

On the occurrence of *Carex* (Cyperaceae) in the Darjeeling-Sikkim-Himalayan Region

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ABSTRACT

The Cyperaceae commonly known as sedge family has the virtues to show unique evolutionary specialization and great ecological variation. In view of this, the interesting genus *Carex* was selected from this family to trace its existence in the subalpine-alpine realms of Darjeeling-Sikkim Himalayan Region. In all thirty species have been documented in this work through studies in the Herbaria(CAL and BSHC) and field during 2012. An artificial key to these species was prepared to facilitate their identification. It was also evident that 4 species(*C.ustata*, *C.rara*, *C.inanis*, *C.nubigena*) occur in alpine region, 5 species (*C.polycephala*, *C.filicina*, *C.rara*, *C.inanis*, *C.nubigena*) in sub-alpine region, 9 species(*C.polycephala*, *C.filicina*, *C.rara*, *C.inanis*, *C.nubigena*, *C.myosurus*, *C.insignis*, *C.baccans*, *C.cruciata*) in temperate region, 6 species (*C.filicina*, *C.myosurus*, *C.baccans*, *C.cruciata*, *C.decora*, *C.vesiculosa*) in sub-temperate and 7 species (*C.filicina*, *C.myosurus*, *C.cruciata*, *C.curticeps*, *C.vesiculosa*, *C.stramentitia*, *C.continua*) in tropical region. Occurrence of *Carex stramentitia* could be recorded at about 4,000' and *Carex ustata* from elevations above 12,000.

Key words: Darjeeling, Cariceae, Mapanioideae, cyperioideae Hypolitreae.

The monocotyledonous family Cyperaceae, commonly known as sedges or rushes constitutes 5500 Species and 109 genera, originated in central Asia at Eocene of Cenozoic Era. This taxon has certain unique features ingrained in their apparently graminoid architecture viz. triangular and solid stem, three ranked leaves, closed rather than open or split leaf sheaths, utricle fruits. The north-eastern parts of the country are the heaven of flowering plants. A large number of Cyperean species grown in this part, especially CARICEAE is more or less alpine taxon. The sedge flora of India was inadequately studied for a long

period for difficulty in their identification. So, for study of this particular taxon, the Darjeeling and Sikkim Himalayan Region are selected.

Cyperaceae superficially resembles grasses and rushes. The family is represented by about 109 genera and about 5,500 species. Perennial or infrequently annual herbs, often of damp bogs or marshes. Roots fibrous from a very short or elongated and creeping rhizome, the latter rarely with tuber like stems (culms), mostly solid, often triquetrous, generally unbranched below the inflorescence, frequently leafless. Leaves in a 1/3 phyllotaxy and a closed (or rarely open) sheath, ligule usually absent. Flowers bisexual or unisexual arranged in spikelets in spicate, racemose, paniculate, or umbellate inflorescence type. Stamens 1 to 6 and usually 3, the anthers basifixed, 2-celled. Pistil 1, the ovary superior, sometimes (in *Carex*) subtended and enveloped by a single posterior prophyll (perigynium or sac), unilocular, the ovule solitary, basal, erect, anatropous, the style 2-3 toothed or with 2-3 branches. Fruit nutlike (achene or nutlet), indehiscent, the achene sometimes enclosed in a sac (perigynium or utricle) or by a partially enveloping and connate glume; seed with albumen.

According to Simpson (2003) the family Cyperaceae has two subfamilies, viz. : Mapanioideae and Cyperioideae, the former having one tribe (Hypolytreae) and the latter 7 tribes (Scirpeae, Abildgaarieae, Cypereae, Dulichieae, Schoeneae, Sclerieae, Cariceae).

Tribe Cariceae which is characteristically with spikelets uni- or bisexual, monoecious or dioecious. Nuts enclosed in an entire or 2-fid sac, has two genera a key to the identification of which is given in the following.

1a. Utricle completely closed except at apex; entire or 2-fid only at apex; spikelets all unisexual with either 1 male or 1 female flower *Carex* L.

1b. Utricle more or less open on one side; at least some spikelets bisexual with male flowers above female flower..... *Kobresia* Willd.

General characters of Carex L.:

Perennial herbs. Culms tufted, erect, trigonous, bladeless sheathed at base. Leaves basal, flat, rarely involute or revolute on margins, sheathed at base. Involucral bracts leaf like, rarely scale-shaped or setaceous. Flowers unisexual, 1 male flower or 1 female flower in a unisexual spikelet, female spikelet included by prophyll. Spikes 1 to numerous, usually numerous spikes arranged in spicate, racemose, or paniculate inflorescence, composed of many unisexual or bisexual spikes, bisexual spike androgynous or gynaeandrous. Male flowers with 3 stamens, filaments distinct. Female flowers with 1 pistil, style slightly slender, persistent or deciduous, base usually not thickened; stigmas 2 or 3. Utricles trigonous, plano-convex or biconvex, with slightly long or short beak. Nutlets rather tightly or loosely enveloped in utricle, trigonous or plano-convex.

The present taxonomic work on the genus *Carex* in Darjeeling and Sikkim Himalayan Region was carried out since November, 2011 which mainly documents the specimens preserved in the Central National Herbarium (CAL) and Sikkim Herbarium Regional Centre (BHC) along with their respective field numbers and information about the place of collection and their flowering and fruiting periods.

Key to the species :

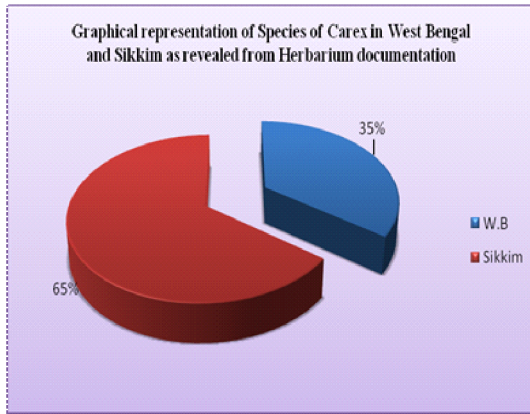
- 1a. Stem with terminal single spike
 2a. Flowers arranged in androgynous manner
 3a. Utricles not inflated ovoid-ellipsoid.
 4a. Style base slightly thickened.....*C. continua*
 4b. Style base not thickened.
 5a. Utricles thickened on margins or narrowly winged upper part of the margins.....*C. nubigena*
 5b. Utricles without winged, trigonous with nearly nerveless.....*C. inanis*
 3b. Utricles inflated or sub-inflated, ovoid.
 6a. Utricle with short conic beak, several-nerved
 7a. Leaves filiform, nut stipitate, ovoid.....
*C. rara*
 7b. Leaves not filiform, nut scarcely stipitate, obovoid-subglobose.....*C. indica*
 6b. Utricle without beak, female glumes broadly ovate*C. lehmannii*
 2b. Flowers arranged in gynaeandrous manner
 8a. Utricles scabrous above on margins.....
C. obscura
 8b. Utricles not scabrous
 9a. Spike short, Utricle ovoid or oblong.....
C. remota
 9b. spikes not short
 10a. spikes 3 to 4 oblong-elliptic
C. duthiei
 10b. spikes not short, utricles elliptic or ovate.....
C. atrata
 1b. Stem not with terminal single spike rather it is panicle or racemose
 11a. Male flowers terminal while female flowers are basal or lateral in position.
 12a. Inflorescence racemose with few spikelets
 13a. The style base slightly thickened
 14a. Utricle oblong, green*C. speciosa*
 14b. Utricle sub erect, membranaceous.....
C. finitima
 13b. The style base not thickened
 15a. Female glumes pale green in colour, margin membranous and brown
C. myosurus
 15b. Female glumes not pale green in colour
 16a. Style 3-fid,
 17a. spikelets chocolate in colour
C. atrofusca
 17b. spikelets dark purple in colour.....
C. praeclara
 16b. Style not 3-fid, spikelets golden-yellow in colour....*C. inanis*
 12b. Inflorescence paniculate in nature
 18a. The utricles compressed or inflated in nature
 19a. Utricle with bidentate beak
 20a. Nut dark brown in colour
 21a. Glumes ovate-oblong, reddish brown in colour.....*C. baccans*
 21b. Glumes ovate, purplish brown in colour....*C. cruciata*
 20b. Nut yellowish brown in colour.....
C. stramentitia
 19b. Utricle not with bidentate beak
C. composita
 18b. The utricles not compressed but ellipsoid in nature
 22a. Glumes and utricles very small and very slender spike.
 23a. Utricle ellipsoid-trigonous, green-yellow in colour*C. munda*
 23b. Utricle ellipsoid-trigonous, red-brown in colour*C. pulchra*
 22a. Glumes and utricles is not very small and not very slender spike.
 24a. Beak bidentate in nature
 25a. Glumes ovate-lanceolate, yellow-brown in colour*C. vesiculosa*
 25b. Glumes lanceolate, stramineous or brown tinged*C. polycephala*
 24b. Beak not bidentate in nature

- 25a. Beak about half as long as the utricule
 26a. Spikes in an involucreal bract sheath
C. decora
 26b. Spikes numerous, sessile not in an
 involucreal bract sheath
C. filicina
 25b. Beak not half as long as the utricule
 27a. Beak linear*C. daltoni*
 27b. Beak striate*C. insignis*
 11b. Female flowers terminal while male
 flowers are basal in position.
 28a. Female ovate, usually cuspidate
C. curticeps
 28b. Female oblong-lanceolate, hispidulous
*C. alopecuroides*

*Check-List of Carex L. in Darjeeling-Sikkim
 Himalayan Region :*

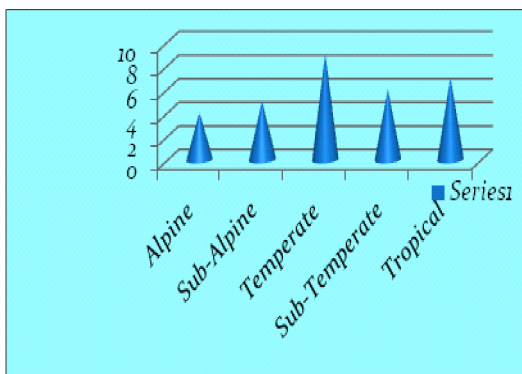
1. *Carex nubigena* D. Don in trans. Linn. Soc. 14:326. 1825.
2. *Carex rara* Boott in proc. Linn. Soc. 1: 284. 1845.
3. *Carex vesiculosa* Boott, Illustr. 3: 107.t.323.1862.
4. *Carex insignis* Boott, Illustr.1: 5.t.14 1858.
5. *Carex polycephala* Boott, Illustr. 1:4.t.12.1858.
6. *Carex speciosa* Kunth, Enum. Pl. 2: 504. 1837.
7. *Carex finitima* Boott, Illustr. 1: 44.t.112.1858.
8. *Carex alopecuroides* D. Don in Trans. Linn. Soc. 14:332.1825.
9. *Carex inanis* Kunth, Enum. Pl. 2: 522. 1837.
10. *Carex munda* Boott, Ill. Gen. Carex 1: 7. 1858
11. *Carex baccans* Nees in Wight, Contr. Bot. India, 122. 1834.
12. *Carex myosurus* Nees in Wight, Contr. Bot. India, 122.1834.
13. *Carex composita* Boott, Ill. Gen. Carex 1: 3. 1858.
14. *Carex indica* Linnaeus, Mant. Pl. Alt. 574. 1771.
15. *Carex cruciata* Wahlenberg, Kongl. Vetensk. Acad. Nya Handl. 24: 149. 1803.
16. *Carex stramentitia* Boott ex Boeckeler, Linnaea 40: 351.1876.
17. *Carex filicina* Nees in Wight, Contr. Bot. India, 123. 1834, nom. cons.
18. *Carex continua* C. B. Clarke in J. D. Hooker, Fl. Brit. India 6: 717. 1894.
19. *Carex praeclara* Nelves, Hooker's Icon. Pl. 35: t. 3403.1940.
20. *Carex duthiei* C. B. Clarke in J. D. Hooker, Fl. Brit. India 6: 731. 1894
21. *Carex atrata* Linnaeus, Sp. Pl. 2: 976. 1753.
22. *Carex lehmannii* Drejer, Symb. Caric. 13. 1844.
23. *Carex daltonii* Boott, Illustr. 1:5, t.16.1858
24. *Carex decora* Boott, Illustr. Carex 1:5, t.15.1858
25. *Carex curticeps* C. B. Clarke in J. D. Hooker, Fl. Brit. India 6: 729. 1894
26. *Carex pulchra* Boott, Illustr. 1:4, t.13.1858
27. *Carex obscura* Nees in Wight. Contrib. Bot. Ind. 126.1834
28. *Carex artofusca* Schkuhr., Reidgr 1:106. F.82.1801.
29. *Carex inclinis* Boott ex C.B. Clarke in Hook.f. Fl. Brit. India 6:728.1894
30. *Carex remota* L. Fl. Angl. (Linnaeus) 24. 1754 [3 Apr 1754]

Herbarium documentation revealed that 35% species of *Carex* occur in Darjeeling Himalaya and the rest in Sikkim Himalayan Region.



It was also evident that 4 species (*C.ustata*, *C.rara*, *C.inanis*, *C.nubigena*) occur in alpine region, 5 species (*C.polycephala*, *C.filicina*, *C.rara*, *C.inanis*, *C.nubigena*) in sub-alpine region, 9 species (*C.polycephala*, *C.filicina*, *C.rara*, *C.inanis*, *C.nubigena*, *C.myosurus*, *C.insignis*, *C.baccans*, *C.cruciata*) in temperate region, 6 species (*C.filicina*, *C.myosurus*, *C.baccans*, *C.cruciata*, *C.decora*, *C.vesiculosa*) in sub-temperate and 7 species (*C.filicina*, *C.myosurus*, *C.cruciata*, *C.curticeps*, *C.vesiculosa*, *C.stramentitia*, *C.continua*) in tropical region.

Altitudinal gradient of prevalence of *Carex* in Darjeeling- Sikkim Himalayan region



In all 30 species of the genus *Carex* has been documented in this work. The liliopsid taxon appears to be fascinating and may be presumed to have evolved as a consequence of high degree of specialization. The evolutionary specialization shows a kind of concomitance of variability with its wide ecological amplitude. In view of all these, the taxon would in all the days to come remain as attractive to taxonomists as it was in the past. A survey of literature within the tenure of the present work was ample enough to reveal significant lacunae, especially in the context of the genus *Carex* in the Himalayan region to be filled up by taxonomic researches in future.

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