RESEARCH ARTICLE

TWELVE BRYOPHYTE GENERA, NEW DISTRIBUTIONAL RECORDS TO ANDHRA PRADESH, INDIA

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Abstract: Twelve Bryophyte genera representing 13 species and a variety, viz., *Rebouliahemisphaerica* (L.)Raddi, *Cheilolejeuneagiraldiana* (Massari) Mizut., *Mastigolejeuneahumalis* (Gottsche) Schiffner, *Leucobryumhumillimum*Cardot, *Hymenostomumedentulum* (Mitt.) Besch, *Hymnostyliumrecurvirostre* (Hedw.) Dixon, *H. recurvirostrum* var.*auranticum*, *Trichostomumtenuirostre* (Hook. & Taylor) Lindb, *Anomobryumfiliforme* (Griff.) A. Jaeger, *A. schimidii* (Mull. Hal.) A. Jaeger, *Pohlia flexuose* Harv, *Bartramidularoylei* (Hook. f.) Bruch &Schimp., *Floribundaria floribunda* (Dozy &Molk.) M. Fleisch and *Entodonscariosus*Renauld&Cardot,are collected fromdifferent forest tracts of Eastern Ghats in Andhra Pradesh are being reported as new distributional records to the state.

Keywords: Bryophyta, Genera, New records, Andhra Pradesh

INTRODUCTION

Andhra Pradesh is the seventh largest state in Indian union covering an area of 162, 970 Km^2, lies between 12°37′ and 19° 25′ Northern Latitude and 76° 45′ and 84° 72′ Eastern Longitude (Map 1). The state comprises 13 districts; four in Rayalaseema region and nine in Coastal Andhra. Forests cover 17.86% of the total geographical area (FSI 2019) which are dry and moist deciduous type with diversified moist habitats. The altitude in the state is from sea level to 1680 m above Mean Sea Level.

Part of bryophyte inventory during 2016 to 2019 in the state of Andhra Pradesh, we could collect curious bryophytes specimens from forest tracts of Eastern Ghats in different localities located in different districts. Critical examination of the specimens revealed their identification to 14 taxa representing 13 species belonging to 12 genera: *Rebouliahemisphaerica* (L.) Raddi, *Cheilolejeuneagiraldiana* (Massari) Mizut., *Mastigolejeuneahumalis* (Gottsche) Schiffner, *Leucobryumhumillimum* Cardot, *Hymenostomu -medentulum* (Mitt.) Besch, *Hymnostyliumre -curvirostre* (Hedw.) Dixon, *H. recurvirostrum*var. *auranticum*, *Trichostomumtenuirostre* (Hook. & Taylor) Lindb, *Anomobryumfiliforme* (Griff.) A. Jaeger, *A. schimidii* (Mull. Hal.) A. Jaeger, *Pohliaflexuose* Harv, *Bartramidularoylei* (Hook. f.) Bruch &Schimp., *Floribundaria floribunda* (Dozy &Molk.) M. Fleisch and *Entodonscariosus* Renauld&Cardot. Perusal of literature (Rao *et al*., 1999; Sowghandika, 2010; Dandotiya*et al*., 2011; Sandhya Rani *et al*., 2011a & 2011b; Sowghandhika*et al*., 2011; Sandhya Rani *et al*., 2012; Sandhya Rani *et al*., 2014; Alam 2015; Manjula & Maju, 2016; Pande *et al*., 2019 and Sreenath & Ravi Prasad Rao 2019& 2020) revealed that the above mentioned species are not recorded from any locality in the state of Andhra Pradesh. Hence the present collection forms are new distributional records to the state.

MATERIALS AND METHODS

Extensive bryophyte explorations were conducted during June 2016 to December 2019. The corticolous plant materials were collected by using sharp edged knife and terrestrial specimens scraped by using manually bent and sharped 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 Nikon D3300. Collected material brought to the laboratory, made it air-dried at room temperature, following Standard Procedure (Bridson& Forman 1989) 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

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ocular micro meter (ERMA) 19 mm, 100 segments in one cm. Photographs were taken by using Moto g3 turbo and Samsung 13 MP camera with 4x wide digital zoom. Identification of the specimens was done by using standard floras. Descriptions, habitat and ecology, voucher specimens and photographs were provided for the species. All the specimens were deposited in Sri Krishnadevaraya University Herbarium (SKU), Ananthapuramu. Names of the collectors are abbreviated as: AS (AnanthaneniSreenath) and BR (Boyina Ravi Prasad Rao). The species are systematically enumerated under respective families.

RESULTS

Systematic descriptions

Aytoniaceae

Rebouliahemisphaerica (L.) Raddi, Opusc. Sci. 2(6): 357 1818; Manju, C.N & K.P. Rajesh, Bryophytes of Kerala, Liverworts, vol 1: 24. 2017.

Plants terricolous, thallus closely attached to the substratum near base and slightly raising towards apex, growing 1-2.5 cm × 2.2 – 3.5 mm, thallus yellowish-green with purple to brown margin; lobes oblong emarginate or bilobed at apex, dorsal epidermal cells 4 -6 angled, walls slightly thickened, pores a little elevated with 3 - 5 concentric rings, 6 – 8 celled each; radial walls and trigones thickened; scales purple in one row on either sides of the midrib, two appendaged, linear, midrib thick, gradually passing into the lamina ending in one cell thick margin, female receptacles hemispherical, 4 lobed, up to 7 mm long. Capsule spherical pale green to yellowish green. Spores yellowish brown, rounded, reticulate with a broad wing, 65 -80 µm. Elaters 250 -350 µm, 2 – 3 spirals.

Habitat and ecology: Found on top hills in moist and cool places, associated with *Fossombronia sp.* (Fossombroniaceae) and *Weisiaedentula* (Pottiaceae).

Specimens examined: India, Andhra Pradesh, Nellore district, Penchalakona top hills, 07 February 2017, 52274, SKU, BR & AS.

Distribution: **World**: Afghanistan, Africa, Australia, China, Europe, Japan, Java, Korea, Nepal, New Zealand, North & South America, Tahiti. India: Darjeeling, Kashmir, Kerala, Khasi hills, Kulu, Mussoorie, Mount Abu, Pachmahri, Shimla and Tamil Nadu.

Lejeuneaceae

Cheilolejeuneagiraldiana(Massari) Mizut. In J. Hattori Bot. Lab. 27: 141. 1964; 35: 401. 1972& 51: 166. 198; Daniels, A.E.D. Bryophytes of Southern W. Ghats 151-152. 2003.

Plants terricolous, foliose closely attached to the substratum, up to 1.5 cm long, brownish green to olive green, irregularly branched stem with covered by imbricate leaves. leaves obliquely wide spreading, ovate, convex, 0.35 – 0.48 × 0.32 - 0.45 mm, apex obtuse, incurved, margin entire, anterior margin crescent to arched, posterior margin straight to slightly incurved. Leaf basal cells 22 – 35 × 12 – 20 µm; middle cells 15 – 20 × 13 – 18 µm; apical cells 12 – 15 × 11 – 13 µm; with distinct trigones at walls and with or without intermediate nodular thickenings. Leaf lobules 0.9 – 0.27 × 0.14 – 0.18 mm, apex obtuse, swollen, constricted with an inconspicuous, 1- 3-celled at first tooth and second tooth a triangular, arched keel, smooth. Under leaves slightly imbricate, 0.25 – 0.32 × 0.23 – 0.31 mm, 3 – 4 times as broad as stem, orbicular, 2-lobed, lobs 1/3-1/4 in deep, margin entire, obliquely inserted. Male inflorescences terminal, on short lateral branches, capitate; bracts 2 – 4 pairs, much swollen; bracteoles 1 or 2 at base. Female inflorescence on main axes or on lateral branches with 1or 2 sub floral innovations. Perianth and sporophytes not seen.

Habitat and ecology: Found on wet soils near waterfallsand other water sources in interior forests,mostly mono-dominant, sometimes associated with *Leucobryumhumillimum* (Dicranaceae).

Specimens examined: India, Andhra Pradesh, Chittoor district, Top hills of Talakona waterfalls, Near above Sirodronitheertham, 12 November 2018, 55267B, SKU, AS.

Distribution: **World:**China, Japan, Nepal, Philippines. India**:** Eastern Himalaya, Tamil Nadu and Western Ghats.

Mastigolejeuneahumalis (Gottsche) Schiffner. Hepat. (Engl. -Prantl) 129 1893; Manju, C.N & K.P. Rajesh, Bryophytes of Kerala, Liverworts, vol 1: 114. 2017.

Plants corticolous, leafy closely to loosely attached to the substratum, yellowish green, 4 – 10 x 1.7 – 2 mm wide with leaves, irregular branching, rhizoids few; leaves ovate or oblong, widely spreading, densely imbricate, lobes convex, falcate, 0.91 – 0.95 x 0.55 – 0.65 mm, margin entire, apex obtuse to apiculate, leaf cells slightly differentiated in size, leaf marginal cells 7 – 10 x 10 – 12.5 µm, middle leaf cells 10 -12 x 17 – 20 µm, basal leaf cells 15 – 20 x 30 – 35 µm, trigones large and nodulous; leaf lobule inflated, oblong, 0. 39 – 0.45 x 0.2 – 0.23 mm, truncate at apex, margin with 1 – 2 teeth, first tooth 1 – 3 cells long, 1 -2 cells wide at base and second tooth 2 cells long, 1 -2 cells wide, under leaves

strongly imbricate, widely ovate, 0.35 – 0.37 x 0.46 - 0.48 mm, truncate at apex, entire margin. Sporophytes on elongate, non-specialized branches, perianth oblong-cylindrical 1.4 -1.7 x 0.7 0.9 mm, 3-keeled, keels smooth.

Habitat and ecology: Found on old tree trunks on high mountains in cool and moist places, associated with *Stereophyllum* sp. (Stereophyllaceae) and other Hypnaceae or Thudiaceae members.

Specimens examined: India, Andhra Pradesh, Visakhapatnam district, Gudem Hills, 27 November 2017, 53851C & 59852C, SKU, AS.

Distribution: **World**: Formosa, Japan, Java, Nepal, Ryukyu. India:Kerala and Meghalaya.

Dicranaceae

LeucobryumhumillimumCardot, Mem. Soc. Sci. Nat. Cherbourg 32: 15 1901; *Leucobyumcuculli -folium* Cardot in Renauld&Cardot in Bull. Soc. Roy. Bot. Belgique 41: 30. Gangulee, moss. E. India 1(2): 421. 1971.

Plants terrestrial, found as dense mats, up to 2 cm high, glaucous-green above, white blow, brown stem near at rhizoids, stem branched or rarely un branched, densely covered by leaves. leaves erectopatent to spreading when moist and not much changed when dry, linier lanceolate, 4 – 5 × 0.3 - 0.7 mm, concave at base, gradually narrowing to a canaliculated, leaf apex acute, distinctly cucullate and closed with incurved margin, with one layer of chlorocysts between 2 layers of leucocysts above, becoming 3 – 4 layered below. Costa wide to slender, smooth on back side. Leaf basal cells 38 – 70 × 24 – 35 µm; middle cells 62 – 75 × 36 – 42 µm; apical cells 25 – 70 × 18 – 40 µm; marginal cells hyaline, 8 -10 rowed below, narrowing up to 2 and one-rowed at apex, linier cells 40 –70 × 25 – 30 µm. Sporophytes not seen.

Habitat and ecology: Found on top hills near water sources in deep shade, mostly mono- dominant, sometimes associated with other leafy liverworts.

Specimens examined: India, Andhra Pradesh, Chittoor district, Top hills of nelakona, Near Dongalabanda Waterfall, 12 November 2018, 55260B, SKU, AS; Top hills of Talakona water Fall, Near above Sirodronitheertham, 12 November 2018, 55267A, SKU, AS.

Distribution: **World**: China, Japan, Nepal and Sri Lanka. India: Tamil Nadu and Western Ghats.

Pottiaceae

Hymenostomumedentulum (Mitt.) Besch., Bull. Soc. Bot. France 34: 95 1887; Gangulee, moss. E. India 1(2): 673-675. 1971.

Plant lignicolous or terricolous, found forming as dense mats, up to 10 mm,yellowish green, stem brown; simple or sometimes branched, densely covered with leaves which are larger at the top, smaller at base. Leaves erect-spreading when moist and crispate when dry, carinate linear lanceolate 1.5 – 3 × 0.28 -0.4 mm; pointed narrow leaf tip. Margin involute in the lamina and unbroken. Costa pale brown up to 75 µm near at base, excurrent, rough at middle of the leaf. Leaf basal cells yellowish or hyaline, quadrate to elongate, 85 – 105 × 15 – 18 µm near at costa, becoming shorter towards margin; middle and apical laminal cells rounded to quadrate up to 13 µm wide in diameter, obscure, densely papillose and yellowish. Sporophytes found on apical portion of the plant, seta erect up to 6 mm long, yellowish brown. Capsule erect or slightly nodding, brown, ovoid, urn up to 0.8 – 1.2 × 0.4 – 0.5 mm in diameter. Operculum conical with elongated and slightly bent at apex, up to 1 mm high. Calyptra cucullate, it covers almost to the base of the capsule, peristome absent. Urn rim shows two layers of slightly tinted, small, horizontal cells. Spores warty, rounded to red-brown to 20 µm in diameter.

Habitat and ecology: Found on soil-covered moist rock substratum, associated with *Plagiochasmaappendiculatum* (Aytoniaceae) and other Bryaceaemembers.

Specimens examined: India, Andhra Pradesh, Chittoor district, Horsley hills, 16 September 2016, 51645B & 51657, SKU, BR & AS;Kailasakona, 25 February 2017, 53333, SKU, BR & AS; Visakhapatnam district, on the way of Rathnagiri to Galikonda, 28 November 2016, 52213B, SKU, BR & AS; Guntur district, Mangalagiri Reserve Forest, MangalagiriGandalayam, Near NDRF training center, 25 January 2017, 52252, SKU, BR & AS; Ameenabad Reserve Forest, near Pirangipuramu, Narasaraopet, 26 January 2017, 52255, 52256 & 52257 SKU, BR & AS; Nellore district, RapurGhat, 18 September 2016, 51666, SKU, BR & AS; Penchalakona, 07 February 2017, 52270 & 52272, SKU, BR & AS; Kurnool district, Tummalabailu, Nallamalais, 28 December 2016, 52225, 52226A & 52227, SKU, BR & AS; Bettudatanarava, Gundlabrahmeswaram Wild Life Sanctuary, Nallamalais, 20 April 2017, 53371B, SKU, BR & AS; Prakasam district, Dornala range, Rollapenta, 24 October 2017, 53610A, SKU, BR & AS; Vizianagaram district, Kondamusuru Reserve Forest, 11 December 2017, 53881& 53882, SKU, BR & AS.

Distribution:**World**: China, Java, New Caledonia, North Vietnam, Philippines, Sri Lanka, Taiwan. India: Andaman & Nicobar Islands, Kerala and Tamil Nadu.

Hymnostyliumrecurvirostre (Hedw.) Dixon, Rev. Broyal. Lichenol. Rev. Bryol. Lichenol. 6: 96 1933;Gangulee, moss. E. India 1(2): 646-648. 1971.

Plants lignicolous or terrestrial, found forming as dense tufts up to 8 mm high, stems yellowish green, reddish near rhizoids, branched, covered with erectopatent to spreading leaves. Leaves recurved when moist, erect to flexuous when dry; leaves linear lanceolate, 1.2 – 1.6 × 0.2 - 0.3 mm, acuminate at apex, carinate concave, margin smooth, usually flat. Costa prominent, pale brown, rough on back, ending below the apex. Leaf cells rectangular and pellucid at base 35 – 40 × 8 – 12 µm; shorter towards margin but base margin shows some narrow elongated, pellucid cells; middle and apical cells subquadrate, 6 – 9 µm wide in diameter, distinctly papillose, small, somewhat incrassate. Sporophyte present on apical portion of the stem. seta slender, up to 6.5 mm long, reddish brown. Capsule erect, brown, oval, 0. 7 - 0.9 × 0.4 -0.5 mm in diameter, wide mouthed after fall of operculum with columella. Operculum rostrate, curved to one side, 0.9 mm long. Capsule mouth with two rows of horizontal 20 – 24 × 12 µm, deeper in coloured, thick-walled annulus cells. Peristome absent. Calyptra cucullate, covering only operculum. Spores rounded, bright brown pellucid, 12 - 14 µm in diameter.

Habitat and ecology: Found as lignicolous on soil covered rock substratum, associated with Fissidentaceae (or) Pottiaceae members.

Specimens examined: India, Andhra Pradesh, Nellore district, Penusila Wild Life Sanctuary, Penchalakona, 06 February 2017, 52268, SKU, BR & AS; Visakhapatnam district, Simhachalam hills, 23 October 2018, 55249B, SKU, BR & AS.

Distributions:**World**:Afghanistan, Caucasus, China, Japan, Korea, Myanmar, New Guinea, New Zealand, Pakistan, Philippines, Western Tibet and India: Darjeeling, Delhi, Kashmir, Kerala, Khasia hills, Kangara, Mussoorie, Shervaroy Hills (Eastern Ghats), Tamil Nadu and Western Himalaya.

Hymnostyliumrecurvirostrumvar. ***auranticum***(Mitt.) Gangulee*Combnov*.Gangulee, moss. E. India 1(2): 648-649. 1971.

Plants lignicolous, found forming as dense clusters up to 12 mm high, plants usually bifurcating by innovations; sturdy golden in color, stem light brown below, densely covered by leaves; erectopatent to spreading when moist and strongly curled when dry. Leaves lanceolate 1.8 – 2.5 × 0.28 – 0.34 m, acuminate, carinate at tip. Smooth margin, usually flat (or) sometimes recurved. Costa pale brown ending below the apex. Leaf basal cells rectangular, thin walled, transparent 37 – 48 × 12 – 14 µm, not shorter towards margin, but margin shows some narrow, elongated and pellucid cells. Middle and apical lamina cells very irregularly quadrate, thick walled, more thickened at the corners, 10 µm in diameter, with coarse papillae. Sporophytes present apical portion of the plant. Seta golden up to 8 mm long. Capsule erect, reddish-golden, ovate-globose, 1 – 1.2 × 0.68 – 0.72 mm in diameter. Peristome absent.Calyptra not seen in this specimen. Spores rounded brown, 15 – 18 µm in diameter.

Habitat and ecology: Found on black stones in deep forest shade, mostly found as monodominant, sometimes associated with other Bryaceaemembers and pleurocarpous mosses.

Specimens examined: India, Andhra Pradesh, Prakasam district, Nallamalais, Peddarutla, 18 April 2017, 53352, SKU, BR & AS; Kurnool district, Nallamalais, Bettudatanarava, Gundlabrahmeswaram wild life sanctuary, 20 April 2017, 53374 & 53375, SKU, BR & AS.

Distribution: **World**: Burma, China, East Nepal, Philippines. India: Darjeeling, Kashmir, Kerala, Sikkim, Tamil Nadu, Western Ghats and Western Himalaya.

Trichostomumtenuirostre (Hook. & Taylor) Lindb., Ofvers. Forh. Kongl. SvenskaVetensk. – Akad. 21. 225 1864; *Oxysteguscylindricus* (Brush ex Bird.) Hilp, Beih. Bot. Centralbl., Abt. 2 50 (2): 620 1933.

Plants terricolous, found forming as loose tufts, up to 2.5 cm high, yellowish green to green, brownish below the stem. Stem slender, flexuouse. Leaves fragile in older part, comparatively lax patent to spreading when moist, flexuouse to curled when dry, longer in upper rosettes, lanceolate-ligulate, 3.5 – 4.3 × 0.48 – 0.65 mm, concave, slightly sheathing at base, margin flat, little wavy, smooth below, somewhat crenulate with papillae above; tip acute with a short apiculus. Costa light brown, prominent, percurrent or excurrent in the apiculus. Leaf basal cells wide rectangular, hyaline, thin walled, 65 – 73 × 10 – 12 µm near costa, shorter towards margin and gradually passing into shorter chlorophyllose cells above. Middle upper laminal cells rounded-quadrate 9 – 14 × 8 – 12 µm in diameter, slightly incrassate, multipapillate, slightly obscure. Perichaetial leaves not differentiated. Sporophytes not seen.

Habitat and ecology: Found on moist soils, associated with *Bryumcellulare* and other Bryaceae members.

Specimens examined: India, Andhra Pradesh, Chittoor district, Talakona waterfalls, 15 November 2016, 51699A; 29 October 2017, 53707D, SKU, BR & AS; Kurnool district, Nallamalais, Thummalabailu, 28 December 2016, 52224B, SKU,

BR & AS; East Godavari district, Papikondalu National Park, Near Vali and Sugreevula temple, 22 November 2018, 55828B, SKU, AS.

Distributions:**World**: East Nepal andIndia: Darjeeling, Kashmir, Kerala, Khasia hills, Naga hills, Sikkim, Southern Western Ghats, Tamil Nadu and Western Himalaya.

Bryaceae:

Anomobryumfiliforme (Griff.) A. Jaeger, Ber. Thatigk. GallischenNaturwiss. Ges. 1893-74: 142 (Gen. Sp. Musc. 1: 604) 1875; Gangulee, moss. E. India 2(4): 958-960. 1974.

Plants lignicolous or terricolous, found forming as densely tufted, julaceous, slendeer, soft, often flexuose, erect, up to 1.5 cm high, branched by 2 or 3 sub-floral innovations about 1 cm long, light green to green. Leaves imbricate, concave when moist and not much changed when dry, may be contorted; oblong-ovate 1 – 1.7 × 0.3 – 0.5 mm, apex acute and slightly acuminate; margin flat, revolute at base and entire and slightly denticulate at apex. Costa percurrent to reaches the apex in most leave. Abundant gemmae present in the axils of the branch leaves of some plants, but not found in all plants; gemmae multicellular, clavate, 150 – 175 × 58 – 70 µm. Leaf cells thin-walled; narrow elongated, parenchymatous, leaf apical and middle cells 75 – 90 × 8 – 10 µm; basal cells gradually broader, laxer and irregularly sub-rectangular, 58 – 65 × 12 – 16 µm; some shorter cells at extreme base; lower cells lacking chlorophyll. Perichaetial leaves larger on the periphery, shorter inside, more acute. Sporophyte present apical portion of the plant. Seta flexuose, bent at tip, up to 2.5 cm long. Capsule horizontal, ovate cylindrical, narrow mouthed, red, 3.5 – 5 × 1 – 1.5 mm with the tapering apophysis. Operculum conical, outer peristome teeth narrow lanceolate, 480 – 520 × 68 – 82 µm brownish below, hyaline papillose at tip; inner peristome hyaline, well developed, segments of the same height as the outer teeth, appendiculate cilia present. Hexothecial cells thick walled, rounded to hexagonal. Spores rounded 12- 20 µm in diameter.

Habitat and ecology:Found as lignicolous or terricolous; found on wet rocks or soil, associated with *Plagiochasmaappendiculatum*(Aytoniaceae).

Specimens examined: India, Andhra Pradesh, Kurnool district, Gundlabrahmeswaram wild life sanctuary, near Lord Gundlabrahmeswara temple, 12 July 2017, 53524, SKU, BR & AS; Visakhapatnam district, Ananthagiri hill ranges, Galikonda near View point, 21 October 2018,55203A& 55204, SKU, AS; Sunkarimetta, 21 October 2018, 55229C, SKU, AS.

Distributions:**World**: Widespread Southern and North Hemispheres, USA-Alaska, Baker, British Columbia, California, Clatsop, Klamath, Oregon. India: Meghalaya, Sikkim, Tamil Nadu and Uttarakhand.

Anomobryumschimidii (Mull. Hal.) A. Jaeger Ber. Thatigk. St. GallischenNaturwiss. Ges. 1873-74: 140(Gen. Sp. Musc. 1: 602) 1875; Chopra R.S. Tax. of Indian mosses: 208 & 210. 1975.

Plants terricolous, found forming as loosly tufted, julaceous, slender, soft, often flexuose, erect, up to 2 cm high, branched by 2 or 3 sub-floral innovations equally julacious, yellowish green to golden-green, densely covered by closely imbricate leaves. leaves closely appressed to stem, concave when both moist and dry conditions; ovate-elliptical, 1 – 1.5 × 0.5 – 0.7 mm, apex obtusely apiculate to obtusely rounded; margin flat, entire and slightly denticulate at apex. Costa pale, thin, percurrent to ending below the apex. Leaf cells thick-walled; linear, vermicular, parenchymatous, leaf apical and middle cells 55 – 60 × 8 – 10 µm; basal cells gradually broader, laxer, rhomboidal and hexagonal to sub-rectangular, 42 – 50 × 16 – 20 µm; some shorter cells at extreme base; lower cells lacking chlorophyll. Perichaetial leaves lanceolate with acute apex. Sporophytes not seen.

Habitat and ecology: Found on wet soil in deep shade, associated with *Barbula*sp. (Pottiaceae) and other mosses.

Specimens examined:India, Andhra Pradesh, Prakasam district, Gundlabrahmeswaram wild life sanctuary, near Isukagundam, ObulesuniPenta, Anjaneyuniborikalu, 04 August 2017, 53541B & 53542B, SKU, BR& AS; Prakasam district, Gundlabrahmeswaram wild life sanctuary, Near obulesunipenta, Bapanakonda, 05 August 2017, 53553B, SKU, BR & AS.

Distribution:**World**:**India**: Southern Western Ghats and Tamil Nadu.

Pohlia flexuose Harv. Icon. Pl. 19: f. 5 1836;Gangulee, moss. E. India 2(4): 908-910. 1974

Plants terricolous or lignicolous, found forming as lax to gregarious tufts, up to 1.5 cm high; yellowish green to brownish green. Stem gradually erect with brown radicles below, simple or sometimes with sub-floralinnovations. Leaves densely arranged on stem, smaller in lower parts of the stem; erectopatent to spreading when moist and curved when dry, lanceolate, 1.8 – 2.7 × 0.4 – 0.6 mm, margin flat, reflexed at base, entire below, slightly dentate at apex; apex acuminate. Costa faintly strong, reddish, percurrent. Leaf basal cells rectangular, 38 – 45 × 8 – 11 µm; alar cells irregularly quadrate, 35 – 45 × 28 – 35 µm, also thick walled; apical and middle leaf cells

linear-rhomboid with fairly thick walls, 48 -60 × 7 – 11 µm. Perichaetial leaves linear-lanceolate, slightly larger, 3 – 3.5 × 0.4 – 0.6 mm, sometimes with twisted apex. Sporophytes present on apical portion of the plant. Seta and capsule not seen clearly.

Habitat and ecology: Found terricolousor lignicolous; found on wet surfaces, associated with *Bryumargentium* var.*lantum* (Bryaceae) and *Riccia* sp. (Ricciaceae).

Specimens examined:India, Andhra Pradesh, Kurnool district, Nallamalais, Ahobilam, 01 July 2017, 53501A, SKU, BR & AS; Nallamalais, RudraKodu, 10 July 2017, 53505B, SKU, BR & AS; Nallamalais,Srisailam Range, NaramamidiCheruvu Basecamp, 22 September 2017, 53598B, BR & AS; Ananthapuramu district, Near Kundurpi, KundurpammaKonda, 05 November 2017, 53717, SKU, AS.

Distribution:**World**: Belgium, Bhutan, Caribbean, China, Colombia, Costa Rica, Hawaiian Island, Ireland, Japan, Nepal, Panama, Sri Lanka, United Kingdom. India: Arunachal Pradesh, Darjeeling, Kashia hills, Maharashtra, Manipur, Orissa, Sikkim, Tamil Nadu, West Bengal and Western Himalaya.

Bartramiaceae:

Bartramidularoylei (Hook. f.) Bruch &Schimp., Bryol. Eur. 4: 55 Fasc. 29-30 Mon. 1) 1846; Gangulee, moss. E. India 2(4): 1107-1108. 1974.

Plants terricolous or lignicolous, found forming as densely to loosely cushions, up to 2 cm; high, light green to brownish green; brownish below, branched by 3 – 5 sub-floral innovations, rhizoids reddish brown, slightly larger than leaves. leaves more or less erectopatent to spreading when moist, closely appressed to slightly curved when dry; leaves narrowly lanceolate, 1 – 1.7 × 0.2 – 0.3 mm, margin more or less flat, serrulate in most upper part, leaf base slightly decurrent on stem, apex acuminate. Costa excurrent in an arista point, up to 0.2 mm long. Leaves on branches smaller and narrower. Leaf basal cells broadly rectangular, thin walled, translucent, 42 - 50 × 12 – 15 µm; marginal cells near the leaf base quadrate to irregularly rectangular, 15 – 18 × 8 -12 µm near at base; leaf apical and middle cells, linear, rectangular thin walled, papillose, 35 – 42 × 5- 7 µm. Sporophytes not seen.

Habitat and ecology: Found on soil covered rocky substratum in waterfall areas, associated with *Mangiferaindica*,*Ricciardia*sp.(Annuraceae) and other Fissidentaceae members.

Specimens examined: India, Andhra Pradesh, Kurnool district, Nallamalais, Mamidimanusela, 29 May 2017, 53392A, SKU, BR & AS; Visakhapatnam district, near Paderu, 25 November 2017, 53824 & 53825A, SKU, BR & AS; Sunkarimetta, 21 October 2018, 55234B, AS; East Godavari district, Papikondalu National Park, Near Vali and Sugreevula Medicinal plant conservation area, 22 November 2018, 55822B & 55825B, SKU, AS.

Distribution:**World**: Sri Lanka. India: Chhattisgarh, Himachal Pradesh, Maharashtra, Tamil Nadu, Uttarakhand and Western Himalaya.

Meteoriaceae:

Floribundaria floribunda (Dozy &Molk.) M. Fleisch., Hedwigia 44: 302. a-i 1905; Gangulee, moss. E. India 2(5): 1301-1303. 1976.

Plants corticolous or sometimes terricolous, forming as dense masses, hanging to 20 cm or more long, pinnately branched. Leaves complanate, feather like arrangement, wide spreading when both moist and dry conditions. Leaves lanceolate, 1.4 – 1.8 × 0.4 – 0.53 mm, wide cordate at base, apex acuminate, acumen often drawn in to a more or less long point; margin slightly denticulate, flat. Costa single, covering about ½ of the leaf length. Leaf cells moderately thickened, narrow elongate, with a row of small papillae in a series on the lumen, except in extremely basal cells and tip border cells. Leaf apical, middle and basal cells, 35 -43 × 2.8 – 3.5 µm; slightly differentiated to larger at basal alar region, 38 – 45 × 6-8 µm. sporophytes not seen.

Habitat and ecology: Found on moist soil, associated with *Racopilumcuspidigerum* (Racopilaceae) and other leafy liverworts.

Specimens examined: India, Andhra Pradesh, Visakhapatnam district, Seethammakonda, 25 November 2017, 53818C, SKU, AS.

Distributions: **World**: East Nepal. India: Arunachal Pradesh, Assam, Darjeeling, Khasia hills, Manipur, Mussoorie, Southern Western Ghats, Tamil Nadu and Western Himalaya.

Entodontaceae

EntodonscariosusRenauld&Cardot, Bull. Soc. Roy. Bot. Belgique 34(2): 75 1896; Gangulee, moss. E. India 3(8): 1789. 1980.

Plants corticolous, found as robust patches or mats, slightly glossy, stem creeping to 6 cm, giving rise to short, erect branches with dense leaves. Leaves in many rows, sometimes pressed to complanate, erectopatent when moist and not much change, appressed to erect, outspread tips when dry, ovate-lanceolate, 1.8 – 2.4 × 0.7 -0.9 mm, plicate, acute at apex, slightly narrowed at base, margin mildly crenulate to dentate. Very shot costa, double, very faint. Leaf cells narrow elongate to linear, leaf apical cells 62 – 70 × 5 – 7 µm; middle cells 95 -110 × 5- 7 µm. alar cells distinguished by a number of lax, quadrate 17 -20 µm in diameter, cells which become

larger to longer at extreme base. Sporophyte not seen.

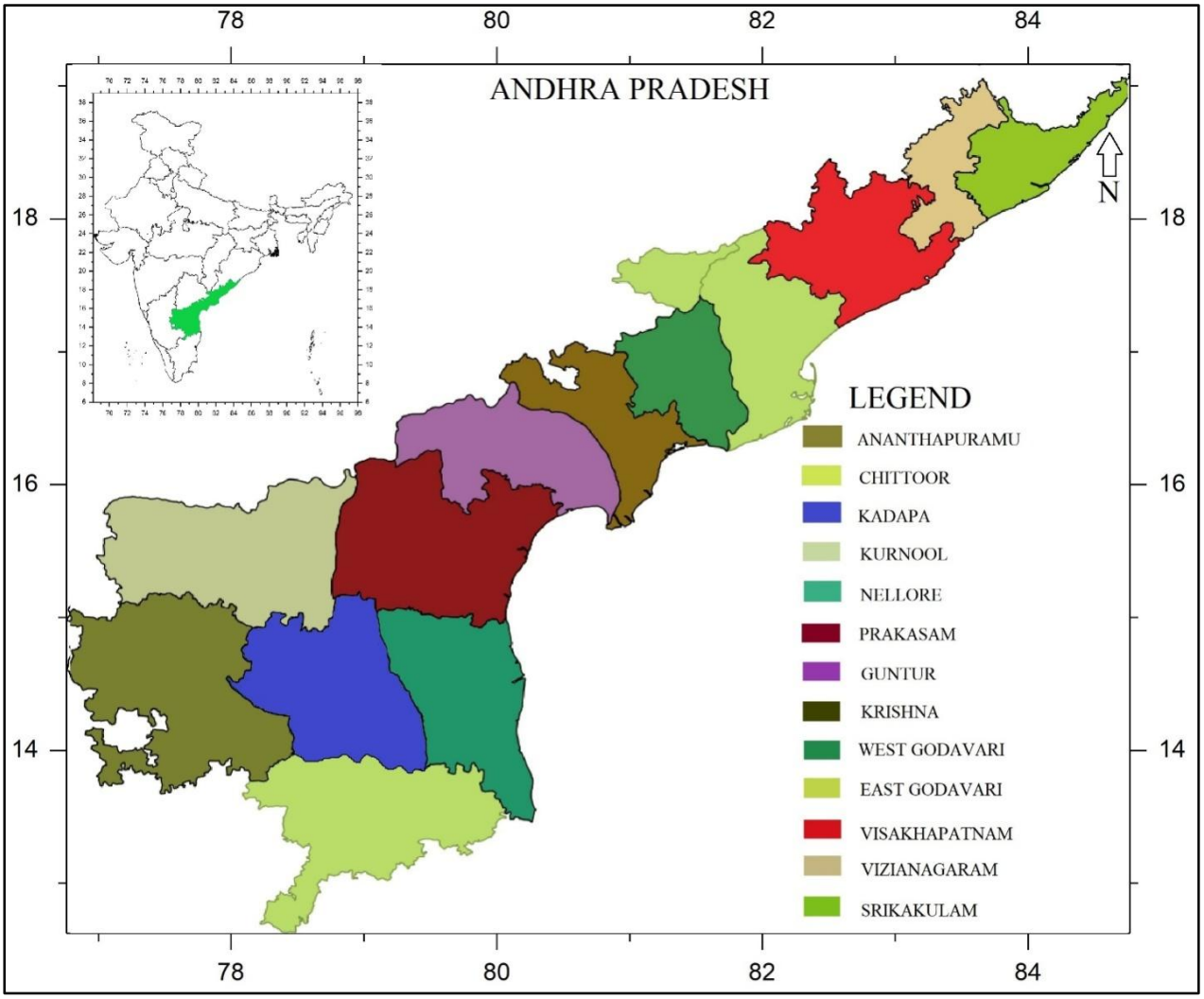
Habitat and ecology: Found on mango tree trunks, associated with*Stereophyllum* sp. (Plageotheciaceae), other leafy liverworts and pleurocarpous mosses.

Specimens examined: India, Andhra Pradesh, Visakhapatnam district, Gudem, 27 November 2017, 53854B, SKU, AS; Lambasingi, 28 November 2017, 53871, SKU, AS; Galikonda near Sunkarimetta, 21 October 2018, 55215B, SKU, AS.

Distribution: **World**: China. India: Darjeeling, Eastern Ghats (Shervaroy hills).

DISCUSSION

Previous reports on Bryoflora of Andhra Pradesh recorded 108 taxa comprising 107 species belongingto 68 genera and 36 families. Of the 108 taxa, Sandhya Rani *et al*. (2014) reported 95 taxa comprising 94 species; Manjula and Manju (2016), added four species of *Fissidens*; Pande*et al*. (2019), added two species of pleurocarpous mosses to Bryoflora of South India from Andhra Pradesh; Sreenath and Ravi Prasad Rao (2019a), added four more species of *Fissidens* to Bryoflora of Eastern Ghats from Andhra Pradesh; Sreenath and Ravi Prasad Rao (2019b), added one species of *Riccia* to Bryoflora of South India from Andhra Pradesh; Sreenath and Ravi Prasad Rao (2020), added two acrocarpous mosses to Bryoflora of Main Land India, from Andhra Pradesh. Present report added 12 genera comprising 13species and one variety to the Bryoflora of Andhra Pradesh.



Map 1: Study Area.

Plate 1.

Plate 2.

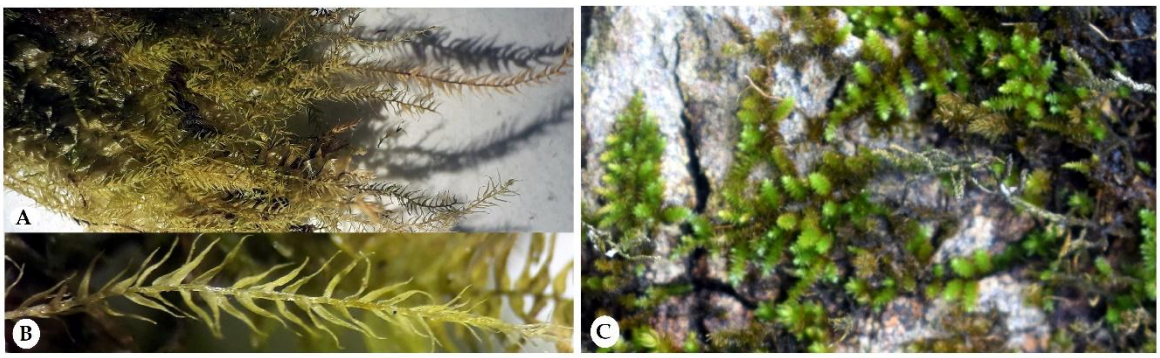


Plate 3.

LEGEND

Plate 1: A. *Rebouliahemisphaerica* (L.) Raddi, B. *Cheilolejeuneagiraldiana* (Massari) Mizut., C & D. *Mastigolejeuneahumalis* (Gottsche) Schiffner, C. Plant habit with sporophyte, D. Magnified view of Sporophyte, E & F.*Leucobryumhumillimum*Cardot, E. Plant Natural habit, F. Magnified view of plants, G – I. *Hymenostomumedentulum* (Mitt.) Besch, G. Plant natural habit, H. Magnified view of single plant with Sporophyte, I. Magnified view of Capsule and J – L. *Hymnostyliumrecurvirostre* (Hedw.) Dixon, J. Plant natural habit, K. Magnified view of plant with Sporophyte, L. Magnified view of Capsule.

Plate 2: A.*Hymnostyliumrecurvirostrum*var. *auranticum*, B. *Trichostomumtenuirostre* (Hook. & Taylor) Lindb, C. *Anomobryumfiliforme* (Griff.) A. Jaeger, D. *Anomobryumschimidii* (Mull. Hal.) A. Jaeger, E.*Pohlia flexuose* Harv andF & G. *Bartramidularoylei* (Hook. f.) Bruch &Schimp., F. Magnified view of single plant, G. Magnified view of leaf.

Plate 3: A & B. *Floribundaria floribunda* (Dozy &Molk.) M. Fleisch A. Plant natural habit, B. Magnified view of single branch and C. *Entodonscariosus*Renauld&Cardot,

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