

***ELODEA NUTTALLII* (PLANCH.) ST. JOHN (HYDROCHARITACEAE) -
A NEW ANGIOSPERMIC RECORD FOR BANGLADESH**

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Abstract

Elodea nuttallii (Planch.) St. John has been explained as a new report from Bangladesh. The taxonomic description including flowering, fruiting, ecology and distribution of the species are elaborated here.

Introduction

In Bangladesh, freshwater wetlands mainly occupied by haors which cover major areas of Kishoreganj and greater Sylhet districts. A large number of aquatic macrophytes have been found of these habitats. Alfasane *et al.* (2010, 2013, 2019, 2020, 2021, 2022, 2023) have been reported 11 species of aquatic macrophytes either as new to science, new records and new occurrence including the present species from Bangladesh. Recently Alfasane *et al.* (2023) reported *Elodea canadensis* Michx. from Hakaluki haor, Bangladesh. It indicates a lot of aquatic macrophytes are not yet listed in the biodiversity components from Bangladesh. There are lots of physico-chemical, socio-ecological, economic and cultural importance present of the haors of Kishoreganj district (Kishoreganj Zilla, 1993). This haor district contains 13 Upazillas where a total number of 85 haors are present. The total area occupied is about 75000 hectare (DAE, 2003-2010). The four upazillas namely, Austogram, Mithamoin, Itna and Nikli are fully bounded by haors. On the other hand five upazillas namely, Bajitpur, Bhairab, Karimganj, Kuliarchar and Tarail are partially bounded by haors. The agricultural sector is the prime focuses around the haors of Kishoreganj district (BHWDB, 2016). Mahitulpa Haor from Austagram upazila of Kishoreganj district covers the approximate area 549 ha. This haor is different in geographical position, morphometric nature and biodiversity standpoint. This haor play a great role for the socio-economic importance of Bangladesh. Due to environmental degradation and losses of biological diversity a taxonomic survey of aquatic plants with hydrobiological study has been made of the Mahitulpa Haor from Kishoreganj districts.

A total of 16 genera and about 100 species have been recorded under Hydrocharitaceae family. The members of this group mostly in aquatic and cosmopolitan in nature. A total of 8 genera and 14 species have been reported from Bangladesh so far (Alfasane *et al.*, 2010, 2022, 2023; Siddiqui *et al.*, 2007) from Hydrocharitaceae. In the present paper, the first report of *Elodea nuttallii* (Planch.) St. John from Bangladesh has been made.

Materials and Methods

The samples were collected from the Mahitulpa Haor from Mankhola village of Austagram Upazila of Kishoreganj district of Bangladesh from 01.02.2024 to 05.02.2024. The collections were made at the latitude 24°18'4.78"N and longitude 91° 1'43.28"E. The samples were collected from the depth between 2.0- 4.0 m of the littoral area. The samples were then put in a collection bag mixing with water.

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The detailed taxonomic work and autecological parameters has been made in the National Professor A.K.M. Nurul Islam Laboratory, Department of Botany, University of Dhaka. The *ex-situ* conservation of the *Elodea nuttallii* was done in the Botanical garden of Curzon Hall campus, University of Dhaka.

The identity of *Elodea nuttallii* has been confirmed with the help of the world monographs and literature (Anderberg, 1992; Barrat-Segretain *et al.*, 2002; Cook and Urmi-König, 1985; Fassett, 1957; Haynes and Holm-Nielsen, 2001; Simpson, 1984, 1990; St John, 1965; Subramanyam, 1974; Xu *et al.*, 2007). The collected fresh materials of the *E. nuttallii* have been used for taxonomic description and illustrations.

There is no report of *E. nuttallii* was found of the studied literature (Alfasane *et al.*, 2023; Hooker 1888; Khan and Halim 1987; Prain 1903; Siddiqui *et al.* 2007) indicating that this species is a new record for Bangladesh.

Results and Discussion

After detailed observation, the collected specimen was identified as *Elodea nuttallii* under the family Hydrocharitaceae. Detailed taxonomic description, ecological features, photographs and illustrations are given below:

Elodea nuttallii (Planch.) St. John, Rhodora 22:29 (1920)

(Fig. 1)

Common name: Nuttall waterweed, western waterweed, waterweed esthwaite, free-flowered waterweed, nuttall's pondweed, slender waterweed and western elodea.

Synonyms: *Anacharis nuttallii* Planch., *A. occidentalis* (Pursh) Victorin, *Elodea canadensis* Rich. in Michx. var. *angustifolia* (Britton ex Rybd.) Farw., *E. columbiana* H. St. John, *E. minor* (Engelm. ex Caspary) Farw., *E. occidentalis* (Pursh) St. John, *Philotria angustifolia* (Muhl.) Britton ex Rydb., *P. minor* Small, *P. nuttallii* (Planch.) Rybd. ex Britton & Brown, *P. occidentalis* (Pursh) House, *Serpicula occidentalis* Pursh, *S. verticillata* L. f. β var. *angustifolia* Muhl. and *Udora verticillata* var. *minor* (L. f.) Spreng. Engelm. ex Caspary.

Description of the plant

Perennial, submerged-rooted aquatic herb; dioecious, stems long, slender, tips not crowded, often freely branched, 35-120 cm long, round in T.S; roots white, unbranched, originated from nodes; whorls of leaves, whorls 3-4, lower leaves lanceolate to ovate, opposite, upper leaves larger, lower leaves smaller rather than that of upper leaves, reduced; wider upper and median leaves 5.5-12 mm long, 0.25-1.4 mm wide, divergent, paler, softer, linear, lanceolate, recurved, margins folded, finely serrulate, green or pale green; flower small, stalk thread like; male flowers sessile, released when anthesis, little floral tube with female flowers ; spathes staminate, 2-parts, twisted lobes, apiculate, sessile, borne at median axis, ovoid to subglobose, suddenly formed twisted acuminate teeth with 2.2 mm long body; obovate to ovate sepals, dark or slightly reddish, 0.75-1.2 mm long, 0.4-0.6 mm wide; petals present or may not be present, obovate, lanceolate to ovate, 1.45 mm long, delicate, white; stamens 9 with short pedicel, 1.3 mm long, 3 inner stamen filaments forming one column, outer 6 in separate; 1.1 mm long and 0.7 mm wide anther, ellipsoid to broadly ellipsoid, tetrad pollen; upper axils remains female flower, cylindrical to broad, 8-24 mm in length, up to 8 cm long threadlike hypanthium, enlarged, tip bifid, slender stigma and style; sigma 3, fusiform to ovoid fruit forming capsule, 5-7 mm in length and diameter 1.5-2.2 mm, sessile, narrowly ovoid to fusiform; seeds nature fusiform and beaked, base of seeds occupied with long hairs, 4.0-4.5 mm long, 0.5-0.9 mm in diameter.

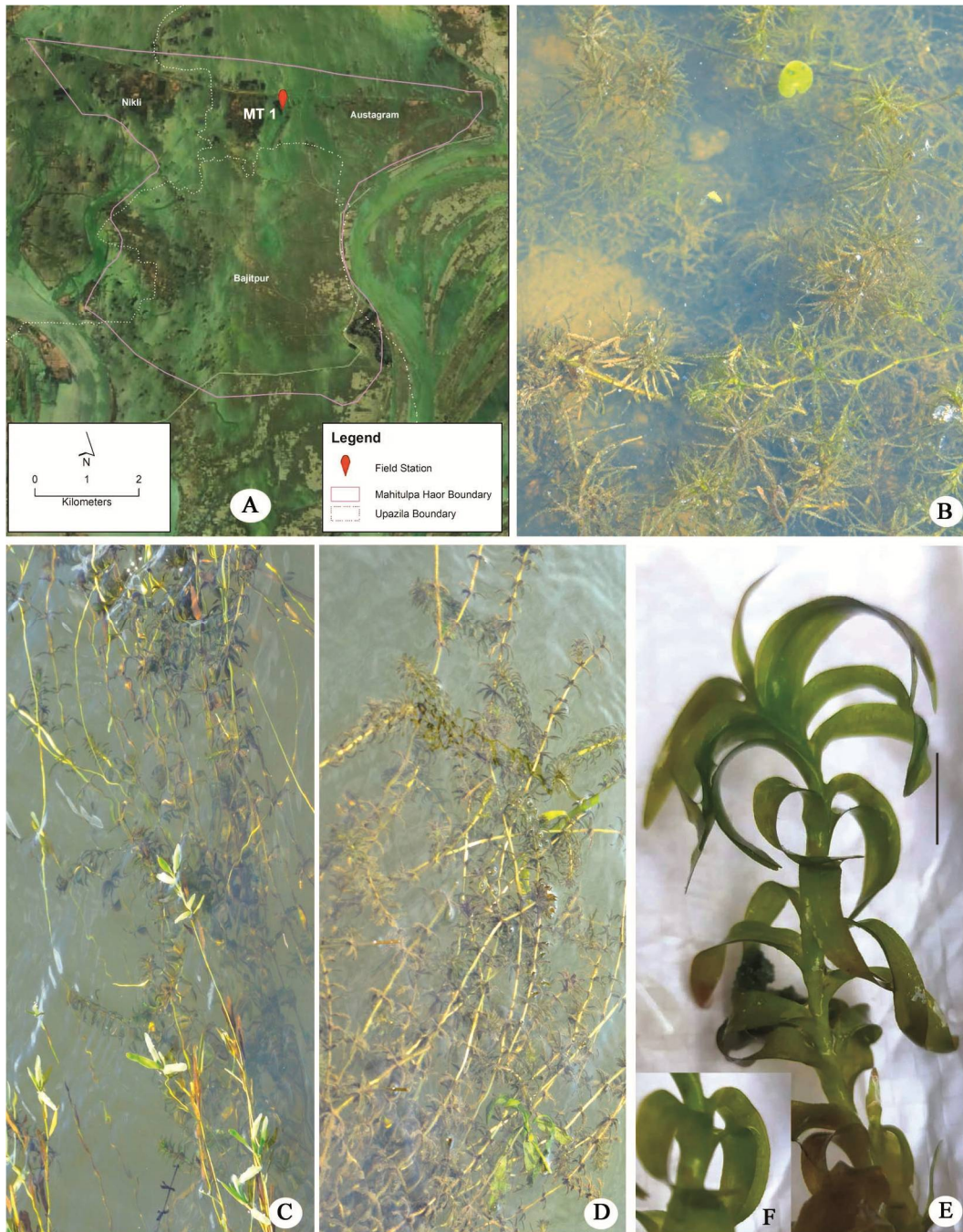


Fig. 1 (A-E): A. Geographical area of the Mahitulpa haor where showing the collection site of (MT1, Sentinel 1 SAR image) of *Elodea nuttallii* (Planch.) H. St John; B-D. Habit and habitat of *E. nuttallii*, anchoring and floating under submerged condition; E-F. Mature plants with the arrangement of leaves (Scale= 5 mm).

Distribution and ecology

In Bangladesh, it is so far only confined to the Mahitulpa haor of Kishoreganj district. *Elodea nuttallii* was found in the littoral portion of the haor under submerged condition at the depth up to 6 ft, calm water with oligotrophic nature. They prefer to grow with sufficient light. A total of 27 samples were collected from 9 stations for physico-chemical and biological analyses of the Mahitulpa haor. The mean values of the ranges of different physicochemical parameters were found during the investigation as follows: air temperature 30.25-32.52°C, water temperature 27.28-30.45°C, Electric Conductivity 78.87-98.57 $\mu\text{S}/\text{cm}$, Total dissolved solids 40.58-52.67 mg/l, pH 7.08 to 7.15, Alkalinity 0.78-0.90 meq/l, turbidity 1.15-1.38 NTU, Biochemical oxygen demand of BOD₅ 0.95-2.95 mg/l, Dissolved oxygen 10.31-14.25 mg/l, Nitrate-nitrogen (NO₃-N) 0.25-0.40, Total suspended solids 17.14-22.58 mg/l, Soluble reactive phosphorus 17.58-20.36 $\mu\text{g}/\text{l}$, Soluble reactive silicate 5.45-6.46 mg/l, F⁻ 0.09-0.15 mg/l, Na⁺ 0.09-0.13 mg/l, SO₄²⁻ 8.56-10.21 mg/l, K⁺ 0.18-0.20, NH₄⁺ 0.17-0.19 mg/l, NO₂⁻ 0.08-0.13 mg/l, Cl⁻ 0.45-0.52 mg/l, Fe²⁺ 0.14-0.25 mg/l, Mn²⁺ 0.17-0.24 mg/l, Mg²⁺ 0.28-0.34 mg/l and Ca²⁺ 0.53-0.75 mg/l. *E. nuttallii* was collected in association with other aquatic plants namely, *Ceratophyllum*, *Potamogeton*, *Myriophyllum*, *Hygrohiza* and *Hydrilla*. As the North American native of *Elodea nuttallii* which were introduced in Europe. It is vastly used in aquarium as an ornamental plant. In 1939, *E. nuttallii* had been reported from Belgium and different countries rest of the world (Cook and Urmi-König, 1985; Nino *et al.*, 2005; Simpson, 1984, 1990; Xu *et al.* 2007). It has massive growth and invasiveness due to the vegetative propagation. The differences between the *Elodea canadensis* and *E. nuttallii* were found in the inflorescences. The male flowers of *E. nuttallii* were found to be sessile and these were released at the time of anthesis. On the other hand a minute floral tube present in the female flower rather than that of *Elodea canadensis*. The leaves of *E. nuttallii* shorter, folded and bent like twisted form row along the midrib and less wider than that of *E. canadensis*.

Specimen examined: Mahitulpa Haor, Austagram Upazila, Collection No. PLHNTL-MAA105(24), 2 February 2024.

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