

## Twelve taxa *Fissidens* Hedw. (Fissidentaceae, Dicranales, Bryopsida) new distributional records to Andhra Pradesh

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### Abstract

Twelve taxa of *Fissidens* Hedw. Viz., *Fissidens bryoides* Hedw., *F. griffithii* Gangulee, *F. involutus* ssp. *curveno involutus*, *F. javanicus* Dozy & Molk., *F. lexis* Sull. & Lesq., *F. orishae* Gangulee, *F. pulchellus* Mitt., *F. ranchensis* Gangulee, *F. semiperfalcatus* Dixon, *F. subangustus* M. Fleiseh. *F. subpulchellus* Nork. and *F. virens* Thawaites & Mitt., collected from different localities of Andhra Pradesh, are new distributional records for the state.

### INTRODUCTION

The study area, Andhra Pradesh (12°37' and 19° 25' NL and 76° 45' and 84° 72' EL) (Map 1) is the eighth largest state in Indian Union extended to 162, 968 sq km, of which 17.88% is under forest cover (FSI 2019). The state comprises 13 districts, nine of them fall in coastal region and four constitute Rayalaseema. The altitude ranges from sea level to 1680m above MSL.

Owing to the presence of rich bryophyte habitats, we held explorations for bryophytes during 2016-2019. During explorations we could collect some curious acrocarpous moss plant specimens in different localities of Andhra Pradesh. After critical study of the specimens revealed their identification to different species of *Fissidens*, viz., *F. bryoides* Hedw., *F. griffithii* Gangulee, *F. involutus* ssp. *curveno involutus*, *F. javanicus* Dozy & Molk., *F. lexis* Sull. & Lesq., *F. orishae* Gangulee, *F. pulchellus* Mitt., *F. ranchensis* Gangulee, *F. semiperfalcatus* Dixon, *F. subangustus* M. Fleiseh. *F. subpulchellus* Nork. and *F. virens* Thawaites & Mitt.

The genus *Fissidens* Hedw. belonging to Fissidentaceae Schimp. *Fissidens* comprises 729 species (World flora online 2018) and have world-

wide distribution except in Antarctica (Gangulee, 1969-72). In India, *Fissidens* are represented by 88 taxa belonging to 76 species (Dandotiya *et al.*, 2011; Uwe Schwarzi 2014 & Afroz Alam, 2015); in Andhra Pradesh, by 16 species (Sowghandhika, 2010; Sandhyarani *et al.*, 2014; Manjula & Manju, 2016 and Sreenath & Ravi Prasad Rao, 2019 & 2020). Perusal of published literature (Dandotiya *et al.*, 2011; Uwe Schwarzi, 2014; Sandhyarani *et al.*, 2014; Alam, 2015; Manjula & Manju, 2016; Sreenath & Ravi Prasad Rao, 2019 and Sreenath & Ravi Prasad Rao, 2020) revealed that these 12 species have not been reported so far from the state of Andhra Pradesh and forms new distributional records to the state.

### MATERIALS AND METHODS:

All the bryophyte specimens were collected with research curiosity. The corticolous plant material was collected by using sharp edged knife and terrestrial specimens were scraped by using manually bent and sharpened flat spoon. The collected specimens were placed in zip-lock polythene cover with labeled field number. Field observations were recorded in the field notes and live photographs were taken using DSLR-Camera (Nikon D3300).

Collected material brought to the laboratory, made it air dried at room temperature and preserved them in brown paper packets (12 × 18 cm) with detailed label (10 × 17cm). Critical examination of the specimens was done by using temporary slides and plant parts were separated by using micro forceps (Varin) VR-15 curved, VR-11 straight with fine sharp edges. Slides were observed under light microscope (Olympus CH20i), light stereo microscope (Olympus SZ61) and micro measurements were taken by using ocular micro meter (ERMA) 19 mm, 100 segments in 1 cm. Photographs were taken by using Moto g3 turbo and Samsung on6 equipped with 13 MP camera with 4x wide digital zoom, different dimensions were measured and identification of the specimens by using standard floras. Descriptions, Habitat & Ecology, Voucher specimens' information, field photographs, microscopic photographs were provided for the species. Voucher specimens are deposited in Sri Krishnadevaraya University Bryophyte Herbarium (SKU) Ananthapuramu. Abbreviated names used for the collectors are: AS (Ananthaneni Sreenath) and BR (Boyina Ravi Prasad Rao).

## RESULTS AND DISCUSSION

### Systematic Descriptions:

*Fissidens bryoides* Hedw. Sp. Musc. Frond. 153 1801. Gangulee, Mosses of E. India and adjacent regions 1(2): 461 – 470. 1971; Daniels, Bryophytes of Southern W. Ghats: 41. 2003.

Plants terricolous, small up to 5 mm high, up to 2.8 mm broad with leaves, yellowish green to brownish green. Leaves up to 7 pairs, 2.2 to 2.5 leaves per mm of stem, oblong- ligulate, 1.8 – 2 x 0.5 0.6 mm. with semi sheathing lamina; semi sheathing lamina below ½ of the leaf or ½ of the leaf length, to 0.8 – 1 x 0.2 – 0.3 mm, dorsal lamina decurrent on the nerve base. Costa excurrent to percurrent, limbidium present in entire leaf, one rowed at apex and two rowed at base, leaf cells smooth, apical and middle cells 16 - 20 µm diagonally and basal cells 48 - 60 µm diagonally, one or two sporophytes present on the apical portion of the plant, seta reddish brown up to 8 mm high, capsule up to 8 mm long and 0.38 mm wide, operculum conic rostrate, peristome teeth up to 0.28 mm long. Spores up to 17 µm smooth rounded.

**Habitat and Ecology:** Found on moist soil in shady places, in the interior forest, associated with other pottiaceae members and *Cycas* sp. (Cycadaceae).

**Specimens examined:** India, Andhra Pradesh, Prakasam District, Gundlabrahmeswaram wild life sanctuary, Isukagundam, 03 August 2017, 53533 B SKU, BR & AS; Chittoor district, Seshachalam hills, Talakona waterfall, 29 October 2017, 53675 SKU, BR & AS; Chittoor district, Moolakona water fall, 12 November 2017, 53760 B, 53765 and 53769 B, SKU, AS.

**Distribution: World:** Brazil, Canada, Chile, Costa Rica, Greenland, Hawaiian Island, Iraq, Libya, Mexico, Mongolia, Philippines, United States and **India:** Calcutta, Gujarat, Kashia hills, Rainhat, Rajasthan, Shimla, Western Ghats and Western Himalayas.

*Fissidens griffithii* Gangulee. Nova Hedwiga 8: 143. pl. 2 1964. Gangulee, Mosses of E. India and adjacent regions 1(2): 520 - 521. 1971; Daniels & Daniel, Indian Jr. Forestry 26(2): 193-194.

Plants terricolous small up to 5 mm and 3 mm wide with leaves, yellowish green to reddish. Leaves up to 6 pairs (about 1.5 leaves per mm of stem), oblong-lingulate up 1.57 x 0.3 - 0.35 mm. sheathing lamina more than ½ of the leaf length up to 0.7 - 0.9 x 0.14 - 0.16 mm wide, dorsal lamina narrowing towards base and ending on stem near costa. Costa percurrent to short excurrent. Leaf cells short punctate, multipapillate, quadrate to hexagonal, all apical, middle and basal leaves up to 15 µm and slightly larger at near costa base up to 18 µm. Sporophyte present on apical portion of the plant. Seta up to 4 mm long, capsule bent downwards at top, up to 0.6 mm long and 0.28 mm in wide (diameter) brown. Spores rounded with elongate papilla like protuberant, up to 15 µm, yellowish brown.

**Habitat and Ecology:** Found on moist soil near waterfalls in interior forests, associated with *Weisia* sp. and pottiaceae members.

**Specimens Examined:** India, Andhra Pradesh, Chittoor district, Seshachalam hills, Talakona waterfalls, 29 October 2017, 53694 SKU, AS.

**Distribution: World:** Bhutan and **India:** Manipur, Tamil Nadu and Western Ghats.

*Fissidens involutus* subsp. *curvato-involutus* Dix. In Not. R. Bot. Gard. Edinb., 19: 279 1938; Gangulee, Mosses of E. India and adjacent regions 1(2): 548-549. 1971; Daniels, Bryophytes of Southern W. Ghats: 46. 2003.

Plants terricolous, small to medium up to 9 mm high and ca. 2.5 mm wide with leaves, green to light-green. Leaves up to 14 pairs (about 1.4 leaves per mm. at base, 2 leaves per mm. at top in some plants 2 leaves per mm. of stem), oblong-lanceolate

to oblong-lingulate, which are more crowded in some plants, in some plants leaves are arranged freely and both plants more crowded towards apex, to 1.2 – 1.8 x 0.3 - 0.45 mm with sheathing lamina; sheathing lamina to 0.7 - 1.2 x 0.15 – 0.22 mm wide. Dorsal lamina base rounded and then decurrent with a fold as involutus. Perichaetial leaves 2 - 2.4 x 0.48 – 0.52 mm wide. Costa light orange ending 3 - 4 cells below the apex. Leaf apical and middle cells rounded to 13 – 16.5 µm diagonally, basal cells irregularly quadrate and more elongated towards base from the middle up to 35 µm long. Sporophytes present on apical portion of the plant.

**Habitat and Ecology:** Found on dry and moist soils along streams, roads in interior forests, mostly as monodominant patches. Sometimes found associated with other pottiaceae members or *Riccia* spp. (Ricciaceae).

**Specimens examined:** India, Andhra Pradesh, Nellore district, Hill tops of Penchalakona 07, February, 2017, 52279, 52282 B, 52283 C and 52290 A SKU, BR & AS; Chittoor district, Hill tops of Sadasivakona, 24, February, 2017, 53328 SKU, BR & AS; Kurnool district, Nallamalais, Gundlabrahmeswaram (Wild Life Sanctuary), Bettudatanarava, 20 April, 2017, 53373 SKU, BR & AS and Prakasam district, Nallamalais, Gundlabrahmeswaram WLS, Anjaneyuniborikalu, 04 August, 2017, 53543 D SKU, BR & AS; near Isukagundam, Bapanakonda, 05 August, 2017, 53351 B SKU., BR & AS.

**Distribution: World:** Myanmar, Nepal, Thailand, Vietnam and **India:** Bihar, Madhya Pradesh, Sikkim, Tamil Nadu, Uttar Pradesh and West Bengal.

*Fissidens javanicus* Dozy & Molk. Bryol. Jav. 1: 11. 3 1855; Gungulee, Mosses of E. India and adjacent regions. 1(2): 542-544. 1971.

Plants terricolous small to medium up to 1.2 cm high and up to 4 mm broad with leaves, light brownish-green to greenish. Leaves up to 22 pairs (about 2 leaves per mm of stem), apical lamina symmetrical, leaves lanceolate up to 2.7 mm long and 0.8 mm broad with sheathing lamina, semi sheathing lamina below ½ of the leaf length up to 1.2 mm and 0.45 mm broad, lamina broader towards base and rounded, dorsal lamina ending on the stem, limbidium absent. Costa percurrent to slightly excurrent reddish brown. Leaf cells rounded to quadrate, tumescent to mamilliose shows a rough appearance, some cells papillose especially in basal cells, leaf marginal cell differentiated with deeper shade of all round the leaf cells, apical and middle

leaf cells 7 to 8 µm wide and basal lamina cells slightly larger up to 9.5 µm. sporophyte not seen in this specimen.

**Habitat and Ecology:** Found on moist soil and moist rocky surface, associated with *Riccardia* sp. (Annuraceae).

**Specimens Examined:** India Andhra Pradesh, Kurnool district, Nallamalais, Paladarapanchadara, Water fall-2, 29 May 2017, 53391 SKU, AS & BR; Visakhapatnam district, Near Vallabu water fall, 16 December 2017, 53949, 53950 SKU, BR & AS.

**Distribution: World:** Burma, China, East Nepal, Philippines, Thailand and **India:** Upper Assam and Western Himalaya.

*Fissidens lexis* Sull. & Lesq. Proc. Amer. Acad. Arts 4: 276 1859; *Fissidens mittenii* Paris. Index Bryol. 477 1895; Gangulee, Mosses of E. India and adjacent regions. 1(2): 531-532. 1971.

Plants terricolous small up to 4.5 mm high and 1.4 mm broad with leaves, light green to yellowish green. leaves up to 6 pairs (about 3 leaves per mm of stem), oblong-lanceolate, up to 0.8 - 1 x 0.2 - 0.25 mm broad with sheathing lamina, semi sheathing lamina below ½ of the leaf length up to 0.3 - 0.35 x 0.1 - 0.12 mm. Dorsal lamina narrowing base ending on the stem, limbidium absent but there are some elongated cells. Costa percurrent ending two cells below the tip. Leaf cells irregularly rounded or quadrate to hexagonal, all apical, middle and basal cells up to 12 µm and some cells little larger near at costa base up to 15 µm. sporophyte present on the apical portion of the plant. Seta up to 3 mm long, capsule 0.34 - 0.37 x 0.2 – 0.25 mm in diameter. Spores smooth, rounded up to 13 µm.

**Habitat and Ecology:** Found on moist soil under tree shade in interior forests near water falls, in association with *Riccia* sp. (Ricciaceae), *Archiolejeunea* sp. Lejeuneaceae members and other pleurocorpous mosses.

**Specimens examined:** India, Andhra Pradesh, Prakasam district, Nallamalais, Gundlabrahmeswaram wild life sanctuary, Rollapenta waterfall, 24 September 2017, 53622 C SKU, BR & AS; near Krishna River, Palanka water fall, 27 September 2017, 53657 SKU, BR & AS; Chittoor district, Seshachalam hills, Talakona waterfalls, 29 September 2017, 53659 C, 53665, 53673 C and 53696 SKU, BR & AS; Ananthapuramu district, Yerraipalli konda, 21 September 2018, 55104 SKU, AS. **Distribution: World:** China (Hainan), Fiji, Philippines, Thailand, Vanuatu and **India:** Bombay, Kumaon and Kerala.

*Fissidens orishae* Gangulee, Nova Hedwigia 8: 140. Pl. 1 1964; Gangulee, Mosses of E. India and adjacent regions. 1(2): 499-500. 1971.

Plants terricolous, small up to 3 mm long and 1.5 mm wide with leaves, stems unbranched, light yellowish to brown. Leaves up to 9 pairs (about 4 pairs per mm of stem). upper leaves usually curled but not crumpled when dry, lower leaves may or may not be inflexed, erect to erectopatent when moist; leaves oblong-ligulate, border in at sheathing region, to 1.1 – 1.4 x 0.32 – 0.36 mm, apical leaf usually symmetrical, broadly acute. Sheathing lamina more than ½ of the leaf length and more than ½ of the leaf width, unequal broader at middle, narrowing to wards base, fusing with on stem. Incomplete semi-limbium (covering about 2/3 of the sheathing lamina) of two rows of elongated pellucid cells at sheathing lamina base. Dorsal lamina quickly narrowing down at base and vanishing just before the costa meets the stem. Costa straight, percurrent to just below the leaf tip. Leaf cells chlorophyllase, somewhat obscure because of mamilllose nature of cells; hexagonal to rounded, 7 – 9 µm. Sporophytes present apical portion of plant. Seta up to 2 mm long. Capsule 0.7 – 1 x 0.2 -0.3 mm in diameter, spores yellowish-brown, rounded to 12 µm.

**Habitat and Ecology:** Found on moist soil in deep shade amidst the rocks, as monodominant patches, sometimes associated with other pottiaceae members.

**Specimens examined:** India, Andhra Pradesh, Prakasam district, Bhairavakona Reserve forest, 30 November 2019, 57024, SKU, AS; Kadapa District, Nitya Poojakona 02 December 2019, 57064, SKU, AS.

**Distribution: World: India:** Gangetic Plains, Kerala, Orissa and West Bengal.

*Fissidens pulchellus* Mitt. J. Proc. Linn. Soc., Bot., Suppl. 2: 140 1859; Gangulee, Mosses of E. India and adjacent regions. 1(2): 524-525. 1971; Asthana & Srivastava, Taiwania 60(3): 141. 2015.

Plants terricolous, medium to large up to 2.8 cm long by with proliferation and 2 - 2.5mm wide with leaves, light green to yellowish-green. Leaves up to 28 pairs (about 2.7 leaves per mm. of stem), curled when dry, oblong-lanceolate, apiculate, distinctly denticulate with sharp cells on the border, to 0.9 - 1.2 mm long and 0.25 - 0.28 mm wide with sheathing lamina. Sheathing lamina 2/3 of the leaf length to 0.5 -0.7 mm long and 0.12 – 0.18 mm wide. Dorsal lamina base rounded to slightly decurrent. Apical part usually symmetrical.

Costa usually excurrent in a short apiculus, and may be some times percurrent. Leaf apical, middle cells irregularly quadrate-hexagonal, to 8 – 11 µm wide with one or two conical on each cell. At extreme leaf base cells become slightly elongated to 18 - 20 µm long, clear, rectangular cells forming a border of the nerve base on the dorsal side. Margin cells distinctly denticulate. Sporophytes present on apical portion of the plant.

**Habitat and Ecology:** Found on thin layer of soil covering rocky substratum in shade of other rocks and associated with *Riccia billarderi* (Ricciaceae).

**Specimens examined:** India, Andhra Pradesh, Guntur district, near Narasaraopet, Pirangipuramu, Ammenabad reserve forest, 26 January, 2107, 52260 SKU, BR & AS.

**Distribution: World:** East Nepal and **India:** Arunachal Pradesh, Darjeeling, Eastern Himalaya, Kerala, Madhya Pradesh, Meghalaya, Tamil Nadu, West Bengal and Western Ghats.

*Fissidens ranchiensis* Gangulee, Bull. Bot. Soc. Bengal 11: 68. F. 7 1957; Gangulee, Mosses of E. India and adjacent regions. 1(2): 495-497. 1971.

Plants terricolous, small to medium up to 11 mm long and 1.1 mm broad with leaves up to 26 pairs of leaves (about 3.2 leaves per mm of stem); leaves curled but not contracted when dry, erect to erectopatent when moist, ovate ligulate up to 0.7 – 0.9 x 0.29 -0.32 mm. with semi sheathing lamina, semi sheathing lamina more than ½ of the leaf length and more than ½ of the leaf width and slightly unequal. Dorsal lamina narrowing to base and usually at nerve base. Leaf tip broadly acute, apical portion usually symmetrical, broader at basal region. Limbium simple, strong and smooth of one row, two rowed at base, elongated pellucid cells almost completely covering the sheathing laminae. Costa yellowish-brown, ending 1 or 2 cells below apex. Leaf cells usually obscure, projecting into conical mamillae rendering the margin corrugated. Leaf cells hexagonal to rounded up to 8.4 µm diagonally, slightly smaller in sheathing lamina, slightly larger near at base. Sporophytes found on apical portion of plant. Seta up to 3 mm long. Capsule cylindrical brown to 0.5 -0.7 x 0.2 – 0.25 mm in diameter. Spores smooth green to transparent, to 33 µm.

**Habitat and Ecology:** Found on moist soil in humid localities in deep shade, associated with other pottiaceae members. **Specimens examined:** India, Andhra Pradesh, East Godavari District, Papikondalu National park, near Vaali & Sugreevula temple (Vaali Sugreevula medicinal

plant conservation area) 22 November 2018, 55834C, SKU, AS; Pamuleru vagu near Valamuru Ghat, 22 November 2018, 55841A, SKU, AS.

**Distribution:** **World:** **India:** Kerala, Madhya Pradesh and Western Ghats.

*Fissidens semperfalcatus* Dixon. J. Siam Soc., Nat. Hist. Suppl. 10: 2 1935; Gangulee, Mosses of E. India and adjacent regions. 1(2): 501-503. 1971; Sreebha et al., Nelumbo 57, 92-95 2015.

Plants terricolous, small to medium up to 6 mm and sometimes about 1.5 mm high with proliferation and 2.2 mm with leaves, yellowish green to orange green. Leaves up to 17 pairs (3.5 leaves per mm of stem), oblong-lingulate with slightly falcate to inflexed at apex, up to 1.7 mm long and 0.29 mm broad with semi sheathing lamina. Semi sheathing lamina not more than ½ of the leaf length up to 0.7 mm long and 0.15 mm broad, dorsal lamina base ending on the stem. Semi limbidium present in four rows. Costa excurrent. Leaf cells with single, apical, large conical papillae with slight obscure, apical, middle and basal cells rounded to hexagonal up to 12 µm, slightly larger semi sheathing lamina cells up to 15 µm. sporophyte arranged on apical portion of the plant, seta up to 8 mm long, capsules not seen clearly. Male flower parts short arranged in axillary or basal shoots.

**Habitat and Ecology:** Found on soil covered rock substratum in deep shade, associated with *Riccia* sp. (Ricciaceae).

**Specimens examined:** India, Andhra Pradesh, Guntur district, Near Phirangipuramu, Ameenabad reserve forest, 26 January 2017, 52258, SKU, BR & AS; Chittoor district, near K V B Puramu, Nagulakona reserve forest, 23 February 2017, 53321 SKU, BR & AS & Visakhapatnam district, Simhachalam hills, 23 October 2018, 55244 SKU, AS.

**Distribution:** **World:** Indonesia, Myanmar, Nepal, Thailand and **India:** Andaman Island, Gangetic plains, Himalaya and Western Ghats of Tamil Nadu.

*Fissidens subangustus* M. Fleiseh. Musci Buitenzorg 1: 47 1904. *Fissidens leptopelma* Dixon, Gangulee, Mosses of E. India and adjacent regions. 1(2): 532- 534. 1971.

Plants racophilous or terricolous, small to 2 mm long, unbranched and 5.4 mm wide with leaves, shoots yellowish green to brownish green. Leaves up to 5 pairs (about 2.75 leaves per mm of stem) rigid, falcate and curled at tips when dry, erect when moist; linear lanceolate, narrowly acuminate,

narrowing from middle of the leaf to 2.8 – 3.5 x 0.3 – 0.4 mm wide at base, dorsal lamina narrowing and meeting on the stem at point of attachment. Semi sheathing lamina equally closed up to more than ½ of the leaf length and more than ½ of the leaf width, acute at tip. Apical lamina symmetrical. Limbidium absent, leaf margin minutely crenulate with bulging cell walls. Costa percurrent or ending just below the tip. All leaf cells irregularly hexagonal to rounded, unipupilled, cells up to 9 µm wide at tip, laxer, more pellucid and slightly larger at base to 12 µm. Sporophyte present apical portion of the plant. Seta orange, terminal strongly geniculate up to 1 cm long, bent at tip, rendering the capsule nodding. Capsule like an urn, brown to 0.8 – 0.9 x 0.35 – 0.4 mm in diameter. Peristome teeth brown, dicranate. Spores light green to yellowish brown, to 12 µm in diameter.

**Habitat and Ecology:** Found on wet rocks or moist soil covered rock substratum, near water streams associated with other pottiaceae members.

**Specimens Examined:** India, Andhra Pradesh, Kadapa district, Palakondalu waterfall, 03 December 2019, 57071A, SKU, AS.

**Distribution:** **World:** Philippines, Thailand and **India:** Eastern Himalaya, Tamil Nadu and Western Ghats.

*Fissidens subpulchellus* Nork. Mosses E. India 2: 521. F. 246 1971; Gangulee, Mosses of E. India and adjacent regions. 1(2): 521- 523. 1971.

Plants terricolous, small to medium up to 1.2 cm long with vegetative growth by proliferation from the apex to 2.5 – 3 m wide with leaves, shoots light green to yellowish-green. Leaves up to 14 pairs (about 2.2 leaves per mm of stem), little curled when dry and crumpling to erect-elongate after regain with moist, oblong-lingulate, sharply acuminate from abroad base, to 1.7 – 2 mm long and 0.29 – 0.35 mm broad with sheathing lamina. Sheathing lamina 2/3 of the leaf length to 1.19 – 1.4 mm and 0.19 – 0.23 mm broad. Dorsal lamina usually rounded then decurrent ending very near nerve base. Costa percurrent just below the leaf tip. Leaf cells rounded to hexagonal, up to 9 -11 µm diagonally cell surface swollen into a rounded protuberance usually bent to one side but these are not prominent enough to render the cells obscure although the leaf margin becomes crenulate. Sporophytes present on apical portion of the plant.

**Habitat and Ecology:** Found along ravines and streams as monodominant patches and rarely found associated with *Selaginella* sp. (Selginellaceae).

**Specimens Examined:** India, Andhra Pradesh, Prakasam district, Nallamalais, Gundlabrahmeswaram WLS, Diguvametta, 03 August, 2017, 53529 SKU, BR & AS; Isukagundam, 03 August, 2017, 53536 SKU, BR & AS.

**Distribution: World:** Endemic to **India:** Arunachal Pradesh, North-East India and Western Ghats of Tamil Nadu.

*Fissidens virens* Thawaites & Mitt. J. Linn. Soc., Bot. 13: 324 1873; Gangulee, Mosses of E. India and adjacent regions 1(2): 497-498. 1971; Daniels, Bryophytes of Southern W. Ghats: 54. 2003.

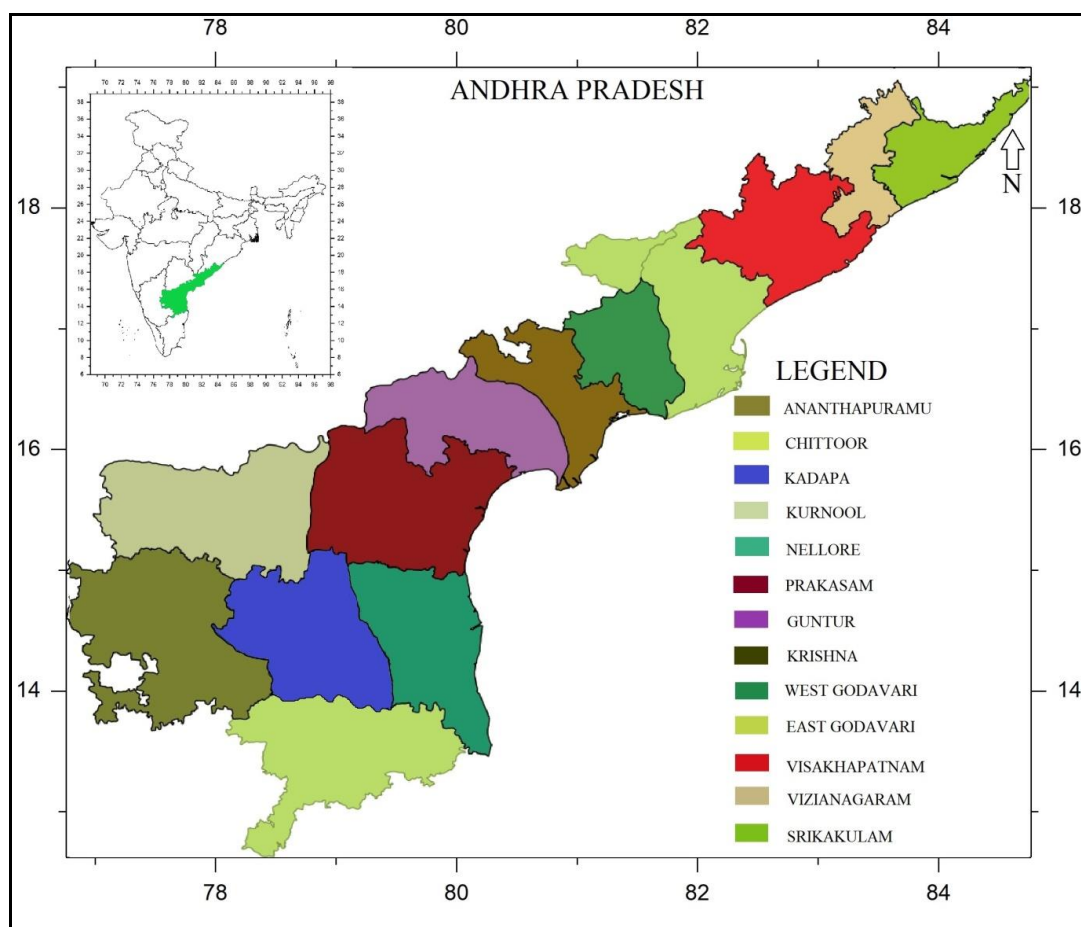
Plants terricolous, very small up to 2 mm long and less than 2 mm wide with leaves. Plants yellowish to brownish-green. Leaves up to 7 pairs on a 1.8 mm of the stem (about 3 leaves per mm. of stem), not much changed when dry and moist, to 0.8 -1.1 mm long and 0.29 – 0.35 mm broad with sheathing lamina. Sheathing lamina 2/3 of the leaf

length to 0.48 – 0.52 mm long and 0.19 – 0.23 mm wide. Dorsal lamina sharply sloping down to base of nerve at the point of leaf attachment, rarely rounded at base. Leaf cells rounded-quadrate, transverse with a conic mamillate papilla, indistinct; apical middle cells to 3 – 6 µm and basal cells 5 – 9 µm highly thick (or) stout, connected with semi limbidium on sheathing lamina margin; semi limbidium 2 or 3 rowed at base, one rowed at apex. Costa excurrent, apiculate. Sporophytes on apical portion of the plant.

**Habitat and Ecology:** Found on dry and moist soils under rock shade and associated with *Bryum cellulare* (Bryaceae).

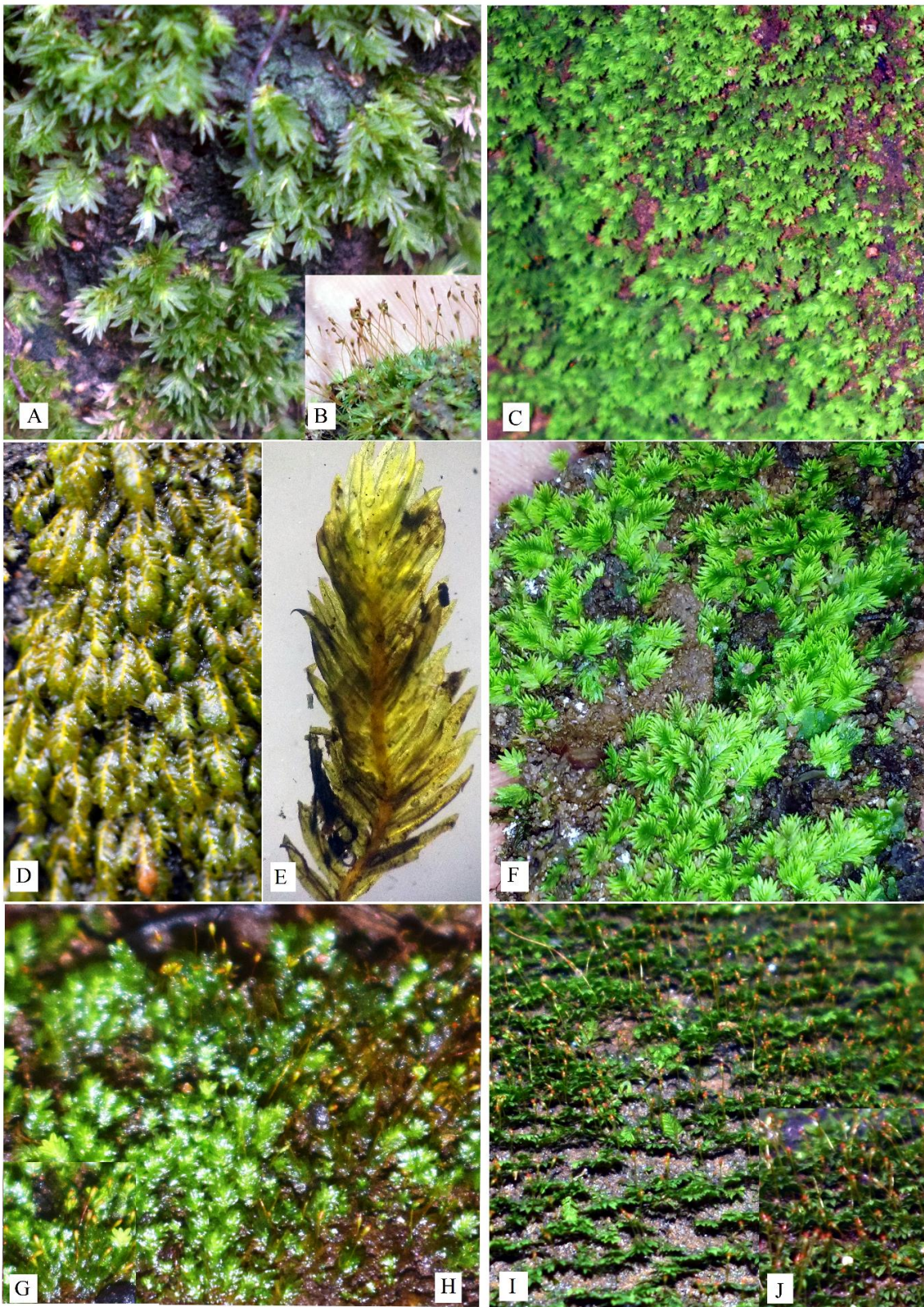
**Specimens examined:** India, Andhra Pradesh, Nellore district, Rapur Reserve Forest, Rapur ghat, 18 September, 2016, 51671 SKU, BR & AS.

**Distribution: World:** Nepal, Sri Lanka, Vietnam and **India:** Kerala, Tamil Nadu, Upper Assam, West Bengal and Western Ghats.



Map 1: Map of Andhra Pradesh with Longitudes and Latitudes.





**Plate 1:** A&B. *Fissidens bryoides* Hedw., C. *Fissidens griffithii* Gangulee, D&E. *Fissidens involutus* ssp. *curveno involutus*, F. *Fissidens javanicus* Dozy & Molk., G&H. *Fissidens lexis* Sull. & Lesq. and I&J. *Fissidens orishae* Gangulee.



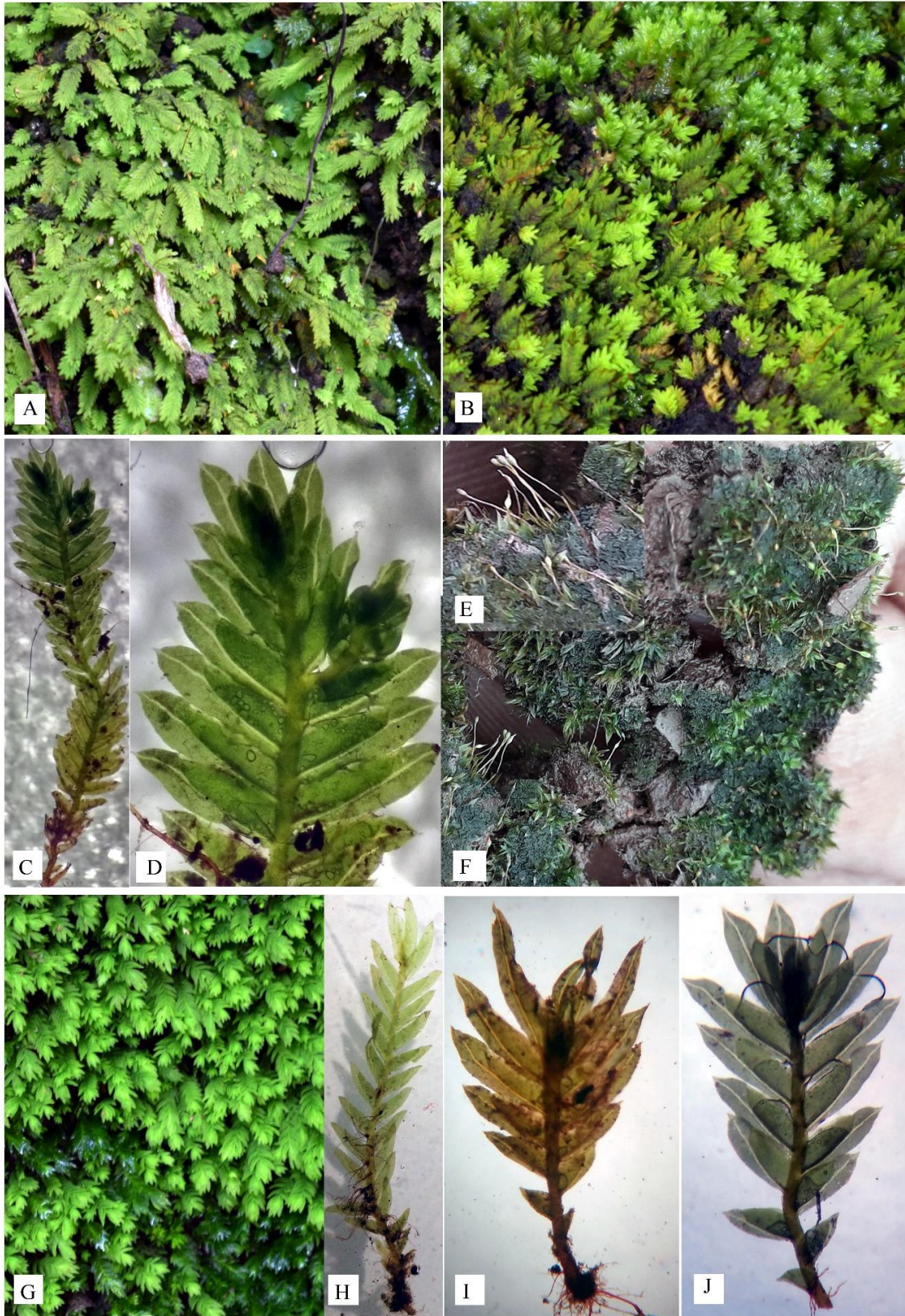


Plate 2: A. *Fissidens pulchellus* Mitt., B. *Fissidens ranchensis* Gangulee, C&D. *Fissidens semiperfalcatus* Dixon, E&F. *Fissidens subangustus* M. Fleiseh., G&H. *Fissidens subpulchellus* Nork. and I&J. *Fissidens virens* Thawaites & Mitt.



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