

## ***ELODEA CANADENSIS* MICHX. (HYDROCHARITACEAE)- A NEW ANGIOSPERMIC RECORD FOR BANGLADESH**

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### **Abstract**

A new angiospermic record, *Elodea canadensis* Michx. is elaborated with illustration. The detailed taxonomic description of the species with other relevant information are provided here. The present species has been collected from Hakaluki haor of Moulvibazar district of greater Sylhet.

### **Introduction**

In Bangladesh, major haor areas are occupied by greater Sylhet and Kishoreganj districts. Hakaluki haor is expanded over Maulvibazar and Sylhet districts which is the biggest haors of Bangladesh and one of Asia's largest haors. It covers the approximate area of 21500 ha in Kulaura, Juri and Barlekha upazilas under Maulvibazar district and Fenchuganj and Golabganj upazilas under Sylhet district (BHWDB, 2012, 2014). A little information on Hakaluki Haor were found on hydrobiological standpoint and this haor is very rich in aquatic macrophytes (Alam *et al.*, 2010; Ahmed, 2013; Islam and Paul, 1978; Islam *et al.* 2011). The Government of Bangladesh declared Hakaluki haor as an Ecologically Critical Area and protected Ramsar Site of international importance of wetlands (BHWDB, 2016). Therefore, the present attempt has been taken to study the aquatic macrophytes of Hakaluki haor from Bangladesh.

The family Hydrocharitaceae consists 16 genera and about 100 species which are aquatic and cosmopolitan. In Bangladesh, it is represented by eight genera and 12 species (Siddiqui *et al.*, 2007; Alfasane *et al.*, 2010). Here, *Elodea canadensis* Michx. has been reported as a new records for Bangladesh. It will be the new addition to the Hydrocharitaceae member from Bangladesh.

### **Materials and Methods**

The plant materials were collected from the Hakaluki haor, Juri upazila under Maulvibazar district of Bangladesh through a hydrobiological expedition carried out from 07.09.2023 to 09.09.2023. It is located between the latitude 24°37'19.22"N and longitude 92°5'13.04"E. The sample was collected from 3.5 m depth of the littoral area of the haor. The collected plant samples were then put in a large air tight ice bag with some water inside. It was then transported to the Phycology, Limnology and Hydrobiology Laboratory, Department of Botany, University of Dhaka. Some materials were preserved as a herbarium sheet in this laboratory. The remaining plant samples were planted in a concrete house (1 × 0.5 m length, depth 40 cm) in the Botanical Garden, Department of Botany, University of Dhaka, for *ex-situ* conservation and further study.

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The specimen has been identified as *Elodea canadensis* Michx. with consultation of the literature *viz.* Fassett (1957), Hackney (1992), Haynes and Holm-Nielsen (2001), Santos (1923, 1924), Simpson (1984), Sr John (1920, 1962-1965), Subramanyam (1974), Wilie (1904) and Wyue (1904). A detailed taxonomic description along with illustrations of the plant have been explained based on the fresh specimen.

### Results and Discussion

During a recent expedition for plant collection in Hakaluki Haor along with so many common plant samples, some very interesting materials have also been collected. One of these interesting materials was later identified as *Elodea canadensis* Michx. After detailed studies, the present specimen was recorded as the genus *Elodea* and the designated species was *E. canadensis* under the family Hydrocharitaceae. Taxonomic diagnosis, detailed description, photographs, illustration and other relevant information are provided below:

#### *Elodea canadensis* Michx., Fl. Bor.-Amer. 1:20 (1803)

(Plate 1)

**Synonyms:** *Anacharis alsinastrum* Bab. *ex* Planch.; *A. canadensis* (Michx.) Planch.; *A. canadensis* var. *latifolia* (Casp.) Sanio; *A. canadensis* var. *planchonii* (Casp.) Vict.; *A. iowensis* (Wylie) Wylie; *A. linearis* (Rydb.) Vict.; *A. nuttallii* Planch.; *A. occidentalis* (Pursh) Vict.; *A. planchonii* (Casp.) M. Peck; *A. pomeranica* Peterm.; *Apalanthe schweinitzii* Planch.; *Elodea brandegeae* H. St. John; *E. canadensis* var. *angustifolia* (Muhl.) Farw.; *E. canadensis* var. *latifolia* (Casp.) Asch. & Graebn.; *E. canadensis* var. *planchonii* (Casp.) Farw.; *E. columbiana* H. St. John; *E. gigantea* J. K. Santos; *E. ioensis* Wylie; *E. iowensis* Wylie; *E. latifolia* Casp.; *E. linearis* (Rydb.) H. St. John; *E. minor* (Engelm. *ex* Casp.) Farw.; *E. oblongifolia* Michx. *ex* Casp.; *E. occidentalis* (Pursh) H. St. John; *E. planchonii* Casp.; *E. schweinitzii* (Planch.) Casp.; *Hydora canadensis* (Michx.) Besser; *Philotria angustifolia* (Muhl.) Britton *ex* Rydb.; *P. canadensis* (Michx.) Britton; *P. iowensis* Wylie; *P. linearis* Rydb.; *P. minor* (Engelm. *ex* Casp.) Small; *P. nuttallii* (Planch.) Rydb.; *P. occidentalis* (Pursh) House; *P. planchonii* (Casp.) Rydb.; *Serpicula canadensis* (Michx.) Eaton; *S. occidentalis* Pursh; *S. verticillata* Rostk. & W.L.E. Schmidt; *S. verticillata* var. *angustifolia* Muhl.; *Udora canadensis* (Michx.) Nutt.; *U. canadensis* var. *minor* Engelm. and *U. verticillata* var. *minor* Engelm. *ex* Casp.

#### **Common name**

American duckweed, American waterweed, Broad waterweed, Canadian waterweed, Canadian elodea, Canadian pondweed, Common elodea, Pond weed, Ditch weed, Elodea, Oxygen weed, Water thyme, Waterweed, Yankee weed.

#### **Description**

Perennial, fresh water submerged, glabrous, plants growing from rootstocks or stolons, dioecious. Roots smooth, slender, pale, unbranched. Adventitious root-tips white or grey-green. Stems erect, rooting at lower nodes, branched or unbranched. Leaves bright green, translucent, opposite or mostly whorled. Leaves in whorls of 3 [2-6] at each node, 4.5-17.5 x 1-6 mm, Lowermost leaves decussate, ovate, 1.7-10.0 x 0.8-2.2 mm, sometimes weakly twisted; median and upper leaves in whorls of 3, sessile, linear to linear-lanceolate, oblong, 1 veined,



Plate 1: Figs 1-2. Submerged to emergent habit of *Elodea canadensis* Michx. were found in Hakaluki haor.  
 Fig. 3. Branches of the stem with whorled foliage of three leaves. Figs 4-5. Dense leaf arrangement in the upper portion of the stems.

margins serrate in higher magnification, the midrib in fresh leaves without prickles on abaxial side. Broadly acute or obtuse leaf apices, narrowly acute rarely, (0.4-) 0.8-2.6 mm wide c. 0.6 mm below the apex. Leaf posture spreading, patent, erecto-patent or arcuate-deflexed, usually firm. Leaf margin teeth 35- 75 (-85)  $\mu$ m long. Female flowers in female plants with sepals oblong-

elliptic, cucullate at apex, 1.5-3.0 x 0.5-2.0 mm, recurved, greenish-white, streaked with purple around apex and midrib; petals elliptic-spathulate, 1.5-2.5 x 0.5-2.0 mm, strongly recurved, translucent, whitish; staminodes linear, c. 1 mm long, white; stigmas strongly recurved or slightly bifid, for a third or less than a third of their length, flattened, 20-3.5 mm long, sparsely papillose, the papillae (105-)115-220  $\mu\text{m}$  long, often purple. Male flowers in male plants similar to female but with staminodes, stigmas and ovary absent; stamens 9, anthers bilocular. Tetrads pollen; staminate pedicels, before or during anthesis detaching; anthers 4 mm or less. The fruit is an ovoid capsule, c. 6 mm long with several seeds, 4-6 mm long seeds, spindle-shaped and smooth. Reproducing by seeds, stem fragments, and turions. Turions are common in *E. canadensis*. Flowering period June to October.

There is no species of *Elodea* genus was reported earlier in any previous relevant literature for this area (Ghani, 1964; Heinig, 1925; Hooker, 1888; Khan and Banu, 1969; Khan and Halim, 1987; Mia and Khan, 1995; Prain, 1903; Rahman, 2004a,b; Raizada, 1941; Siddiqui *et al.*, 2007; Sinclair, 1955). However, Datta and Mitra (1953) reported its occurrence in their "Common plants in and around Dacca". Datta and Mitra neither provided information on its specific locality and collection numbers, nor the place where the materials were housed.

Ghani made an extensive survey on the Aquatic and Marsh angiosperm of the Dacca in 1964. He could not collect any specimen of *Elodea*. There is no *Elodea* specimen available in any herbaria of Bangladesh including Bangladesh National Herbarium (DACB). All these facts indicates that the documentation of *E. canadensis* from in and around Dacca (Dhaka) by Data and Mitra is not beyond doubt.

Datta and Mitra describe *E. canadensis* Michx. as flowers bisexual, stamens 3, but the fact is that the flowers of *E. canadensis* are unisexual, staminate flowers with 9 stamens, the plants are dioecious (Willis, 1960; Lawrence, 1968; Mukherji, 1990). Therefore, Datta and Mitra must have misidentified any other plant as *E. canadensis* Michx.

Considering all the facts stated above the authors of the present paper are very much confident to say that *E. canadensis* Michx. is a new angiospermic record for Bangladesh. At the same time the genus *Elodea* is also a new generic record for Bangladesh.

#### *Distribution and autecology*

*E. canadensis* has been found at the depth up to 4 m, sufficient light, oligotrophic with turbulent haor water. During the collection of the samples, a total of 24 physico-chemical parameters were detected of the Hakaluki haor. The ranges of mean values which were obtained: air temperature 29.27-29.80°C, water temperature 26.50-27.00°C, turbidity 1.00-1.10 NTU, Electric Conductivity 45.28-64.78  $\mu\text{S}/\text{cm}$ ; TDS 30.25-32.07 mg/l; pH 7.02 to 7.20; Alkalinity 0.58-0.59 meq/l; DO 14.25-17.54 mg/l; TSS 10.21-12.25 mg/l; BOD 0.50-0.58 mg/l; NO<sub>3</sub>-N 0.12-0.15; SRS 3.45-3.89 mg/l; SRP 11.34-12.30  $\mu\text{g}/\text{l}$ ; SO<sub>4</sub><sup>2-</sup> 7.11-8.12 mg/l; Cl<sup>-</sup> 0.30-0.40 mg/l; F<sup>-</sup> 0.08-0.09 mg/l; NO<sub>2</sub><sup>-</sup> 0.02-0.03 mg/l; Na<sup>+</sup> 0.08-0.09 mg/l; K<sup>+</sup> 0.14-0.15; NH<sub>4</sub><sup>+</sup> 0.14-0.16 mg/l; Ca<sup>2+</sup> 0.45-0.56 mg/l; Mg<sup>2+</sup> 0.14-0.18 mg/l; Mn<sup>2+</sup> 0.13-0.17 mg/l; Fe<sup>2+</sup> 0.09-0.21 mg/l. The *E. canadensis* helps to promote water quality. They have a great role for absorbing and releasing of nutrients including heavy metals. According to local people, *E. canadensis* plays a great role for supporting the nesting sites of the fishes and support of lay eggs of different fish species. *E. canadensis* Michx., has been recorded for the first time in Hakaluki haor from Maulvibazar district, Bangladesh. It is a flowering plant mainly reproduced by fragmentation and turions. Fragmentation is very much common. The present study reveals that high ecological tolerance with moderate nutrients maintained its rapid growth and distribution. The plants prefers to grow mesotrophic to eutrophic waters. These characteristics of *Elodea* helps to promote as invasive. The

recorded biomass during summer ranged between 150-200 g/m<sup>2</sup> in dry weight. The distribution of the plant occurred in the middle of the haor. Moreover, this species may support to identify ecological water quality of haor water bodies as indicator species. The *E. canadensis* is native to, Alabama, Arkansas, British Columbia, California, Colorado, Connecticut, Delaware, Florida, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Manitoba, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, Nevada, New Brunswick, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Nova Scotia, Ohio, Ontario, Oregon, Pennsylvania, Québec, Rhode I., Saskatchewan, South Dakota, Tennessee, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin and Wyoming (<https://powo.science.kew.org/taxon/90075-2>). It has been introduced to Austria, Baltic States, Belarus, Belgium, Bulgaria, Buryatiya, Canary Is., Central European Russia, Cuba, Czechoslovakia, Denmark, East European Russia, Egypt, Finland, France, Germany, Great Britain, Greece, Hungary, Ireland, Irkutsk, Italy, Jamaica, Krasnoyarsk, Krym, Morocco, Netherlands, New South Wales, New Zealand North and South, North and Northwest European Russia, Northern Territory, Norway, Palestine, Poland, Portugal, Puerto Rico, Queensland, Romania, South Australia, South European Russia, Spain, Sweden, Switzerland, Tasmania, Transcaucasia, Turkey, Ukraine, Victoria, West Siberia, Western Australia, Yakutsk and Yugoslavia (<https://powo.science.kew.org/taxon/90075-2>).

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