

ACROCARPOUS MOSSES OF BANGLADESH.

XI. FAMILY: BARTRAMIACEAE-1¹

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Abstract

Bartramiaceae under the Order Eubryales among the Acrocarpus mosses is represented in Bangladesh by a single genus *Philonotis* Brid. with nine species. Out of these, three species namely, *Philonotis thwaitesii* Mitt., *P. hastata* (Dub.) Wijk. et Marg. and *P. falcata* (Hook.) Mitt. have been described and illustrated along with an artificial key to all the species, a short note on the described species and their distribution in and outside Bangladesh.

Introduction

In an attempt to give illustrated descriptions of all the families of Acrocarpus mosses of Bangladesh Banu-Fattah and Hadiuzzaman in a series of publications (1994 a, 1885, 1996 a, b, c; 1998 a, b, c; 2003 a, b; 2004) dealt with families Polytrichaceae, Ditrichaceae, Dicranaceae, Leucobryaceae, Calymperaceae, Fissidentaceae, Pottiaceae, Funariaceae, Splachnaceae and Bryaceae. In addition, two new species and one variety, *Fissidens hadii* Banu-Fattah (1995), *Splachnobryum schofieldii* Banu-Fattah et Syed (1997) and *Fissidens sylvaticus* Griff. var. *ramosus* Banu (1999) have been reported. According to the classification used by Gangulee (1969) the family Bartramiaceae among the Acrocarpus mosses is the last family of the Order Eubryales of Subseries Metacranoideae, Series Diplolepideae, Cohort Eubryiidae, Section Arthrodoneteae, Subclass Bryidae, Class Bryopsida of the Division Bryophyta.

Tixier in 1965 collected a large number of hepatics and mosses from the forest reserves of Chittagong region, from Kaptai forest, Karnafuli banks, evergreen coastal forest, along the beach of Cox's Bazar and the hill of Sitakundu. Out of all these collections he reported two species of *Philonotis* but without any description or illustration (Tixier 1967). Banu (1991) worked on Acrocarpus mosses of Bangladesh and reported two genera *Leiomela* (Mitt.) Broth. and *Philonotis* Brid. from the family Bartramiaceae. Subsequently in a Checklist of Acrocarpus mosses of Bangladesh Banu-Fattah and Hadiuzzaman (1994b) enlisted 10 species under two genera in the family Bartramiaceae. But *Leiomela* was later found to be misidentified, so it was deleted from the Checklist of the Bryophytes of Bangladesh (Banu-Fattah 2001). Thus the family Bartramiaceae is represented in Bangladesh by nine species under only one genus *Philonotis*. These are *Philonotis angusta* Mitt., *P. falcata* (Hook.) Mitt., *P. griffithiana* Hook., *P. hastata* (Dub.) Wijk. et Marg., *P. mollis* (Doz. & Molk.) Molk., *P. nitida* Mitt., *P. pergracilis* Broth., *P. thwaitesii* Mitt. and *P. turneriana* Mitt.

While surveying the Bryophytes of Chittagong zone of Bangladesh conducted by National Conservation Strategy Implementation Project during 1996-98, Banu-Fattah (1998) reported three species, *Philonotis hastata* (Dub.) Wijk. et Marg., *P. mollis* (Doz. & Molk.) Mitt. and *P. nitida* Mitt. All the specimens examined have been preserved in the Bryology Herbarium of the Dhaka University (DUBH), except the specimens from Cox's Bazar which are in the Bangladesh National Herbarium (DACB).

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Species of *Philonotis* grow on different substrata. *P. thwaitesii* is an epiphyte. Among all other species, *P. hastata* is the most common and usually grow on old damp bricks, walls, drains, roofs etc. and are found in many localities of different districts. The rest of the species usually grow on soil of hills and forests. The genus *Philonotis* with nine species is the third largest beside *Fissidens* Hedw. with 30 species and *Calymperes* Schwaegr. with 19 species (Banu-Fattah 2001) in Bangladesh.

Out of all species, three namely, *Philonotis thwaitesii* Mitt., *P. hastata* (Dub.) Wijk. et Marg. and *P. falcata* (Hook.) Mitt. are described here with illustrations. An artificial key of seven species is provided along with a short note on described species and their distribution in and outside Bangladesh.

FAMILY BARTRAMIACEAE

Plants densely tufted, of variable size, usually robust with whorls of subfloral innovations. Stem tomentose. Leaves ovate to lanceolate to linear-lanceolate, acuminate, serrate. Costa subpercurrent, percurrent or excurrent, often dentate at back. Leaf cells narrow-rectangular or sub-rectangular, usually papillose. Seta usually terminal and elongate. Capsule erect or inclined, subglobose, mostly furrowed when dry, mouth often oblique. Peristome usually double or absent, teeth 16, processes divided ; endostome often rudimentary ; cilia rudimentary or absent. Operculum short, broadly conical, usually flat when dry. Calyptra small, cucullate.

GENUS *PHILONOTIS* Brid.

Bryol. Univ. 2 : 15 (1827)

Plants in dense tufts or mats, usually slender, of variable size. Stem usually elongate, laxly erect with subfloral whorls of innovations, often densely tomentose below. Leaves ovate-lanceolate, acuminate. Margin dentate. Costa percurrent or excurrent. Laminal cells rectangular, papillose near apical or basal walls. Seta terminal, erect, solitary. Capsule sub-globose, strongly furrowed when dry. Peristome double. Operculum convex or flat.

Key to the species

- | | | |
|--|-------------------------|---|
| 1 . Plants epiphytic | 1. <i>P. thwaitesii</i> | |
| - Plants not epiphytic | | 2 |
| 2 . Costa percurrent or end much below apex | | 3 |
| - Costa long excurrent | | 4 |
| 3 . Plants soft ; usually unbranched ; apex blunt ; costa ends much below apex | 2. <i>P. hastata</i> | |
| - Plants not soft ; branched ; apex acuminate, costa percurrent | 3. <i>P. falcata</i> | |
| 4. Leaf margin recurved | 4. <i>P. nitida</i> | |
| - Leaf margin flat | | 5 |
| 5. Plants medium, up to 2.6 cm high ; mamillae not very prominent | 5. <i>P. turneriana</i> | |
| - Plants long, up to 4.7 cm high ; mamillae very prominent | | 6 |
| 6. Stem highly radiculose | 6. <i>P. angusta</i> | |
| - Stem sparsely radiculose | 7. <i>P. mollis</i> | |

1. *Philonotis thwaitesii* Mitt., Musci Ind. Or. 60 (1859)

(Plate 1)

Plants gregarious or scattered, yellowish-green, unbranched, up to 9 mm high and 0.5 - 0.9 mm broad. Stem mostly unbranched, erect, often half of the lower part without leaf, radiculose. Leaves erect, stiff, appressed, more appressed when dry; leaves small, lanceolate from a broader base to triangular, c. 0.7 mm long and 0.17 mm broad at base, acuminate. Margin denticulate by cell tip projections all along except the basal portion. Costa percurrent, 17 - 26 μm broad at base, gradually narrowing. Laminal cells quadrate to shortly rectangular at extreme base, 8 - 12 μm long and 8 μm broad, without any mamilla; other cells above base rectangular, up to 52 μm long and 8 - 12 μm broad, mamillate. Sporophyte not found.

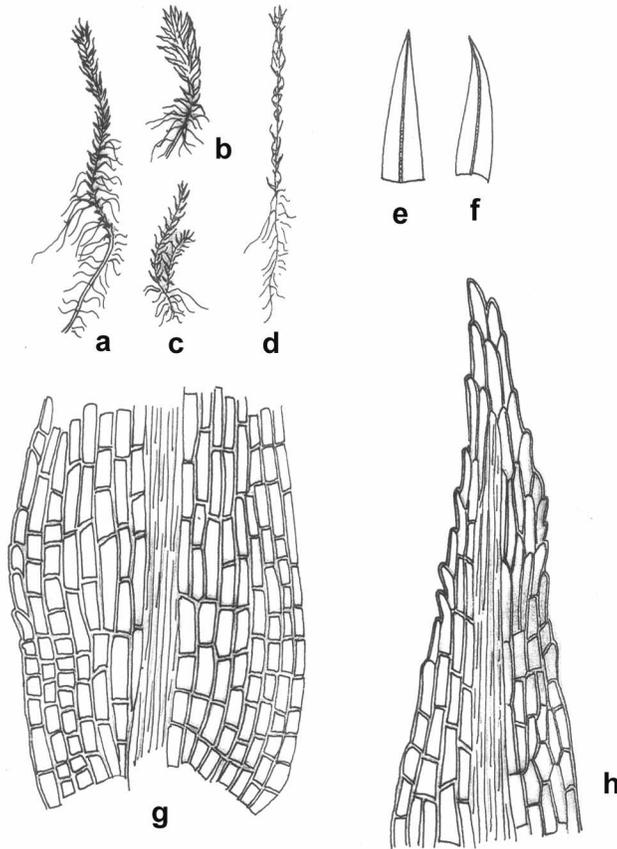


Plate 1. *Philonotis thwaitesii* Mitt. a-b. Wet unbranched plant ($\times 5$), c. wet branched plant ($\times 5$), d. dry unbranched plant ($\times 5$), e & f. leaves ($\times 15$), g. basal lamina cells ($\times 113$), h. leaf apex ($\times 113$).

Specimens examined: **Sylhet:** Sylhet Nursing Home, on bark of *Mangifera indica*, Khurshida Banu, 19.10.1988, 689 (DUBH)

Distribution: Nepal, Sikkim, India, Myanmar, Sumatra, Borneo, New Guinea, Hongkong, Taiwan, China, Korea, Japan.

Note: This species differs from the other species of *Philonotis* in being epiphytic in habit. The plant apparently looks like *P. hastata*, but differs in having narrower leaves and much elongated laminal cells.

2. *Philonotis hastata* (Dub.) Wijk. & Marg., Taxon 8: 74 (1959)

(Plate 2)

Hypnum hastatum Dub. in Moritzi in Syst. Verz. zoll. pfl. 132 (1846)

Plants dioicous; dense, forming mats, very slender, soft, bright-green above, yellowish at base, loosely attached to the surface. Shoots laxly erect, mostly unbranched, very rarely branched, small, usually 5 - 7 mm (rarely up to 1.9 cm in high), stem often highly radiculose up to half of the whole length. Leaves very lax, erectopatent, thin, curled and appressed to stem when dry, short-lanceolate with broad base, acuminate or with blunt obtuse apex, 0.7 - 0.85 mm long and c. 0.26 mm wide at base. Margin crenulate to denticulate by upturned tips or mamillae of the cells, often not distinctly

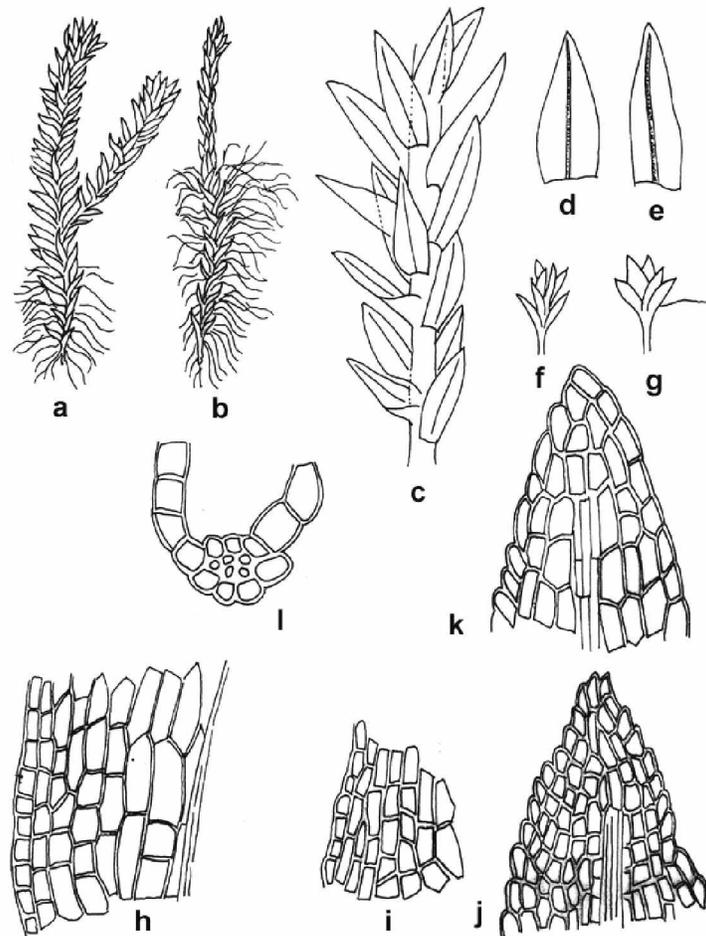


Plate 2. *Philonotis hastata* (Dub.) Wijk. et Marg. a. Wet plant ($\times 5$), b. dry plant ($\times 5$), c. a portion of wet plant ($\times 15$), d & e. leaves ($\times 15$), f & g. loosely attached small shoots from stem ($\times 15$), h. basal lamina cells ($\times 113$), i. middle lamina cells ($\times 113$), j & k. apex of leaves ($\times 113$), l. T.S. of leaf ($\times 225$).

mamillose. Costa green to light-brown, ends below apex, c. 20 μm broad at base. Laminal cells lax, thin-walled; basal cells large, broadly rectangular, 20 - 60 μm long and 10 -16 μm broad, shorter and narrower towards margins; middle cells short-rectangular, 16 - 45 μm long and 12 μm broad; upper cells hexagonal-rhomboid, 12 - 28 μm long and 8 μm broad, with mamilllose tips. Plants mostly sterile but female plants with archegonia found. Female plants mostly branched, innovations in a whorl. Perichaetial leaves bigger with broader base, acuminate with long, pointed apex up to 1.3 mm long and 0.42 mm wide at base. Bunch of archegonia (up to 0.52 mm long) with paraphyses present at the apex of the shoot. Sporophyte not found.

Specimens examined: **Cox's Bazar**, Himchhari, Barachhara, on moist shady soil, Mustafa Kamal Pasha 27.08.96, **66, 72. Dhaka:** Botany Department, University of Dhaka, on sides of drain, Khurshida Banu, 25.2.1987, **1**; Dhaka University Science Campus, on sides of cemented drain and brick wall, Khurshida Banu, 26.2.1987, **21**; 24.9.1988, **336**; 26.12.1988, **442**; Mirpur, Botanical Garden, on brick wall, Khurshida Banu, 10.1.1988, **179**; Savar, Jahangir Nagar University, on wall. Khurshida Banu, 1.10.1988, **341**; Al Beruni Hall, Md. Enayet Hossain, 4.11. 1988, **762**; Banani, on regularly watered soil, Farida begum, 8.2.1988, **470**; Gulshan, on garden soil, Khurshida Banu, 3.6.1988, **618. Munshiganj:** Near Haraganga College, on brick wall, Khurshida Banu, 20.10.1989, **1499. Mymensingh :** Agriculture University, Sultana Razia Hall, on brick and cemented roof, Khurshida Banu, 19.1.1989, **174**; Agriculture University, Botanical Garden, on soil under shade of big trees, Khurshida Banu and Quazi Abdul Fattah, 1.10.1987, **386**; Circuit House compound, on soil, Khurshida Banu, 19.1.1989, **505**; Iswarganj, on soil, Khurshida Banu and Md. Sehab Uddin, 20.12.1989, **1110**; Phulpur, on soil, Khurshida Banu and Jashim Uddin, 5.10.1989, **1086. Natore:** Near Natore Railway Station, on brick wall, Abu Bakar Siddique, 7.7.1987, **390. Pabna:** Kashinathpur, on soil and brick, Abdul Kafi Mia, 21.5.1988, **99. Rajshahi:** Rajshahi University, Botany Department Garden, on soil, Quazi Abdul Fattah, 15.10.1987, **358. Sirajganj:** Salap, on soil under shade of trees, Akmal Hossain, 12.8.1990, **1572. Tangail:** Town, on soil, Quamruzzaman, 21.3.1988, **535.**

Distribution: India, Thailand, Sumatra, Java, Borneo, Celebes, Philippines, Taiwan, Japan, Mid-W. Asia, Africa, South America, Australia, Hawaii. A pantropical species.

Note: A fairly common species found mostly on sides of drains, damp walls and also on wet soil. This plant is different from other species of *Philonotis* being very slender, laxly covered by leaves, lingulate with blunt, obtuse apex, margin crenulate or denticulate and costa ending much below apex. Sporophyte never found although checked all throughout the year.

3. *Philonotis falcata* (Hook.) Mitt., Musci Ind. Or. **62** (1859) **(Plate 3)**

Bartramia falcata (Hook.) in Trans. Lin. Soc. Lond., **9**: 317 (1808)

Plants dioicous; fairly robust, densely tufted; upper part yellow-green, interwoven with dark-brown silky tomenta below. Shoot 5 - 10 mm high with a whorl of innovations. Leaves densely covering stem, particularly in upper portion, spirally arranged in regular rows, erect to erectopatent, appressed, otherwise not much changed when dry, small, triangular-ovate with a broad base, acuminate, carinate, 0.5 - 0.8 mm long and 0.16 - 0.27 mm broad at base. Margin flat, slightly denticulate at apex. Costa short-excurrent or percurrent in stem leaves; subpercurrent or end much below apex in branch leaves, rough on back at tip, c. 33 μm broad. Laminal cells rectangular; basal cells 20 - 48 μm long and 8 - 12 μm broad; middle cells 20 - 40

μm long and 6 - 7 μm broad and apical cells 12 - 20 μm long and 4 - 8 μm broad. Perigonia at the apex of shoot, perigonial leaves much longer, ovate to lanceolate with long tapering end, 1 - 1.2 mm long and 0.36-0.50 mm broad. Numerous antheridia (400 μm long and c. 100 μm broad) with paraphyses present. Female plant not found.

Specimens examined: **Mymensingh:** Ananda Mohan College, on damp roof of Torun Hostel, Khurshida Banu and Md. Anamul Haque, 10.4.1987, 5 (DUBH).

Distribution: Bhutan, India, Tonkin, Java, Philippines, Taiwan, China, Korea, Japan, South Africa, Europe, North America. A very wide spread species.

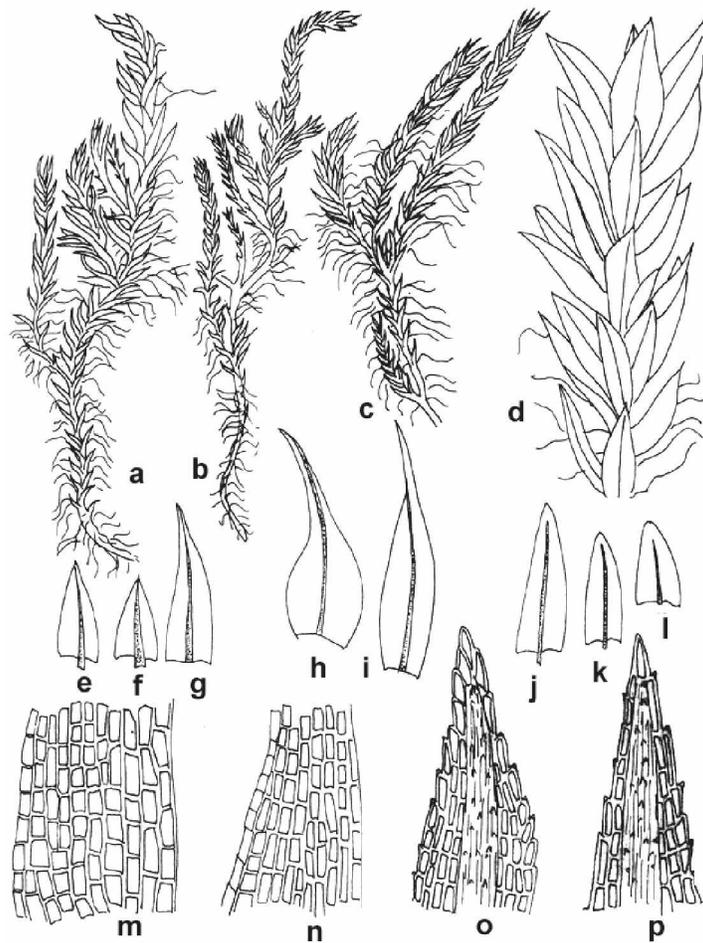


Plate 3. *Philonotis falcata* (Hook.) Mitt. a. Wet plant ($\times 5$), b. dry plant ($\times 5$), c. plant with perigonial bracts ($\times 5$), d. a portion of a branch ($\times 15$), e-g. stem leaves ($\times 50$), h & i. perigonial leaves ($\times 50$), j-l. branch leaves ($\times 50$), m. basal lamina cells ($\times 113$), n. middle lamina cells ($\times 113$), o & p. apex of leaves ($\times 113$).

Note: This plant is characterized by being robust and densely tomentose, and having leaves with percurrent or short-excurrent costa and acuminate apex in stem leaves, but sub-percurrent costa and blunt apex in branch leaves and also with slightly denticulate margin at apex.

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