* (Kindb.) Müll.Hal. (*F. ganguleei*), sect. *Crispidium* Müll.Hal. (*F. crispulus* var. *robinsonii*), and sect. *Serridium* Müll.Hal. (*F. nobilis*, *F. anomalous*, *F. elongatus*) (Gangulee 1971).

REFERENCES

- Asthana, A.K. & A. Srivastava (2015). A study on genus *Fissidens* Hedw. in Meghalaya (north-eastern Hills), India. *Taiwana* 60(3): 137–142.
- Asthana, A.K., V. Sahu & V. Awasthi (2021). Diversity of mosses in some underexplored regions of Manipur, northeastern India. *Bryophyte Diversity and Evolution* 44(1): 22–47. <https://doi.org/10.11646/bde.44.1.3>
- Biswas, K. & C.C. Calder (1936). *Handbook of Common Water and Marsh Plants of India and Burma*. Bishen Singh Mahendra Pal Singh, Dehradun (Reprint, 1984), 216 pp.
- Brotherus, V.F. (1901). Fissidentaceae. In: Engler, A. & K. Prantl (eds.). *Die Natürlichen Pflanzenfamilien* 1(3): 351–363.
- Brotherus, V.F. (1924). Musci. In: Engler, A. & K. Prantl (eds.) *Die Natürlichen Pflanzenfamilien* 2(10): 243–302.
- Bruggeman-Nannenga, M.A. (1978). Notes on *Fissidens*. I & II. Proceedings of the Koninklijke Nederlandse Akademie van Wetenschappen, 387–402 pp.
- Deb, D.B. (1954). On the occurrence of *Riccia natans* Corda from the eastern Himalayas. *Science & Culture* 19: 353–354.
- Devi, N.P., S.D. Yumkham & P.K. Singh (2019). Two new records of *Riccia* L. (Ricciaceae) for the Eastern Himalaya Bryogeographical Region of India. *Journal of Asia-Pacific Biodiversity* 12(4): 626–630. <https://doi.org/10.1016/j.japb.2019.08.005>
- Gangulee, H.C. (1971). *Mosses of Eastern India and Adjacent Regions*. Fasc. 1. B.N. Das Printer, Calcutta, 171–566 pp.
- Govindaparyi, H. (2014). Habitat preference in pleurocarpus mosses of Imphal District, Manipur, India. *Evansia* 31(3): 99–108. <https://doi.org/10.1639/079.031.0305>
- Govindaparyi, H., P. Kumari, Y.M. Bahuguna & P.L. Uniyal (2012). Evaluation of species richness of acrocarpus mosses in Imphal District, Manipur, India. *Taiwana* 57(1):14–26.
- Lal, J. (1979). Epiphyllous bryophytes of Manipur I. Metzgeriaceae. Proceedings of the Indian Science Congress, 42–43 pp.
- Manjula, K.M. & C.N. Manju (2020). An account of Section *Crispidium* of *Fissidens* Subgen. *Pachyissidens* in Western Ghats of India with description of a new variety and an extension range. *Taiwana* 65(3): 295–314. <https://doi.org/10.6165/tai.2020.65.295>
- Nath, V., A.K. Asthana & R. Gupta (2011). Genus *Fissidens* Hedw. (Fissidentaceae, Bryopsida) at Pachmarhi Biosphere Reserve (Madhya Pradesh), India. *Taiwana* 56(1): 71–80.
- Norkett, A.H. (1969). Some problems in a monographic revision of the genus *Fissidens* with special reference to the Indian species. *Bulletin of the Botanical Society of Bengal* 23: 75–82.
- Pursell, R.A. (1988). *Fissidens amazonicus* sp. nov. from Brazilian Amazonia, with comments on the relationship and taxonomy of subgenus *Fissidens* sections *Areofissidens*, *Weberiopsis* and *Reticularia* and subgenus *Aneuron* (Bryopsida: Fissidentaceae). *Nova Hedwigia* 90: 345–355.
- Pursell, R.A. & M.A. Bruggeman-Nannenga (2004). A revision of the infrageneric taxa of *Fissidens*. *Bryologist* 107(1): 1–20.
- Singh, D., M. Dey & D.K. Singh (2010). A synoptic flora of liverworts and hornworts of Manipur. *Nelumbo* 52: 9–52. <https://doi.org/10.20324/nelumbo/v52/2010/57702>
- Singh, R.K.H. & R.K. Kishor (2009). *Riccia thongjaorokensis*—a new fossil liverwort from Oligocene Beds of Tertiary, Northeastern India. *Journal of the Geological Society of India* 73(5): 606–608. <https://doi.org/10.1007/s12594-009-0046-4>
- Sreenath, A. & B.R.P. Rao (2020). Twelve taxa *Fissidens* Hedw. (Fissidentaceae, Dicranales, Bryopsida) new distributional records to Andhra Pradesh. *Bioscience Discovery* 11(2): 67–75.
- Suzuki, T. & Z. Iwatsuki (2007). A new approach to the infrageneric classification of the genus *Fissidens* (Fissidentaceae, Bryopsida). *Hikobia* 15: 67–85.
- Suzuki, T., Y. Inoue & H. Tsubota (2018). Molecular phylogeny of the genus *Fissidens* (Fissidentaceae, Bryophyta) and a refinement of the infrageneric classification, *Molecular Phylogenetics and Evolution*. *Molecular Phylogenetics and Evolution* 127: 190–202.

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ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

November 2025 | Vol. 17 | No. 11 | Pages: 27787–28010

Date of Publication: 26 November 2025 (Online & Print)

DOI: 10.11609/jott.2025.17.11.27787-28010

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Morpho-taxonomic studies on the genus *Fissidens* Hedw. (Bryophyta: Fissidentaceae) in Senapati District, Manipur, India

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