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A Taxonomic Treatment of Corticolous Mosses from Nambor Reserve Forest, Golaghat, Assam, India

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ABSTRACT

A taxonomic treatment of Corticolous mosses of Nambor Reserve Forest, Assam, India has been made. The present paper deals with 23 species of corticolous mosses from the study area with taxonomic description. It is the first ever work on taxonomic description of mosses from the present study area as well as from Assam.

Key words: *Corticolous Mosses, Nambor Reserve Forest, Taxonomic Treatment.*

Introduction

Mosses belongs to the bryophytes are believed to have highest number of taxa among the autotrophic plants followed by angiosperms (Chopra, 1975). However, the taxonomic studies on these elegant groups of plants have received little attention in the present study area. Moreover, Mosses are considered as the most appropriate plant material to study the atmospheric deposition of Heavy metals (Govindpyari *et al*., 2010). The study area is situated in between 26.0-26.1 Latitude and 93.0-94.18 Longitude. The altitude of the study area ranges from 100 to 150 mean sea level. The average annual rainfall is 2500 mm; relative humidity is 89.8%; minimum and maximum temperature is 11 ºC and 38 ºC respectively. The forest covers chiefly by the evergreen angiospermic trees along with shrubs, under shrubs, herbs, epiphytes and lians, ferns and fern-allies, orchids, arroides, bamboos and rattan etc. and some gymnosperms like *Gnetum gnemon* L and *G. motnanum* Markgr. Climatic conditions of Nambor Reserve Forest, Assam have bestowed with rich corticolous moss flora, yet there is no taxonomic treatment of these elegant groups of plants. To fill this lacuna an attempt has been made to record corticolous mosses of the study area. Dhansiri is the main river flowing through the forest and Nambor is the one of the rivulets of Dhansiri which is also flows through the forest. The forest is also famous for fresh water Hot springs-(Garam pani) for tourist. There are no taxonomic work on mosses from entire Assam till date and therefore it is a sincere attempt to observe and documentations as taxonomical based work on mosses not only from the present study area but also found the floristic records for the first ever from Assam. In the present study 23 species of corticolous mosses have been recorded.

Materials and Methods

The materials have been collected from entire Nambor Reserve Forest during different seasons especially following rains during the year 2018-2020. The all collections made during the period were air dried in open shaded area, pressed and preserved in well kept in herbarium packets with their proper field records for further studies. The species col-

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lected were identified in the laboratory consulting with various standard published literatures (Barukial, 2011a and b; Barukial and Gogoi, 1995, 1997a&b; Barukial *et al*., 2002a and b; Chopra, 1975; Dixon, 1914, 1937; Gangulee, 1957-1985; Mitten, 1859; Robinson, 1964, 1968; Vohra, 1983 etc.) Nomenclatures and citation were updated by using THE PLANT LIST, IPNI (International Plant Name Index), KEW SCIENCE and TROPICOS. The taxa are arranged in alphabetical order.

Results and Discussion

The present paper is the first consolidated taxonomic Descriptions of 23 corticolous mosses of Nambor Reserve Forest, Assam, India. They are arranged in alphabetical order.

1. ***Acanthorrhynchium papillatum* (Harv.) M. Fleisch. Musc. Fl. Buitenzorg. IV: 216, 1923 (*Hypnum*, 1836); Chopra in Tax. Indian Mosses 516 & 517, 1975; *Stereodon papillatus* (Harv. in Hook.) Mitt. J. Linn. Soc., Bot. Suppl. 1 : 113, 1859.**

Description *:* Corticolous. slender plants in extensive flat mat. Stem 8.0 – 11.0 cm long. Stem creeping, closely pinnate; branches complanate foliate. Leaves ovate, concave, with long filliform acuminate, 1.5 – 1.7 mm long and 0.6 -0.9 mm breadth; margin serrulate; enervate. Lamina cells rhomboidal, thick walled, unipapillose on the lumen, 48.0 – 50.0 x 4.0 -5.6 µ; however, large and inflated on basal angles; alar cells elongate, gradually larger towards margin, 85.0 -90.0 x 20.0-25.0 µ. Perichaetial leave large. Seta long, smooth; capsule incline, horizontal, mostly gibbose, 1.0 -1.2 mm long and 0.25 – 0.28 mm breadth; operculum short, conical; peristome double, teeth coherent at the bases, dagger – shaped, brownish yellow, transversely striate, hyaline and papillose near the tip, 300.0 – 320.0 µ long; cilia mostly uniserriate; calyptra cucullate; spores small to medium sized, 15.0 – 16.0 µ in diameter.

2. ***Brotherella falcata* (Dozy and Molk.) M. Fleisch. Gangulee in Hand book Indian Mosses Sl. No. 87, Pl. No. XLIV, 1985; Vohra & Kar in Bull. Bot. Surv. India 38 (1-4), 52, 1996.**

Description*:* Corticolous, trailing, slender to moderately robust. Main stem creeping, densely branched, 16.0-18.0 cm long, glossy, yellow green to reddish, often pendulous, ultimate branches small, erect to ascending. Leaves falcate, concave, usually long subulate acuminate, ovate-lanceolate; stem leaves larger than branch leaves; apex narrowly acute; margin smooth, dentate at apex; costa absent. Lamina cells narrow elongate, 55.0-60.5 x 5.0-7.0 µ at apex and 50.0-54.5 x 7.0-10.0 µ at median portion of leaf; alar cells differentiated, inflated, oblong cells in one row with a few irregular cells on top, alar cells often tinted with yellow or reddish, one or two rows of cells joining alar along line of attachment elongated and porose. Seta slender, erect or flexuose, long; capsule ovate to oblong, inclined to horizontal, often symmetrical, 1.80-2.0 x 0.90-1.0 mm.; operculum conic rostrate; peristome normal, double, cilia irregular; spores small, 14.0-16.5 µ in diameter.

3. ***Calymperes heterophyllum* (Mitt.) Besch. in Ann. Sci. Nat. Bot., Ser. 8 (1) : 286, 1896; Gangulee in J. Bombay Nat. Hist. Soc. 60 (3) : 635, 1963; *Syrrhopodon heterophyllus* Mitt. in Musc. Ind. Or. 40, 1859.**

Description*:* Corticolous, sturdy with branched stems 2.5-3.5 cm long, lax caespitose. Stem uniformly covered with erectopatent leaves which are curled to falcate when dry. Leaves carinate – lanceolate with a broad apex, 2.5 - 3.5 mm long and 0.25 - 0.35 mm wide in the comparatively broader, oblong, sheathing; concave base which is about 1/6th of the total leaf length. Upper leaves longer, 3.0 - 3.6 mm long and 0.35 - 0.4 mm broad in the base which is more abruptly wider in these leaves. Chlorophyllose lamina cells very small, quadrate, 3.0–5.0 µ wide, densely Papillose with many blunt papillae and obscure; marginal row of cells bigger (10.5 - 11.5 ì in high), clear and causing a serrate margin of the leaf from tip almost to base. Cancellinae 1.0 -1.2 mm high in lower leaves and 0.8-0.9 mm in the upper leaves formed of up to 9 rows of thin – walled, quadrate to rectangular, hyaline cells which are 40.5 - 45.0 x 35.5 - 37.5 µ near costa. Cancellinae top obovate to slightly pointed; the hyaline cells are bordered by the tenioli of transparent, narrow, elongated cells, 3 rows at top of cancellinae, extending to about 8 rows below. The tenioli bordered on the margin by 4 or 5 rows of smaller cells as on top lamina, the outermost row of which is the serrulate outer margin. The tenioli becomes narrower (1 or 2 layers) above the cancellinae and extended to a little below the tip. Costa rough on back, light brown, 55.0 - 62.5 µ wide at base, excurrrent into a gemmiferous tip in all the upper leaves. The gammae germinate

by forming protonema like filaments. All plants sterile.

4. ***Calymperes tenerum* Müll. Hal. in Linnaea 37 : 174, 1871; Gangulee in J. Bombay Nat. Hist. Soc. 60 : (3), 627, 1963 & Hand book Ind. Mosses Sl. No. 21, Pl. No. XI, 1985; Yano & Mello in Revta. Brazil. Bot. 14: 39–40, 1991; *C. dozyanum* Bescherelle (non Mitt.) in Ann. Sci. Nat. Bot., Ser. 8 : (1), 264 & 283, 1896.**

Description*:* Corticolous, forming tufts of green with stiff leaves (mainly apical leaves), soften when getting wet. Stem short, simple, 4.0 -5.0 mm long, rosette- like spreading of leaves at top of the stem. Normal leaves lingulate, base not broader than lamina, apex obtuse, 2.0 - 2.5 mm long and 0.5 - 0.8 mm broad, curled and incurved when dry. Upper gemmiferous leaves longer and narrower at top, 2.5 -3.0 mm long and 0.5 - 0.7 mm broad at base (sometimes even broader). Chlorophyllose lamina cells hexagonal to quadrate, swollen with one or several coarse papillae, smaller than the basal hyaline cells (cancellinae), 5.0 - 5.8 µ wide and 5.7 – 7.2 µ long. Cancellinae within leaf base, 0.65 - 0.75 mm high, of about 10 rows of pellucid, elongated, rectangular cells on both sides of costa; cells very large near costa, 130.5 -135.5 x 42.0 - 45.0 µ, gradually becoming narrower towards margin and bordered by about 6 rows of elongated, very narrow cells at the margin, 2 rows of these cells may extend to a little above the cancellinae region as very short tenioli. Leaf margin smooth at tip, may be slightly denticulate at base. Costa prominent, percurrent in normal leaves but excurrrent into a club like structure (which may be branching by splitting in some cases) in gemmiferous leaves bearing the radiating brood bodies in star like clusters. Gammae 135.0 -142.5 x 22.0 - 24.0 µ, green, germinating from tip forming a protonematous hypha.

5. ***Chaetomitrium papillifolium* Bosch & sande Lac. in Bryol. Java II : 50, 171, 1862; Chopra in Tax. Indian Mossses 391, 1975; *Gyrosine andamaniae* Müll. Hal. in Fleisch. Musci. Fl. Buitenzorg. II : 1052, 1908, *fid*. Fleisch., *l.c.***

Description *:* Corticolous. Slender, Stem creeping, 3.5 – 11.8 cm long, profusely branched; branches prostrate, usually elongate, radially symmetrical and regularly pinnate. Leaves erectopatent, more or less concave, ovate to elliptic- lanceolate, 1.4 1.6 mm long and 0.30 – 0.32 mm wide; long acumen, apiculate; margin revolute; costa short thin. Lamina cells at the back mostly Papillose to spiny or the upper angle extended as papillose, thin to fine walled, elongate to linear, prosenchymatous, towards the apex shorter (70.0 -75.0 x 10.0 -12.0 µ); towards the base somewhat larger, (70.0 – 75.5 x 18.0 -20.5 µ). Seta elongate, smooth or papillose to aculeate. Capsule mostly inclined, ovoid short necked. Peristome teeth lanceolate or linear – anceolate, 0.15 mm long, yellow brown, lamellae extended, median line zigzag or nearly straight; endostome yellow or brownish yellow, finely papillose; basal membrane high; processes as long as the teeth; cilia absent or rudimentary; operculum with a long recurved, articulated cilia; spores normal, 17.5 -22.0 µ in diameter.

6. ***Claopodium assurgens* (Sull. & Lesq.) Cardot in Bull. Bot. Geneve Ser. 23 : 383, 1911; Noguchi in Journ. Hattori Bot. Lab. 27 : 37, 1964; Watanbe in *ibid* 36 : 217, 1972; Chopra in Tax. Indian Mosses 431 & 432, 1975; Vohra in Rec. Bot. Surv. India 23 : 77 & 78, 1983 ; Dix. in J. Bombay Nat. Hist. Soc. 39 (3), 787, 1937; Gangulee in Hand book Indian Mosses Sl. No. 68, Pl. No. XXXIV, 1985.**

Description*:* Corticolous, robust, yellow to dirty green forms a dense mats. Main stem long, creeping with distant, erect, dendroid branches which may be several cm high. Stem leaves larger, ovate, finely long acuminate, ending in a narrow tip. Branch leaves progressively smaller, cordate-lanceolate; margin toothed and revolute. Costa single, strong, almost reaching tip. Lamina cells rounded to hexagonal, moderately incrassate; some cells at the tip of leaf elongated and smooth; basal lamina cells linear; alar cells quadrate. Inner Perichaetial bracts erect; seta 1 cm tall, pale red, densely papillose; capsule cylindrical, horizontal; calyptra narrow, cucullate, smooth; peristome teeth linear-lanceolate, endostome with single cilia; spores finely papillose, 12 to 18 ì in diameter.

7. ***Erpodium mangiferae* Müll. Hal. Linnaea 37: 178, 1872; Dixon in J. Bombay Nat. Hist. Soc. 39 (3) : 780, 1937; Chopra in Tax. Indian Mosses 265, 1975; *E. bellii* Mitt. J. Linn. Soc. Bot. 13: 307, 5 B, 1837 *fid*. Dix. J. Bot., London 47 : 160, 1909 b.**

Description*:* Corticolous, slender, in loose or dense mats, appressed, pale green. Stems irregularly branched, green to brown, 0.1-0.20 mm in cross sec-

tion, 6-celled across; cortex 1-layered; cells 10-20 × 6-15 µm, thin-walled; medullary ones 10-25 × 8-20 µm, thin-walled; branches 2-3 mm long, horizontal to ascending. Leaves complanate, 0.6-0.8 × 0.3-0.45 mm, oblong-ovate, concave, entire, acute, ecostate; cells thin-walled, ovate-hexagonal with a distinct, roughly spindle-shaped, primordial utricle; apical cells 6-40 × 5-16 µm; median ones 32-54 × 12-16 µm; basal ones 55-80 × 17-25 µm, sometimes without a primordial utricle; marginal ones 16-28 × 12-24 µm. Rhizoids scattered on ventral side of stem. Sporophytes terminal on branches. Setae very short, 0.2-0.4 mm high. Perichaetial leaves smaller than vegetative ones, 0.45 × 0.17-0.50 x 0.20 mm, oblong-ovate, concave, entire, acute.

8. ***Erythrodontium julaceum*** **(Hook. ex Schwägr.) Paris. Index. Bryol. 436, 186 (*Neckera*, 1828); Chopra in Tax. Indian Mosses, 474, 1975; Gangulee in Hand book Indian Mosses, Sl. No. 80, Pl. No. XL, 1985; *Stereodon juliformis* Mitt. J. Linn. Soc., Bot. Suppl. 1 : 92, 1859.**

Description: Corticolous, plants robust and rigid, looks golden green to brown forming a dense tuft mats. Stem creeping, 8.0-10.5 cm with narrow central strand. Secondary branches numerous, short, julaceous, erect, regularly and closely pinnate. Leaves distant to closely imbricate- appressed at dry condition, usually concave, broadly oval or ovate-oblong, small and narrowly acuminate from a hardly decurrent base; margin almost smooth, sometimes slightly denticulate at tip; costa absent. Lamina cells smooth, narrow, elliptical to linear, 55.0-60.0 x 7.0-10.0 µ at tip, 70.0-75.0 x 10.0-13.5 µ at base; alar cells at basal angles on both side there are large triangular patches of transverse, ovate rectangular cells reaching to considerable heights on two margins which look oblique, 25.0-27.5 x 15.0-17.0 µ. Seta arises on main stem or from very strong secondary branches. Perichaetial leaf small, often erect, narrower leaves; seta erect (may be a little sinuous), spirally twisted when dry, 2.0-2.2 mm high; capsule erect, ovate cylindrical, red, 2.5-2.8 x 1.0-1.5 mm; operculum conical, short rostrate; calyptra cucullate, covering more than half the capsule; peristome double, inserted deep inside rim; exostome teeth red, 16, broadly lanceolate with horizontal stripes at base and vertically stripes above; endostome rudimentary, formed of 16 short, very fragile segments which are almost adhering to the inner side of exostome teeth; spores coarse papillose, large, 20.0 – 28.0 µ in diameter.

9. ***Herpetineuron toccoae*** **(Sull. & Lesq.) Cardot. Beich, Bot. Centralbl. 19 (2) : 127, 1905; Watanabe in J. Hattori Bot. Lab. 36: 240 , 1972; Chopra in Tax. Indian Mosses, 429, 1975; Vohra in Rec. Bot. Surv. India 23 : 91, 1983; *Anomodon toccoae* Sull. *et*. Lesq. Musc. Bor. Am. 52, 1956; *A. devolutus* Mitt. J. Linn. Soc., Bot. Suppl. 1 : 127, 1859.**

Description: Corticolous, moderately robust, stiff, in dense tufts, growing over rocks of old monument sculpture. Primary stems creeping; secondary stem erect, simple or two to many time branched, with a central strand, sub-circinate; branches sometimes flagellate, 2.5-3.0 cm tall; on drying hooked coil at the apex. Paraphyllia absents. Leaves on drying erect and appressed, involute and secund; when moist erect spreading, concave or longitudinally folded, 2.0-3.0 x 5.0-8.0 mm, oblong-lanceolate, faintly plicate; apex acute; margin plane, entire below, irregularly and sharply serrulate in the upper 1/3rd portion; costa percurrent, tortuous above, glossy, smooth. Lamina cells not differentiated, 2 to 6 µ wide.

10. ***Isopterygium minutirameum*** **(Müll. Hal.) A. Jaeger Bericht. That. St. Gall. Naturw. Ges. 1867-77 : 434 (Ad. 2 : 250) (*Hypnum*, 1851); Robinson in J. Hattori Bot. Lab. 27 : 129, 1964; Chopra in Tax. Indian Mosses, 534, 1975.**

Description: Corticolous. Mostly slender and glossy in appearance. Stem elongate, prostrate, 6.0 – 9.0 cm long, frequently intermittently stoloniferous branches; branches pinnate, complanate. Leaves of main stem and branches alike, narrow, oblong-lanceolate, concave, 1.80 -1.90 mm long and 0.4 -0.5 mm wide at base; leaf apex longley acuminate, subpilliform; margin almost entire; costa absent. Lamina cells narrow, elongate, linear to rhomboidal, prosenchymatous, 54.0 -56.0 x 12.5 – 13.5 µ; alar cells not differentiated. Sporophyte on main stem. Seta elongate, straight, twisted when dry; capsule ovate cylindrical, sub-erect to horizontal, 1.0 -1.5 x 0.32 – 0.40 mm ; peristome teeth perfect, normal, hypnoid, 250 µ long; operculum conic – convex; calyptra cucullate; spores small, 20.0 -25.0 µ in diameter.

11. ***Leucophanes octoblepharoides*** **Brid. in Bryol. Univ. 1 : 763, 1826; Dixon in J. Bombay Nat. Hist. Soc. 38 : (3), 775, 1937; Gangulee in *ibid* 60 : (3), 607, 1963; Robinson in J. Hattori Bot.**

Lab. 27 : 127, 1964; Chopra in Tax. Indian Mosses 93, 1975; *Syrrhopodon octoblepharis* Nees in Schaegr. Suppl. 4 : t 311 a, 1842; *Octoblepharum octoblepharoides* Mitten in Voy. Challenger , Bot. 3 : 259.

Description: Corticolous, pale green to whitish, glossy, densely covered with leaves, 2-4 mm long, erect to drooping, usually simple, without central strand; leaves rather crowded, erect or widely spreading, narrowly lanceolate, slightly concave at base, flat above, 1-3 mm long; costa broad at apex, covers whole surface, near base narrower, slightly toothed abaxially near the apex, stereidal cells towards the lower side, leucocyst occurs on the lower base of the leaves in 3 or more layers; lamina cells confined to the marginal part of the leaf base, hyaline, short rectangular, 20-22 µm wide, leaves bordered all around with 2-3 rows of very long narrow yellowish cells.

12. ***Octoblepharum albidum* Hedw. in Sp. Musc. 50. 1801; Dixon inJ. Bombay Nat. Hist. Soc. 39: (3), 775, 1937; Gangulee in *ibid* 60: (3), 618, 1963; & Handbook Indian Mosses Sl. No. 18, Pl. no IX, 1985; Robinson in J. Hattori Bot. Lab. 27 : 127, 1964; Chopra in Tax. Indian Mosses 94, 1975.**

Description: Corticolous, greenish white plants forming tuft mats. Plants 1.2-1.5 cm high. Stem short, 0.35-4.2 mm long, unbranched and without central strand. Leaves crowded, rigid, usually forming a rosette near tip of the plant, erect spreading on stem, 0.4-0.5 mm long, ligulate from a wider and concave, with or without sheathing base, more or less flat above, apiculate at tip where it may be minutely serrulate, leaves not changed when dry. Costa wide forming most of leaf, with a median row of almost triangular chlorocyst cells sandwiched between 5 or 6 layers of leucocyst in the middle of the leaf and 2 or 3 layers of the margins. Leaf base flanked by 5 to nine rows of hyaline laminar cells of which inner rows are rectangular and the boarder 2 rows are narrow linear to rhomboidal which persists to the tip of the lamina. Seta straight, apical, 0.4 - 0.5 mm long. Capsule erect, oblong – ovoid; calyptra cucullate, entire at base, reaching about 2/3rd down the capsule; operculum conical; Peristome single layer, 8 yellowish Peristome teeth, not split but showing longitudinal line fissure, formed of short rectangular cells; spores light brown, finely papillose, 20.5 - 25.0 µ in diameter.

13. ***Pelekium fuscatum* (Besch.) A. Touw in J. Hattori Bot. Lab. 90: 203 2001; *Thuidium koelzii* Robinson in Bryologist. 71 : 98, 1968; Vohra in Rec. Bot. Surv. India 23 : 124, 1983, *Leskea remotifolia* Hook. *ined.***

Description *:* Corticolous, yellow green, forming in mats. Stems 2.0-2.5 cm long; branches 5.0-7.5mm long. Stem leaves incurved when dry; erect- spreading when moist; concave, 1.0-1.5 x 0.5-0.7 mm , from a wide ovate cordate base suddenly lanceolate acuminate; Costa ceasing below the apex. Cells unipapillose, obscure, 7.0-8.0 µ wide; branch leaves ovate; acute; 250.0-260.0 µ long on ultimate branches. Paraphyllia short, simple, unbranched, apical cell of the Paraphyllia acute. All plants sterile.

14. ***Pelekium investe* (Mitt.) A. Touw in J. Hattori. Bot. Lab. 90 : 203 2001; *Thuidium brotheri* Salm. In J. Bot. 39 : 153, 1901; Dix. in J. Bombay Nat. Hist. Soc. 39 (3), 787, 1937; Vohra in Rec. Bot. Surv. India 23 : 108 – 110, 1983.**

Description *:* Corticolous. Yellowish green, forming thin mats over the bark. Stems 1.0-1.4 cm long; branches 3.0-5.4 mm tall. Stem leaves incurved when dry; spreading when moist, 0.25-0.30mm long, ovate to ovate lanceolate; acute or shortly acuminate; margin plane; costa ceasing just below the apex. Cells opaque, 150.0-160.0 µ long. On secondary branches margin serrulate from base to apex. Paraphyllia absents. All plants sterile.

15. ***Pterobryopsis auriculata* Dixon. in J. Bombay Nat. Hist. Soc. 39 (3) : 782, 1937; Vohra & Kar in Bull. Bot. Surv. India. 38 (1-4): 50, 1996.**

Description: Corticolous, robust. Main stem wiry, strong, secondary branches erect. Stem leaves and branch leaves not alike. Leaves mostly concave, at moist the plants erectopatent, when dry they become appressed to the stem and imbicate. Leaves ovate lanceolate, shortly acuminate from an ovate base; leaf base auricled ; margin entire; costa single, mostly ending in median part of the leaf. Lamina cells narrow, linear to rhomboidal, prosenchymatous, 55.0-60.0 x 5.0-8.0 µ, cell wall thick; alar cells differentiated, quadrate to rectangular.

16. ***Syrrhopodon gardneri* (Hook.) Schwägr. in Hedw. Sp. Musc. Suppl. 2 (2) : 110, 1826; Gangulee in J. Bombay Nat. Hist. Soc. 60 (3), 623 & 624, 1963; *Calymperes gardneri* Hook. in**

Musc. Exot. Pl. 146, 1818; *Syrrhopodon curranii* Brotherus in Phillip. J. Sci. C5 : 142, 1910; *Cleisostoma gardneri* Brid. in Bryol. Univ. 1: 155, 1926; *Weisia macclellandi* Griffith in Not. 408, 1849 and Icon. Plant Asiat. 2 : t 78, 1849.

Description: Corticolous, tufted, dull green, usually un branched, sometimes dichotomously branched. Stem without central strand, 1.2 - 1.5 cm high. Leaves rigidly erect spreading from a wider sheathing base into a ligulate, carinate lamina, 2.8 - 3.5 mm long and 0.5 - 0.6 mm broad at base; leaf tip acute; leaf margin sharply serrate from slightly above to apex. Leaf edge with a triangularly thickened double toothed border cells which are similar to lamina cells. Each side of the costa, cancellinae of about 8 to 10 rows of rectangular hyline cells filling most of the leaf base , except a narrow border of 3 to 6 rows of smaller hyaline cells , to a height of about 1/3rd the leaf length with a rounded acute – angled top. Chlorophyllose lamina cells quadrate to ovate, 10.0 -12.0 µ in diameter, Papillose and obscure. Costa narrow, with deuter cells in cross section, ending in a number of spines slightly below apex. protonema like elongated gammae developed at the leaf tips, from which young plants are seen to arised.

17. ***Stereophyllum anceps* (Bosch & Sande Lac.) Broth. Broth. Nat. Pfl. I (3) : 898, 1907 (*Hypnum*, 1867); Robinson in J. Hattori Bot. Lab. 27 : 128, 1964; Chopra in Tax. Indian Mosses, 485 & 486, 1975.**

Description: Corticolous. Stem prostrate, irregularly branched, main stem 8.0-10.0 cm long, often glossy in appearance. leaves aggregated, lateral leaves are not distinctly asymmetrical; ovate, complanate, concave, acuminate. Costa strong single, homogenously reached to mid leaf. Leaf margin smooth, however, basal part curved on one side. Lamina cells rhomboid to linear, 48.0-58.0x10.5-15,5µ, basal cells hyaline, opaque and quadrate, alar cells numerous, 50.0-60.0 × 10.0-14.5 µ, basal lamina cells shorter, smooth; alar cells generally numerous, quadrate, hyaline, sometimes opaque. Seta short, thin, red colour; capsule sub erect, faintly gibbose; peristome teeth perfect, 225.0- 235 µ long, generally connate at base; operculum apiculate, conic rostrate; calyptra cucullate; spores small, round to elliptic, 10.0 – 14.0 µ.

18. ***Taxithelium laeviusculum* Dixon in J. Bombay Nat. Hist. Soc. 39 (4) : 793, 1937; Chopra in Tax. Indian Mosses, 519, 1975; Vohra & Kar in Bull. Bot. Surv. India. 38; (1-4), 52, 1996.**

Description: Corticolous, small. Main stem creeping, 7.0-10.0 cm long; branches irregularly pinnate, complanate. Leaves asymmetrical, concave, oblong-lanceolate gradually; acute or shortly acuminate, margin plan; costa absent. Lamina cells small, narrower, spindle shaped, mostly smooth, 4.0-5.8 x 30.0-35.0 µ, sometimes faintly papillose; alar cells absent. Seta elongate, erect; capsule inclined or horizontal, curved, constricted below the mouth at dry condition, 0.3-0.5 x 1.2-1.6 mm; peristome teeth double, dagger shaped, transversely striate, often papillose, lamellae extended, teeth 265.0-270.0 µ long; operculum conical; calyptra cucullate; spores small, 12.0-16.0 ì in diameter.

19. ***Thamnobryum fruticosum* (Mitt.) Gangulee in Hand book Indian Mosses Sl. No. 59, Pl. No. XXX, 1985; *Thamnium fruticosum* (Mitt) Kindb. Index Musc. IV : 28, 1967.**

Description: Corticolous, robust, dendroid habits, yellow green above brown below. Main stem tomentose, rhizomatous, propagating by runners, secondary branches are aggregated, pinnately branched, erect and dendroid. Leaves in 4 rows. Sometimes showing complanate tendency, ovate-lanceolate, mostly asymmetrical, 2.6- 3.0 x 1.5-2.0 mm on main branches; margin serrulate at tip, smooth below, showing a tendency to be inflexed in one side at base. Leaves longitudinally undulate when dry. Costa strong, covering more than 3/4th of the leaf. Lamina cells incrassate, smooth, irregularly rhomboid-elongate, 30.0-32.5 × 10.0-12.0 µ, often full of gleaming chloroplast at tip; rhomboid elongate, 55.0-57.5 x11.0-12.5 µ with highly porose walls at median leaf; elongated rectangular 70.0-75.0 x 12.0-15.0 µ also with highly porose walls at extreme base.

20. ***Thuidium meyenianum* (Hampe) Dozy & Molk. Bryol. Jav. 2: 121, 224 , 1865 ; Watanabe in J. Hattori Bot. Lab. 36 : 181, 1972; Dix. in J. Bombay Nat. Hist. Soc. 39 : (3), 787, 1937; Vohra in Rec. Bot. Surv. India 23: 128, 1983 & Bull. Bot. Surv. India 12 (1-4), 1970.**

Description: Corticolous. Plants yellowish green to brownish green, in dense mat over tree trunk. Stems 5.0-6.5 cm long, densely radiculose. Stem leaves incurved when dry, erect spreading when moist,

0.6-0.7 x 0.3-0.5 mm, triangular – ovate or cordate, suddenly narrowed into a fine acumen; margin entire; costa ceasing little below the apex or sometimes percurrent. Cells pellucid, 6.0-8.0 μ wide, 1-3 papillate; branch leaves spreading, ovate or oval, obtuse, keeled, 0.2-0.4 mm long on ultimate branches. Inner Perichaetial bracts from sheathing bases spreading, 2.0-2.2 x 0.5-0.7 mm; costa percurrent into a long flexuose, denticulate arista. Seta 1.0-1.2 cm tall, scabrous; capsule horizontal, arcuate; theca 2.0-2.2 x 0.7-0.9 mm; peristome teeth 500.0 - 510.0 x 70.0-72.5 μ; endostome segments and cilia equally long; cilia 2-3; spores 10.0-12.0 μ, finely Papillose.

21. ***Thyridium piluliferum*** **(Dixon) Gangulee in J. Bombay Nat. Hist. Soc. 60: (3), 226, 1963; *Syrrhopodon pilulifer* Dixon in *ibid* 39 : (3), 775 & 776, 1937**.

Description*:* Corticolous. Small, olive green ramifying on bark giving rise to erect shoots 3.0 – 8.0 mm high, 4.0-5.0 mm wide with leaves. Leaves erectopatent, densely arranged, oblong, lanceolate, 2.0- 2.5 mm long and 0.75-0.90 mm wide at wider base ; margin wavy, almost smooth, apex acute, minutely denticulate. Dry leaves curled to falcate. Costa brownish at base, yellowish abov, smooth, 50.0 - 55.0 μ wide at top of cancellinae. Broad margin 60.0 - 65.0 μ wide at top of cancellinae showing 14 to 16 rows narrow, elongated, incrassate, cartilaginous cells 42.0 - 45.5 μ long; this broad border spreads from base to a little below tip , narrowing at both ends. Transperent cancellinae horizontal at top, 550.0 - 565.0 μ high, formed of large, thin walled rectangular cells 45.0- 48.0 x 10.5 - 12.5 μ. Chlorophyllose cells small at above, 5.0 - 6.5 μ wide, oval to sub- quadrate, sometimes incrassate, papillose though not obscure. Spherical multicellular gammae 20.0 –28.0 μ in diameter on upper leaf surface, specially on the upper half; small fusiform apical gammae as well as filamentous growth noticed on tips of some mature leaf. All plants sterile.

22. ***Vesicularia levieri*** **Cardot in Dix. J. Indian Bot. 2: 187, 10, 1921; Chopra in Tax. Indian Mosses, 538, 1975; *Ectropothecium reticulata* in Herb. Levier no. 5138.**

Description: Corticolous, robust, yellow green. Main stem creeping, short, 5.0 - 6.0cm, more or less frondiform, prostrate habit, often branched; branches mostly regularly pinnate. Leaves distinctly appeared in dorsal, ventral and lateral, leaves transluscent, ovate lanceolate, 1.20-1.50mm long and 0.80-0.85mm at base apical margin distinctly toothed; costa short, double, thin. Lamina cells rhomboid to hexagonal, vesicular, smooth, apical lamina cells smaller (100.0 -106.0 x 16.0 – 18.0 μ) than basal lamina cells (73.0 -75.0 x 15.0 -16.0 μ); alar cells not differentiated.

23. ***Vesicularia reticulata*** **(Dozy & Molk.) Broth. Nat. Pfl. 1 (3) : 1094, 1908 (*Hypnum*, 1844); Dixon in J. Bombay Nat. Hist. Soc. 39 : 794, 1937; Robinson in J. Hattori Bot. Lab. 27 : 129, 1964; Chopra in Tax. Indian Mosses, 538, 1975; *V. filicuspis* Broth. Phiipp. J. Sc. 8 : 98, 1913, *fid*. Broth in Bart. Philipp. J. Sc. 68 (1-4) : 1939.**

Description*:* Corticolous, Pleurocarpous, slender, frondiform. Main stem creeping, 3.0-4.2 cm; stem short, prostrate, branched; branches regularly pinnate, spreading, complanate, mostly small; branch leaves homomalous. Leaves ovate-lanceolate, 1.0-1.5 x 0.5-0.9 mm; acumen filliform, abruptly acuminate and hamate; margin entire; costa absent. Lamina cells rhomboid, vesicular, smooth, slightly opaque, apical laminar cells 60.0 – 65.0 x 13.0 -15.0 μ, basal laminar cells 46.0 50.0 x 10.0 -12.0 μ; alar cells not differentiated. Sporophyte on main stem, seta elongate, 1.2-1.5 cm , erect, sometimes twisted at dry condition; capsule erect to horizontal, ovoid- cylindrical, contracted below the mouth at dry condition; peristome diplolepidous, normal, hypnoid, 560-580 μ long; operculum conic-rostrate, annulus differentiated; calyptra cucullate; spores medium sized, 20.0-22.0 μ in diameter.

Conclusion

Due to some anthropogenic activities like traffic, tourist spot, deforestation the corticolous mosses of the study area facing threat their natural habitats. Therefore, it is an urgent need to explore and conserve them in proper ways; otherwise they become extinct in near future.

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References

Barukial, J. 2011a. A Bryofloristic Ecological Assessment

of Assam, India. *Indian Journal of Fundamental and Applied Life Science*. 1 (3) : 98-106.

Barukial, J. 2011b. Moss Diversity of Assam Valley Wet Evergreen Forest, India. *Indian Journal of Fundamental and Applied Life Science.* 1(4) : 1-8

Barukial, J. and Gogoi, P. 1995. An Enumeration of Mosses from Golaghat District, Assam, India. *Ad. Plant Sc.* 8 (2): 397-400.

Barukial, J. and Gogoi, P. 1997a. An Enumeration of Mosses from Golaghat District, Assam, India-II. *Ad. Plant Sc.* 10 (2) : 237-240.

Barukial, J. and Gogoi, P. 1997b. Anisospory in *Macromitrium moorcroftii* (Hook. & Grev.) Schwagr. *Ad. Plant Sc.* 10 (2) : 275-276.

Barukial, J. and Gogoi, P. 1998. An Ecological Assessment of Moss Vegetation of Nambor Reserve Forest, Assam, India. *Ad. Plant Sc.* 11 (1) : 113-117.

Barukial, J. , Gogoi, P. and Borua, P. K. 2002a. A Checklist of Bryophytes of Brahmaputra Valley, Assam, India. *Ad. Plant Sc.* 15 (1) : 89-94.

Barukial, J. , Gogoi, P. and Borua, P. K. 2002b. An Enumeration of Mosses and Their Ecology of Proposed Joydihing Wildlife Sanctuary, Assam, India. *Ad. Plant Sc.* 15 (1) : 97-102.

Chopra, R. S. 1975. *Taxonomy of Indian Mosses*. CSIR Publication, New Delhi.

Dixon, H. N. 1914. Report on the Mosses of Abor Expedition 1911-1912. *Rec. Bot. Surv. India*. 6 : 55-73.

Dixon, H. N. 1937. Mosses collected in Assam. *J. Bombay Nat. Hist. Soc.* 39 (4) : 769-795.

Gangulee, H. C. 1957. Mosses of Eastern India – I. *Bull. Bot. Soc. Bengal.* 11 (2) : 59-84.

Gangulee, H. C. 1959. Moses of Eastern India.-II. *Bull. Bot. Soc. Bengal.* 13(1-2) : 1-9.

Gangulee, H. C. 1960. Mosses of Eastern India.- III. *Bull. Bot. Soc. Bengal*. 14 (1-2): 10-57.

Gangulee, H. C. 1963. Mosses of Eastern India- IV. *J. Bombay Nat. Hist. Soc.* 60 (3): 606-637.

Gangulee, H. C. 1964. Additions to the Mosses of Eastern India and Adjacent Regions.-I. *Nova Hedwigia.* 8 (1-2) : 139-150.

Gangulee, H. C. 1966. Additions to the Mosses of Eastern India and Adjacent regions-II. *Nova Hedwigia.*12 (3-4) : 417-431.

Gangulee, H. C. 1969. Additions to the Mosses of Eastern India and Adjacent regions-III. *Bull. Bot. Soc. Bengal.* 23: 131-134.

.Gangulee, H. C. 1969-1980. Mosses of Eastern India and Its Adjacent Regions. 1-8.Calcutta.

Gangulee, H. C. 1970. The needs of district records of Indian Mosses and the Moss Flora of some eastern Indian districts. *Bull. Bot. Soc. Bengal.* 24 **:** 5-29.

Gangulee, H. C. 1980. Muscology in India. In: Nair, P.K.K. (ed.). *Glimpses in Plant Res*. 5 : 85-89.

Gangulee, H. C. 1985. *Handbook of Indian Mosses.* International Book House, New Delhi.

Govindpyri, H., Laleeka, M., Nivedita, M. and Uniyal, P.L. 2010. Bryophytes: Indicators and Monitoring agents of Pollution. *NeBIO*. 1 (1) : 35-41.

Mitten, W. 1859. Musci Indae Orientalis. *J. Linn. Soc., Bot. Suppl*. 1 : 1-171.

Robinson, H. 1964. A small collection of bryophytes from Upper Assam, India. *J. Hattori Bot. Lab.* 27: 124-130.

Robinson, H.1968. Notes on bryophytes from the Himalayas and Assam. *J. Hattori Bot. Lab.* 71 : 82-97.

Vohra, J. N. 1983. Hypnobryales: Sub-Order Leskeineae (Musci) of the Himalaya. *Rec. Bot. Surv. India.* 23: 1-336.