

DIVERSITY AND HABITAT HETEROGENEITY OF BRYOPHYTES IN CHITTAGONG UNIVERSITY CAMPUS, BANGLADESH

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Abstract

This study intends to document the distribution of bryophytes across the campus, contributing to the existing knowledge of the regional bryoflora. The present study identified a total of 28 species from 19 genera in 17 families in the study area. They include 15 moss species from 11 genera and 10 families, 12 liverworts from 7 genera and 6 families, and one hornwort. Importantly, 26 species were recorded for the first time from the CU campus. According to the IUCN Red List, two of the recorded species are classified as Near Threatened and two as Vulnerable species. This survey provides a baseline for conservation efforts and promotes further research on bryophytes of Bangladesh.

Introduction

Bryophytes are one of the richest plant groups in Bangladesh, thriving on a wide variety of surfaces. Bangladesh has an abundance of habitats that are ideal for bryophytes. Approximately 248 species belonging to 73 genera under 34 families were recorded from Bangladesh (Siddiqui *et al.* 2007). Later studies added new records, including *Marchantia polymorpha* (Alfasane *et al.* 2013) and *Jungermannia exertifolia* (Tabassum *et al.* 2020). Khan (1955) embarked on the journey of working with bryophytes in Bangladesh and did outstanding work by discovering some new species of *Riccia*. Moreover, 92 taxa of Acrocarpous mosses, including 77 new reports (Banu 1991) and 72 taxa of Pleurocarpous mosses, 62 of which were new records (Khatun 2002) in Bangladesh were documented. A significant amount of research on bryophytes has been conducted in the greater Mymensingh region. 51 species belonging to 35 genera of Bryopsida have been listed from Mymensingh (Banu-Fattah and Sarker 2007). Subsequently, 48 species under 12 genera of the class Hepaticopsida (liverworts) and Anthocerotopsida (hornworts) were documented from the same district (Banu-Fattah and Sarker 2010). Later, a survey carried out to study the diversity of bryophytes in Boldha Garden, Dhaka, listed 32 species under 12 genera (Rahman and Khatun 2014). Tixier (1967) provided the earliest document of some bryophytes from Chittagong, covering Kaptai, Cox's Bazar, and the Sitakunda hill areas. Furthermore, around 46 species of bryophytes belonging to 29 genera, with 17 new records for Bangladesh, were documented from the Chittagong area (Banu-Fattah 1998). Later, *Marchantia polymorpha* was also reported from Lake Rainkhyongkain, Chittagong (Alfasane *et al.* 2013). In contrast, prior research only identified two species from the University of Chittagong, which were *Cyathodium cavernarum* (Long 2006) and *Dumortiera hirsuta* (Hadiuzzaman and Chakravarty 1981).

Despite these records, much remains unknown about bryophyte diversity in other parts of the country, including the campus of the University of Chittagong. Hence, this study intended to document bryophyte species found on the university campus along with their distribution, habitats and conservation status, which will provide a valuable foundation for future studies in taxonomy, ecology, and conservation of bryophytes.

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Materials and Methods

The University of Chittagong campus is home to a diverse forest ecosystem. It is situated in Fatehpur Union (22°27'30" and 22°29'0" North latitudes, and 91°46'30" and 91°47'45" East longitudes) of Hathazari Upazila, approximately 22 km north of Chittagong city, covering more than 2,100 acres of land (Akter *et al.* 2022). Because of its geographical location, there are immense assemblages of biodiversity on the CU campus. Bryophytes are abundant and widely distributed on this campus. The water reservoirs on the CU campus, ideal habitats for these plants, are rich in bryophytes. The research team visited different locations across campus: botanical garden, botanical garden chora, near biological sciences faculty, science faculty, forestry nursery, central library to collect the samples at different times between 2022 and 2025 through repeated field trips. Necessary tools like knives, polythene, newspaper, hand lens, paper packet, notebook, etc., along with the GPS, were taken during the collection. Photographs of each species were taken with a DSLR camera. Specimens were collected during their peak development phases from the diverse habitats, including soil, rocks, bark of the trees and decaying wood, using a knife to ensure that adequate patches were collected along with their substrate. Specimens were collected and processed following standard herbarium techniques for bryophytes (Singh and Singh 2015). Briefly, each sample was kept in a paper packet to prevent moisture accumulation, labelled with necessary field data such as habitat, GPS location, collection date, collector's name and special identifying characters. Collected specimens were then dried in a shaded environment which were later transferred into standard folded packets with proper labelling. The herbarium specimens were then deposited at the Chittagong University Herbarium (HCU) with accession numbers (Table 1).

Identification of the selected bryophytes was done following recommended techniques, including their morphological (Fig. 1) and anatomical study along with expert consultation and literature study (Encyclopedia 2007). Features such as antheridium, archegonium, leaf arrangement, costa, laminal cells, peristome teeth, and gemmae were examined under a compound light microscope.

Results and Discussion

This study documents the diversity of bryophyte species within the campus of Chittagong University, representing 28 species distributed across 19 genera and 17 families. Of these, 27 were identified to the species level, while one species was identified only to the genus level. Based on the IUCN Red List, two recorded species, i.e., *Philonotis hastata* and *Dumortiera hirsuta*, fall under the Near Threatened (NT) category, while *Trematodon longicollis* and *Hyophila involuta* are classified as Vulnerable (VU). The botanical information, along with habitat and GPS coordinates of all documented species, is summarized in Table 1.

Among the bryophytes, eight species i.e., *Philonotis angusta*, *P. falcata*, *Trematodon longicollis*, *Octoblepharum albidum*, *Stereophyllum anceps*, *Taxithelium nepalense*, *Dumortiera hirsuta* and *Marchantia palmata* were earlier recorded from greater Mymensingh (Hadiuzzaman and Chakravarty 1981, Banu 1991, Banu-Fattah and Hadiuzzaman 2006, Banu-Fattah and Sarker 2007, Banu-Fattah and Sarker 2010). Furthermore, *Riccia bengalensis* and *R. compaginata* were previously reported from Dhaka (Kamruzzaman 1995), while *Fissidens virens* and *Riccia sorocarpa* were reported from Sylhet and Tangail respectively (Banu 1991, Banu-Fattah and Sarker 2010). In contrast, *Philonotis hastata*, *Cyathodium tuberosum*, *M. papillata* and *Ricciocarpos natans* were recorded as widely distributed throughout Bangladesh (Hadiuzzaman and Chakravarty 1981, Hadiuzzaman and Chakravarty 1984, Banu 1991, Banu-Fattah and Hadiuzzaman 2006, Zheng and Shimamura 2020). Notably, among all the documented species from this study, 14 species, including *Philonotis angusta*, *P. nitida*, *Calymperes tenerum* var. *teniolata*, *Vesicularia montagnei*, *Taxiphyllum taxirameum*, *Hydrogonium amplexifolium*,

Table 1. Documented species with their botanical information.

Accession No.	Botanical Names	Family	Habitat	Location	GPS coordinates
MM180822-26	<i>Philonotis angusta</i> Mitt.	Bartramiaceae	Stone surface	Biological sciences faculty chora	N 22°37'29" E 91°27'32"
KSR110324-65	<i>P. falcata</i> (Hook.) Mitt.		Brick wall	Biological sciences faculty bridge	N 22°27'55" E 91°46'49"
JF070724-69	<i>P. hastata</i> (Duby) Wijk and Margad.		Brick wall	Biological sciences faculty bridge	N 22°28'5" E 91°46'51"
APC140724-72	<i>P. nitida</i> Mitt.		Damp soil	Botanical garden chora	N 22°27'34" E 91°47'14"
JF070724-70	<i>Trematodon longicollis</i> Michx.	Bruchiaceae	Damp soil	Botanical garden chora	N 22°17'29" E 91°40'22"
MM070822-29	<i>Calymperes tenerum</i> var. <i>teniolata</i> Gangulee	Calymperaceae	Tree bark	Near central library	N 22°23'13" E 91°41'10"
MM180822-23	<i>Octoblepharum albidum</i> Hedw.	Octoblepharaceae	Tree bark	Gol pokur (central pond)	N 22°17'09" E 91°37'19"
MM081022-28	<i>Fissidens virens</i> Thwaites and Mitt.	Fissidentaceae	Damp soil	Botanical garden chora	N 22°27'29" E 91°47'12"
MM081022-32	<i>Vesicularia montagnei</i> (Bél.) Broth.	Hypnaceae	Soil and also on higher plants	Besides science faculty	N 22°27'3" E 91°47'5"
MM070822-23	<i>Taxiphyllum taxirameum</i> (Mitt.) M.Fleisch.	Taxiphyllaceae	Soil	Botanical garden chora	N 22°25'29" E 91°46'10"
MM040123-43	<i>Stereophyllum anceps</i> (Bosch and Sande Lac.) Broth.	Stereophyllaceae	Epiphytic habitats	Jarul tola, in front of old Arts faculty	N 22°27'29" E 91°47'12"
MM040123-44	<i>Taxithelium nepalense</i> (Schwägr.) Broth.	Pyraliadelphaceae	Lower part of the tree bark and soil	Beside sciences faculty	N 22°20'19" E 91°37'22"
MM040123-47	<i>Hydrogonium amplexifolium</i> (Mitt.) P.C.Chen	Pottiaceae	Moist slope of hills	Botanical garden chora	N 22°18'19" E 91°37'32"
MM040123-49	<i>H. pseudoehrenbergii</i> (M.Fleisch.) P.C.Chen		Old bricks and damp soil	Near administration building	N 22°18'19" E 91°37'32"
MM130223-54	<i>Hyophila involuta</i> (Hook.) A. Jaeger var. <i>teniolata</i>		Damp bricks, stones, walls etc	Beside administration building	N 22°27'29" E 91°47'12"
SAD150222-06	<i>Cyathodium tuberosum</i> Kashyap	Cyathodiaceae	Brick stairs/ wall	Near central museum	N 22°16'54" E 91°28'30"
SM040624-74	<i>C. cavernarum</i> Kunze ex Lehm.		Stone wall	Botanical garden	N 22°27'38" E 91°47'21"
SAD150222-18	<i>Dumortiera hirsuta</i> (Sw.) Nees	Dumortieraceae	Shady damp soil	Near biological sciences faculty	N 22°27'55" E 91°46'36"
SAD070922-18	<i>Marchantia papillata</i> Raddi	Marchantiaceae	Stone wall	Near IT faculty	N 22°13'24" E 91°30'6"
MM130323-61	<i>M. palmata</i> Reinw., Blume and Nees		Moist damp, shady soil	Near biological sciences faculty	N 22°27'55" E 91°46'42"
SAD150222-08	<i>M. polymorpha</i> L.		Soil	Beside Shahjalar hall	N 22°27'3" E 91°47'5"
MM130223-57	<i>Riccia bengalensis</i> Sultan Khan	Ricciaceae	Damp soil	Botanical garden chora	N 22°27'30" E 91°47'5"
MM220324-76	<i>R. compaginata</i> Zaman et Syed		Hill slope	Biological sciences faculty chora	N 22°27'29" E 91°47'12"
SAD150222-09	<i>R. sorocarpa</i> Bisch.		Soil	Forestry and environmental science nursery	N 22°16'26" E 91°28'30"
MM070822-24	<i>Ricciocarpos natans</i> (L.) Corda		Water	Botanical garden chora	N 22°27'30" E 91°47'5"
MM280523-46	<i>Cololejeunea brunellii</i> Tixier	Lejeuneaceae	Leaf of higher plant	Botanical garden chora	N 22°25'29" E 91°46'10"
MM170822-25	<i>Chiloscyphus argutus</i> (Reinw., Blume and Nees)	Nees Lophocoleaceae	Damp soil	Biological sciences faculty chora	N 22°29'19" E 91°27'22"
MM170822-27	<i>Anthoceros</i> sp.	Anthocerotaceae	Damp soil	Botanical garden chora	N 22°27'29" E 91°47'12"

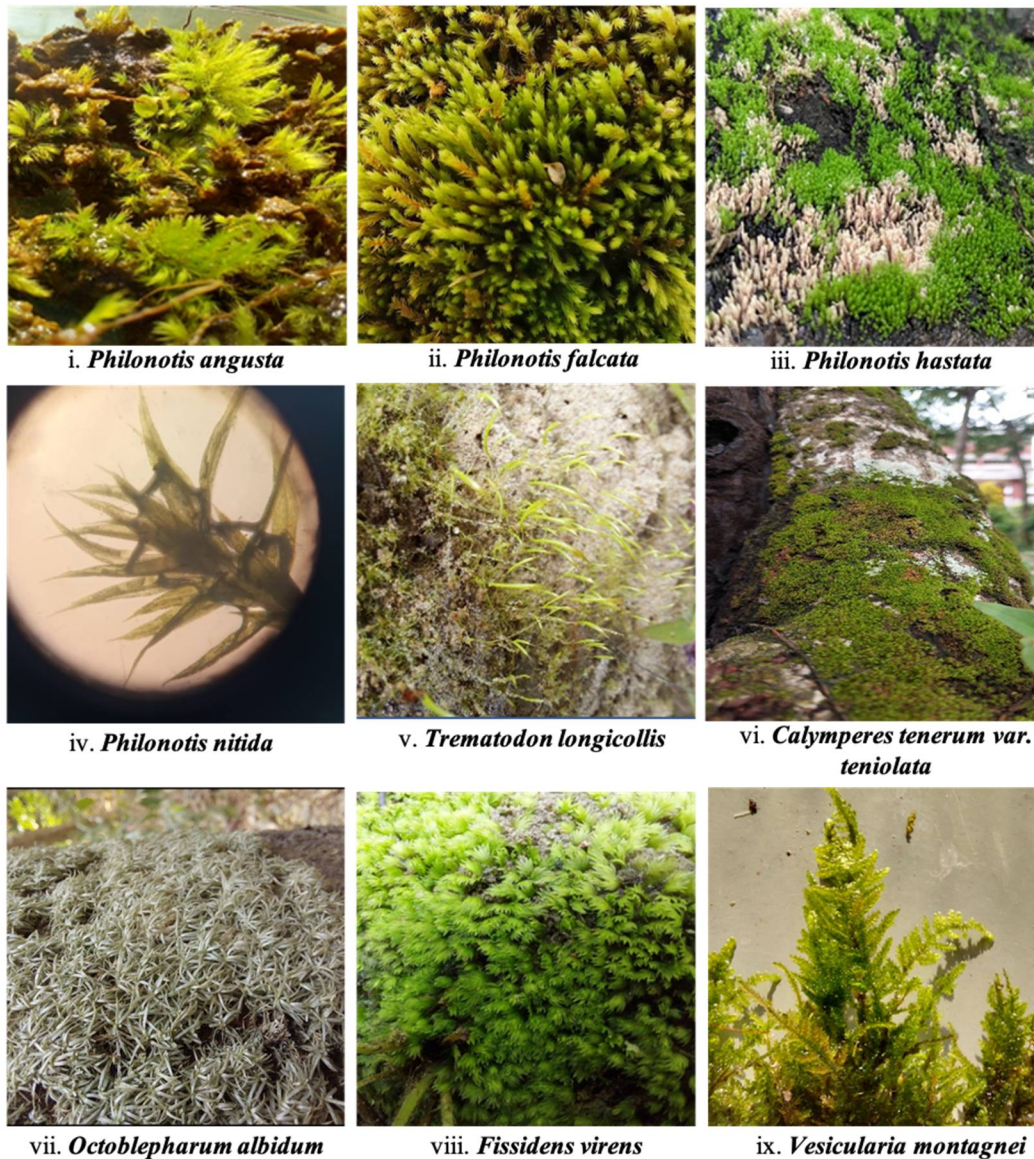


Fig. 1(i-ix). Morphology of recorded species.

H. pseudo-ehrenbergii, *Hyophila involuta* var. *teniolata*, *Cyathodium cavernarum*, *Dumortiera hirsuta*, *Marchantia palmata*, *M. polymorpha*, *Cololejeunea brunelii* and *Chiloscyphus argutus*, have previously been reported from the Chittagong region (Tixier 1967, Hadiuzzaman and Chakravarty 1981, Banu 1991, Khatun and Hadiuzzaman 1994, Banu-Fattah and Hadiuzzaman 1996, Banu-Fattah 1998, Khatun and Hadiuzzaman 1999, Long 2006, Alfasane *et al.* 2013). To the best of our knowledge and literature study, only *C. cavernarum* (Long 2006) and *D. hirsuta* (Hadiuzzaman and Chakravarty 1981) were previously recorded from the University of Chittagong. The remaining taxa are reported here for the first time from this campus.



Fig. 1(x-xviii). Morphology of recorded species.

According to the present study, mosses were the dominate group in the bryophyte flora, comprising 15 species belonging to 11 genera and 10 families. This accounts for 53.57% of the total recorded species, underscoring the ecological significance and adaptability of other bryophytes across the campus. Liverworts represents the second most diverse group, contributing 42.86% of the total species, with 12 species belonging to 7 genera and 6 families. In contrast, hornworts were represented by a single species, contributing 3.57% of the overall bryophyte diversity. *Anthoceros* sp. remained unidentified to species level due to its close morphological resemblance to existing species within the same genus. According to the encyclopedia of bryophytes, five species of this genus were recorded from Bangladesh. Therefore, due to the lack of accurate identification, it remains uncertain whether this species represents a new record for Bangladesh or corresponds to a previously recorded species. Hence, further morphological, anatomical and molecular investigation is required to validate its identity.



Fig. 1(xix-xxviii). Morphology of recorded species.

This study established a baseline on the bryophyte diversity within the Chittagong University campus, highlighting its importance as an appropriate environment for bryophytes. Given the scarcity of literature study, further survey could record additional species from the unexplored areas, which will contribute to the diversity of Chittagong University campus as well as national flora of Bangladesh.

References

- Akter N, Gupta SS, Sinha S and Hossain MK 2022. Tree species diversity of Chittagong University Campus flora in Bangladesh. *J. Biodiver. Conser. Biores. Manag.* **8**(1): 57-72.
- Alfasane MA, Ullah MS and Khondker M 2013. Limnology of Lake Rainkhyongkain of Bangladesh with a new record of *Marchantia polymorpha* L. var. *aquatica* Nees. *Bangladesh J. Bot.* **42**(2): 223-229.
- Banu K 1991. Taxonomic studies on the Acrocarpous mosses of Bangladesh Ph. D. Thesis. Department of Botany, University of Dhaka. 460 pp.
- Banu-Fattah K 1998. Bryophytic flora of Chittagong in Bangladesh. *Bangladesh J. Plant Taxon.* **5**(2): 83-89.
- Banu-Fattah K and Hadiuzzaman S 1996. Acrocarpous mosses of Bangladesh VI: Family Calymperaceae. *Bangladesh J. Plant Taxon.* **3**: 59-76.
- Banu-Fattah K and Hadiuzzaman S 2006. Acrocarpous mosses of Bangladesh-XI. Family: Bartramiaceae-2. *Bangladesh J. Bot.* **35** (2): 91-97.
- Banu-Fattah K and Sarker SK 2007. Bryophyte flora of greater Mymensingh district of Bangladesh-Class: Bryopsida. *Bangladesh J. Plant Taxon.* **14**(1): 47-66.
- Banu-Fattah K and Sarker SK 2010. Bryophyte flora of greater Mymensingh district of Bangladesh-Class: Hepaticopsida and Anthocerotopsida. *Bangladesh J. Plant Taxon.* **17**(1): 55-67.
- EFFB (Encyclopedia of Flora and Fauna of Bangladesh) 2007-2008. Encyclopedia of Flora and Fauna of Bangladesh. Vol. 5. Asiatic Society of Bangladesh, Dhaka, Bangladesh.
- Hadiuzzaman S and Chakravarty A 1981. Marchantiales of Bangladesh. *Bangladesh J. Bot.* **10**(1): 69-81.
- Hadiuzzaman S and Chakravarty A 1984. Anthocerotae of Bangladesh. *Bangladesh J. Bot.* **13**(1): 101-107.
- Kamruzzaman M 1995. Studies on the genus *Riccia* of Bangladesh. Ph. D. Thesis, Department of Botany, University of Dhaka. 272 pp.
- Khan SA 1955. *Riccia perssonii* SA Khan: A new and interesting species from East Pakistan. *Sven. Bot. Tidskr.* **49**(3): 433-436.
- Khatun H 2002. Taxonomic Studies on Pleurocarpic Mosses of Bangladesh. Ph. D. Thesis. Department of Botany, University of Dhaka. 554 pp.
- Khatun H and Hadiuzzaman S 1994. Taxonomic studies of some Pleurocarpic mosses of Bangladesh. *Bangladesh J. Bot.* **23**(1): 113-122.
- Khatun H and Hadiuzzaman S 1999. Addition to the checklist of the pleurocarpous mosses of Bangladesh. *Dhaka Univ. J. Biol. Sci.* **8**(2): 207-209.
- Long D 2006. Notes on Himalayan Hepaticae 3: new records and extensions of range for some Himalayan and Chinese Marchantiales. *Cryptogam. Bryol.* **27**(1): 119-129.
- Rahman MS and Khatun H 2014. Floristic account of Boldha garden, Dhaka: Class-Hepaticopsida and Bryopsida. *Dhaka Univ. J. Biol. Sci.* **23**(2): 147-156.
- Siddiqui KU, Islam MA, Ahmed ZU, Begum ZNT, Hassan MA, Khondker M, Rahman MM, Kabir SMH, Ahmed M, Ahmed ATA, Rahman AKT and Haque EU (eds.) 2007. Encyclopaedia of Flora and Fauna of Bangladesh, Asiatic Society of Bangladesh, Dhaka 5: 391 pp.
- Singh DK and Singh SK 2015. Manual of Liverworts and Hornworts of Himachal Pradesh, India (17 pp.). Dehradun (India), Bishen Singh Mahendra Pal Singh.
- Tabassum N, Begum M and Rahman MO 2020. *Jungermannia exertifolia* Steph. -a new bryophyte record from Bangladesh. *Dhaka Univ. J. Biol. Sci.* **29**(1): 133-136.
- Tixier P 1967. Bryophytae indosinicae. *Dacca Univ. Stud.* **15**: 1-14.
- Zheng TX and Shimamura M 2020. *Marchantia papillata* Raddi subsp. *grossibarba* (Steph.) Bischl. (Marchantiaceae, Marchantiophyta) new to Japan. *Hikobia.* **18**: 93-96.

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