

An account of Cyperaceae A. L. Jussieu of Darjeeling District of Paschimbanga, India

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Abstract

The floristic diversity of Darjeeling region of Paschimbanga (formerly West Bengal) is well known. The hills of Darjeeling are forming a part of Eastern Himalaya. Vast differences in altitudinal ranges, extreme variation in temperature, climate soil character, etc. have created a wide range of variation in habitat structure. The Cyperaceae A. L. Jussieu has emerged to be the third dominant family amongst monocots in the district of Darjeeling after Poaceae and Orchidaceae. Out of about 72 genera and 4000 species world wide and about 38 genera and 485 species in India, a sizeable number of 134 species from 19 genera have been recorded from the study area. The members of the Cyperaceae are widely distributed and are present almost in all types of vegetation starting from hot tropical to chilling sub-alpine zones. Species of *Schoenoplectus*, *Eleocharis*, *Scirpus*, *Cyperus* etc. are most dominant in lower elevations while *Carex*, *Kobresia* etc. are mostly present in sub-alpine zone. Habitat wise they may be aquatic, marshy, mesophytic, lithophytic and some times even epiphytic.

The present article emphasizes upon the distribution pattern, dominance, RET species, endemism etc. of this important plant family in Darjeeling district.

Key words: Cyperaceae, Darjeeling flora, 19 genera, 134 species

INTRODUCTION

Geographically the Darjeeling district of the Indian state of Paschimbanga (formerly West Bengal) is located between 26° 31' 05" to 27° 13' 10" N latitudes and 87° 59' 30" to 88° 5' 31" E longitudes. It comprises an area of 3351.9 km² of which about 2417.3 km² lies in the hills and rest (934.6 km²) in plains. The forest cover of the district is 1,455 km² [46.20%] (Bhujel 1996). The altitude ranges from about 120 m amsl at Bidhan Nagar of Siliguri Terai to 3,660 m amsl at Sandakphu. As the area is expanded from the Himalayas to the Terai of Gangetic Plains, it possesses a vast variation in topographical, altitudinal, geographical and climatic features which gave rise to extremely rich vegetation and plant diversity in the area. The area is located within the IUCN recognized Himalaya Biodiversity Hotspot.

While working on the flora of different parts of the country and adjoining countries, many renowned botanists have explored this area at least since early 19th century (Das 1995, 2004). Among the well known explorers Clarke (1877, 1886), Hooker (1872 – 1897), Hara (1966, 1971), Hara *et al* (1978, 1979, 1982), Ohashi (1975), Koyama (1978), Mukherjee (1988), Noltie (1994), Das (1986, 1995, 2004), Hajra & Verma (1996), Rai (2001) and Ghosh (2006) has contributed considerably towards the floristic exploration of the area.

Cyperaceae A.L. Jussieu, commonly know as the sedge family is the third dominant family amongst the monocotyledonous flora in the region after Poaceae and Orchidaceae. Worldwide 72 genera with about 4000 species of the family were reported (Mabberley 2005), of which 38 genera with about 485 species are known to grow in India (Karthikeyan *et al* 1989).

Most of the members of Cyperaceae love to grow in wet and marshy places, though the number of mesophytic species are not less. Species of *Eleocharis*, *Fuirena*, *Hypolytrum*, *Lipocarpha*, *Rhynchospora*, *Schoenoplectus*, *Scirpus* etc. grow in wet and marshy lands, low lands, ditches, along streams, rice fields etc. whereas *Actinoscirpus*, *Carex*, *Erioscirpus*, *Kobresia*, *Pycnus*, *Scleria* etc. prefer dry land habitat and members of *Bulbostylis*, *Cyperus*, *Fimbristylis*, *Kyllinga*, *Isolepis* etc. like the both. Some species of *Cyperus*, *Carex* etc. are often found growing lithophytic and some times even epiphytically. In the Terai, the sedge flora covers most of the ground vegetation. It seems to be natural phenomenon that many open waste and unused lands the ground flora is fully dominated by the members of Cyperaceae. Most species of *Carex*, *Kobresia* etc grow in the temperate regions. It is by virtue the nature of the area has provided almost all the favourable conditions for the occurrence of these plants, therefore the Cyperaceae has emerged as the 3rd dominant family amongst monocots in the district of Darjeeling (Hara 1966, 1971; Ohashi 1975; Noltie 2000).

MATERIAL AND METHODS

Random collections were made while exploring the monocotyledonous flora of the Darjeeling district visiting the different places in different seasons during 2002 to 2009. The collected specimens were processed following the herbarium techniques of Jain & Rao (1977) and identified using different literature including Hooker (1893, 1894), Hara (1966, 1971), Ohashi (1975), Hara *et al* (1978), Rao & Verma (1982) and Noltie (2000). Specimens were matched at CAL and NBU-Herbarium. The identified sedges were studied properly mainly in relation to their distribution pattern mainly with help of literature and herbarium study. After completion of the work specimens will be deposited in the NBU-Herbarium.

RESULTS AND DISCUSSIONS

The present survey recorded the occurrence of 134 species and varieties of sedges covering 19 genera [Appendix –I]. Of these *Carex* is best represented with 40 species and is followed by *Cyperus* (29 sp.), *Fimbristylis* (15 sp.), *Pycnus* (8 sp.), *Scleria* (5 sp.), *Kyllinga* (5 sp.) and *Kobresia* (4 sp.). In addition, *Eleocharis* and *Schoenoplectus* are represented by 3 species each. Five genera [*Bulbostylis*, *Fuirena*, *Lipocarpha*, *Rhynchospora* & *Scirpus*] are with 2 species each and the remaining four genera [*Actinoscirpus*, *Erioscirpus*, *Hypolytrum* & *Isolepis*] are represented by solitary species only (Fig. 1).

Like the floristic elements in any vegetation, sedges in Darjeeling district are also locally not equally distributed. This may be generally analyzed from two angles, overall observation of the frequency of occurrence or availability and with the change of altitude in the habitat. From the availability point one species may be:

Abundant: Some members of the family grow abundantly as ground flora which covers different land forms dominating and intermixing with other flora. These include *Cyperus compressus*, *Fimbristylis acuminata*, *F. aestivalis*, *F. dichotoma*, *Kyllinga berrifolia*, *K. nemoralis*, *Pycnus pumilus*, *P. Sanguinolentus* etc.

Very common: *Bulbostylis barbata*, *Carex cruciata*, *C. filicina*, *C. cuspidata*, *Cyperus cyperinus*, *C. cyperoides*, *C. distans*, *C. haspan*, *C. iria*, *C. laxis*, *C. pilosus*, *Fimbristylis littoralis*, *Pycnus stramineus* etc.

Common: The common Cyperian species include *Bulbostylis densa*, *Carex baccans*, *C. condensata*, *C. decora*, *Cyperus compactus*, *C. difformis*, *C. digitatus*, *C. pangorie*, *C. paniceus*, *Eleocharis retroflexa*, *E. tetraquetra*, *Erioscirpus comosus*, *Fimbristylis complanata*, *F. miliacea*, *Fuirena ciliaris*, *Lipocarpha chinensis*, *Pycnus pumilus*, *Schoenoplectus juncooides* etc.

Rare: The occurrence of some species of sedges appears to be rare in the study area, like *Carex odorhampha*, *Scleria biflora*, *S. caricina* etc. and some species which sparsely found in few places only like *Scleria lithosperma*, *Actinoscirpus grossus*, different species of *Carex* like *C. duthiei*, *C. fucata*, *C. fusiformis*, *C. munda*, *C. obscura*, *C. rara*, *C. vesiculosa*, *Cyperus involucratus*, *C. niveus*, *C. nutans*, *C. silletensis*, *F. thomsonii*, *Hypolytrum nemorum*, *Kobresia curticeps*, *K. fragilis*, *K. pygmaea*, *K. uncinoides*, *Kyllinga squamulata*, *K. tenuifolia*, *Lipocarpha squarrosa*, *Pycreus diaphanus*, *Rhynchospora rugosa* var. *griffithii*, *R. rubra*, *Scirpus ternatanus* etc.

Endangered: Due to the abundance and less usefulness for the plant hunters, no such great threat has been arisen for the members of this taxon.

Altitudinal Distribution

Altitude is one important factor for the distribution of different species especially in the Himalayas as here the change of altitude is inversely proportional with the temperature (Fig. 6). The tropical environment of Terai can not support the same species as those can grow in high altitude areas in this district like Sandakphu, Phalut, etc. However, there are some species with quite broad ecological amplitude. Majority of the species do respond closely with the change of altitude. So, following type of altitude related distribution can be observed:

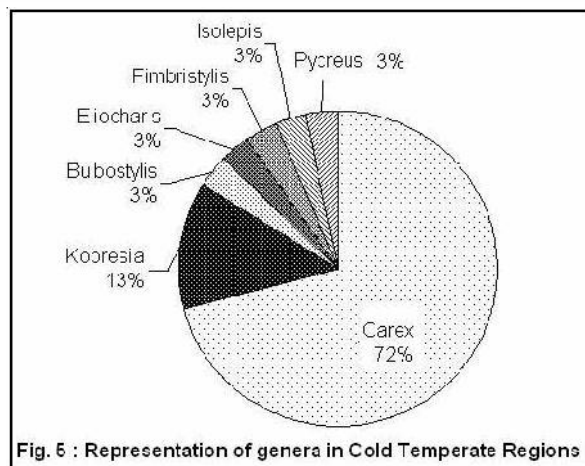
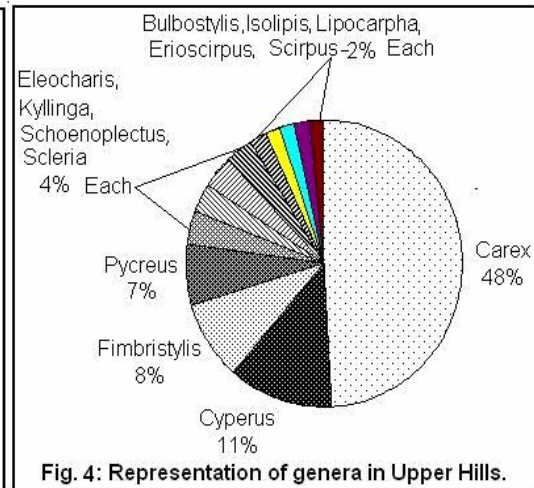
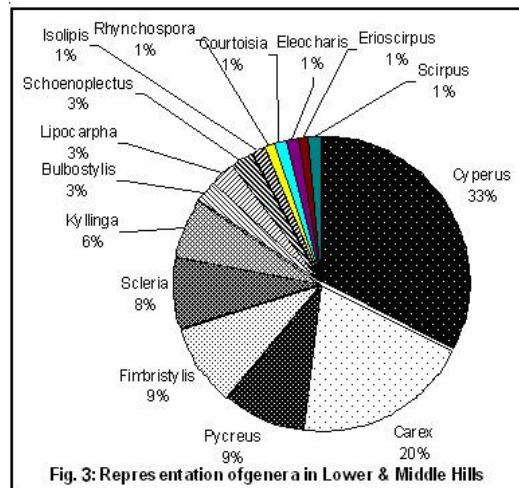
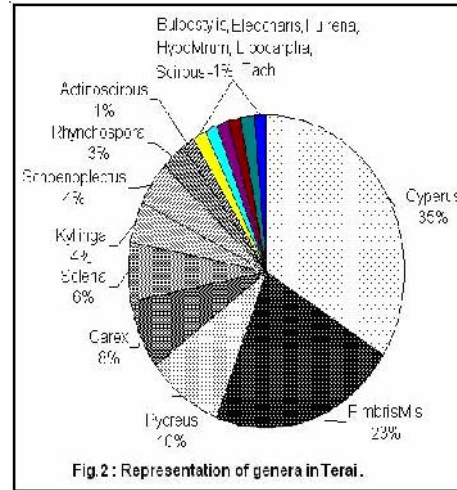
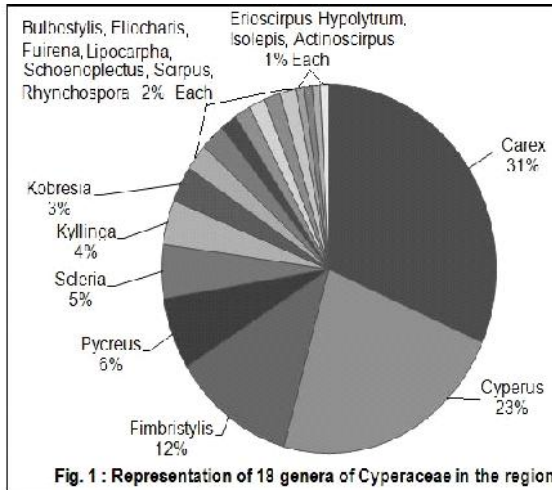
Plains of Terai (upto 200 m): The hot tropical conditions favour the occurrence of large number of species. *Cyperus* is with highest 35 % dominance succeeded by *Fimbristylis* (23 %) and *Pycreus* (10 %) of the total sedge flora of Darjeeling (Fig: 2). Some such important species includes *Actinoscirpus grossus*; *Bulbostylis barbata*; *Carex stramentita*; *Cyperus castaneus*, *C. compactus*, *C. compressus*, *C. cuspidatus*, *C. cyperinus*, *C. difformis*, *C. digitatus*, *C. distans*, *C. halpan*, *C. haspan*, *C. laxus*, *C. niveus*, *C. pangorie*, *C. paniceus*, *C. pilosus*, *C. pseudokyllingoides*, *C. rotundus*, *C. squarrosus*, *C. tenuiculmis*, *C. tenuispica*, *C. thomsonii*; *Eleocharis retroflexa*; *Fimbristylis acuminata*, *F. aestivalis*, *F. complanata*, *F. dichotoma*, *F. filifolia*, *F. littoralis*, *F. miliacea*, *F. schoenoides*, *F. tetragona*; *Fuirena umbellata*; *Hypolytrum nemorum*; *Kyllinga bervifolia*, *K. nemoralis*, *K. odorata* subsp. *cylindrica*; *Lipocarpha chinensis*; *Pycreus polystachyos*, *P. pumilus*, *P. stramineus*, *P. sanguinolentus*; *Rhynchospora rugosa*, *R. rubra*; *Schoenoplectus atriculatus*, *S. juncoides*, *S. mucronatus*; *Scirpus michelianus*; *Scleria biflora*, *S. caricina*, *S. terrestris*, *S. levis*.

Lower to Middle hills (200 – 1500 m): The characterist species of this region are *Carex cruciata*, *C. speciosa*, *C. thomsonii*, *Cyperus cyperoides*, *C. involucratus*, *C. nutans*, *C. sikkimensis*, *Kyllinga tenuifolia*, *Lipocarpha squarrosa*, *Scleria lithosperma* etc. (Fig. 3)

Upper hills to Sub-alpine (1500 m and above): With gradual decrease in temperature and increase in altitude the dominance of *Carex* species also increases. In the upper hills, upto 2700m, the scenario totally changes regarding that of Terai and the lower hills with 48 % representation of *Carex* and only of 11 % *Cyperus* and 8 % of *Fimbristylis* (Fig: 4). Finally in the cold temperate region, i.e. above 2700 m altitude, no more *Cyperus* is found but different species of *Kobresia* are seemed to be growing frequently. Here, both the genera *Carex* (72%) and *Kobresia* (13%) together dominate all other cyperian genera (15%). Most frequent species of the cold temperate region are *Carex decora*, *C. duthiei*, *C. fucata*, *C. fusiformis*, *C. fusiformis* subsp. *finitima*, *C. inanis*, *C. inclinis*, *C. munda*, *C. muricata*, *C. nubigena*, *C. obscura*, *C. odorhampha*, *C. polycephala*, *C. pulchra*, *C. rara*, *C. remota*, *C. setigera*, *C. setosa*, *C. speciosa*, *C. teres*, *C. vesiculosa*; *Kobresia fragilis*, *K. pygmaea*, *K. uncinoides*; *Pycreus diaphanus* etc (Fig: 5).

Wide vertical distribution: There is only one species, *Fimbristylis dichotoma* that is found from Terai to cold temperate region (100 – 3100 m). However, species like *Cyperus compressus*, *C. cuspidatus*, *C. difformis*, *C. rotundus*, *C. squarrosus*, *C. tenuiculmis*, *Fimbristylis*

aestivalis, *F. miliacea*, *Kyllinga complanata*, *K. bervifolia*, *Lipocarpa chinensis*, *Pycreus flavidus*, *P. sanguinolentus*, *Schoenoplectus juncoides*, *S. mucronatus* etc grow in areas with altitude ranging from 120 to 2700m; and some other species like *Carex filicina*, *Eleocharis tetraquetra* etc. are found growing between 200 and 2700 m.



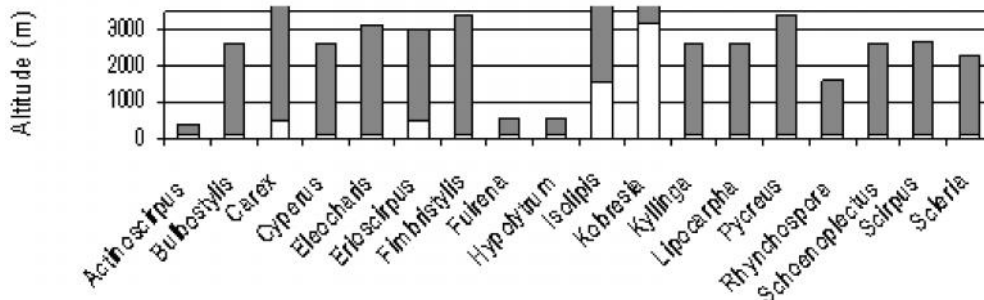


Fig. 6. Altitudinal distribution pattern of different genera of Cyperaceae

Endemism

Cyperaceae being a cosmopolitan family very few species show endemism to Himalayan region. However, the endemism in sedges in this locality may be studied as (i) Endemic to Darjeeling-Sikkim Himalayas: two species [*Carex teres*, *Cyperus sikkimensis*]; (ii) Endemic to Eastern Himalaya (Nepal to Bhutan): such as *Carex daltonii*, *C. decora*, *C. fucata*, *C. fusiformis* ssp. *fusiformis*, *C. insignis*, *C. munda*, *C. olivacea*, *C. polycephala*, *C. pulchra*, *Fimbristylis filifolia* & *F. stolonifera*. (iii) Endemic to Eastern Himalaya but extending to NE India: *Fimbristylis filifolia*, *F. fuscina* and *Carex polycephala*; (iv) Endemic to the Himalayas (Kashmir to Arunachal Pradesh): like *Carex inanis*, *C. inclinis*, *C. setigera*, *Fimbristylis fuscina* etc.

The data shows that most of the species of *Carex* found in the region are endemic to Himalayas. Most of the plants grow within the Asian boundaries from W to SE Asia and up to Australia and many are pantropical and cosmopolitan in their distribution.

Table 1. Comparison of Cyperaceae of Darjeeling District with other floras of adjoining regions [Abbreviations used: FEH = Flora of Eastern Himalaya (Hara 1966, 1971 & Ohasi 1975); FS = Flora of Sikkim (Hajra & Verma 1996); FB = Flora of Bhutan (Noltie 1994); PW = Present Work]

GENERA	FEH	FS	FB	PW
<i>Actinoscirpus</i>	0	0	1	1
<i>Bulbostylis</i>	2	2	2	2
<i>Blismus</i>	0	1	1	0
<i>Carex</i>	54	67	73	41
<i>Courtoisia</i>	1	0	0	1
<i>Cyperus</i>	25	19	25	29
<i>Eleocharis</i>	2	4	6	3
<i>Erioscirpus/ Eriophorum</i>	3	2	2	1
<i>Fimbristylis</i>	9	9	17	18
<i>Fuirena</i>	0	0	2	2
<i>Hypolytrum</i>	0	0	1	1
<i>Isolepis</i>	0	1	4	1
<i>Kobresia</i>	14	22	22	4
<i>Kyllinga</i>	0	3	5	5
<i>Lipocarpus</i>	0	1	2	2
<i>Mariscus</i>	0	12	0	0
<i>Pycurus</i>	0	11	8	8
<i>Rhynchospora</i>	0	5	2	2
<i>Schoenoplectus</i>	0	5	4	4
<i>Scirpus</i>	5	1	2	2
<i>Scleria</i>	0	4	6	7
Total:	9 # 115	17 # 169	19 # 185	19 # 134

Richness of Sedge Flora

Richness of the sedge flora recorded from the district of Darjeeling can be realized if it is compared with the other published floras covering this region. According sedge flora of Darjeeling has been compared with the floras of *Eastern Himalaya* (Hara 1966, 1971; Ohashi 1975); *Flora of Sikkim* (Hajra & Verma 1996) and *Flora of Bhutan* (Noltie 2000) in Table 1. Eastern Himalayan flora recorded 115 species of nine genera, Sikkim flora recorded 169 species of 17 genera and the Bhutan flora has recorded 185 species covering 19 genera of Cyperaceae. One needs to remember that all these three floras under discussion are covering much larger areas. Floras of Bhutan and Eastern Himalaya are also covering the Darjeeling region. The present survey in Darjeeling district has recorded as much as 134 species covering 19 genera of Cyperaceae. This is a clear indication that the sedge flora of Darjeeling is extremely rich. This is probably due the presence of wide diversity of habitat structure in the study area.

Importance

The members of Cyperaceae occupy the most important position in the vegetation along with the grasses of the area. Sedges cover most of the open lands, grasslands, forest floors, river banks and marshlands and are import fodder for the grazing animals.

CONCLUSION

The study revealed that the species of Cyperaceae are mostly dispersed towards lower elevations hence the number of species decrease along increase in altitude. *Carex* is the genus which has most endemic species, most of its members are confined within the Himalayas and very few have spread elsewhere. *Cyperus*, *Pycneus*, *Eleocharis*, *Kyllinga*, *Fimbristylis* etc. are the most important genera in the Terai & lower hills and *Carex*, *Kobresia*, *Isolepis* in the upper hills. *Carex* is the largest genus of the family, following *Cyperus* and *Fimbristylis* having maximum no. of species. The members of the family are one of the important floras in the grasslands so they provide most import fodder for the grazing animals. Maximum species grow in the marshes so the family is called as sedge family. They grow as weed crop fields.

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APPENDIX – I.

Members of Cyperaceae recorded from the Darjeeling district of Paschimbanga along with their distribution and status in the vegetation

[**Abbreviations used: General distribution:** Afg = Afghanistan, Afr = Africa, As = Assam, Ast = Australia, BD = Bangladesh, Bt = Bhutan, C = Central, Ch = China, Dj = Darjeeling, Eur = Europe, Him = Himalaya, In = India, In-Ch = Indo-China, In Sbcont = Indian Subcontinent, Indsia = Indonesia, Intr = Introduced, Jap = Japan, Jv = Java, Kh HI = Khasia Hills, Ksm = Kashmir, Kum = Kumaon, Mad = Madagascar, Maur = Mauritius, Mly = Malaysia, Myn = Myanmar, N = North, NGun = New Guinea, Nilg = Nilgiri, Np = Nepal, NZ = New Zealand, O = Old, Pak = Pakistan, Phil = Philippines, S = South, Singpr = Singpr, Sk = Sikkim, SL = Sri Lanka, Slmn Ild = Solomon Island, Tbt = Tibet, Temp = Temperate, Thl = Thailand, Tr & STr = Tropical & Subtropical, Vit = Vietnam, W = West, WInd = W Indies. **Altitudinal distribution:** T = Terai (up to 200m); L = Lower Hills (200-700m); M = Middle Hills (700-1500m); U = Upper Hills (1500 -2700m); C = Cold Temperate Region (2700-3636m). **Status:** A = Abundant, VC = Very Common, C = Common, LC = Less common, S = Sparse, R = Rare. **Exsiccatae:** PC = Collected by P. C. Rai (Rai P.C. 2001); FB = Recorded in *Flora of Bhutan* for Darjeeling region (Noltie 1994)]

Species, variety & sub-species	Exsiccatae	General distribution	Altitudinal distribution					Sta tus
			T	L	M	U	C	
<i>Actinoscirpus grossus</i> var. <i>kysoor</i> (Roxburgh) Noltie	1307	Tr.S & SE Asia; Ast.	+					S
<i>Bulbostylis barbata</i> (Rottboel) Clarke	796,911	Pnatic	+	+				VC
<i>B. densa</i> (Wallich) Handel-Mazzetti ex Karsten & Shenck	42,797	E Him, Jap & Ch.			+	+	+	C
<i>Carex alopecuroides</i> D. Don ex Tilloch & Taylor var. <i>alopecuroides</i>	PC 076, 0165,	Tr-Str Asia			+	+		MC
<i>C. alopecuroides</i> var. <i>chlorostachya</i> Clarke	FB	E. Him, C Ch. to Jap.				+	+	MC
<i>C. baccans</i> Nees	1156	In, Np, SL, In-ch, Jv, Ch.			+	+		C
<i>C. condensata</i> Nees	856	Mad, In, Ch, In-Ch, Jap.		+	+	+		C
<i>C. continua</i> Clarke	FB	In, Ch, Mly.	+	+				C

Species, variety & sub-species	Exsiccatae	General distribution	Altitudinal distribution					Sta tus
			T	L	M	U	C	
<i>C. crassipes</i> Boeckeler	1079	Endemic to Dj-Sk to Bt				+		S
<i>C. cruciata</i> var. <i>agrocarpa</i> Clarke	63	Mad, In, In-Ch, Tw, Indsia, Jap.		+	+	+		VC
<i>C. daltonii</i> Boott	PC980	E Him (Sk. to Bt)				+	+	
<i>C. decora</i> Boott	442,563,755	C to E Him (Nepto Sk.-Bt)				+	+	C
<i>C. duthiei</i> Clarke	FB	Pak, W Him to Sk; C Ch.					+	S
<i>C. filicina</i> Nees	222,761	E Him, Kh HI, As; SE Asia.		+	+	+	+	VC
<i>C. foliosa</i> D. Don	FB	Pak to As; Nilg; Intr. to Eur, W Asia				+	+	
<i>C. fucata</i> Boott ex Clarke	FB	E Him (E Nep to Sk-Dj)					+	S
<i>C. fusiformis</i> Nees ex Wight ssp. <i>fusiformis</i>	FB	E Him (E Nep to Sk-Dj)				+	+	S
<i>C. fusiformis</i> ssp. <i>finitima</i> (Boott) Noltie	FB	Him, S Ch, Mly.					+	
<i>C. inanis</i> Kunth	226,432	Temp. Him (Ksm-Sk)				+	+	C
<i>C. inclinis</i> Boott ex Clarke	754	Temp. Him (Ksm-Sk).				+	+	C
<i>C. indica</i> Linnaeus	FB	In, S Afr.	+					LC
<i>C. insignis</i> Boott	66	E Him (Nep-Bt), As.			+	+		LC
<i>C. longipes</i> D. Don ex Tilloch & Taylor	601	Tr-Str Him & S. Ch.			+	+	+	C
<i>C. munda</i> Boott	FB	E Him (Nep-Bt)					+	S
<i>C. muricata</i> Linnaeus	FB	W Asia, Intr. to Eur.				+		LC
<i>C. moysurus</i> Nees	696, 779	Him, S In to Indsia		+	+	+		C
<i>C. nubigena</i> D. Don	462	Pak & NW Him; Mly & C Ch.				+	+	C
<i>C. obscura</i> Nees	440	NW to E Him; S Ch					+	S
<i>C. odorrhampha</i> Nelves	FB	Him, S Ch, Mly.				+		R
<i>C. oligostachya</i> Nees ex Hooker	FB	Dj-Sk Him, As to Slmn Ild.	+	+				LC
<i>C. olivacea</i> Boott	FB	Dj-Sk to Bt			+	+	+	LC
<i>C. phacota</i> Sprengel	FB	Np, In, SL, Mly, In-Ch, Jap.	+	+				C
<i>C. polycephala</i> Boott	FB	Him (Nep-Bt), As.				+	+	LC
<i>C. pulchra</i> Boott	1106	C to E Him				+	+	LC
<i>C. rara</i> Boott	FB	Him to Jap, SL.				+	+	S
<i>C. remota</i> Linnaeus	569	Eur, SW Asia to Pak, Him, (Ksm-NE In)				+	+	C
<i>C. setigera</i> D. Don	FB	Tr. Him (Ksm-Bt)				+	+	LC
<i>C. setosa</i> Boott	1049, 1097	Him (Pak to Sk); Ch					+	C
<i>C. speciosa</i> Kunth ssp. <i>speciosa</i>	1157	Him, N In, N Myn, S & C Ch to W Mly	+	+	+			C
<i>C. speciosa</i> ssp. <i>dilatata</i> Noltie	FB	NE In to Ch				+		
<i>C. stramentita</i> Boott	544	In Sbcont, SC Ch, In -Ch, Jv.	+	+	+			C
<i>C. teres</i> Boott	785	Endemic to Dj & Sk Him				+	+	LC
<i>C. thomsonii</i> Boott	FB	S Afr to NZ		+	+			LC
<i>C. vesiculosa</i> Boott	FB	Nep to SE Asia to Jv				+		S
<i>Courtoisia cyperoides</i> (Roxburgh) Nees	1077	Nep, Bt, In, Myn, Vit, Laos, Thl; Afr, Mad.		+	+			LC
<i>Cyperus castaneus</i> Willdenow	792	S Afr, Tr Asia, Ast.	+	+				LC
<i>C. compactus</i> Retzius	176	Pak, In, Ch, Tw, Mly & Maur.	+					C
<i>C. compressus</i> Linnaeus	181,986	Cosmopolitan	+	+	+	+		A
<i>C. cuspidatus</i> Kunth	09	Pantropic	+	+	+	+		VC
<i>C. cyperinus</i> (Retzius) J.V. Suringar	183	Tr.E Asia, In, Ch, Mly, Jap & Ast.	+	+	+			VC
<i>C. cyperoides</i> (Linnaeus) Kuntze	199	STr- temp. of World		+	+			VC
<i>C. difformis</i> Linnaeus	111	STr- temp. of World	+	+	+	+		C
<i>C. digitatus</i> Roxburgh	294	Pantropic	+	+	+			C
<i>C. distans</i> Linnaeus f.	793	Pantropic	+	+	+			VC
<i>C. haspan</i> Linnaeus ssp. <i>haspan</i>	10081,125	Trop. of O & N World.	+	+	+			VC
<i>C. haspan</i> ssp. <i>juncooides</i> (Lamarck) Kukenthal	FB		+					VC
<i>C. involucratus</i> Rottboel	292	E Him, Asia, Afr, Amer.		+	+			S
<i>C. iria</i> Linnaeus	07,780	Tr-Str of World			+	+		VC
<i>C. laxus</i> Lamarck	128	S & SE Asia, Afr, Mad.	+	+	+			VC
<i>C. laxus</i> var. <i>macrostachya</i> (Boeckeler) Karthals	188,198		+	+				
<i>C. lucidulus</i> Klein	310	NGun to Ast.	+	+				

Species, variety & sub-species	Exsiccatae	General distribution	Altitudinal distribution					Status
			T	L	M	U	C	
<i>C. niveus</i> Retzius	FB	Iran to Myn; E Afr.	+	+	+			S
<i>C. nutans</i> Vahl	180	Tr. Afr, In, SL, S Ch to Mly; Ast.		+	+			S
<i>C. pangorie</i> Rottboel	1029	Pak, Np, In to Myn, SL.	+	+	+			C
<i>C. paniceus</i> (Rottboel) Boeckeler	FB	N In to Vit, Jv.		+				C
<i>C. pilosus</i> Vahl	267,1007	S, E & SE Asia, Intr. else where	+	+	+			VC
<i>C. pseudokyllingoides</i> Kukenthal	FB	Mad, Afr, Asia.	+	+	+			C
<i>C. rotundus</i> Linnaeus	144	Cosmopolitan	+	+	+	+		A
<i>C. sikkimensis</i> Kukenthal	182	Endemic to Dj & Sk Him.		+	+			LC
<i>C. silletensis</i> Nees ex Wight	FB	Tr. Asia	+					S
<i>C. squarrosus</i> Linnaeus	1005	Pantropic	+	+	+	+		LC
<i>C. tenuiculmis</i> Boeckeler	310	Tr. Afr, In subcont to SE Asia, Ast.	+	+	+	+		C
<i>C. tenuispica</i> Steudel	1019	Tr-Str of O World	+	+				C
<i>C. thomsonii</i> Boeckeler	1153	NE In to Vit	+					C
<i>Eleocharis acutangula</i> (Roxburgh) Schultes	177	S Asia (Nep to Phil); trop. Afr, Amer, Aust; Mad.	+					LC
<i>E. retroflexa retroflexa</i> (Poiret) Urban	113	Pantropic	+					C
<i>E. tetraquetra</i> Nees ex Wight	FB	Afg, Pak, In, SL, Ch, Jap, N Gun & Ast.		+	+	+	+	C
<i>Erioscirpus comosus</i> (Wallich) Palla	1315	Him, N Myn, S Ch.		+	+	+		C
<i>Fimbristylis acuminata</i> Vahl	794	S & SE Asia, Ast.	+					A
<i>F. aestivalis</i> (Retzius) Vahl	179,784	Temp-Trop Asia; Ast.	+	+	+	+		A
<i>F. bisumbellata</i> (Forsskal) Bubani	1108	Tr Afr-S Eur, Pak, In, Mly, tr Ast – NZ	+	+				C
<i>F. complanata</i> (Retzius) Link	1118	Pantropic.	+	+	+	+		C
<i>F. dichotoma</i> (Linnaeus) Vahl	327,782	Tr-Str of world.	+	+	+	+	+	A
<i>F. filifolia</i> Boeck	FB	Dj-Sk Him to As	+					LC
<i>F. fuscinux</i> Clarke	FB	Dj to N In	+	+				LC
<i>F. littoralis</i> Gaudichaud	45,797	Tr-Str world.	+	+	+			VC
<i>F. miliacea</i> (Linnaeus) Vahl	FB	Pantropic.	+	+	+			C
<i>F. rigidula</i> Nees ex Wight	FB	Pak, N In to S. Ch, N Thl, Phil.	+					LC
<i>F. schoenoides</i> (Retzius) Vahl	774	Pak, N In to S. Ch, Mly, Taiw & N Ast.	+					LC
<i>F. tetragona</i> R. Brown	FB	Tr & STr Asia to Ast.	+					C
<i>F. tomentosa</i> Vahl	FB	Pantropic	+					LC
<i>F. squarrosa</i> Vahl	542	Pantropic	+					S
<i>F. stolonifera</i> Clarke	233	E. Him (Nep to Bt)				+		C
<i>F. tetragona</i> R. Brown	790	Tr & Str of Nep, In, SL, Myn, Vit, Indsia, Thl, Mly, Phi; N Ast	+					LC
<i>F. thomsonii</i> Boeckeler	FB	Tr-Str Asia	+					S
<i>F. tomentosa</i> Vahl	03	Nep, Bt, In, SL, Ch, Thl, Vit, Indsia, Phil; tr Afr, Ast, Pac isld.	+					LC
<i>Fuirena umbellata</i> Rottboel	FB	Tr-Str of the world.	+					C
<i>F. ciliaris</i> Linnaeus	121,528	Tr-Str O World	+					
<i>Hypolytrum nemorum</i> (Vahl) Sprengel	FB	Tr Asia to W Pacific	+					S
<i>Isolepis setacea</i> (Linnaeus) R. Brown	772	Pantropic			+	+	+	LC
<i>Kobresia curticeps</i> (Clarke) Kukenthal	FB	C & E Him to Tbt						+ S
<i>K. fragilis</i> Clarke	PC1138	Nep to S&C Ch						+ S
<i>K. pygmaea</i> (Clarke) Clarke	PC1104	Pak to Myn & Ch						+ S
<i>K. uncinoides</i> (Boott) Clarke	PC850	C & E Him to SC Ch						+ S
<i>Kyllinga bervifolia</i> Rottboel	30,786	Pantropic	+	+	+	+		A
<i>K. nemoralis</i> (J. R. & G. Forster) Dandy ex Hutchinson & Dalziel	14,1034	Pantropic	+	+	+			A
<i>K. odorata</i> ssp. <i>cylindrica</i> (Nees) T. Koyama	1031	Trop Him (Kum-Sk), Singpr; Afr; Ast.	+	+	+			LC
<i>K. squamulata</i> Thonning ex Vahl	1033,1161	Tr Afr; In, Pak; WInd.			+	+		S
<i>K. tenuifolia</i> Steudel	785			+	+			S
<i>Lipocarpha chinensis</i> (Osbeck) Kern	27	Tr-Str O World	+	+	+	+		C
<i>L. squarrosa</i> (Linnaeus) Goetgh	FB	In Subcont - S Ch, Vit & Mly.	+	+				S

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			T	L	M	U	C	
<i>Pycreus diaphanus</i> Schrader ex Romer & Schultes) Hooper & T. Koyama	FB	Tr-Str Asia				+	+	S
<i>P. flavidus</i> (Retzius) T. Koyama	FB	Eur, Mad; S & SE Asia, Ast.	+	+	+	+		C
<i>P. polystachyos</i> (Rottboel) P. Beauvois	1320	In, Np, BD, Myn.	+	+				C
<i>P. pumilus</i> (Linnaeus) Nees	1006	Tr-Str O World	+	+				A
<i>P. sanguinolentus</i> (Vahl) Nees ex Clarke	10,24,49	O World	+	+	+	+		A
<i>P. stramineus</i> Clarke	221,996	Nep to Mly	+	+	+			VC
<i>P. sulcinus</i> Clarke	FB	Tr-Str Asia to Ast.	+	+	+			LC
<i>P. uniloides</i> (R. Brown) Urban	FB	Tr-Str of world.		+	+	+		LC
<i>Rhynchospora rugosa</i> var. <i>griffithii</i> (Boeckeler) Verma & V. Chandra	FB	Tr-Str of world.	+	+	+			S
<i>R. rubra</i> (Laureiro) Makino	FB	Tr-Str of O World	+					S
<i>Schoenoplectus atriculatus</i> (Linnaeus) Palla	60	Tr of O World.	+	+				VC
<i>S. juncooides</i> (Roxburgh) Palla	1162	SW Asia, Mad, Pak & In, Ch, Jap, Mly, Hawaii, Ast.	+	+	+	+		C
<i>S. mucronatus</i> (Linnaeus) Palla	1310	In; Eur to Jap; Mly, Mad, Aust & Afr.	+	+	+	+		C
<i>S. triqueter</i> (Linnaeus) Palla	1302	Eur-Ch,Japan; Tajik, SW Asia, Afg, Pak, N to NE India; Egypt, S Africa.	+					C
<i>Scirpus michelianus</i> Linnaeus	FB	O World	+					LC
<i>S. ternatanus</i> Reinwardt ex Miquel	PC1305	E Him, Tbt, Tr-Str Asia		+	+	+		S
<i>Scleria biflora</i> Roxburgh	795	Tr-Str Asia	+	+				R
<i>S. caricina</i> (R. Brown) Bentham	312	Tr-Str Asia to W Pacific	+					R
<i>S. levis</i> Retzius	706	Tr-Str Asia to W Pacific	+	+				LC
<i>S. terrestris</i> (Linnaeus) Swartz	1016,1158	Tr-Str Asia to N Ast.	+	+	+			LC
<i>S. parvula</i> Steudel	775	Tr-Str O World		+	+	+		LC
<i>S. rugosa</i> R. Brown	749	Tr-Str Asia to N Ast.		+	+	+		LC
<i>S. lithosperma</i> (Linnaeus) Swartz	FB	Tr-Str of world		+				S