

TWELVE NEW ADDITIONS TO CYPERACEAE OF BANGLADESH

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Abstract

This study adds twelve Cyperaceae species to the flora of Bangladesh from the specimen deposited at the Central National Herbarium, Kolkata (CAL). Taxonomic information such as updated nomenclature, important synonyms, brief description, phenology, ecology, specimen citation, distribution, use (if any) and herbarium image of these species are provided.

Introduction

Bangladesh is situated between the latitudes of 20°34'N to 26°33'N and longitudes of 88°01'E to 94°41'E. It has an area of about 147570 sq. km (BER, 2016). The land is mostly a flat plain criss-crossed by many river systems. Being a subtropical country and having a favorable geophysical condition for plant growth, she is very rich in biodiversity. It is assumed that about 5000 plant species occur in the country. However, the exact number of the angiosperm species of the country is still unknown. Bangladesh National Herbarium (BNH) has been involving in publishing the series of 'Flora of Bangladesh' since its establishment. Thus resulting in the compilation of 94 angiosperm families of the country in 84 number of fascicles. However, taxonomic accounts of 110 angiosperm families of the country still to be compiled and the family Cyperaceae is one of them.

The family Cyperaceae (the Sedge family) is grass like herbaceous plant usually grows on wet ground. The family, among the 10 largest families of flowering plants, consists of about 90 genera and 5500 species (Christenhusz & Byng, 2016). The members are distributed throughout all the continents except Antarctica. The six largest genera within the family account for about 3,500 species. *Carex* is the largest genus with over 2,000 species; *Cyperus* with 650 species; *Rhynchospora* with 250 species; *Fimbristylis* with 200 species; *Eleocharis* with 200 species; and *Scleria* with 200 species. The Sedges family have a significant ecological value. They play a vital role in ecological succession. Apart from that many species of this family are used to weave mats, baskets, screens and even sandals for their strong, fibrous stem & leaves. C.B. Clarke (1874) reported 53 species and 13 genera under the family Cyperaceae in J.D. Hooker's 'Flora of British India' and later on, David Prain (1903) reported 76 species 18 genera under the family in 'Bengal Plants' from present Bangladesh territory. Recently, Uddin (2007) compiled 146 species under 22 genera of this family from Bangladesh. Very recently, Sarwar *et al.* (2011), Rahman & Uddin (2016) and Uddin (2018) have recorded five additional sedges species from the country (*viz.* *Cyperus eleusinoides* Kunth, *Eleocharis atropurpurea* Kunth, *E. plantaginea* R.Br., *Fimbristylis hookeriana* Boeckeler, *F. intonsa* S.T. Blake). These new additions indicate the necessity of more floristic study of Cyperaceae of the country. Therefore, a program has been taken to collect specimens and to complete a revisionary work on the family Cyperaceae of Bangladesh. In course of that study, the second author visited the Central National Herbarium, Kolkata, India (CAL) and documented the specimens of Cyperaceae collected from present Bangladesh territory by the most illustrious pioneer scientists William Roxburgh, Nathaniel Wallich, J. Gibson, F.B. Hamilton, William Griffith, J.D. Hooker, C.B. Clarke and David Prain.

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Materials and Methods

The paper is based on herbarium specimens stored at CAL and collected from present Bangladesh territory. A total of 196 herbarium sheets of Cyperaceae were examined and information (i.e. place of collection, collector's name, collection number, collection date with particular year, month or date in which they have collected, accession numbers of the sheets) were recorded. The identification of those specimens have been confirmed by consulting taxonomic literature *viz.* Hooker (1872-1897); Prain (1903); e-flora of India (<http://www.efloraindia.nic.in>), e-flora of China (<http://www.efloras.org>), e-flora Malesiana (<http://portal.cybertaxonomy.org/floramalesiana/node/1>).

Results and Discussion

During the screening of the 196 herbarium specimens of the family Cyperaceae deposited at the Central National Herbarium, Kolkata from present territory of Bangladesh, a total of 94 species are found. Among those 12 species are new to the flora of Bangladesh as they are not mentioned in any floristic publications referring to the country. These species are *Carex baccans* Nees, *Carex insignis* Boott, *Carex myosurus* Nees, *Carex nubigena* D.Don, *Carex phacota* Spreng., *Carex teinogyna* Boott, *Carex scitula* Boott, *Carex thomsonii* Boott, *Carex vesiculosa* Boott, *Cyperus flexuosus* Vahl, *Cyperus castaneus* Willd. and *Fimbristylis eragrostis* (Nees) Hance. They are distributed under 3 genera namely *Carex*, *Cyperus* and *Fimbristylis*. These species are being reported here for the first time as new addition for Bangladesh, since there has been no record of occurrence of these species in any floristic works of Bangladesh *viz.* Hooker (1874), Prain (1903), Heinig (1925), Sinclair (1956), Uddin (2007).

The species are arranged in alphabetical order and presented below with their updated nomenclature, important synonyms, brief description, flowering and fruiting period (whenever available), distribution, ecology and specimen citations. The data presented here may also be important in understanding the floristic elements of Bangladesh and the relationship with those of neighboring countries. This will be helpful to the foresters, field botanists, conservationists and researchers to relocate the plants or to judge their present status in their earlier site of collections which were carried out more than a century ago and to formulate conservational strategies to protect these national resources.

Taxonomic Enumeration

1. ***Carex baccans*** Nees, Contr. Bot. India 122. 1834. *Carex baccans* f. *aurantiaca* Kuntze, Revis. Gen. Pl. 2: 747. 1891. *Carex baccans* f. *nigra* Kuntze, Revis. Gen. Pl. 2: 747. 1891. *Carex baccans* f. *recurvirostris* Kuntze, Revis. Gen. Pl. 2: 747. 1891. *Carex baccans* var. *siccifructus* C.B.Clarke in Hook. f., Fl. Brit. India 6: 723. 1894. *Carex curvirostris* Kunze, Suppl. Riedgräs. 79. 1841. *Carex javanica* Boeckeler, Beitr. Cyper. 1: 43. 1888. **Fig. 1.**

Vernacular name: Crimson-seeded Sedge.

Woody rhizomatous perennial sedges. Culms densely tufted, erect, usually 50-150 cm × 5-8 mm, triquetrous, glabrous, leafy beneath. Leaves cauline, longer than culms, blades linear, gradually narrowed, 50-100 cm × 5-15 mm, flattish, abaxially glabrous, adaxially scabrid, long acute; basal sheaths reticulate, 9-15 cm long, greenish to reddish brown, sheaths becoming fibrous. Involutral bracts leafy, surpassing inflorescence, long sheathed. Inflorescence paniculate, 9-40 cm long, axes triquetrous, slightly glabrous, 5-8 nodes, lower ones distant, each subtending 1 partial inflorescence; partial inflorescence 5-30 cm long, branched into spikes. Spikes 5-20, cylindric, 3-9 cm long, androgynous, bisexual, originating from utriculiform cladophylls, upper section male,

lower female; male spikes tenuous, shorter than female part, few flowered; female spikes with numerous flowers. Male glumes ovate, 1.5-3.5 mm long, compressed, chestnut, apex awned. Female glumes broadly ovate to elliptic, 1-5 mm long, papery, sides herbaceous, glabrous, 1 green midrib, margins hyaline, apex acute to obtuse, awned, purplish brown. Utricles ellipsoid, obovate-globose or subglobose, inconspicuously trigonous, 2.5-4.5 × 1.5-2.5 mm, inflated, sub-leathery, 6-8 nerved, upper margin hairy, shortly stipitate, whitish or greenish at first, dark reddish or blackish at maturity, abruptly narrowed into beak, beak 0.2-0.9 mm long, margin hispid, orifice minutely 2-toothed. Nutlets elliptic, 2.5-3.0 × 1.0-1.5 mm, trigonous, shortly stipitate, brown at maturity, apex apiculate. Style base thin; stigmas 3. *Flowering & fruiting period*: April-June. *Ecology*: Open grassy slopes, scrub, forest margins and clearings, 900-1000 m. *Distribution*: India, Malaysia, Taiwan and Thailand. *Specimen examined*: East Bengal; Specific locality unknown, 15. viii. 1884, Griffith, 6054 (CAL 513447). *Use*: The plant has ornamental value and also used to create a border around gardens or lawns.

2. **Carex insignis** Boott, Ill. Carex 1: 5. 1858.

Fig. 2.

Vernacular name: Notable Sedge.

Stoloniferous perennial sedges. Rhizome present. Culms tufted, 80-90 cm (-100) tall, triquetrous, glabrous, base covered with purple bladeless sheaths. Leaves cauline, blades linear, shorter than to equaling culm, 3.5-5.0 mm wide, flattish, scabrous above, purple-reddish leaf sheaths. Involucral bracts leaf-like, 3-5 mm, purple-reddish long sheaths. Spikes long linear, 1.5-5.5 cm wide, numerous, 3-5 each originated from involucral bract axil, androgynous or terminal male. Female glumes ovate, 2.0-2.5 mm long, margins hyaline, apex emarginate and ciliate, pale brown, 3-veined costa excurrent into a scabrous awn. Utricles elliptic, longer than glume, 3-4 mm long, trigonous, membranous, hispidulous or sometimes smooth, base truncate, olive-green, purple punctulate, apex abruptly narrowed into a scabrous long beak, emarginate or subentire, orifice hyaline. Nutlets rhomboid-trigonous, 1.5-2.5 mm long, tightly enveloped, dark chestnut; style base thickened; stigmas 3. *Flowering & fruiting period*: August-October. *Ecology*: Forests, wet meadows, marshes, ditch sides, along streams and lakes; 500-1000 m. *Distribution*: China, India, Nepal, North America and Vietnam. *Specimen examined*: East Bengal, specific locality unknown, 15 viii 1884, Griffith 6061 (CAL 513583). *Use*: It has ornamental value and also used as ground cover in shady areas.

3. **Carex myosurus** Nees, Contr. Bot. India 122. 1834. *Carex aequata* Nees ex Boott, 3. Carex 2: 83. 1860. *Carex kuntzeana* Boeckeler, Beitr. Cyper. 2: 51.1890. *Carex longibracteata* f. *angustifolia* Kük., Pflanzenr. 4, 20(38): 260. 1909. *Carex longibracteata* f. *distans* Kük., Pflanzenr. 4, 20(38): 260. 1909. *Carex macrophylla* Hochst. ex Steud., Syn. Pl. Glumac. 2: 207. 1855. *Carex myosurus* var. *gracilior* Kük., Pflanzenr. 4, 20(38): 259. 1909. *Carex myosurus* var. *nobilis* (Boott) C.B. Clarke, Fl. Brit. India 6: 724. 1894. *Carex myosurus* var. *praestans* (C.B. Clarke) Kük., Pflanzenr. 4, 20(38): 259. 1909. *Carex myosurus* subsp. *spiculata* (Boott) Kük., Pflanzenr. 4, 20(38): 259. 1909. *Carex nobilis* Boott, Ill. Carex 1: 4. 1858. *Carex praestans* C.B. Clarke, Fl. Brit. India 6: 723. 1894. *Carex spiculata* Boott, Proc. Linn. Soc. London 1: 288. 1846.

Fig. 3.

Vernacular names: Mouse-ear Sedge, Myosurus Sedge, Short-beaked Sedge.



Fig. 1: *Carex baccans* Nees



Fig. 2: *Carex insignis* Boott,



Fig. 3: *Carex myosurus* Nees



Fig. 4: *Carex nubigena* D. Don

Woody perennial sedges. Rhizome conspicuous, short, lignified. Culms tufted, 50-150 cm × 0.3-0.4 mm, obtusely triquetrous, robust, scabrid, leafy above base, clothed at base with fuscous to purplish sheaths. Leaves longer than culms, blades flat, 5-10 mm wide, long-attenuate, glabrous abaxially, scabrid adaxially, margin revolute; leaf sheaths long, fibriform, dark brown. Involucral bracts leafy, surpassing inflorescence, long sheathed. Inflorescence large panicles, simple or with 5-10 partial inflorescences, axes triquetrous, scabrid. Spikes single, cylindric, 20-60 × 3.5-4.5 mm, androgynous; male part of spike shorter than female part; female part with numerous flowers. Male glumes oblong-lanceolate, 2.5-4.0 mm long, membranous, pale green. Female glumes oblong 2.3-4.1 mm long, papery, with 1 scabrid midrib, upper margin hyaline, mucronate to aristate, pale green at middle, pale brown laterally. Utricles obovate-lanceolate, subovoid to ellipsoid, longer than glumes, 3.0-5.0 mm long, trigonous, papery, slightly scabrous above, stipitate, base attenuate, lateral veins prominent, subsessile, apex shortly beaked, beak 0.7-1.0 mm long, abruptly contracted, bifid, orifice minutely 2-toothed. Nutlet ellipsoid to obovoid, 1.8-3.5 mm long, trigonous, shortly stipitate, enclosed in utricle, dark brown at maturity. Style base thickened; stigmas 3. *Flowering & fruiting period*: August-September. *Ecology*: Damp open slopes, evergreen forests and forest margins; 200-1000 m. *Distribution*: India, Myanmar, Nepal, North America and Vietnam. *Specimen examined*: East Bengal; Specific locality unknown, 15. viii. 1884, Griffith, 6005 (CAL 513553). *Use*: It is used as an ornamental grass in gardens and also used as soli binder.

4. ***Carex nubigena*** D. Don *ex* Tilloch & Taylor, Philos. Mag. J. 62: 455. 1823. *Carex argyrolepis* Maxim. *ex* Franch. & Sav., Enum. Pl. Jap. 1: 126. 1873. *Carex fallax* Steud., Syn. Pl. Glumac. 2: 189. 1855. *Carex nubigena* var. *fallax* (Steud.) C.B. Clarke, J. Linn. Soc., Bot. 36: 301. 1904. *Carex nubigena* f. *laxiuscula* Kük., Pflanzenr. 4, 20(38): 146. 1909. *Carex nubigena* f. *viridans* Kük., Bull. Acad. Int. Géogr. Bot. 22: 250. 1912. *Carex pleistogyna* V.I. Krecz., Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk S.S.S.R. 9: 194. 1946. *Carex yodoensis* Boeckeler, Bot. Jahrb. Syst. 5: 515. 1884. *Vignea nubigena* (D. Don) Soják, Cas. Nár. Mus., Odd. Prír. 148: 196. 1979 (pub. 1980). *Vignea pleistogyna* (V.I. Krecz.) Soják, Cas. Nár. Mus., Odd. Prír. 148: 196. 1979 (pub. 1980). **Fig. 4.**

Vernacular names: Cloud-born Sedge, Cloud-generated Sedge, Nubigena Sedge.

Caespitose perennial sedges. Rhizome short, 0.5-1.0 mm wide, indurate, horizontal or ascending. Culms tufted, 0.8-1.3 mm wide, obliquely trigonous, scabrous above, covered with brown bladeless sheaths at base. Leaves as long as or slightly shorter than culms, blade linear, 0.9-2.1 mm wide, plicate, lower surface finely papillose, folded or involute, keel and margins scabrous, apex acuminate, grey-green; sheaths 15-50 mm long, finely nerved, fibrous, margin of scarious side slightly erect, black to grey-brown; ligule 0.1-0.3 mm, scarious, brown spots on surface, arch shallow. Lower involucral bracts 1-2, leaf-like, filiform, surpassing inflorescence, green; upper involucral bracts obscure, setaceous. Inflorescence spicate, long cylindric 2.5-55.0 × 0.7-1.0 cm, thick at apex, lower ones remote, mostly overlapping. Spikes 3-15, ovate to globose, 5-10 × 3-6 mm, androgynous, branched at base, green. Female glumes ovate, 2.4-2.9 × 1.2-1.4 mm, triangular, membranous, scarious, green mid-nerve extending into arista to 1 mm, pale green. Utricles ovate-lanceolate or oblong-elliptic, 3.5-4.3 × 1.1-1.3 mm, plano-convex, membranous, both sides densely nerved, glabrous, base shortly stipitate, wings absent, margins thickened, smooth, pale green, rarely tinged with red-brown, apex gradually narrowed into a long beak, pale green, rarely tinged with red-brown; beak conical, 1.1-1.7 mm, compressed, margins smooth or slightly scabrous; orifice 2-toothed. Nutlet broadly elliptic or suborbicular, 1.4-1.6 × 0.8-0.9 mm,

plano-convex, tightly enveloped, base shortly stipitate, glossy, smooth or obscurely reticulate, greyish brown or yellowish; stigmas 2. *Flowering & fruiting period*: June-August. *Ecology*: Stream-sides, forest margins and roadsides on slopes, grassy slopes, wet places; 300-1000 m. *Specimen examined*: East Bengal: Specific locality unknown, 15 viii 1884, Griffith 6068 (CAL 512856). *Use*: It is used in landscaping for attraction and thriving in moist soils. It is also used in erosion control and creating a natural barrier to protect against wind and water damage.

5. ***Carex phacota*** Spreng., Syst. Veg. 3: 826. 1826. *Carex cincta* Franch., Bull. Soc. Philom. Paris 8, 7: 35. 1895. *Carex cincta* var. *subphacota* Kük., Pflanzenr. 4, 20(38): 353. 1909. *Carex fauriae* Franch., Bull. Soc. Bot. France 26: 89. 1879. *Carex gracilipes* Miq., Ann. Mus. Bot. Lugduno-Batavi 2: 151. 1866. *Carex lepidopristis* H.Lév. & Vaniot, Bull. Acad. Int. Géogr. Bot. 10: 198. 1901. *Carex phacota* var. *gracilispica* Kük., Pflanzenr. 4, 20(38): 352. 1909. *Carex platycarpa* Hochst. ex Steud., Syn. Pl. Glumac. 2: 214. 1855. *Carex pruinosa* var. *aristata* Kuntze, Revis. Gen. Pl. 2: 748. 1891. *Carex shichiseitensis* Hayata, Icon. Pl. Formosan. 10: 58. 1921. *Carex subphacota* (Kük.) Nakai, Veg. Ins. Quelp. 24. 1914. **Fig. 5.**

Vernacular names: Bunch-scale Sedge, Phacota Sedge.

Perennial tufted sedge. Rhizome shortly creeping. Culms acutely trigonous, usually 25-90 (-120) cm × 1-4 mm, smooth to scabrid above, base covered with yellowish brown or dark-brown sheaths. Leaves few, basal, cauline, subequal to culm, lamina linear, 20-80 cm × 3-10 mm, flat, plicate, margins revolute, long-acuminate; sheath pale to dark brown. Leaflike Lower involucral bracts, exceeding inflorescence, sheathless; upper involucral bracts setaceous. Inflorescence with 3-6 spikes, upper 2-3 crowded, remainder short on distant; terminal spike male, rarely with a few female flowers at apex; lateral spikes female, rarely a few male flowers at apex. Male spike narrowly cylindric, 45-65 × 1.5-2.8 mm, nodding, pedunculate. Female spike, long cylindric, 2-7 × 3-4 mm, androgynous, nodding; with slender, slightly scabrous peduncles, lowest one 2-3 cm, pendent. Pistillate glumes oblong-ovate or ovate, 1-3 mm long, obtuse to rounded, sides membranous, pale, ferruginous flecked, keel broad, green 3-veined costa excurrent into a scabrous awn at truncate or emarginate apex. Utricles broadly ovate, elliptic or suborbicular, 2.5-3.2 × 1.5-2.2 mm, erect-patent, biconvex, compressed, greenish brown to dark brown, minutely papillose, few-nerved towards base, rounded above into beak; beak 1 mm long, minute, orifice entire or emarginate. Style long, base thin; stigmas 2. Nutlets orbicular, suborbicular or broadly ovate, 1.5-2.5 × 1-2 mm, brown, densely papillose. *Flowering & fruiting period*: March-May. *Ecology*: Moist soil of grasslands, ditches, stream-banks, roadsides. *Distribution*: India, Indonesia, Japan, Malaysia, Myanmar, Nepal, Sri Lanka and Thailand. *Specimen examined*: East Bengal; Specific locality unknown, 15 xi 1884, Griffith, 6106 (CAL 513049). *Use*: Plant has ornamental value; medicinally used for its anti-inflammatory and anti-bacterial properties.

6. ***Carex scitula*** Boott, Ill. Carex 4: 177. 1867.

Fig. 6.

Vernacular names: Scitula Sedge, Slender-Fruited Sedge, Tall-Fruited Sedge.

Stoloniferous perennial sedges. Culms tufted, 0.2-0.5 mm wide, slender, trigonous. Leaves several, longer than culm, 0.7-1.8 mm wide, filiform, crowded at base; sheaths ladder-fibrillose splitting, stramineous. Involucral bracts foliaceous, surpassing the raceme, lowest one 12-18 cm long. Inflorescence racemose, 3.5-7.5 cm long. Spikelets 3-6, oblong, 10-25 × 3.0-3.5 mm, dense comose from brown red stigmas, suberect, many flowered, male at apex and bottom, female in centre, laterals androgynous with short male apices. Male glumes oblanceolate, 3.2-4.5 mm long,

mucronate reddish brown. Female glumes lanceolate, 3.1-3.5 mm long, aristate-mucronate. Utricles oblong-ellipsoid, 1.5-2.5 × 0.5-0.6 mm, trigonous, nerveless, pubescent, beaked, stramineous; beak 0.8 mm long, bidenticulate, scabrid. Nutlets ellipsoid, 0.7-1.0 × 0.2-0.5 mm, stipitate, triquetrous, brown. Stamens 1-2, anthers 1.7-2.1 mm long. Style 0.4-0.6 mm long, slender; stigmas 3. *Flowering & fruiting period*: December-February. *Ecology*: Shady areas mainly on grassy slopes; up to 1000 m. *Distribution*: Austria, France, Germany, Italy and Switzerland. *Specimen examined*: East Bengal: Specific locality unknown, 15 ix 1884, Griffith, 6097 (CAL 513576). *Use*: Medicinally the plant is used to treat fever and skin diseases; also has ornamental value.

7. **Carex teinogyna** Boott, Ill. *Carex* 1: 60. 1858. *Carex scabriculum* (Kük.) Ohwi, Acta Phytotax. Geobot. 2: 27. 1933. *Carex teinogyna* var. *scabriculum* Kük., Pflanzenr. 4, 20(38): 602. 1909. **Fig. 7.**

Vernacular names: Teinogyna Carex, Teinogyna Sedge, Teinogyna Wood Sedge.

Rhizomatous perennial sedges. Rhizome short. Culms tufted, triquetrous, usually 25-70 (-100) cm × 0.4-0.5 mm, slender, scabrid, covered with bladeless sheaths. Leaves equal to culms, basal and cauline, blades narrowly linear, 10-40 cm × 1.3-3.5 mm, flattish, conduplicate at base, midrib surface canaliculated, scabrous on veins and margin, acuminate; basal sheaths up to 4-6 cm, greenish to brownish, basal sheaths usually turning into fibres. Involucral bracts shorter than or as long as inflorescence, lower ones leaf-like, up to 7-10 cm long, upper involucral bract setaceous, scabrid on margin, sheathed; sheaths 6-35 mm long. Inflorescence up to 20-25 cm long, nodes 4-8, each subtending 1-3 spikes. Spikes narrowly cylindrical, 1.5-5.0 cm long, long-pedunculate, androgynous, upper part male, lower female; female part longer than male part. Female spikes sometimes branched, laxly flowered, slender, sometimes short-pedunculate. Female glumes elliptic, elliptic-ovate or oblong-ovate, 2.1-5.5 mm long, membranous, glabrous, aristate or mucronate, green 3-veined, apex acute, shortly awned, hispidulous on margins of awn, pale to mid-brownish or brownish yellow. Utricles elliptic, oblong or narrowly elliptic, shorter than glume, 2.5-4.5 × 1.0-2.5 mm, plano-convex, compressed, hispidulous, several-nerved, greenish to mid-brown, base abruptly narrowed into beak; beak 1-2 mm long, orifice minutely 2-toothed. Nutlets elliptic to oblong-elliptic, 2-3 × 1.0-1.5 mm, compressed, biconvex, sessile, tightly enveloped, yellowish. Style thickened; stigmas 2, slender, persistent. *Flowering & fruiting period*: February-May. *Ecology*: Lax forests in valleys, riversides, wet places at ditch sides or on rocks, sands; 500-1000 m. *Distribution*: India, Japan, Korea, Myanmar and Vietnam. *Specimen examined*: East Bengal; Specific locality unknown, 15 viii 1884, Griffith 6082 (CAL 512952). *Use*: Plant is used to control soil erosion and also has ornamental value.

8. **Carex thomsonii** Boott, Ill. *Carex* 1: 1. 1858. *Carex thompsonii* Franch., Nouv. Arch. Mus. Hist. Nat. 3, 8: 212. 1896. **Fig. 8.**

Vernacular names: Thomson's Fox Sedge, Thomson's Sedge.

Rhizomatous perennial sedges. Rhizome short, indurate, culms loosely tufted, obtusely trigonous, (10-) 15-40 cm × 1.2-4.0 mm, smooth, stiff, nodes present, base bulbous, covered with dark brownish sheaths, becoming fibrous. Leaves basal and cauline, longer than culm, blade narrowly linear, 30-50 cm × 2-5 mm, flattish plicate, stiff, scabrid on margins, long-acuminate; long sheathing up to 5-10 cm long, pale greenish to dark brownish. Lowest involucral bract leaf-



Fig. 5: *Carex phacota* Spreng



Fig. 6: *Carex scitula* Boott



Fig. 7: *Carex teinogyna* Boott



Fig. 8: *Carex thomsonii* Boott

like, exceeding inflorescence, upto 30-40 cm long. Inflorescence long cylindrical to subcylindrical, usually 3-12 cm long, spike-like, with numerous spikes. Spikes broadly ellipsoid to ovoid, 3-10 cm × 3-4 mm, patent, androgynous, short upper section male, lower female. Female glumes ovate to ovate-lanceolate, 2-3 × 1.2-4.0 mm, sides membranous, margins white hyaline, keel 3-nerved forming a short mucro at acute apex, pale ferruginous with brownish spots. Utricles equal or as long as glume, ovate to ovate-elliptic, 2.0-2.8 × 1.0-2.5 mm, plano-convex, patent, compressed, sub-leathery, narrowly winged, abaxially many-nerved, serrulate above, pale brown with dark spots, apex gradually narrowed into a beak; beak 0.3 mm long, plano-convex, serrulate on upper margins, apex entire, orifice 2-toothed. Nutlets oblong-ovate, 1.2-1.6 × 0.8-1.0 mm, plano-convex, tightly enveloped, brown. Stigmas 2. *Flowering & fruiting period*: April-August. *Ecology*: Along streams and rivers in forests, 400-1000 m. *Distribution*: India, Myanmar, Thailand and Vietnam. *Specimen examined*: East Bengal: Specific locality unknown, 15 viii 1884, C.B. Clarke, (CAL 512854). *Use*: Medicinally the plant is used to treat fever, headaches and stomachache; and also used as soil binder.

9. **Carex vesiculosa** Boott, Ill. Carex 3: 107. 1862. *Carex diffusa* Boott ex C.B. Clarke in Hook. f., Fl. Brit. India 6: 717. 1894. *Carex gembolensis* C.B. Clarke, Bull. Misc. Inform. Kew, Addit. Ser. 8: 72. 1908. *Carex vesiculosa* var. *congesta* Kük., Pflanzenr. 4, 20(38): 183. 1909. *Carex vesiculosa* var. *latifolia* Kük., Candollea 6: 431. 1936. *Carex vesiculosa* var. *paniculata* C.B. Clarke in Hook. f., Fl. Brit. India 6: 717. 1894. **Fig. 9**

Vernacular names: Vesiculosa Meadow Sedge, Vesiculosa Sedge.

Rhizomatous perennial sedges. Rhizomes shortly creeping, woody, covered with decayed sheaths. Culms tufted, 20-160 × 2-3 mm, triquetrous, rigid, glabrous, clothed below the leaves by reddish bladeless sheaths. Leaves basal, 1-2 higher on culms, blades 2-9 mm wide, coriaceous, long-attenuate, margin revolute, scabrous on the margins, vesiculose-asperous towards apex. Lower bracts shorter than inflorescence, foliaceous, long sheathed, upper ones reduced; bracteoles excurrent in a hispidulous awn. Inflorescence decomposed, panicle 14-44 cm long, ferruginous; secondary panicles 6-10, 3-6 nodes, lowest ones single, remainder unevenly binate, oblong-pyramidal, 7-10 × 3-5 cm, compact, erect, glabrous, sometimes scarbid, peduncles 15 cm long, rachis hispidulous. Spikelets numerous, 4-15 mm long, androgynous, male part longer than female part; female parts few-flowered. Glume lanceolate-ovate, 2.5-5.1 mm long, lightly emarginate, membranous, hyaline, glabrous, sometimes hispidulous, hispid excurrent from mid-nerve of upper glumes, 1.5-1.8 mm long awn. Utricles narrowly ellipsoid, 3-5 × 1.1-2.8, triquetrous, slightly coriaceous, erect or slightly recurved, obscurely nerved, densely setulose, barely stipitate, abruptly beaked, reddish with castaneous flecks; beak narrow, scabrous on margin, 1.2-2.0 mm long. Style base thin. Stigmas 3. Nutlet ellipsoid to obovoid, 1.2- 2.5 × 1.0-1.5 mm, trigonous, concave, shortly stipitate, abruptly beaked. *Flowering & fruiting period*: April- May. *Ecology*: In dry grasslands, open stony places, mountain scrub, 200-1000 m. *Distribution*: Malaysia, Nepal, Thailand. *Specimen examined*: East Bengal: Specific locality unknown, 15 viii 1884, Griffith 6059 (CAL 513223). *Use*: Medicinally the plant is used to treat fever, headaches and stomachache; and also has ornamental value.

10. **Cyperus castaneus** Willd., Sp. Pl. 1: 278. 1797. *Cyperus castaneus* var. *brevimucronatus* Kük., Pflanzenr. 4, 20(101): 264. 1936. *Cyperus flavescens* var. *castaneus* (Willd.) Pursh, Fl. Amer. Sept. 1: 52. 1813. *Dichostylis castanea* (Willd.) Palla, Bot. Jahrb. Syst. 10: 296. 1888.

Fig. 10.

Vernacular names: Chestnut Tassel Sedge, Chestnut Umbrella Sedge.



Fig. 9: *Carex vesiculosa* Boott



Fig. 10. *Cyperus castaneus* Willd.



Fig. 11. *Cyperus flexuosus* Vahl



Fig. 12: *Fimbristylis eragrostis* (Nees) Hance

Annual sedges with fibrous yellow rhizome. Culm few to many, tufted, 2-15 cm × 0.3-2.0 mm, trigonous, slender, oblique. Leaves shorter than inflorescence, 0.5-1.0 mm wide, narrow, setaceous, rigid, upper part slightly rough, apex gradually acuminate; sheaths straight, membranous, reddish brown. Involucral bracts 2-4 (-6), longer ones surpassing inflorescence, patent. Inflorescence simple with terminal spike. Ray 0-4, uneven, 1-3 cm, filiform, obliquely erect to spreading, smooth. Spikes ovoid, 2.5 × 2.5 cm; spikelets narrower, 0.4-2.0 × 0.10-0.16 cm, multiflorous, 12-80 flowered, rachilla straight, wingless. Glumes 1.5-1.8 mm long, slightly patent, chestnut brown, rarely ferruginous; mucros shorter, 0.3-0.8 mm, slightly recurved. Stamen 1. Stigmas 3. Nutlets usually oblong, sometimes sub-obovoid, 0.7-0.9 × 0.25-0.30 mm, trigonous, dark brown. *Flowering & fruiting period*: June- September. *Ecology*: In open sandy localities, up to 300 m. *Distribution*: Australia, Bhutan, India, Indonesia, Malaysia, Myanmar, Nepal, Sri Lanka, Thailand and Vietnam. *Specimen examined*: Mymensing: Specific locality unknown, 14 vii 1872, C.B. Clarke, 17294 b (CAL 502781). *Use*: Plant has ornamental value and also used to make traditional medicines.

11. **Cyperus flexuosus** Vahl, Enum. Pl. Obs. 2: 359. 1805. *Cyperus ehrenbergii* Kunth, Enum. Pl. 2: 89. 1837. *Cyperus ehrenbergii* f. *fulvescens* (Kük.) Kük., Ark. Bot. 22A (17): 5. 1929. *Cyperus ehrenbergii* f. *pallidiflorus* (Kük.) Kük., Repert. Spec. Nov. Regni Veg. 23: 190. 1926. *Cyperus flexuosus* f. *fulvescens* Kük., Pflanzenr. 4, 20(101): 622. 1936. *Cyperus flexuosus* var. *insignis* (Kunth) Kük., Pflanzenr. 4, 20(101): 622. 1936. *Cyperus flexuosus* f. *pallidiflorus* Kük., Pflanzenr. 4, 20(101): 622. 1936. *Cyperus insignis* Kunth., Enum. Pl. 2: 92. 1837. *Torulinium flexuosum* (Vahl) T.Koyama, Phytologia 29: 74. 1974. **Fig. 11.**

Vernacular name: Vahl's Flatsedge

Rhizomatous perennial sedges, up to 10-100 cm tall. Rhizome short, woody. Culms 1-few, 2-5 mm wide above base, triquetrous, minutely ribbed, sheath 0.4-1.0 cm wide. Leaves basal, 4-8; blade linear 12-55 cm × 4-12 mm, flat, finely veined, glabrous on below mid-vein, slightly scarbid on margin, long-acuminate; sheath veined, smooth, septate, inner band membranous with a convex to truncate apex, light brown, purplish close to base. Involucral bracts 7-8, leaf-like, 3-60 × 0.4-1.5 cm, scabrous on margin, long-acuminate. Inflorescence simple to compound umbel-like corymb, 5-30 cm wide; rays 8-10, 0.1-15 cm × 0.4-2.0 mm, obscurely triangular to compressed, densely ribbed, glabrous. Spikes broadly ovate to rounded, 1.6-3.5 × 0.8-1.1 cm; spikelets 30-80, linear to subcylindrical, 0.4-2.5 cm × 0.6-1.3 mm, spicate, occasionally radiate, slightly crowded, 3-12 flowers, disrupted at base and rachilla nodes, internodes of rachis between spikelets less than 1 mm, bottom most reflexed at maturity, broad scarious wings of rachilla becoming thick and corky at maturity, enveloping achene, rachilla node and achene declining together, yellowish to brown; scales ovate to elliptic-ovate, 2.3-3.5 × 2.0-2.5 mm, dorsally compressed, 7-9-nerved, densely membranous, subcoriaceous, shiny, with a narrow, scarious margin, apex obtuse, chestnut-colored, reddish brown to dark brown sides, median band elongated as a short, prickly mucro beneath the apex. Nutlets oblong-obovoid, 1.2-2.0 × 0.3-0.7 mm, trigonous, compressed, finely punctulate, slightly falcate at maturity, apiculate. Stamens 3, anthers narrowly ellipsoid, 0.3-1.2 mm long; styles subulate, 3- branched from below middle. *Flowering & fruiting period*: October-December. *Ecology*: In moist seepage areas and prefer a sunny to half-shady situation on wet soil. *Distribution*: Brazil, Cuba, Jamaica and Mexico. *Specimen examined*: Shariatpur: Bilashkhan, 25 vii 1883, C.B. Clarke 7511 (CAL 502627).

12. **Fimbristylis eragrostis** (Nees) Hance, J. Linn. Soc. Bot. 13: 132. 1873. *Abildgaardia eragrostis* Nees, Contr. Bot. India 95. 1834. *Fimbristylis lepidota* E.G.Camus, Gen Notul. Syst. (Paris) 1: 247. 1910. *Fimbristylis schlechteri* Kük., Bot. Jahrb, Syst. 59: 50. 1924. *Fimbristylis subtetrastachya* Boeckeler, Linnaea 37: 50. 1871. *Fimbristylis tortispica* Turrill, Bull. Misc. Inform. Kew 1911: 348. 1911. *Iria eragrostis* (Nees) Kuntze, Revis. Gen. Pl. 2: 753. 1891. *Iria subtetrastachya* (Boeckeler) Kuntze, Revis. Gen. Pl. 2: 753. 1891. **Fig. 12.**

Vernacular name: Eragrostis Fimbristylis.

Rhizomatous perennial sedges. Rhizome short, woody. Clumps tufted, 30 cm × 0.4-2.6 mm, flattend, glabrous, tip scaberulous. Leaves numerous, 2-5 mm wide, flat, coriaceous, truncate, eligulate, apex acute. Involucral bracts small, lowest 8-20 mm long, foliaceous. Inflorescence simple, decompound or subcapitate, 2.4-5.2 cm, bearing 6-37 spikelets; ray suberect, lowest one 1-6 cm long. Spikelets solitary or in clusters of 2-4, ellipsoid, oblong to ovate, 5-15 × 2-4 mm, compressed, often contorted, apex acute. Glumes triangular-ovate, 2-8 mm long, lower glumes of spikelets distichous or sub-distichous, rest of all spiral, apiculate, mucronulate, keel short, green, apex acute, dark shiny brown. Stamen 2-3; anthers 1.0-1.6 (-2) mm long. Style 2-4 mm long, trigonous; stigmas 3, 2-3 mm long. Nutlet obovoid, trigonous, 0.8-1.3 × 0.5-1.2 mm, stipitate, verrucose, a faint surface pattern of isodiametric cells, brownish or stramineous. *Flowering & fruiting period:* April-September. *Ecology:* On open hillocks and moist to shady places, 900-1000 m. *Distribution:* Africa, America, Asia and Indonesia. *Specimen examined:* Sylhet: Specific locality unknown, 15. viii. 1967, C.B. Clarke, 3523 (CAL 508100). *Use:* Medicinal plant is used for treating skin diseases, digestive disorders, and respiratory problems.

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