FOUR NEW RECORDS FOR THE VASCULAR FLORA OF BANGLADESH

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Abstract

This study records two species of Pteridophytes, viz., Hemionitis cordata Roxb. ex Hook. & Grev. and Ophioglossum nudicaule L.f. of Pteridaceae and Ophioglossaceae, and two species of Angiosperms, viz., Bacopa australis V.C. Souza and Salvia misella Kunth of Plantaginaceae and Lamiaceae, respectively, for the first time in Bangladesh, based on the plant specimens collected during the recent botanical explorations conducted in selected areas of Bagerhat, Barguna, and Cumilla districts. A detailed taxonomic description with key characters, notes on ecology, uses, distribution, distinctness from other similar taxa, representative specimens examined, and photographs of each of these four species have been provided.

Introduction

Bangladesh, as an integrated part of the Indian-Subcontinent Centre of Plant Diversity (Vavilov, 1926) and the South Asian Mega Centre of Genetic Diversity (Chowdhury, 1996), harbours almost all groups of plants in its 148,460 sq. km. area. Within the territory of Bangladesh, a total of around 6,612 species of green plants have so far been recorded, in contrast to the flexible estimate of 11,650 plant species for the country (Khan 1977; Ahmed et al., 2007, 2008–2009, 2009a, b; Siddiqui et al., 2007; Sarkar and Hossain, 2009; Begum et al., 2014; Rahman and Khatun, 2014; Tabassum, 2018; Alfasane et al., 2019; Tabassum et al., 2020; Dong and Haque, 2021; Sultana and Rahman, 2021; Sultana et al., 2022; Jone et al., 2022; Rahman et al., 2022; http://bforest.portal.gov.bd). Nevertheless, the publication of 329 new records of vascular plants following the report of a total of 3,813 species for the vascular flora of Bangladesh (Siddiqui et al., 2007; Ahmed et al., 2008–2009, 2009a) raises the total number of recorded vascular plant species in this country to around 4,142 (Sultana and Rahman, 2021; Hossain et al., 2022; Rahman et al., 2022; Sultana et al., 2022; Uddin and Uddin, 2022).

During our botanical explorations conducted in 2019–2022, in different areas of Bagerhat, Barguna and Cumilla districts, including the Sundarbans and Tengragiri Mangrove Forests, many specimens of vascular plants were collected and housed in the Jahangirnagar University Herbarium (JUH). Recently, we found that some of these specimens do not match any known plant species in Bangladesh. After a detailed taxonomic investigation, we identified a few of these specimens belonging to two Pteridophyte species, namely, Hemionitis cordata Roxb. ex Hook. & Grev. of family Pteridaceae and Ophioglossum nudicaule L. f. of Ophioglossaceae, and a few other species associated with two Angiosperm species, namely, Bacopa australis V.C. Souza and Salvia misella Kunth of Plantaginaceae and Lamiaceae, respectively. These species have never been reported earlier in any taxonomic literature published so far on the flora of Bangladesh (e.g., Hooker, 1872–1897; Prain, 1903a, b; Siddiqui et al., 2007; Ahmed et al., 2008–2009, 2009a; Rahman et al., 2015; Haque et al., 2018; Shetu et al., 2018, 2022; Uddin and Hassan, 2018;

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Hossain et al., 2019, 2020, 2021, 2022; Khanam et al., 2020; Roy and Khan, 2020a, b; Khan et al., 2021a, b; Islam et al., 2022). Therefore, these four species have been reported here as the new records of vascular plant species for Bangladesh.

Materials and Methods

The plant specimens of B. australis and H. cordata were collected from Lalmai hill and its adjacent areas in Cumilla district; specimens of O. nudicaule from the coastal areas of Bagerhat (Sundarbans East Wildlife Sanctuary) and Barguna (Tengragiri Eco Park) districts; and those of Salvia misella from Mongla port area of Bagerhat district, during our recent floristic explorations conducted in 2019–2022. The collected specimens were processed, dried, and managed using standard herbarium techniques (Singh and Subramaniam, 2008). These specimens were critically examined in the Plant Systematics and Biodiversity Laboratory of Jahangirnagar University. Their taxonomic identification was confirmed through consulting the experts and taxonomic descriptions and keys available in the relevant literature (Hooker, 1885; Prain, 1903a, b; Li and Hedge, 1994; Stevens et al., 2001; Hammel et al., 2003–2014; Cui et al., 2004; Mirza, 2007a, b; Khanam, 2009; Rahman, 2009; Gangmin et al., 2013; Xianchun et al., 2013; Sosa et al., 2018), matching with the relevant voucher specimens of the Jahangirnagar University Herbarium (JUH) and Bangladesh National Herbarium (DACB), and digital images of the respective voucher specimens available on the websites of different international herbaria, including Herbarium of Royal Botanic Gardens (K) and Muséum National d’Histoire Naturelle (P).

Nomenclatural details and worldwide distribution were fetched from the most recent and relevant taxonomic publications (Li and Hedge, 1994; Cui et al., 2004; Gangmin et al., 2013; Xianchun et al., 2013) and databases (e.g., GBIF Secretariat, 2022; IPNI, 2023; POWO, 2023; Tropicos, 2023; WFO, 2023). The taxonomic descriptions were produced in the Plant Systematics and Biodiversity Laboratory, Department of Botany, Jahangirnagar University, after consulting the relevant representative specimens, field notes on ecology, and photographs of mature individuals, collected during field surveys.

Results and Discussion


(Fig. 1)

A terrestrial, erect herb, 20–35 cm tall when fertile fronds develop. Rhizomes dark brown, erect, short, 1.5–2.5 cm long, with numerous scales, and fibrous roots. Scales brownish to reddish brown, narrowly lanceolate, 1.75–2.25 mm long. Roots many, fibrous, profusely branched, with numerous root hairs. Sterile fronds 6–12 per plant, 7.0–12.5 cm long; stipes 3.0–5.5 cm long, reddish brown, densely with 1.0–1.5 mm long brown hairs; lamina 8.5–9.5 × 3.5–5.5 cm, simple, dorsiventral, adaxially light green and glabrous, abaxially yellowish green, sparsely with 0.5 mm long broad base white hairs, narrowly cordate, base cordate, entire or repand with dense, small whitish hairs, and reduced with maturity. Fertile fronds 4–7 per plant; stipe much longer than that of the sterile frond, 15–20 cm long, reddish brown, sparsely with 1.0–1.5 mm long brown hairs; lamina 7.2–10.8 × 3.2–5.3 cm, abaxially light green, adaxially deep green, sagittate, base sagittate to sub-cordate, abaxially sparse, 1.0–1.5 mm long white, broad base brownish hairs along veins, adaxially glabrous, sparse reddish brown hairs around the margins, apex obtuse or rounded. Sori black to brown, confluent throughout the abaxial surface along the veins when mature.

*Sporophytic stage:* October to February.
Ecology: On the shady place of the hill slope.
Uses: This plant is used as an ornamental herb in shade houses.

Distribution: This species is native to Cambodia, China, India, Indonesia, Laos, Malaya, Myanmar, the Philippines, Sri Lanka, Taiwan, and Viet Nam (POWO, 2023). In Bangladesh, this species is recorded in the Lalmai Hill area of the Cumilla district. As Bangladesh belongs to the historical native range of the Indian subcontinent, this species is most probably native to this country.

Representative specimens examined: Cumilla: Lalmai, Lalmai Hill, 26.10.2022, G.M. Hossain 7415; S.S. Shetu 4044 (JUH).

Fig. 1. Hemionitis cordata Roxb. ex Hook. & Grev. a) Habit (fertile stage) (×0.3), b) Habit (vegetative stage) (×0.3), c) Root system (×0.3), d) Stipe hairs (×15), e) Stem scale (×30), f) A sterile lamina (adaxial surface) (×0.3), g) A sterile lamina (abaxial surface) (×0.3), h) A fertile lamina (×0.45) with sori (×15) (inset).

In Bangladesh, only one species of the genus Hemionitis L., namely H. arifolia (Burm. f.) T. Moore has been reported before (Mirza, 2007a). H. cordata can be distinguished by its sagittate or narrowly cordate lamina with a sagittate to cordate base and reddish-brown stipes and hairs, in contrast to the narrowly ovate lamina with a deeply cordate base and nearly black stripes with brown hairs of H. arifolia.

Ophioglossum nudicaule L.f., Suppl. Pl. 433 (1782). Type: South Africa, Cape of Good Hope, Thunberg s.n. (UPS-25286). O. capense Sw. (1803), O. ellipticum Hook. & Grev. (1831), O. vulgatum var. nudicaule (L.f.) D.C. Eaton (1860), O. dendroneuron E.P.St. John (1938), O. nudicaule var. typicum R.T. Clausen (1938). (Fig. 2)

A terrestrial, small, erect herb, 3–8 (–10) cm tall. Rhizomes erect, 3.0–4.5 mm height with 2.0–2.5 mm diam., very thick, and with fibrous roots. Roots unbranched, yellowish to pale brown,
1.5–2.5 cm long, with 0.5–1.0 mm diam. Stem cylindrical, pale green, upright, 0.5–1.8 cm, 0.8–1.5 mm diam., most parts being buried underground, usually bearing 1–2 (3) fronds per plant. Sterile lamina 1.2–1.8 × 0.4–0.6 cm; trophophore stalk 2–4 mm, trophophore blade spreading, green, elliptic or elliptic-ovate, 1.0–1.5 × 0.4–0.6 cm, fleshy, cuneate, entire, acute or rounded; Venation indistinct due to thick and fleshy texture of blade. Fertile spikes arise from the base of the sterile lamina, 2.8–8.5 cm long, light green, cylindrical. Sporophore 2.5–7.5 cm long, 0.7–1.0 mm diam.; sporangial clusters 0.8–1.3 cm long, 1.0–1.5 mm diam., apex acute, usually bearing 10–18 pairs of sporangia.

Sporophytic stage: July to November.

Ecology: Moist sand and clay soils in shady habitats.

Uses: It is used as medicine in the treatment of anti-inflammatories and wounds and as a vegetable or salad.

Distribution: This species is native to Cape Province, South Africa. It is reported from Argentina, Africa, Australia, Brazil, French Guiana, Guyana, Mexico, Peru and the United States of America (POWO, 2023). In Bangladesh, it is recorded in the coastal habitats of Bagerhat (Sundarbans East Wildlife Sanctuary) and Barguna (Tengragiri Eco Park) districts.

Representative specimens examined: Bagerhat: Sharankhola, Katka, 19.08.2019, G.M. Hossain 0249 (JUH); Barguna: Taltoli, Tengragiri, 05.09.2022, G.M. Hossain 5892 (JUH).

Fig. 2. Ophioglossum nudicaule L.f. a) Natural habitat (×0.3), b) Habit (×0.6), c) A fertile spike with sporangia and spores (×5), d) A spike without spore (×4).

In Bangladesh, five species of Ophioglossum L., viz., O. costatum R. Br., O. pendulum L., O. petiolatum Hook., O. polyphyllum A. Braun ex Schub., and O. reticulatum L., have been reported previously (Mirza, 2007b). O. nudicaule is clearly distinct from these species of Ophioglossum by
its stem height, sterile lamina size, shape, venation, etc. *O. nudicaule* differs from *O. pendulum* by its terrestrial habit and elliptic, erect sterile lamina, in contrast to the epiphytic habit and ribbon-shaped pendulous sterile lamina of *O. pendulum*. *O. nudicaule* can be easily distinguished from *O. costatum*, *O. petiolatum*, *O. polyphyllum*, and *O. reticulatum* by possessing a plant height of up to 10 cm, a sterile lamina length of less than 3 cm, and indistinct venation as compared to the latter’s having a 10 cm plant height and a more than 5 cm long sterile lamina with apparent reticulate venation.


(Fig. 3)

**Fig. 3.** *Bacopa australis* V.C. Souza. a) Natural habitat (×0.45), b) Habit with flowering branches (fresh) (×0.75), c) Whole plant (dry sample) (×0.25), d) Flowering branch (dry) (×0.75), e) Dense hairs on apical internode (×15), f) Sparse hairs on median internode (×15), g) A flower (dry) (×4), h) Calyx (×5), i) A fruit with persistent calyx (×4), j) Seeds (×30).
An annual, prostrate, aquatic, or amphibious herb, up to 15 cm tall. Roots fibrous, arising from lower nodes with dense and fine short hair. Stems stout, green or reddish, succulent, prostrate with ascending tips, strigose or villous, denser towards the apex; internodes slender, 2.5–3.5 cm long. Leaves simple, opposite, entire, sessile, 1.0–1.8 cm × 0.7–1.4 cm, fleshy and thick but very thin and fragile when dry, broadly spatulate to orbicular, shallowly cordate to rounded or broadly angled at the base, slightly clasping the stem, rounded at the tip, the venation palmate with 6–8 main veins, glabrous at maturity, adaxial surface glassy. Inflorescences axillary, solitary, or 2–3 per leaf axil. Flowers bisexual, zygomorphic, pedicellate, 0.5–2.5 cm long, sub-glabrous or sparsely pubescent, bracteoles absent; calyx 5-lobed, the outer 3 lobes leaf-like, green and the inner 2 inconspicuous, the external dorsal lobe ovate to broadly ovate, 3.5–4.5 × 2.2–3.0 mm, apex rounded, base cordate, hispid towards the apex; the two lateral lobes ovate, 3.5–4.2 × 1.7–2.0 mm, apex obtuse, base cordate, hispid; the two internal lobes linear, 2–3 × 0.4–0.5 mm, apex acute, hispid on the margins; corolla 5-lobed, glabrous, tubular, 2.5–4.5 mm long, white; stamens 4, not exerted, the anthers attached near the midpoint, the anther sacs parallel, staminodes absent; ovary bilocular, glabrous, style not exserted, bifid, apex smooth. Fruits a capsule, globose to broadly ellipsoid, 3.5–3.8 × 1.7–2.0 mm long, glabrous, usually enclosed within a persistent calyx, dehiscent longitudinally by 4 valves. Seeds numerous, 0.4–0.6 mm long, ellipsoid to cylindrical, with a minute tail-like appendage at each end and a yellowish-brown surface with a network of fine ridges.

**Flowering and fruiting:** June to December.

**Ecology:** On mud in ditches and paddy fields.

**Uses:** The stems and leaves of this species are eaten by wildlife.

**Distribution:** This species is native to Argentina, Brazil, and Paraguay (POWO, 2023). In Bangladesh, this species seems to be introduced.

**Representative specimens examined:** Cumilla: Lalmai, 26.10.2022, S.S. Shetu 4171; G.M. Hossain 7413 and 7414 (JUH).

In Bangladesh, two species of *Bacopa* Aubl., viz., *B. hamiltoniana* Wettst. and *B. monnieri* (L.) Pennell., have been reported previously (Rahman, 2009). *B. australis* differs from *B. hamiltoniana* and *B. monnieri* by its pubescent stems, broadly spatulate to orbicular leaves, and bracteate flowers, in contrast to the glabrous stems, linear-lanceolate to oblong-oblancoate leaves and bracteate flowers of the latter two species.


FIG. 4

An annual to perennial, erect or decumbent terrestrial herb, up to 1 m tall, with a strong and unpleasant odour. Stems quadrangular, pubescent, with simple, unbranched white hairs, reddish-tined, swollen above nodes. Leaves simple, sessile; leaf blades membranous, deltoid ovate, lanceolate-ovate or rhombic-ovate, 4.5–8.0 × 2–4 cm, acute, crenate-serrate along the distal margins, the bases narrowed, obtuse to truncate or rarely attenuate, sparsely pubescent with short hairs on both surfaces but more on abaxial surface. Inflorescence terminal racemes, up to 20 cm long with 6 to 15 interrupted verticils of 1–2 flowers in each, pubescent with glandular-capitate hairs. Bracts broadly ovate and long-acuminate, or rhomboid, ca 4.5–5.0 × 2.0–2.5 mm long, persistent, glabrous inside, glandular-pilose outside. Flowers pedicellate, ca 1.0–1.5 mm long, zygomorphic; calyx green, zygomorphic, tubular or campanulate, 3.5–5.0 mm long, clothed, bilabiate, prominently veined (the upper lip mostly 5–9-veined), densely covered with capitate glandular hairs persisting in fruit; corolla tubular, ca 2.5 mm long, blue with white streaks, naked
within, the upper lip ca 1.2–1.8 mm long, the lower lip weakly 3-lobed, ca 3.0–3.5 mm long; stamens 2, included, filaments 1.2–1.3 mm long, pubescent, connective produced, adnate towards the lower half of anther; anthers slender, ca 0.6–0.8 mm long; styles 5–6 mm long, included, slender, glabrous; stigmas 2-lobed, lobes flattened. Fruits a mericarp, oblong, ca 1.5 mm long, grey with dark streaks, mucilaginous when wet. Seeds greyish to brown, obovate with highly reticulate venation.

Flowering and fruiting: November to February.

Ecology: Found to grow along the roadside in moist and semi-shady habitats.

Uses: This species is considered a weed in Tropical America (Richardson and Keng, 2010).

Distribution: This species is native to Belize, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panamá, Peru, Puerto Rico, United States of America (Florida), and Venezuela. It is introduced to Australia, Central Africa, India, and Indonesia (POWO, 2023). In Bangladesh, it has been recorded from wild habitats along the roadside near the Mongla Port area of the Bagerhat district. This species is most probably introduced to Bangladesh.

Representative specimens examined: Bagerhat: Mongla (near Mongla port area), 22.12.2021, G.M. Hossain 2951 and 5805; S.S. Shetu 3891 (JUH).

Fig. 4. Salvia misella Kunth. a) Habit (×0.25), b) Stem with swollen part and reddish tinged dots (×0.8), c) Stem hairs (×3.5), d) A leaf (adaxial surface) (×0.30), e) A leaf (abaxial surface) (×0.3), f) An inflorescence (×1), g) A flower (×3.75), h) Calyx (lower lips) (×3), i) Calyx (upper lip) (×3), j) Anthers and stigma (×10), k) Ovary (top view) with glandular hairs on calyx tube (×6), k) Ovary (lateral view) with glandular hairs on calyx (×7), l) Seeds (×6.5).

In Bangladesh, four species of Salvia L., viz., S. coccinea Juss. ex Murr, S. leucantha Cav., S. plebeia R.Br., and S. splendens Sellow ex Rome & Schult., have been reported so far (Khanam, 2009). S. misella is clearly distinct from S. splendens by its deltoid, sparsely pubescent leaves, deep green calyx, and 5–6 mm long corolla, in contrast to S. splendens' ovate, glabrous leaves, red calyx, and 4.5 cm long corolla. S. misella is a herb with a green calyx, while S. leucantha is a
subshrub with a purple calyx. *S. misella* differs from *S. coccinea*’s campanulate and deep red or scarlet, 2 cm long corolla by its tubular, purple, 5–6 mm long corolla. *S. misella* is different from *S. plebeia* by its deltoid ovate leaves and bluish-purple corolla, in contrast to *S. plebeia*’s elliptic-lanceolate leaves and white corolla.

**References**


FOUR NEW RECORDS FOR THE VASCULAR FLORA


Khanam, M. 2009. 
Salvia


Hemionitis

Ophioglossum


Rahman, M.O. 2009. 
Bacopa


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