

# HYPERACEAE OF NORTH EAST INDIA

**A. S. RAO. AND D. M. VERMA**

**BOTANICAL SURVEY OF INDIA**

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## FOREWORD

This account of the family CYPERACEAE of north-eastern India is the first consolidated account of sedges published in the current century for such a large region, spreading over more than 250,000 sq. km and covering the States of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura. A reasonably full account of dicotyledonous plants of this region was published about fifty years ago by Kanjilal and others, and of the grasses by Bor in 1940. Accounts of several monocotyledonous families were published during the last two decades, but some families still remained unworked. The present work will, therefore, fill a gap in the knowledge of monocotyledonous flora of the area.

Cyperaceae is one of the larger families in our country and the present publication dealing with 173 species covers about fifty per cent of the total Indian taxa, which are estimated at 350.

With the publication of the Fascicles of Flora of India on different families, tribes and larger genera of Indian flora, the need was felt for more detailed and more profusely illustrated accounts of certain economically important or otherwise interesting or neglected groups of plants. Cyperaceae is one such group which, due to the usually small size of its floral parts and comparatively lesser number of economically important members, has not received adequate attention. It was, therefore, considered appropriate to bring out the present special publication, particularly in view of the critical first hand observations of the authors on the habit and habitat of the plants, as also their freshly drawn illustrations.

It is hoped that this work will create interest in this family and detailed accounts of sedges of other regions of India would be attempted by other workers.

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S. K. JAIN  
DIRECTOR

## PREFACE

This account of Cyperaceae of the north-east region of India (old Assam) is the result of efforts made to complete the incomplete Flora of Assam, Kanjilal *et al.* Of the five volumes, 4 cover only the Dicotyledonous families. However, of the Monocotyledonous families, out of turn, the Gramineae was completed as the 5th volume by N. L. Bor, an unusual Forest Officer with a special love for grasses. The Assam Forest Herbarium was transferred to the newly re-organised Botanical Survey of India in 1956, with the understanding that the rest of the monocot families be studied and the publication of the Flora of Assam completed. A subsequent review of the herbarium holdings revealed the paucity of Monocot collections, while Bor's studies and publication was possible due to his own special efforts in collection of the grasses. Drs. R. S. Rao, G. Panigrahi and D. B. Deb, all made efforts in filling the lacunae in the collections and also published a few papers. However, from 1964 onwards increased efforts in selective collection of the Monocot plants for the Herbarium and introduction of several species for critical studies in the experimental garden, made it possible for a surer planning, regular studies and preparation of accounts of the monocot families for publication. These have appeared in a series of papers in the Bulletin of the Botanical Survey of India, 1972-1979.

Cyperaceae of this region formed the subject matter of the thesis which earned the second author (D.M.V.), the Ph. D. Degree of the Gauhati University. The account, containing a study of 14 out of 21 genera and 173 out of 350 species in India, could not be accommodated as a paper in a periodical. We are grateful to Dr. S. K. Jain, Director, Botanical Survey of India for kindly consenting to publish this as a distinct volume. We hope this publication will stimulate further work on this family, not only in the north-eastern region but also in the entire Indian sub-continent.

We remember with regard the late Prof. H. K. Barua, Professor of Botany and Vice Chancellor, Gauhati University for his keen interest in the progress of this work.

Several colleagues have also discussed and contributed to the crystalising of some ideas and taxonomic concepts, during the period of this study. We are indebted to them all.

Scientific studies of this kind would not have been possible without the co-operation of para-scientific staff. We would like to record our appreciation of the efforts of these staff both at the Eastern Circle at Shillong and at the Central Circle at Allahabad. Lastly, we should like to record our thanks to the staff of the Publication Section and to Dr. V. S. Agarwal, Editor of Publications, for the special pains they have taken to see the manuscript through the press and to get the publication out early.

ALLAHABAD  
25th November, 1982

A. S. RAO  
AND  
D. M. VERMA

## INTRODUCTION

Cyperaceae or the sedge family with its wide range of distribution and habitat adaptability found a place even in the pre-Linnaean contributions of Tournefort (1719) and Micheli (1729). Linnaeus (1753 & 1754) described 5 genera and 81 species. Subsequent floristic works included many novelties in Cyperaceae also, and of these historical works, in particular relation to Indian plants, mention may be made of Burman (1768), Linnaeus (1767 & 1771), Rottboell (1773), Retzius (1786-1791), Willdenow (1797-1830), Vahl (1805/1806), R. Brown (1810), Roxburgh (1820, 1824, 1832) and Miquel (1855-1859). These were followed by more comprehensive treatments of Cyperaceae by Nees (1834), Kunth (1837), Steudel (1854-1855), Boott (1858-1867), Boeckeler (1868-1877), Bentham (1881, 1883) and Pax (1888). However, it is Clarke's pioneer contribution (1893, 1894) in J. D. Hooker's Flora of British India which even after 90 years still continues to be the main source of information on Indian Cyperaceae. The accounts of the family in Indian Regional Floras by Prain (1903), Cooke (1908), Haines (1924), Parker & Turill (1929) and Fischer (1931) are largely based on Clarke's contribution. There are several other isolated and miscellaneous publications on Indian Cyperaceae which have been mentioned in the bibliography.

The north-eastern part of the country, or the

old Assam region, lacks even an outline treatment as provided in other Indian Regional Floras, with the hitherto published volumes of the Flora of Assam by Kanjilal *et al* (1934-1940) remaining incomplete. The present contribution is part of a programme to complete the above Flora, and further adds to a series of earlier publications on the monocotyledonous families of this region by A. S. Rao & D. M. Verma (1972-1979).

The account is chiefly based on the collections deposited in the Kanjilal Herbarium of the Botanical Survey of India, Eastern Circle, Shillong (ASSAM) and study of some live populations. Some of the specimens deposited in the Central National Herbarium, Botanical Survey of India, Howrah (CAL) were also consulted. For a few taxa no specimens could be studied. These have been included on the basis of the literature, and have been appropriately indicated (*n. v.*). In all, the treatment includes 14 genera and 173 species of Cyperaceae from north-east India out of about 21 genera and 350 species in India, and about 80 genera and 4000 species in the world.

In finalizing the present work a large number of publications from India and the neighbouring countries were also consulted and these have been given only in the appended bibliography instead of individual taxa.

## AREA AND PHYSIOGRAPHY

The north-eastern region of India, as treated here lies between 21°81'-29°50' N latitude and 89°46'-97°40' E longitude, with a land area of about 2,52,700 sq. km (97,567 sq. miles) comprising the states of Arunachal Pradesh (formerly North East Frontier Agency), Assam, Manipur, Meghalaya, Nagaland, Tripura and the Union territory of Mizoram.

Early 19th century literature pertaining to this area abound in confusion as to the precise localities

and political boundaries, and are mostly referred to by vague terms, partly geographical and partly on the basis of local tribal inhabitants. Thus, the plains of this region flanking Brahmaputra and Surma rivers were simply referred to either as Assam or as Sylhet, Brahmaputra valley and Surma valley; Meghalaya as Garo hills, Khasi hills, Jaintia hills; Nagaland as Naga hills (which also then included some parts now in Burma); Mizoram as Lushai hills; hills of Arunachal Pradesh as Aka



hills, Daphla hills, Abor hills and Mishmi hills. This geographical confusion is pointedly highlighted by J. D. Hooker (1854), who during his visit to this region found the incongruity with its botanical implications. He has remarked (in his *Himalayan Journals* 2: 264-265. 1854), "Before the geographical features of the country north of Silhet were known, the plants brought from those hills by native collectors were sent to the Calcutta garden (and thence to Europe) as from Pundua. Hence, Silhet mountains and Pundua mountains, both very erroneous terms, are constantly met with in botanical works, and generally refer to plants growing in the Khasia mountains."

The mighty Brahmaputra river divides off on its north the geologically younger Himalayan mountain ranges with peaks rising to about 7,750 m (25,400 ft) and on its south, the geologically more ancient

hills of the Assam range, like Garo hills, Khasi & Jaintia hills, Lushai (Mizo) hills and the hills of Manipur and Nagaland with peaks rising to 2,655 m (8,710 ft) in Nagaland-Manipur. In the central part, Shillong peak is the highest point with an altitude of 1,930 m (6,433 ft). Brahmaputra receives innumerable rivers and rivulets all along its long course from the Himalayas to the Bay of Bengal. The Brahmaputra, as well as its tributaries, many of them with indeterminate banks, periodically inundate and flood extensive areas. Among some of the principal tributaries from the Himalayas mention may be made of Manas, Kameng, Subansiri, Siang or Dihang, Dibang or Sikang and Lohit. The southern rivers from parts of Nagaland, Manipur, Cachar, Tripura and Mizoram contribute to the larger rivers of Surma and Meghna in Bangladesh, and Chindwin and Irrawady in Burma.

## CLIMATE

Climatically four different seasons are noticeable viz. (a) Winter, from December to February; (b) Pre-monsoon or summer, from March to May; (c) Monsoon, from June to September and (d) Retreating monsoon, from October to November (Das, 1950). While average annual rainfall (based on the Indian Meteorological Memoirs) varies in general from about 1200 mm to 3000 mm, higher rainfall is known on the southern slopes of

the Khasi & Jaintia hills and at the upper reaches of the Brahmaputra valley. Cherrapunji area records an average rainfall of 11,282 mm (av. during 1955-1959), the highest rainfall in the world. While mean monthly temperature in January at higher altitudes in the Himalayas is around freezing point, in other parts it varies from about 4°C to 12°C and mean maximum temperature in May-June varies from about 23°C to 35°C.

## BOTANICAL COLLECTIONS

I. H. Burkill, with his long span of life and intimate knowledge of Indian botany, and botanists who have played an important role in India, has held Indian botanists in debt by his detailed chronicles in his *Chapters on Indian botany* (1965), and his work has been frequently consulted. It may be added that many of the early contributors who collected Indian plants were not botanists and collected more as a hobby. They were naturally attracted by the more ornamental elements in the native flora, and the unglamorous Cyperaceae plants have been almost uniformly neglected.

A

Francis Buchanan (later, in 1820, Hamilton) was the first to visit Assam in 1808-1809, and gathered plants in the vicinity of Gauhati. Subsequently, M. R. Smith made some collections from Khasi & Jaintia hills for the Calcutta Botanic Garden. A missionary couple, Mr. & Mrs. Mack, collected in Khasi hills in 1826. Col. Lister, during 1828-1832, collected between Cherrapunji and Gauhati, and in the foot-hills of Dukrung and Daphla hills.

Wallich and Griffith, who were primarily deputed to establish the occurrence of tea in



Assam, made deliberate botanical collections with a view to know the flora of the area and in these, are found some of the earliest gatherings of Cyperaceae in the routes and tracts traversed by the two, which incidentally was a good cross-section of this region, with Sylhet at one end and Mishmi hills at the other end. They left Calcutta by boat on 31st August, 1835 and through Sylhet and Terryaghat entered Khasi hills, and after trekking this hilly terrain, reached Gauhati on 23rd November, 1835. From here they again took to boat and went upstream by Brahmaputra to reach Sadiya on 16th January, 1836, collecting plants on the way, and also making a short trip to Dibrugarh and Jorhat. Wallich subsequently left back for Calcutta but Griffith stayed on at Sadiya till February, 1837, chiefly collecting in the vicinity of Sadiya but also making short trips to Mishmi hills (in October, 1836) and Naga hills before he left back for Calcutta via Burma. On 31st August, 1838, Griffith again left Calcutta for Bhutan traversing and collecting in Khasi hills and the present Kamrup district—this time slightly altering his route in the Khasi hills. Roughly, Griffith collected about 1700 spp. from Assam, Meghalaya and Nagaland, and about 800 spp. from Mishmi hills (Arunachal Pradesh), besides about a 1000 spp. that he received through his personal collectors. These included about 50 spp. of Cyperaceae from the present day Assam, about 30 spp. from the present day Meghalaya and about 20 spp. from Mishmi hills. The next major element of early Cyperaceae collections is the contribution of J. D. Hooker & T. Thomson in the Khasi & Jaintia hills. They came to Khasi hills from Calcutta via Sylhet and with their base camp at Cherrapunji, moved and collected about 3000 spp. in the Khasi & Jaintia hills during their six months stay from June to November, 1850. The collections in the Assam region were further enriched by many other collectors, principal among them being: Jenkins (1834-1854), alongwith his collector Simons, in Khasi hills, Mikir hills and in the Brahmaputra valley, chiefly around Gauhati; Masters (1843-1873) in Golaghat, Nowgong, Sadiya and in the hills of Angami Nagas; Oldham (around 1850) in the

Khasi hills; Falconer's collectors (1852-1854) in the Khasi hills; Keenan (1872-1873) in Cachar; Mann (1875-1877) in the Khasi hills, Charduar and in other places in the Brahmaputra valley; Watt (1882-1883) along Golaghat-Kohima-Manipur-Cachar, but mostly along the Burma border; Peal in Sibsagar; Collett (1891) in Kohima; King's collector, Gammie (1894) between Gauhati and Sadiya and Gallatly (1894) in the Khasi hills.

Charles Baron Clarke, who came to India in 1866 as a mathematics teacher seems to have been particularly attracted towards Cyperaceae and made special collections of this family in the Khasi hills in 1867, 1872 and later, as Inspector of Schools between 1883-1887, extensively at Shillong and nearby areas, and along Golaghat-Kohima-Manipur in October-November, 1885.

All these collections from this region, alongwith those from other parts of the country, were the basis of Clarke's account of the Indian Cyperaceae (in Hook. f. *Fl. Brit. Ind.* 6: 585-748, 1893-1894) and his subsequent phyto-geographical interpretations (in *J. Linn. Soc. Bot.* 34: 1-146, 1898). With particular reference to the north-eastern region, it may be observed that most of the collections came only from the Khasi & Jaintia hills and the Brahmaputra valley, and very little or nothing from the rest of this botanically bountiful area.

Subsequent to the publication of the Flora of British India, Gage (1899), Mrs. Parry (1924-1928) and Wenger (1924-1932) collected in Lushai hills (Mizoram); Meebold (1906-1907) along Golaghat-Kohima-Manipur; Prain in Nagaland; Burkill (1911-1912) in the Abor hills (Siang); Kingdon-Ward (1927-1950) in Manipur and Lohit. These collectors however, did not, even after the establishment of the Assam Forest herbarium, send or deposit their material here (or even for that matter, much at Calcutta) preferring to send their collections to Kew from where some of the extra duplicate material appear to have been distributed to other principal European herbaria, and sometimes to Calcutta. Thus, an ardent patriotic habit of these pioneer collectors has put the present Indian taxonomists in a very compulsive

dependence on materials at Kew for any critical taxonomic study of Indian plants.

In this roll of the early plant collectors of the region should be included the several Indian (apart from N. L. Bor) forest personnel, whose zeal culminated in the first publication of an Indian regional Flora by Indian authors (Kanjilal *et al.*, *Flora of Assam*, 1934-1940). Principal among those who made major contributions to the development of the Kanjilal herbarium at Shillong and the publication of the Flora were, U. N. Kanjilal, P. C. Kanjilal, R. N. De, P. R. Dutta, S. R. Sharma, Purkayastha, B. B. Syam and G. K. Deka. However, in view of

their professional interest, the collections had a strong emphasis on the woody elements with a natural neglect of herbaceous plants like those of Cyperaceae. Some other collections were also made by P. M. Deb Burman (1914-1921) and D. B. Deb (1956-1961) in Tripura, and S. K. Mukerjee (1948) and D. B. Deb (1951-55) in Manipur.

With the inception of the Botanical Survey of India, Eastern Circle at Shillong, in 1956, serious efforts in a survey of the plant resources, involving exploration and plant collection, including all kinds of plants, are being made, with the Cyperaceae receiving due attention.

## DISTRIBUTION

Sedges, with their wide distribution, have frequently attracted the attention of the phytogeographers, the family distribution pattern being used as an index for phytogeographical interpretations (Clarke, 1898; Raymond, 1951; C. K. Shah, 1967). Naturally, this aspect has always been in the background during the present revision, particularly since Clarke (*l.c.*) had based his phytogeographical Sub-subareas of British India on the bulk of evidence from Cyperaceae. However, since studies in plant distribution must always be linked with adequate exploration and collection, it is considered necessary to pointedly mention that, leaving aside intensive collections, even today, over half the area of the Assam region (including Arunachal Pradesh, Assam, Meghalaya, Nagaland, Manipur, Mizoram and Tripura) has never been visited for botanical collections (A. S. Rao, 1974). Even more meagre is our knowledge of the adjoining areas of Bhutan, China, Burma and Bangladesh. Considering the paucity of distribution data, Clarke's more or less intuitive conclusions of considering the present day Arunachal Pradesh as part of the Sub-subarea East Himalaya, the eastern peripheries of Nagaland and Manipur draining into Irrawady as part of the Sub-subarea Ava (Burma) and the rest of the region including Assam, Meghalaya, Mizoram, Tripura and the remaining parts of Manipur and Nagaland as part

of the Sub-subarea Assam, have remarkably stood the test of the time with D. Chatterjee (1940), to a very great extent, adhering to Clarke's conception.

An analysis (Table 1) has revealed that among the species of this north-east region, while *Cyperus brevifolius*, *C. difformis*, *C. rotundus*, *Eleocharis atropurpurea*, *E. palustris* and *Scirpus lacustris* are cosmopolitan, and *Cyperus compressus*, *C. kyllingia*, *C. iria*, *C. unioides*, *Eleocharis acutangula*, *Fimbristylis dichotoma*, *F. miliacea*, *F. squarrosa*, *Rhynchospora corymbosa* and *Scleria lithosperma* are pantropical, the rest are more or less restricted in distribution, and show a strong affinity to the flora of the rest of India, south-east Asia and China. Among the larger genera it would be of interest to note that while several species of *Cyperus*, *Eleocharis*, *Fimbristylis*, *Scirpus* and *Scleria*, frequently found as weeds, have a very wide range of distribution in the tropics of India, China, Japan, south-east Asia, Australia, Africa and America, those of the *Carex*, of which not a single species is found as a weed, are restricted in distribution to the rest of India, China, Japan and south-east Asia and it is to this genus belong the largest number of endemics in the north-east region. Thus, the distribution of *Carex* spp. is expected to highlight more the phytogeographical affinities of the area, and an analysis of its distribution data within

India, with reference to Clarke's Sub-subareas, shows that out of the total of 46 spp. of *Carex* presently found in the major part of his Sub-subarea Assam (including Assam, Meghalaya, Nagaland, Manipur, Mizoram & Tripura) 7 are common to West Himalaya, 5 to India Deserta, 12 to Malabar, 9 to Ceylon, 3 to Coromandelia, 1 to Gangetic Plain and 26 to East Himalaya. In considering the distribution of 16 spp. presently found in Arunachal Pradesh which is part of the Sub-subarea East Himalaya it is found that 3 are common to West Himalaya, 2 to India Deserta, 3 to Malabar, 3 to Ceylon, 2 to Coromandelia, none to Gangetic Plain and 12 to Assam. Considering the whole of the Assam region (including Arunachal Pradesh, Assam, Meghalaya, Nagaland, Manipur, Mizoram and Tripura) it is found that out of the total of 49 spp. found here 9 are common to West Himalaya, 5 to India Deserta, 12 to Malabar (mainly the Nilgiri and Pulney hill areas), 9 to Ceylon, 3 to Coromandelia and 1 to Gangetic Plain. It reflects on the close affinity, within India, between the flora of Assam and Eastern Himalayas, and the flora of the whole of the Assam region with that of the south Indian hills. While these data are presented as a tentative guide it must be emphasized again that any satisfactory phytogeographic analysis would be

possible only with a full knowledge of the distribution of plants, not only of the present, but also of the past.

On the basis of our present knowledge, *Carex desponsa* Boott, *C. distracta* Clarke, *C. ecostata* Clarke, *C. fuscifructus* Clarke, *C. munipoorensis* Clarke, *C. parvigluma* Clarke, *C. repanda* Clarke, *C. rubrobrunnea* Clarke, *C. spiculata* Boott., *C. scitula* Boott, *Fimbristylis carpopoda* Govindarajalu, *F. circumciliata* Govindarajalu and *Scleria bracteata* var. *assamica* Clarke have turned out to be endemic to north-east India. However, it may be indicated that the status accorded to them may become changed with further addition to plant distribution data based on increased exploration in the hitherto scarcely explored adjoining areas of Bhutan, China, Burma and Bangladesh (A. S. Rao & D. M. Verma, 1982). It may also be pointed out that *Carex daltonii* Boott, *C. hebecarpa* C. A. Mey., *C. insignis* Boott, *C. polycephala* Boott and *C. spiculata* var. *nobilis* (Boott) Clarke are also extremely restricted, being known outside north-east India, only from Sikkim and Bhutan; *C. praelonga* var. *angustior* Clarke only from Burma; and *Rhynchospora rugosa* var. *griffithii* Verma & Chandra only from Sikkim and Bangladesh.

TABLE 1—DISTRIBUTION OF NORTH EAST INDIA CYPERACEAE  
NUMBER OF SPECIES

GENERA OF CYPERACEAE	N. E. Region Assam	Rest of India	China	Japan	S. E. Asia	Africa	America	Australia	Europe
<i>Bulbostylis</i>	2	2	2	2	2	2	—	2	—
<i>Carex</i>	49	33	19	16	18	—	—	—	—
<i>Cyperus</i>	42	40	25	13	32	20	11	19	5
<i>Eleocharis</i>	8	8	7	6	8	6	4	4	2
<i>Eriophorum</i>	1	1	1	—	—	—	—	—	—
<i>Fimbristylis</i>	33	30	15	5	26	7	4	14	—
<i>Fuirena</i>	2	2	1	1	2	2	—	1	—
<i>Hypolytrum</i>	1	1	1	—	1	—	—	1	—
<i>Lipocarpa</i>	2	2	1	1	1	2	1	—	—
<i>Machaerina</i>	1	1	—	—	1	—	—	—	—
<i>Mapania</i>	1	1	—	—	—	—	—	—	—
<i>Rhynchospora</i>	5	5	2	3	4	3	2	3	—
<i>Scirpus</i>	12	12	7	5	9	9	1	7	4
<i>Scleria</i>	14	12	11	8	12	4	1	7	—
<b>TOTAL</b>	<b>173</b>	<b>150</b>	<b>92</b>	<b>60</b>	<b>116</b>	<b>55</b>	<b>24</b>	<b>58</b>	<b>11</b>

## CYPERACEAE OF NORTH EAST INDIA

*Perennial* or *annual*, grass-like or rush-like herbs. *Rhizomes*, if present, monopodial or sympodial, short or long. *Stems* usually trigonous or triquetrous, sometimes 3-winged, 4-5-angled, terete or compressed, solid or rarely hollow, usually nodeless below the inflorescence. *Leaves* all clustered at the base, or some or all scattered all along the stem, usually 3-, sometimes 2-ranked, setaceous, linear or lanceolate, or absent; sheaths usually closed, sometimes open; ligules usually absent, sometimes a fringe of hairs or a short membrane. *Inflorescence* anthelate (umbellate), paniculate, racemose, spicate, fasciculate, capitate, or reduced to a solitary spikelet, subtended by one-several foliaceous or setaceous bracts; spikelets compressed, polygonal or terete; rachilla persistent or caducous; glumes (scales or floral bracts) few to many, distichous, sub-distichous or spiral, persistent or acropetally caducous, lower one-few empty. *Flowers* minute, solitary in the axils of the glumes, sessile or subsessile, bisexual, or when unisexual the plants monoecious (rarely dioecious); perianth absent, or

of bristles, scales or hairs; stamens 1-3 (rarely more); filaments usually flattened; anthers basifixed, dehiscing by longitudinal slits; connective sometimes produced to form an anther crest and/or spurred at the base; ovary superior, usually 2-3-carpellate, unilocular, sometimes surrounded by a prophyll (*perigynium*, *utricle*); ovule solitary, basal, erect, anatropous; styles sometimes thickened at the base, the thickened part whether or not articulated with the ovary; stigmas 2-3 (rarely more, or obscure). *Nuts* (achenes) sessile or stipitate, sometimes seated on a disk, usually 2-3-angled, sometimes beaked by the persistent style-base, smooth or variously sculptured; seed erect; embryo small; endosperm mealy or fleshy.

Holtum (in *Bot. Rev.* 14: 525-541. 1948), Koyama (in *J. Fac. Sc. Tokyo* III. 8: 37-64. 1961), Kern (in Steenis, *Fl. Males.* ser. I. 7: 444-451. 1974), Eiten (in *Ann. Miss. Bot. Gard.* 63: 81-199. 1976) and Rao & Verma (in *Rec. Bot. Surv. Ind.* 21: 209-220. 1981) may be consulted for detailed discussion on morphology.

- |                                                                                                                                                                                                                          |     |               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---------------|
| 1a. Leaves 2-6 cm broad. Inflorescence capitate; glumes 10-15 mm long                                                                                                                                                    | ... | MAPANTIA 12   |
| 1b. Leaves absent or up to 2 cm broad, or if broader (spp. of <i>Rhynchospora</i> , <i>Scirpus</i> , <i>Scleria</i> & <i>Hypolytrum</i> ) the inflorescence not capitate. Inflorescence various; glumes 0.7-6.5 mm long. |     |               |
| 2a. Perianth present, of six bristles divided to the base into numerous white hairs, long exserted, particularly in fruits, thus making the spikelets comose                                                             | ... | ERIOPHORUM 6  |
| 2b. Perianth absent, or if present, of a few undivided scales or bristles, not or rarely exserted ( <i>Scirpus asiaticus</i> ).                                                                                          |     |               |
| 3a. Inflorescence pseudolateral because of the solitary erect bract appearing as though a continuation of the stem                                                                                                       | ... | SCIRPUS 5     |
| 3b. Inflorescence terminal, or terminal and axillary, with one to several foliaceous or setaceous bracts.                                                                                                                |     |               |
| 4a. Flowers unisexual; nuts enclosed within a utricle                                                                                                                                                                    | ... | CAREX 14      |
| 4b. Flowers bisexual or unisexual; nuts not enclosed within a utricle.                                                                                                                                                   |     |               |
| 5a. Inflorescence paniculate or spicate. Flowers all unisexual. Nuts borne on a hypogynous disk                                                                                                                          | ... | SCLERIA 13    |
| 5b. Inflorescence paniculate, anthelate, capitate, or reduced to a solitary spikelet. Flowers almost all bisexual. Nuts not borne on a hypogynous disk.                                                                  |     |               |
| 6a. Perianth present.                                                                                                                                                                                                    |     |               |
| 7a. Perianth of only scales or of scales alternating with bristles.                                                                                                                                                      |     |               |
| 8a. Inflorescence capitate                                                                                                                                                                                               | ... | LIPOCARPHA 8  |
| 8b. Inflorescence paniculate.                                                                                                                                                                                            |     |               |
| 9a. Leaves 25-120 cm long, glabrous. Perianth scales oblanceolate                                                                                                                                                        | ... | HYPOLYTRUM 11 |
| 9b. Leaves 5-26 cm long, hairy. Perianth scales subquadrate                                                                                                                                                              | ... | Fuirena 7     |

- 7b. Perianth of only bristles.
- 10a. Leaves all reduced to bladeless sheaths or sometimes the uppermost few with short apicula. Inflorescence reduced to a solitary, rarely 2-3 spikelets (*E. congesta*) ... ELEOCHARIS 2
- 10b. Leaves at least some with well developed blades. Inflorescence paniculate or anthelate, bearing few to many spikelets.
- 11a. Nuts beaked by the persistent style-base ... RHYNCHOSPORA 9
- 11b. Nuts not beaked by the style-base ... SCIRPUS 5
- 6b. Perianth absent.
- 12a. Inflorescence paniculate.
- 13a. Stems spongy. Leaves 4-7 mm broad ... MACHAERINA 10
- 13b. Stems not spongy. Leaves setaceous ... RHYNCHOSPORA 9
- 12b. Inflorescence anthelate, capitate, or reduced to a solitary spikelet.
- 14a. Style-base persisting on the nut like a beak or a button.
- 15a. Leaves all reduced to bladeless sheaths. Inflorescence reduced to a solitary spikelet ... ELEOCHARIS 2
- 15b. Leaves at least some with well developed blades. Inflorescence anthelate or capitate, bearing few to many spikelets.
- 16a. Style-base persisting as a conspicuous beak ; stigmas 2. Nuts lenticular ... RHYNCHOSPORA 9
- 16b. Style-base persisting as a minute button ; stigmas 3. Nuts trigonous ... BULBOSTYLIS 4
- 14b. Style-base not persisting on the nut.
- 17a. Stems sympodially branched ... SCIRPUS 5
- 17b. Stems not branched.
- 18a. Glumes spiral, distichous or sub-distichous. Styles articulated with the ovary, usually dilated at the base and usually fimbriate ... FIMBRISTYLIS 3
- 18b. Glumes distichous, rarely (in *C. michelianus*) spiral. Styles continuous with the ovary, neither dilated at the base nor fimbriate ... CYPERUS 1

## 1. CYPERUS L.

Sp. Pl. 44. 1753 *et* Gen. Pl. ed. 5. no. 61. 1754, *sensu amplo* ; Kern. in Fl. Males. ser. I. 7 : 592-661. 1974. *Kyllinga* Rottb. Descr. *et* Icon. 12. 1773, *nom. cons.* *Mariscus* Vahl, Enum. Pl. 2 : 372. 1806, *nom. cons.* *Pycneus* P. Beauv. Fl. Oware 2 : 48. t. 86. 1807. *Torulinum* Desv. in Ham. Prodr. Pl. Ind. Occ. 15. 1825. *Courtoisia* Nees in Linnaea 9 : 286. 1834. *Juncellus* (Griseb.) Clarke in Hook. f. Fl. Brit. Ind. 6 : 594. 1893.

*Perennial* or *annual* herbs. *Rhizomes*, if present, short or long creeping. *Stems* usually trigonous or triquetrous, sometimes terete. *Leaves* mostly clustered at the base, lowermost or sometimes all reduced to bladeless sheaths. *Inflorescence* anthe-

late or capitate ; bracts usually several, forming an involucre, outermost longest, inner gradually shorter ; spikelets sessile or subsessile, digitately or spicately arranged, linear, lanceolate, ovate or oblong, compressed or subcylindric, one-many-flowered ; rhachilla sometimes winged by the persistent decurrent glume bases ; glumes alternate, distichous or rarely spiral, navicular, lower 1-2(-4) empty. *Flowers* all bisexual or upper one-few male or barren ; perianth absent ; stamens 1-3 ; filaments slender, flat ; anthers linear-oblong ; styles uniformly slender, continuous with the ovary, caducous ; stigmas 2-3. *Nuts* ellipsoid-obovoid, lenticular, trigonous or triquetrous.

- 1a. Styles entire or 3-notched. Nuts with a stipe about as long as the main body, corky thickened on the angles ... *C. cephalotes* 13
- 1b. Styles deeply cleft into 2-3 stigmas. Nuts sessile or shortly stipitate, not or rarely (*C. platystylis*) thickened on the angles.
- 2a. Nut-angles corky thickened ... *C. platystylis* 14
- 2b. Nut-angles not thickened.
- 3a. Styles bifid. Nuts lenticular.
- 4a. Inflorescence capitate ; glumes spiral ... *C. michelianus* 12
- 4b. Inflorescence capitate or anthelate ; glumes distichous.
- 5a. Inflorescence capitate, of 1-5 glomerules ; spikelets numerous, crowded, each maturing a solitary nut.
- 6a. Central glomerule of the inflorescence cylindrical, glistening white. Nuts black ... *C. sesquiflorus*
- 6b. Central glomerule of the inflorescence ovoid-subglobose, greenish. Nuts brown. var. *subtriceps* 1
- 7a. Rhizomes 1-5 cm long. Glumes closely red-dotted throughout ; keel with a cristate or erose-dentate wing in the upper half ... *C. kyllingia* 3
- 7b. Rhizomes 3-40 cm long. Glumes not or sparsely brownish striolate or dotted ; keel not winged, sometimes spinulose ... *C. brevifolius* 2
- 5b. Inflorescence anthelate or capitate ; spikelets few-many, each maturing several nuts.
- 8a. Spikelets digitate ; glumes mucronate-aristate, 1.0-1.5 mm long. Nuts ca 0.5 mm long ... *C. pumilus* 7
- 8b. Spikelets spicate ; glumes muticous-mucronulate ; glumes and nuts frequently larger.
- 9a. Epidermal cells of the nut longitudinally stretched, linear-oblong ; nuts wrinkled by wavy or broken transverse lines.
- 10a. Spikelets linear, ca 2 mm broad, suberect even in fruit ; glumes ca 2 mm long, mucronulate, stramineous-yellowish ... *C. substramineus* 4
- 10b. Spikelets oblong-lanceolate, 3-4 mm broad, finally spreading ; glumes 2.5-3.5 mm long, muticous, fulvous, castaneus, or purplish ... *C. diaphanus* var. *latespicatus* 5
- 9b. Epidermal cells of the nut isodiametric, roundish or hexagonal ; nuts not wrinkled.
- 11a. Spikelets 4-5 mm broad ; glumes 3.5-4.0 mm long. Stamens 3, style, including the stigmas, 6-9 mm long ... *C. unioides* 8
- 11b. Spikelets 1.5-3.0 mm broad ; glumes 1.5-2.5 mm long. Stamens 1, 2, or 3 ; style usually shorter.
- 12a. Stem mostly decumbent and rooting at the lower nodes. Leaves at the base of the stem and a few upwards also. Spikelets oblong ; glumes broadly ovate, with arcuate keel, and usually with a depression on either side. Nuts obovate-suborbicular ... *C. sanguinolentus* 6
- 12b. Stem always erect. Leaves only at the base of the stem. Spikelets linear-lanceolate ; glumes oblong-lanceolate with straight keel, without any depression on the sides. Nuts linear-oblong or narrowly obovate.
- 13a. Stamen 1. Nuts with a median, longitudinal depression on either side ... *C. sulcinus* 10
- 13b. Stamens 1 or 2. Nuts with flat or convex sides.
- 14a. Leaves flat. Spikelets gradually tapering to an acute apex ; rhachilla narrowly winged ; glumes acute. Nuts linear oblong subtruncate at the top ... *C. polystachyos* 9
- 14b. Leaves canaliculate. Spikelets parallel-sided ; rhachilla wingless ; glumes obtuse. Nuts elliptic-narrowly obovate, not truncate ... *C. flavidus* 6

- 3b. Styles trifid. Nuts trigonal.
- 15a. Rhachilla of the spikelets caducous, the spikelets thus falling off as a whole along with the persistent glumes ; each spikelet maturing only 1-4 nuts ( except *C. compactus* ).
- 16a. Anthela compound or decompound ; spikes globose.
- 17a. Spikelets linear-lanceolate, 6-12 mm long, each maturing 4-14 nuts ; glumes muticous ; keel not winged ... *C. compactus* 41
- 17b. Spikelets elliptic-oblong, 3-4 mm long, each maturing 1-2 nuts ; glumes mucronate ; keels spongy-winged ... *C. pseudokyllingoides* 42
- 16b. Anthela simple ; spikes cylindrical.
- 18a. Rhizome emitting slender stolons clothed with lanceolate scales. Spikelets maturing a solitary nut ... *C. paniceus* 38
- 18b. Rhizome not stoloniferous. Spikelets maturing a solitary, or 2-4 nuts.
- 19a. Spikes sessile or peduncled, somewhat obovoid-cylindrical, attenuated at the base with ascending spikelets ; glumes subchartaceous ... *C. cyperinus* var. *bengalensis* 39
- 19b. Spikes peduncled, exactly cylindrical with divaricate spikelets ; glumes membranaceous ... *C. cyperoides* 40
- 15b. Rhachilla of the spikelets persistent, the glumes acropetally caducous ; each spikelet maturing six-many nuts (except *C. iria*).
- 20a. Annual herbs. Inflorescence capitate ; glumes spiral ... *C. michelianus* 12
- 20b. Annual or perennial herbs. Inflorescence capitate or anthelate ; glumes distichous.
- 21a. Annual herbs. Glumes long aristate, the arista about half to as long as the main body ... *C. cuspidatus* 15
- 21b. Annual or perennial herbs. Glumes muticous or mucronate.
- 22a. Inflorescence capitate.
- 23a. Spikelets 10-35 mm long, 3-6 mm broad ; glumes 3-5 mm long. Nuts less than half as long as the glumes.
- 24a. Spikelets strongly compressed ; rhachilla ca 1 mm broad ; stigmas ca 2 mm long ... *C. niveus* 21
- 24b. Spikelets compressed-quadrangular ; rhachilla ca 0.2 mm broad ; stigmas ca 0.3 mm long ... *C. compressus* 24
- 23b. Spikelets 3-8 mm long, 1-2 mm broad ; glumes 0.6-0.8 mm long. Nuts more than half as long as the glumes ... *C. difformis* 16
- 22b. Inflorescence anthelate with distinct rays.
- 25a. Spikelets in much elongated spikes, the rhachis several times longer than the spikelets.
- 26a. Rhachis pilose ... *C. pilosus* 29
- 26b. Rhachis glabrous.
- 27a. Rhachilla wingless, glumes broadly obovate to sub-orbicular, bright yellow. Nuts as long as the glumes ... *C. iria* 25
- 27b. Rhachilla winged ; glumes linear-lanceolate or ovate-oblong, red-brown. Nuts frequently shorter than the glumes.
- 28a. Glumes in the upper half with a broad hyaline margin, soon incised at the tip, mucronulate somewhat below the apex ... *C. nutans* 27
- 28b. Glumes not hyaline-margined, with entire tip, muticous or with a short apical mucro.
- 29a. Spikelets strongly compressed ; glumes with a short but distinct mucro ... *C. exaltatus* 36
- 29b. Spikelets subterete or slightly compressed ; glumes muticous or apiculate ... *C. digitatus* 37

- 25b. Spikelets digitate or shortly spicate, the rhachis obscure or much shorter than to about as long as the spikelets.
- 30a. Spikelets digitate, 3-20 mm long.
- 31a. Spikelets mostly pedicelled, sometimes a few sessile or subsessile intermixed ... *C. multispicatus* 23
- 31b. Spikelets all sessile.
- 32a. Glumes mucronate.
- 33a. Leaves 1.5-4.0 mm broad. Bracts shorter than to scarcely equalling the anthela. Nuts 0.4-0.5 mm long ... *C. halpan* 19
- 33b. Leaves 5-20 mm broad. Lower bracts much exceeding the anthela. Nuts 1.0-1.5 mm long... *C. diffusus* 22
- 32b. Glumes muticous.
- 34a. Spikelets numerous together. Nuts equalling the glumes ... *C. difformis* 16
- 34b. Spikelets 2-15 together. Nuts much shorter than the glumes.
- 35a. Bracts lower exceeding the anthela. Nuts oblong-ellipsoid, half to three-fifth as long as glumes.
- 36a. Glumes 1.5-2.0 mm long, tips erect or excurved ... *C. silletensis* 1
- 36b. Glumes *ca* 1 mm long, tips incurved when dry ... *C. pulcherrimus* 18
- 35b. Bracts all shorter than the anthela. Nuts broadly obovoid or subglobose, *ca* one-third as long the glumes.
- 37a. Mature spikelets with ascending and appressed glumes, the rhachilla thus not visible. Anther crest setose. Mature nuts yellowish, 0.4-0.5 mm long ... *C. halpan* 19
- 37b. Mature spikelets with widely spread glumes, the rhachilla thus distinctly visible. Anther crest smooth. Mature nuts marble white, 0.2-0.3 mm long ... *C. tenuispica* 20
- 30b. Spikelets shortly spicate, 6-60 mm long
- 38a. Anthela simple; glumes mucronate with up to 1 mm long mucro. Stigmas *ca* one-sixth as long as the style .. *C. compressus* 24
- 38b. Anthela simple or compound; glumes muticous or mucronulate. Stigmas *ca* as long as or longer than the style.
- 39a. Rhachis hispidulous; glumes scabrid on the keel ... *C. babakan* 30
- 39b. Rhachis glabrous; glumes smooth on the keel.
- 40a. Stems stout, 4-8 mm thick in the middle, terete in the lower part, trigonous towards the top. Leaves absent or solitary. Anthela compound or decompound.
- 41a. Bracts all shorter than the anthela ... *C. corymbosus* 31
- 41b. Bracts lower much exceeding the anthela ... *C. pangorei* 33
- 40b. Stems slender or stout, 1-5 mm thick in the middle, trigonous or triquetrous throughout. Leaves two-several. Anthela simple to supra-decompound.



- 42a. Spikelets almost terete, *ca* 1 mm broad ; glumes 1.5-2.0 mm long.  
Nuts *ca* three-fourth as long as the glumes ... *C. distans* 26
- 42b. Spikelets distinctly compressed, 1.5-3.0 mm broad ; glumes 3.0-4.5 mm long. Nuts less than half as long as the glumes.
- 43a. Rhizome bearing wiry stolons ending in subglobose or ellipsoid tubers. Spikelets strongly compressed ; glumes deep reddish brown ... *C. rotundus* 35
- 43b. Rhizome not bearing stolons. Glumes yellowish, or if brownish, the spikelets compressed-quadrangular.
- 44a. Leaves scarcely one-third as long as the stem, 1.5-2.5 mm broad. Bracts shorter than the anthela ... *C. macer* 32
- 44b. Leaves more than half as long as the stem, 2-10 mm broad. Bracts equalling or exceeding the anthela.
- 45a. Rhachilla green ; glumes 4.0-4.5 mm long, stramineous with scattered ferruginous dots. Nuts ellipsoid-oblong ... *C. thomsonii* 28
- 45b. Rhachilla black ; glumes 3-4 mm long, uniformly stramineous or fulvous. Nuts obovoid ... *C. tenuiculmis* 34

1. *C. sesquiflorus* (Torr.) Mattf. *et* Kuekenth. var. *subtriceps* (Nees) Koyama in quarterly Journ. Taiwan Mus. 14 : 191. 1961. *Kyllinga cylindrica* var. *subtriceps* Nees in Wt. Contr. Bot. Ind. 91. 1834. *C. sesquiflorus* var. *cylindricus* Kuekenth. in Engl. Pflanzenr. heft 101 : 593. 1936. *K. cylindrica* Nees, l.c. ; Clarke in Hook. f. Fl. Brit. Ind. 6 : 588. 1893.

*Perennials*, 2.0-4.5 dm high. *Rhizomes* simple, or sometimes branched, 1-4 cm long, 2.0-3.5 mm thick, aromatic ; scales ultimately fibrous. *Stems* solitary or 2-3, erect or nodding, slender, trigonous, 1.0-1.5 mm thick. *Leaves* 3-7, half as long as to equalling the stem, 2-3 mm broad, longest 15-20 cm ; margins and nerves beneath scaberulous in the upper part. *Inflorescence* capitate ; bracts 3-5, foliaceous, all spreading when young, lower 1-2 completely deflexed with age, longest 7-15 cm ; spikes usually solitary, sometimes with two smaller additional spikes, cylindric, white, or ultimately black in fruits ; central spike 7-10 × 4-6 mm ; spikelets numerous, congested, elliptic-lanceolate, 2.5-3.0 × 1.2 mm, 1-flowered ; glumes 2.0-2.5 mm long, keeled, white-hyaline, 7-9-striate. *Stamens* 2 ; anthers *ca* 0.7 mm long, crest ovate ; styles deeply bifid. *Nuts* obovoid, lenticular *ca* 1.5 × 1.0 mm, mature glossy black (Figs. 1-1b).

*Fls. & Frts.* : July-Sept. Sporadic on roadsides and wastelands, on sandy loam to gravelly substratum, often in association with *C. brevifolius* but never dense ; 1300-2000 m.

The very short rhizomes, white cylindric heads and deflexed bracts are quite characteristic.

ASSAM † *s.l.* MEGHALAYA † K. & J. Hills.

2. *C. brevifolius* (Rottb.) Hassk. Cat. Hort. Bogor. 24. 1844. *Kyllinga brevifolia* Rottb. Descr. *et* Icon. 13. t. 4. f. 3. 1773.

*Perennials*, 0.3-9.0 dm high. *Rhizomes* short or long, creeping, usually simple, sometimes branched, 3-40 cm long, 1.5-2.0 mm thick, pinkish to purplish black ; scales ultimately fibrous. *Stems* 5-20 together, 1-3 cm apart, trigonous, 1.0-1.5 mm thick. *Leaves* 1-5, much shorter than to equalling the stem, 4-20 cm long, 1.5-3.5 mm broad. *Inflorescence* capitate ; bracts usually 3, sometimes 4, foliaceous, stellately spreading or sometimes ultimately deflexed, longest 3-20 cm ; spikes solitary or sometimes with 2-3 smaller additional lateral spikes, 3-10 mm broad, flowering green, fruiting stramineous-brownish ; spikelets numerous, congested, elliptic-lanceolate, 2.5-3.5 × 1.0 mm, 1-flowered ; glumes keeled, mucronate ; keel with few to several spinules only towards the base or up to two-third way up ; sides pale greenish or sometimes brown striolate or dotted. *Stamens* usually 3, sometimes 1-2 ; anthers 0.7 mm long, crest ovate, papillose ; styles deeply bifid. *Nuts* obovoid or oblong-obovoid, 1.0-1.5 × 0.7 mm, yellowish or ultimately brown.

*Fls. & Frts.* : March-Nov. Very common in

wastelands, on dry to moist-sandy alluvium to gravely substratum, often forming dense patches; 100-2000 m.

Recognised by its usually long creeping rhizomes bearing several stems in linear succession and green globose heads.

ARUNACHAL PRADESH † Kameng; Subansiri; Tirap. ASSAM † Cachar; Darrang; Kamrup; Lakhimpur; Nowgong; Sibsagar. MEGHALAYA † Garo Hills; K. & J. Hills. MIZORAM. NAGALAND.

3. *C. kyllingia* Endl. Cat. Hort. Acad. Vindob. 1 : 94. 1842; Kern in Steenis, Fl. Males. ser. I. 7 : 659. 1974. *C. kyllingia* f. *subtriceps* Kuekenth. in Engl. Pflanzenr. heft 101 : 608. 1936. *Scirpus cephalotes* Jacq. Vindob. 1 : 42. t. 97. 1770; non *Cyperus cephalotes* Vahl, 1806. *Kyllinga monocephala* Rottb. Descr. et Icon. 13. t.4. f.4. 1773 p.p.; Clarke in Hook. f. Fl. Brit. Ind. 6 : 588. 1893; non *C. monocephalus* Roxb. 1832. *K. monocephala* var. *subtriceps* Kunth, Enum. Pl. 2 : 130. 1837. *K. nemoralis* Dandy ex Hutch. et Dalz., Fl. West Trop. Afr. 2 : 487. 1936. *Thryocephalon nemorale* J. R. et. G. Forst., Char. Gen. 129. t. 65. 1776; non *C. nemoralis* Cherm. 1921.

*Perennials*, 0.8-3 (-4.5) dm high. *Rhizomes* 1-5 cm long, 1.0-2.5 mm thick, aromatic. *Stems* usually 2-3, sometimes up to 8 in linear succession, rather approximate, compressed-triquetrous, 1.0-1.5 mm thick. *Leaves* several, shorter than to as long as the stem, 1.5-3.5 (-5.0) mm broad. *Inflorescence* capitate; bracts 3-4, foliaceous, spreading to reflexed, longest 7-18 (-30) cm long; spikes solitary (-four), subglobose, 5-10 mm broad, greenish white in flowers, brownish in fruits; spikelets numerous, congested, ovate-elliptic, 2.5-3.0 × 1 mm, 1-2-flowered, the upper flower sometime male; glumes keeled, mucronulate, 5-7-nerved, conspicuously red-dotted all over; keel lunately crested in upper half; crest ciliate-spinulose, red dotted. *Stamens* 3; anthers 0.5-1.0 mm long, crest ovate; styles deeply bifid. *Nuts* obovoid-oblong, lenticular, 1.2-1.5 × 0.5 mm, blackish brown.

*Fls. & frts.* : June-Sept. Along forest margins, streams and in wastelands, usually in moist places; 100-1000 m.

In the field it appears similar to *C. brevifolius* though its heads are rather whitish and it lacks the usually long creeping rhizome of the later. The conspicuously red-dotted glumes, with lunate crest in the upper half are distinctive.

ASSAM; Lakhimpur; Sibsagar. MEGHALAYA † K. & J. Hills. MIZORAM.

4. *C. substramineus* Kuekenth. in Engl. Pflanzenr. heft 101 : 398. 1936. *C. stramineus* Nees in Wt. Contr. Bot. Ind. 74. 1834; non Desf. ex Link, 1820. *Pycneus stramineus* Clarke in Hook. f. Fl. Brit. Ind. 6 : 589. 1893.

*Annual*, tufted, 5-32 cm high. *Stems* slender, subtrigonal. *Leaves* 3-5, shorter than to equalling the stem, 1.5-2.0 mm broad. *Anthela* simple, contracted or evolute; bracts 2-3, foliaceous, suberect, lowest 5-7 cm long; rays 1-3, longest 0.5-1.5 cm long; spikelets 2-6 together, suberect, linear, compressed, 8-35 × 2 mm, 14-80-flowered; rachilla broad, wingless; glumes closely imbricating, ovate, 2 mm long, mucronulate, stramineous; keel 3-nerved; margins hyaline. *Stamens* 2; anthers 0.6 mm long, crest ovate, red; styles long, deeply bifid. *Nuts* obovoid, lenticular, 1.0-1.2 mm long, apiculate, blackish brown, with whitish transversely undulating lines (Figs. 2-2a).

*Fls. & frts.* : Aug.-Oct. In moist sandy alluvium, along ponds and streams; 100-1700 m.

ASSAM † Sibsagar. MEGHALAYA † K. & J. Hills. MIZORAM.

5. *C. diaphanus* R. & S. var. *latespicatus* (Boeck.) Kern in Steenis, Fl. Males. ser. I. 7 : 653. 1974. *C. latespicatus* Boeck. in Flora 42 : 441. 1859. *Pycneus latespicatus* Clarke in Hook. f. Fl. Brit. Ind. 6 : 590. 1893.

*Annual*, tufted, 0.6-4.0 dm high. *Stems* rigid, subtrigonal, 1.0-1.5 mm thick. *Leaves* 3-5, half to three-fourth as long as the stem, 2-3 mm broad. *Anthela* simple, contracted or evolute; bracts 2-4 foliaceous, spreading, lowest 5-11 cm long; rays 1-4, longest 2-7 cm; spikelets congested, 3-6 together, spreading, oblong-lanceolate, compressed, 10-17 × 3-4 mm, 16-30-flowered; rachilla wingless; glumes tightly imbricating,



Figs. 1-6 : 1-1b. *Cyperus sesquiflorus* var. *subtriceps* (Nees) Koyama. 2-2a. *C. substramineus* Kuekenh. 3-3b. *C. cephalotes* Vahl. 4. *C. platistylis* R. Br. 5-5a. *C. tenuiculmis* Boeck. 6-6b. *C. pilosus* Vahl.

ovate-oblong, 2.5-3.5 mm long, muticous, fulvous, castaneus or purplish; keel 3-nerved; margins undulating. *Stamens* 2; anthers *ca* 0.7 mm long, crest ovate; styles long, deeply bifid. *Nuts* stipitate, broadly obovoid, lenticular, *ca* 1.5 mm long, apiculate, blackish, transversely undulately zonate.

*Fls. & frts.* : July-Oct. In moist places along streams and ditches; a common weed in the paddy-fields of K. & J. Hills; 1000-3000 m.

ARUNACHAL PRADESH : Kameng. MEGHALAYA : K. & J. Hills.

6. *C. sanguinolentus* Vahl, Enum. Pl. 2 : 354. 1806 ssp. *sanguinolentus*. *Pycnus sanguinolentus* Nees in Linnaea 9 : 283. 1834; Clarke in Hook. f. Fl. Brit. Ind. 6 : 590. 1893.

*Annuals* or *perennials*, 0.6-9.0 dm high. *Rhizomes*, when present, short or sometimes creeping to 15 cm, *ca* 2 mm thick. *Stems* erect or decumbent at the base, compressed-trigonal, 1-2 mm thick. *Leaves* several clustered at the base and a few also scattered upwards up to middle of the stem, shorter than to equalling the stem, 1.5-4.0 mm broad. *Anthela* evolute or capitate contracted; bracts 2-5 foliaceous, spreading, lowest 5-20 cm long; rays, when present, 1-3, suberect, usually 1-2 cm, sometimes up to 4 cm long; spikelets congested, 3-21 together, diverging, ovate or oblong-lanceolate, compressed, 5-25 mm long, 2-3 mm broad, 8-40-flowered; rhachilla wingless; glumes subclavately imbricating, ovate, 2.2-2.5 mm long, obtuse, with a distinct depression and a marginal sanguineous band on both sides; keel green, 3-5-nerved. *Stamens* 3; anthers 0.5 mm long; styles 1.5-2.0 mm long, bifid. *Nuts* broadly obovoid to suborbicular, 1.1-1.3 × 0.8-1.0 mm, apiculate, blackish-brown.<sup>1</sup>

*Fls. & frts.* : April-Jan. Common on wastelands and river-banks, on moist sandy, sandy loam or clayey soil; a common weed in paddy-fields; 100-1600 m.

ARUNACHAL PRADESH : Subansiri. ASSAM : Goalpara; Kamrup; Nowgong. MEGHALAYA : K. & J. Hills.

var. *micronux* (Clarke) Kuekenh. in Engl. Pflanzenr. heft 101 : 387. 1936. *C. eragrostis* var.

BSI—2

*micronux* Clarke in J. Linn. Soc. (Bot.) 21 : 59. 1884.

*Glumes* *ca* 2 mm long, cinnamomeus-fuscous. *Styles* *ca* 3 mm long. *Nuts* smaller, *ca* 0.5 mm long.

ASSAM : s. l., Wallich 3354 B (CAL).

ssp. *melanocephalus* (Miq.) Kern in Reinwardtia 3 : 54. 1954. *C. melanocephalus* Miq. Fl. Ind. Bat. 3 : 259. 1856.

*Leaves* 1-2 mm broad. *Anthelas* capitate contracted; bracts usually erect or suberect; glumes *ca* 2.3 mm long, not sulcate, dark castaneous to blackish or sometimes brownish. *Stamens* 2; styles *ca* 1.7 mm long. *Nuts* 1.2-1.5 mm long.

*Fls. & frts.* : May-Sept. In swamps; 1000-1700 m.

ARUNACHAL PRADESH : Kameng. MANIPUR. MEGHALAYA : K. & J. Hills. NAGALAND.

7. *C. pumilus* L. Cent. Pl. 2 : 6. 1756. *C. nitens* Retz. Observ. 5 : 13. 1788. *Pycnus nitens* Nees in Linnaea 9 : 283. 1834; Clarke in Hook. f. Fl. Brit. Ind. 6 : 591. 1893. *P. pumilus* Domin in Bibl. Bot. heft 85 : 417. 1915.

*Annual*, tufted, 1-25 cm high. *Stems* compressed-trigonal, *ca* 1 mm thick. *Leaves* few, canaliculate, usually half to three-fourth as long as or sometimes exceeding the stem, 1-2 mm broad. *Anthela* simple or subcompound, contracted or evolute; bracts 3-5 foliaceous, spreading, lowest 5-18 cm long; rays 2-6, very short or up to 3 cm long, diverging; spikelets *ca* 10-40 congested together in subglobose heads, linear-oblong, compressed, 5-13 × 1-2 mm, 8-20-flowered; rhachilla hyaline margined; glumes tightly imbricating, ovate, 1.0-1.5 mm long, mucronate, truncate on shoulders, uniformly stramineous or sometimes brown striolate; keel 3-5-nerved; mucro erect or subcurved, *ca* 0.2 mm long. *Stamens* 1-2; anthers 0.5 mm long, crest ovate; styles deeply bifid. *Nuts* shortly stipitate, narrowly obovoid, lenticular, *ca* 0.5 mm long, apiculate, blackish brown.

*Fls. & frts.* : June-Nov. In moist places, sometimes as a weed in paddy-fields; 100-1300 m.

ASSAM : Cachar ; Goalpara ; Kamrup. MEGHALAYA : K. & J. Hills. MIZORAM.

8. *C. flavidus* Retz. Observ. 5 : 13. 1789 ; Korlahalli in Bull. Bot. Surv. Ind. 9 : 236. 1968 ; *non* Auctt. *C. globosus* All. Fl. Pedem. 49. 1789 ; *non* Forsk. 1775. *C. capillaris* Roxb. Fl. Ind. 1 : 198. 1820. *C. strictus* Roxb. l. c. 203. *C. nilagiricus* Steud. Syn. 2 : 2. 1854. *C. globosus* var. *khasiana* et var. *nilagiricus* Clarke in Journ. Linn. Soc. (Bot.) 21 : 47-48. 1884. *C. flavidus* var. *khasiana* Korlahalli, l. c. 273. *Pycreus globosus* Reichb. Fl. Germ. Excurs. 2 : 140. 1830. *P. capillaris* Nees in Linnaea 9 : 283. 1834.

*Annual* or *perennial*, tufted, 1-8 dm high. *Rhizome*, if present, short, woody. *Stems* slender, trigonous, 1-2 mm thick. *Leaves* 1-4, usually shorter than, sometimes equalling the stem, 1-2 mm broad ; lower sheaths reddish brown. *Anthela* simple (sometimes subcompound) ; lax or dense, evolute or capitately contracted ; bracts 2-4 foliaceous, spreading, lower exceeding the anthela ; rays 1-4, up to 11 cm long ; spikelets numerous, congested, linear, compressed, 8-35 × 1.5-3.0 mm, 14-54-flowered ; rhachilla wingless, internodes *ca* 0.6 mm long ; glumes closely imbricating, ovate-oblong, 1.5-2.5 mm long, muticous, glossy, pale brown to chestnut ; keel green, 3-nerved ; margins hyaline. *Stamens* 2 ; anthers *ca* 1 mm long, crest ovate ; styles long, deeply bifid. *Nuts* obovoid, lenticular, 0.8-1.2 mm long, apiculate, blackish-brown.

*Fls. & frts.* : June-Sept. In open or shady, moist to swampy places, in wastelands and paddy-fields ; 1200-2000 m.

ARUNACHAL PRADESH : Kameng. MEGHALAYA : K. & J. Hills. NAGALAND.

var. *erectus* (Clarke) Korlahalli, l. c. *Pycreus globosus* var. *erectus* Clarke in J. Linn. Soc. (Bot.) 34 : 15. 1898 et 36 : 205. 1903. *C. globosus* var. *erectus* Kuekenh. in Engl. Pflanzenr. heft 101 : 356. 1936.

*Anthela* simple or compound ; rays 1-10 ; spikelets more densely flowered, 7-16 × 1.5-2.0 mm, cinnamonous to purplish with age, 20-40-flowered ; internodes of the rhachilla 0.3-0.4 mm long ; glumes 1.7-2.0 mm long.

*Fls. & frts.* : April-May ; 300-1200 m.

ASSAM : Lakhimpur. MEGHALAYA : K & J. Hills. NAGALAND.

9. *C. polystachyos* Rottb. Descr. et Icon. 39. t. 21. f. 1. 1773. *Pycreus polystachyos* P. Beauv. Fl. de Oware 2 : 48. t. 86. f. 2. 1807.

*Annual* or sometimes *perennial*, tufted, 1-7 dm high. *Stems* slender or rigid, compressed-trigonous, 1-2 mm thick (sometimes almost absent). *Leaves* 5-9, half to three-fourth as long as the stem, 2-4 mm broad, greyish green. *Anthela* compound, evolute or capitately contracted ; bracts 3-6 foliaceous, lowest 3.5-20.0 cm long ; rays 1-7, longest up to 4 cm long ; spikelets numerous, congested, suberect to spreading, linear, 8-25 × 1.5 mm, 16-50-flowered ; rhachilla flexuous, narrowly winged ; glumes membranaceous, rather remote, ovate-lanceolate, 1.5-2.0 mm long, muticous or mucronulate, keeled, stramineous or pale ferrugineous (rarely castaneous). *Stamens* 1-2 ; anthers 0.5 mm long, crest ovate ; styles deeply bifid. *Nuts* linear-oblong, lenticular, with almost truncate shoulders, 1.0-1.2 mm long, apiculate, brown or ultimately glossy black.

*Fls. & frts.* : July. In paddy-fields, at about 100 m.

ASSAM : Cachar ; Lakhimpur.

var. *laxiflorus* Benth. Fl. Austr. 7 : 261. 1878. *Pycreus polystachyos* var. *laxiflorus* Clarke in Hook. f. Fl. Brit. Ind. 6 : 592. 1893.

*Stems* longer. *Anthela* lax ; rays 6-10 ; spikelets remote, the lower often spreading ; glumes ferrugineous.

MEGHALAYA : K. & J. Hills, s.l., Hook. f. & Thom. (n.v.).

10. *C. sulcinux* Clarke in Journ. Linn. Soc. (Bot.) 21 : 56. 1884. *Pycreus sulcinux* Clarke in Hook. f. Fl. Brit. Ind. 6 : 593. 1893.

*Annual*, tufted, 5-40 cm high. *Stems* slender, trigonous, smooth or scabrid at the top. *Leaves* few, shorter than the stem, 0.5-2.0 mm broad. *Anthela* simple, lax ; bracts 3-5 foliaceous, spreading, lowest 4-15 cm long ; rays 3-8, slender, longest 2-10 cm ; spikelets shortly spicate, 3-8 together,

ultimately divaricate or the lower even deflexed, linear-lanceolate, 1-3 cm long, *ca* 1.5 mm broad, 16-50-flowered; rhachilla flexuous, narrowly winged when young; glumes membranaceous, laxly imbricating, ovate-oblong, 1.5-2.0 mm long, keeled, mucous, ferrugineous. *Stamen* 1; anthers 0.3 mm long, crest red; styles *ca* 0.7 mm long; stigmas 2, 0.3-0.5 mm long. *Nuts* subsessile, linear-oblong, lenticular, with almost truncate shoulders and a median longitudinal depression on each face, 1.2-1.8 mm long, apiculate, smooth, blackish brown.

*Fls. & frts.* : July-Dec.; 300-1500 m.

ARUNACHAL PRADESH : Kameng. ASSAM : Cachar : Darrang. MEGHALAYA : K. & J. Hills.

11. *C. unioides* R. Br. Prodr. 216. 1810. *Pycnus angulatus* Nees in Linnaea 9 : 283. 1834. *P. unioides* Urb. Symb. Antill. 2 : 164. 1900.

*Perennial*, tufted, 3-9 dm high. *Rhizomes* short. *Stems* rigid, triquetrous, 1-2 mm thick, smooth or scabrid at the top. *Leaves* 3-5, flat or conduplicate, usually about half as long as, sometimes equalling the stem, 2-4 mm broad; margins cartilaginous, spinulous-scabrid upward. *Anthela* simple, contracted or evolute; bracts 2-4 foliaceous, spreading, lower two exceeding the anthela, lowest 12-20 cm long; rays 3-6, suberect, longest 2.5-6.0 cm; spikes broadly ovate; spikelets 4-12 together, oblong-lanceolate, compressed, 7-20(-25) × 4-5 mm, acute, 12-24 (-30)-flowered, lower diverging; rhachilla flexuous, wingless; glumes chartaceous, ovate-oblong, 3.5-4.0 mm long, acute, glossy yellowish brown; keel 3-nerved; margins white hyaline. *Stamens* 3; anthers 1.5-2.0 mm long, crest ovate; styles 6-9 mm long, bifid. *Nuts* broadly obovoid, *ca* 1 mm long, apiculate, blackish.

*Fls. & frts.* : June; at about 1300 m.

The cartilaginous leaf-margins and glossy yellowish green to brown spikelets are quite characteristic.

MEGHALAYA : K. & J. Hills.

12. *C. michelianus* (L.) Link, Hort. Bot. Berol. 1 : 303. 1827. *Scirpus michelianus* L. Sp. Pl. 52. 1753. *Isolepis micheliana* Roem. et Schult. Syst. 2 : 114. 1817.

*Annual*, tufted, 2-15 cm high. *Stems* slender, sometimes slightly curved, compressed-trigonous below, trigonous above, *ca* 1 mm thick. *Leaves* few, shorter than to slightly exceeding the stem, 1-2 mm broad. *Inflorescence* capitate, of 4-6 ovoid-subglobose, 6-15 mm broad spikes; bracts 3-8 foliaceous, dilated at the base, lowest 4-8 cm long; spikelets numerous, subterete, 3.5 × 1-2 mm, 10-16-flowered; rhachilla slender, hyaline-margined; glumes membranaceous, spiral, tightly imbricating, oblong-lanceolate, 1.5-2.0 mm long, mucronate, stramineous to sometimes purple spotted, 3-5-nerved, mucro stout, slightly excurved. *Stamens* usually 2, sometimes 1; anthers 0.3 mm long, crest obscure; styles *ca* 1 mm long; stigmas 2 (rarely 3), long. *Nuts* slightly stipitate, linear-oblong, plano-convex (or trigonous), *ca* 1 mm long, pale brown, surface cells hyaline, inflated, the nut thus appearing narrowly marginate.

*Fls. & frts.* : Dec.; at about 350 m.

The glumes are all tightly and spirally imbricating with ultimately excurved mucros. In its spiral arrangement of the glumes it shows close similarity to other genera like *Fimbristylis* Vahl and *Scirpus* L.

MEGHALAYA : Garo Hills.

13. *C. cephalotes* Vahl, Enum. Pl. 2 : 311. 1806.

*Perennial*, aquatic, floating herbs. *Stolons* long, slender, rooting at the nodes, *ca* 2 mm thick. *Stems* subcompressed, trigonous, 15-55 cm long, 1-2 mm thick. *Leaves* 2-3, rigidulous, half to two-third as long as the stem, 2.0-3.5 mm broad, keeled, greyish-green, gradually narrowed into a triquetrous scabrid tip. *Inflorescence* of 1-4 spikes, capitately contracted, globose-ovoid, 1-2 cm across; bracts 3-5, suberect or ultimately reflexed, purple striate, base dilated, margins scarious, lowest 6-13 (-30) cm long; spikelets congested, suberect to spreading, ovate-lanceolate, compressed, 4-12 × 3-4 mm, 8-22-flowered; rhachilla rigid, scarcely winged; glumes subcoriaceous, closely imbricating, ovate, acute, 3-4 mm long, faintly cellular-reticulate, keel green, 3-nerved, very sharp to narrowly winged, smooth

or scabrid, produced into a short stout mucro, sides pale to deep brown, several striate. *Stamens* 3; anthers 1 mm long; style slightly exserted, entire or 3-notched, base persisting for a long time, inflated, trigonous, scaberulous on the angles. *Nuts* stipitate, ovoid-oblong, triquetrous, *ca* 2.2 mm long including 1 mm long stipe, glossy brown; stipes at first narrowly 3-winged, ultimately corky-thickened, thickenings stramineous, subentire (Figs. 3-3b.).

*Fls. & frts.*: Dec.-April; on lake edges, 100-150 m.

Its aquatic floating habit, capitate inflorescence, subentire styles and corky stipes of the nuts are very distinctive.

ASSAM: Cachar; Darrang; Lakhimpur; Sibsagar.

**14. *C. platystylis* R. Br. Prodr. 214. 1810.**

*Perennial*, aquatic herbs. *Rhizomes* short. *Stems* triquetrous, 1-11 dm long, 3-8 mm thick, smooth or scabrid at the tip. *Leaves* few, coriaceous, transversely septate, as long as or longer than the stem, 7-12 (-20) mm broad, greyish green, margins and midrib beneath scabrid; sheaths strongly keeled. *Anthela* decompound, lax, 6-30 cm across, bracts 5-8, foliaceous, rather distant from each other, spreading to reflexed, lowest 40-80 cm long; rays 8-12, diverging, longest 3-10 cm long; spikelets in clusters of 3-8, stellately spreading, ovate-lanceolate, 6-15 (-20) × 2.5-3.0 mm, 10-40 (-50)-flowered; rhachilla wingless; glumes membranaceous, tightly imbricating, broadly ovate, 2.0-2.5 mm long, mucronate, cellular-reticulate, glossy yellowish brown, 3-nerved. *Stamens* 3; filaments ferrugineous; anthers 0.7 mm long, crest white to rose; styles flattened, fimbriate, trifid. *Nuts* liploid, trigonous, ventrally concave, dorsally convex with raised angles, 1.7-2.0 mm long, greyish brown, apiculate, the angles in mature nuts corky thickened (Fig. 4).

*Fls. & frts.*: Nov. Floating on the edges of the tanks, or in marsh; at *ca* 100 m.

ASSAM: Lakhimpur.

**15. *C. cuspidatus* Kunth in H. B. K., Nov. Gen. et Sp. 1: 204. 1815. *C. uncinatus* Clarke in**

Durand *et* Schinz. Consp. Fl. Afr. 5: 580. 1895 *et* in Journ. Linn. Soc. (Bot.) 36: 219. 1903.

*Annuals*, tufted, 1-18 cm high. *Roots* 1-3 cm deep. *Stems* slender, trigonous, *ca* 0.5 mm thick. *Leaves* 4-6, shorter than to longer than the stem, 0.5-1.0 mm broad. *Anthela* simple or compound, contracted or evolute; bracts 2-4 foliaceous, much exceeding the anthela, lowest 1.8 to 10.0 cm long; rays 1-3, suberect to spreading, up to 3 cm long, sometimes absent in depauperated plants; spikelets up to 22 together, linear, 4-12 (-20) × 1.0-1.3 mm (excl. the mucros), 10-26(-60)-flowered; rhachillas zig-zag, red-streaked, wingless; glumes obliquely spreading, scarcely imbricating, ovate, aristate, *ca* 2 mm long, usually fuscous-ferrugineous, sometimes hyaline; keel 3-nerved, aristas *ca* 1 mm long, recurved. *Stamens* (1-)2-3; anthers 0.3 mm long, crest reddish; styles 0.5 mm long; stigmas 3, *ca* 0.3 mm long. *Nuts* sessile, obovoid, trigonous, *ca* 0.8 mm long, chestnut, punctulate, apiculate.

*Fls. & frts.*: Aug.-Nov. Fairly common and frequently colonising on somewhat moist sandy to sandy-loam substratum; 100-1700 m.

ARUNACHAL PRADESH: Lohit; Tirap. ASSAM: Lakhimpur. MEGHALAYA: Garo Hills; K. & J. Hills. NAGALAND, *s.l.* (*n.v.*).

**16. *C. difformis* L. Cent. Pl. 2: 6. 1756.**

*Annuals*, tufted, 6-65 cm high. *Roots* reddish. *Stems* flaccid, compressed triquetrous, 1-3 mm thick. *Leaves* 1-3, shorter than the stem, 1.5-5.0 mm broad, rather abruptly acuminate. *Anthela* simple, evolute or almost capitately contracted; bracts 2-3 foliaceous, erect or spreading, lowest 6-25 cm long; rays 1-7, spreading, lowest 0.5-5.0 cm long; spikelets numerous together forming 5-15 mm broad subglobose heads, stellately spreading, linear-lanceolate, 3-8 × 1 mm, 12-36-flowered; rhachilla slender, wingless; glumes membranaceous, spreading, broadly obovate-orbicular with rotundate tips, 0.6-0.8 mm long, 3-nerved, mucicous or mucronulate, hyaline with a reddish brown band on each side of the midrib, sometimes discolouring, caducous. *Stamens* 1-2; anthers 0.15 mm long;

styles 0.15 mm long ; stigmas 3, *ca* 0.2 mm long. *Nuts* sessile, obovoid, trigonous, about as long as the glumes, apiculate, yellowish brown.

*Fls. & frts.* : July-Oct. ; at *ca* 100 m.

ASSAM : Goalpara.

**17. *C. silletensis*** Nees in Wt. Contr. Bot. Ind. 79. 1834.

*Annuals*, tufted, 1.5-3.0 dm high. *Stems* slender, trigonous, 1-2 mm thick. *Leaves* 4-6, usually half to two-third as long as, sometimes sub-equalling, the stem, 1.5-4.0 mm broad. *Anthela* compound, dense or somewhat open, 3-6 cm across ; bracts 4-5 foliaceous, spreading, lowest 7-12 cm long ; primary rays 4-10, up to 2.5 (-4.0) cm long, secondary up to 7 mm long ; spikelets in clusters of 5-15, lanceolate, 3-6 × 1.5-2.0 mm, 12-22-flowered ; rhachilla reddish brown, wingless ; glumes subclavately imbricating with the tips ultimately spread out, ovate-lanceolate, 1.5-2.0 mm long, muticous, greenish stramineous or sometimes reddish, keeled, 3-nerved. *Stamen* solitary ; anthers 0.5 mm long, apiculate ; styles short, trifold. *Nuts* subsessile, ellipsoid, trigonous, *ca* 0.8 mm long, apiculate, brownish.

*Fls. & frts.* : Oct.-Feb. In orchards and along streams ; 100-1700 m.

ASSAM : Cachar (*n. v.*) ; Goalpara ; Kamrup ; Lakhimpur. MEGHALAYA : K. & J. Hills.

**18. *C. pulcherrimus*** Willd. ex Kunth, Enum. Pl. 2 : 35. 1837.

*Perennials*, tufted, 15-40 cm high. *Stems* rigid, trigonous below, triquetrous above, 1.5-2.5 (-4.0) mm thick, ribbed. *Leaves* 5-7, subequalling the stem, 2-4 (-6) mm broad. *Anthela* compound or decompound, dense or lax, 3-14 (-20) cm across ; bracts 4-6 foliaceous, ascending to spreading, lowest 5-18 (-25) cm long ; primary rays up to 9 (-20) cm long, secondary up to 3 cm long, diverging ; spikelets in clusters of 5-12, linear-oblong, subcompressed, 3-10 × 1.0-1.2 mm, 12-46-flowered ; rhachilla brown streaked and dotted, wingless ; glumes suddenly imbricating with their tips incurved, membranaceous, ovate, *ca* 1 mm

long, stramineous to purplish red tinged, keeled, 3-nerved, scarious-margined. *Stamen* solitary ; anthers 0.5 mm long, apiculate ; styles short, trifold. *Nuts* subsessile, ellipsoid, trigonous, 0.5 mm long, apiculate, stramineous.

*Fls. & frts.* : Dec. : 150-300 m.

ASSAM : Goalpara ; Lakhimpur (*n. v.*).

**19. *C. halpan*** L. Sp. Pl. 45. 1753 ('haspan') ; Kern in Steenis, Fl. Males. ser. I. 7 : 624. 1974.

*Perennials*, rarely annuals, usually tufted, 0.8-7.0 dm high. *Rhizomes* slender, short, or long and creeping up to 5 cm. *Stems* solitary to many together, slender or rigid, sometimes almost absent in depauperated plants, compressed-trigonous, 1-3 mm thick, frequently ribbed. *Leaves* 3-7, about half to three-fourth as long as the stem, all reduced to bladeless sheaths, 1-4 mm broad. *Anthela* compound or decompound, lax, bracts 2-3 foliaceous, spreading, shorter than to, or rarely the lowest slightly exceeding the anthela ; rays slender, usually 7-15 (-20), sometimes only 1-2, spreading, up to 12 cm long ; radiolii 1-3 ; spikelets digitate, usually 3-6, sometimes only 2, sometimes up to 13 together, linear-lanceolate, 2.5-13.0 × 1.0-1.5 mm, 10-50-flowered ; rhachilla slender, wingless ; glumes ascending and appressed to the rhachilla is not or scarcely visible even in fruits, ovate-oblong, 1.0-1.7 mm long, keeled, mucronulate, yellowish red, margins inrolled. *Stamen* 1(-3) ; anthers 0.3 mm long, crest white setose ; styles short, trifold. *Nuts* shortly stipitate, broadly obovoid, trigonous, 0.4-0.5 mm long, apiculate, yellowish.

*Fls. & frts.* : throughout the year. In ditches and along streams ; a wide spread weed of paddy-fields ; 100-1700 m.

ARUNACHAL PRADESH : Tirap. ASSAM : Goalpara ; Lakhimpur ; Nowgong. MEGHALAYA : Garo Hills ; K. & J. Hills. NAGALAND.

**20. *C. tenuispica*** Steud. Syn. Cyper. 11. 1854. *C. flavidus* Clarke in Journ. Linn. Soc. (Bot.) 20 : 287 et 21 : 122. 1884, in Hook. f. Fl. Brit. Ind. 6 : 600. 1893 ; *non* Retz. 1789.



*Annuals*, tufted, (2-)7-25(-40) cm high, usually short lived. *Stems* slender, trigonous, 0.8-1.2 mm thick, yellowish green or alongwith the leaves, blackish with age. *Leaves* much shorter than to equalling the stem, 1.7-3.2(-4) mm broad. *Anthela* compound or decompound, lax, 1.5-7.0(-10.0) cm across; bracts 2-3 foliaceous, spreading, lowest 1-12(-25) cm long; rays 2-10, slender, spreading, longest 1-7(-10) cm long; spikelets digitate, 3-9 together, linear-lanceolate, 3-7(-13) × 1.0-1.5 mm, 8-28 (-50)-flowered; rhachilla wingless; glumes laxly arranged, ultimately widely spreading so that the rhachilla is distinctly visible, ovate-oblong, truncate on shoulders, 0.7-1.0 mm long, keeled, acute or mucronulate, yellowish green to ferrugineous, purple striolate, apices usually excurved, sometimes straight. *Stamens* 1(-2); anthers 0.3-0.5 mm long, crest smooth; styles 0.3 mm long; stigmas 3, *ca* 0.6 mm long. *Nuts* sessile, broadly obovoid to subglobose, obscurely trigonous, 0.2-0.3 mm long, obtuse or apiculate, tubercled, marble-white.

*Fls. & frts.*: July-Nov. In open marshy places; sometimes as a weed in paddy-fields; 100-1300 m.

ARUNACHAL PRADESH. Subansiri. ASSAM: Cachar; Kamrup; Sibsagar. MEGHALAYA: K. & J. Hills. NAGALAND.

**21. *C. niveus* Retz. Observ. 5: 12. 1789.**

*Perennial*, tufted, 1.5-7.5 dm high. *Rhizomes* creeping, 2-3 cm long, 2-3 mm thick. *Stems* rather rigid, trigonous, 1.5-2.0 mm thick, base swollen. *Leaves* 3-4, usually shorter than, sometimes equalling the stem, 1.5-2.5 mm broad, glaucous green. *Inflorescence* capitate, 1-4 cm broad; bracts 2-3 foliaceous, spreading to deflexed, lowest 5-8 cm long; spikelets oblong-lanceolate, 10-25 × 4-6 mm, obtuse, 14-40-flowered; rhachilla broad, wingless; glumes chartaceous, tightly imbricating, ovate-lanceolate, 4-5 mm long, mucronulate, whitish stramineous, pale brown striolate. *Stamens* 3, anthers 1 mm long; styles long; stigmas 3. *Nuts* sessile, obovoid, triquetrous, *ca* 1.5 mm long, apiculate, deep brown, densely punctulate.

*Fls. & frts.*: May-Oct. In wastelands; 600-1300 m.

Its capitula of large stramineous spikelets are very characteristic.

ARUNACHAL PRADESH: Kameng.

**22. *C. diffusus* Vahl, Enum. Plant. 2: 321. 1806; Kern in Steenis, Fl. Males. ser. I. 7: 619. 1974. *C. holophyllus* Miq. Fl. Ind. Bat. 3: 283. 1856, incl. var. *celebicus* Miq. *C. diffusus* var. *celebicus* Kuekenth. in Bot. Jahrb. 59: 43. 1924.**

*Perennials*, tufted, 2-8 dm high. *Rhizomes* short, woody. *Stems* stout, trigonous below, triquetrous above, 2-5 mm thick. *Leaves* several, rigid, subequalling the stem, 5-20 mm broad, subcaudate. *Anthela* decompound or supradecomound, lax, 9-30 cm across; bracts 4-12 foliaceous, spreading or deflexed, lowest 25-50 cm long; rays 6-27, rigid, sometimes 2-3 arising from the same prophyll, longest 4-20 cm; secondary rays 3-7, divaricate, up to 3 cm long; spikelets usually in clusters of 2-4, sometimes up to 9 together, rarely a few solitary, lanceolate, subcompressed, 3-12 × 2-3 mm, 4-22-flowered; rhachilla rigid, almost wingless; glumes rather remote and spread out so that the rhachilla is distinctly visible, broadly ovate to suborbicular, 1.5-2.0 mm long, mucronate, keeled; keel green, 3-nerved, sides reddish, faintly 2-nerved, mucros setulose, sometimes curved. *Stamens* (2-) 3; anthers 0.7 mm long. Crest ovate, white, setose; style short; stigmas 3, long. *Nuts* ellipsoid, triquetrous, *ca* 1.5 mm long, acute, blackish brown.

*Fls. & frts.*: May-Feb. In moist to marshy, open or shady places; 100-1700 m.

ARUNACHAL PRADESH: Kameng; Lohit; Subansiri; Tirap. ASSAM: Darrang; Goalpara; Kamrup; Nowgong. MEGHALAYA: Garo Hills; K. & J. Hills. NAGALAND.

var. *macrostachyus* Boeck. in Linnaea 35: 534. 1868. *C. pubisquama* Steud. Syn. Cyper. 20. 1854; Clarke in Hook. f. Fl. Brit. Ind. 6: 604. 1893; Kern in Steenis, Fl. Males. ser. I. 7: 619. 1974.

*Spikelets* linear, 6-20 × 1.5 mm, 12-40-flowered; glumes appressed, tightly imbricating, the rhachilla thus not visible. *Nuts* *ca* 1 mm long.

*Fls. & frts.* : Sept.-Feb. ; 100-700 m.

ARUNACHAL PRADESH : Lohit. ASSAM : Goalpara ; Lakhimpur ; Sibsagar.

Hooper (in Saldanha & Nicholson, Fl. Hassan dist. 668. 1976) treats it as a distinct species, without taking into consideration numerous intermediates precluding specific separation as given by Kern (*l.c.*).

**23. C. multispicatus** Boeck. in Linnaea 38 : 362. 1874.

*Perennials*, tufted, (3-)4-6(-8) dm high. *Stems* compressed-triquetrous, 2-3 mm thick. *Leaves* 4-6(-8) mm broad, abruptly acuminate. *Anthela* compound or decompound, lax, 10-15(-30) cm across ; bracts 4-5 foliaceous, spreading, lowest 20-30 (-50) cm long ; rays 8-12, rigid, suberect, longest 8-12 cm ; secondary rays up to 5 cm long ; spikelets numerous, most of them solitary, pedicelled, a few sometimes clustered, linear, compressed, 5-10 × 1.5-2.0 mm, 12-30-flowered ; rhachilla wingless ; glumes tightly imbricating, ascending or the tips somewhat spread out, ovate-oblong, 1.2-1.5 mm long, keeled, acute or mucronulate, stramineous, purple striolate ; keel 3-nerved, sides nerveless, slightly sulcate. *Stamen* 1 ; anthers 0.3-0.5 mm long, crest setose ; styles *ca* 0.3 mm long ; stigmas 3, *ca* 1 mm long. *Nuts* shortly stipitate, broadly obovoid to subglobose, trigonous, 0.5-0.7 mm long, apiculate, brown.

*Fls. & frts.* : May ; at about 100 m.

ASSAM : Cachar, Keenan (*n.v.*) ; Sibsagar.

**24. C. compressus** L. Sp. Pl. 46. 1753.

*Annuals* (sometimes *perennials*), tufted, 3-40 (-75) cm high. *Stems* slender or rigidulous, compressed-trigonous, 0.5-2.0 mm thick. *Leaves* subcoriaceous, usually shorter than, sometimes subequalling the stem, 1.5-4.0 mm broad, greyish green. *Anthela* simple, lax ; bracts 3-7 foliaceous, spreading, slightly to much exceeding the anthela, lowest 7-30 cm long ; rays 1-8, slender, diverging, longest 3-10(-15) cm, sometimes absent in depauperated plants ; spikelets in clusters of 3-13, linear-oblong, compressed subquadrangular, 10-35 × 3-5 mm, 12-40 (-60)-flowered ; rhachilla flexuous,

hyaline margined in the early stages ; glumes tightly imbricating, ovate, 3.0-4.5 mm long, mucronate, pale yellowish or brownish, several-nerved, broadly scarious-margined, mucro stout, sometimes excurved. *Stamens* 3 ; anthers 0.7 mm long, crest ovate-rotundate, reddish ; style long ; stigmas 3, short. *Nuts* shortly stipitate, obovoid, triquetrous, 1.5-1.7 mm long, apiculate, glossy, blackish brown.

*Fls. & frts.* : May-Dec. In river-beds, fallow paddy-fields and on roadsides, on moist sandy alluvium or clayey soil ; 100-700 m.

ARUNACHAL PRADESH : Lohit ; Subansiri ; Tirap. ASSAM : Darrang ; Kamrup ; Lakhimpur ; Sibsagar. MEGHALAYA : K. & J. Hills.

**25. C. iria** L. Sp. Pl. 45. 1753 ; Miq. Fl. Ind. Bat. 3 : 269. 1856, incl. var. *parviflorus* Miq. *et* var. *diaphaniria* Miq. ; Clarke in Hook. f. Fl. Brit. Ind. 6 : 606. 1893 *et* Illustr. Cyper. t. 14. f. 2, *non* f. l. 1909 ; Kern in Steenis Fl. Males. ser. I. 7 : 616. 1974.

*Annuals*, tufted, 0.5-5.0 (-8.0) dm high. *Stems* slender, compressed-triquetrous, 1-3(-5) mm broad. *Leaves* 3-6, shorter than to subequalling the stem, 1.5-5.0 (-8.0) mm broad. *Anthela* simple or compound, lax, 5-20 cm across ; bracts 3-7 foliaceous, spreading, lowest 9-30 (-40) cm long ; rays 3-8, slender, compressed, longest 5-15 cm ; anthelules subdense ; secondary rays almost absent to 1.5 cm long ; spikes narrow, 1-4 cm long, bearing 5-23 spikelets ; spikelets approximate to remote, suberect, linear-oblong, 3-8(-13) × 1.5-2.0 mm, 6-16 (-24)-flowered ; rhachilla slender, wingless ; glumes loosely imbricating, broadly obovate to suborbicular, 1.2-1.5 mm long, muticous or mucronulate ; keel green, 3-5-nerved, sides cellular reticulate, yellow, 1-2-striate, scarious margined. *Stamens* 2(-3) ; anthers 0.3 mm long ; style short, trifid almost to the base. *Nuts* broadly stipitate, obovoid-ellipsoid, triquetrous, 1.0-1.5 mm long, apiculate, glossy, deep brown.

*Fls. & frts.* : May-Dec. Along roads and streams, on moist sandy loam or clayey soil ; a common weed in paddy-fields ; 100-700 m.

This species stands out with its yellow long narrow spikes bearing short spikelets and laxly disposed suborbicular glumes with equal sized nuts.

ARUNACHAL PRADESH : Lohit ; Tirap. ASSAM : Cachar ; Darrang ; Goalpara ; Kamrup ; Lakhimpur ; Nowgong ; Sibsagar. MEGHALAYA : Garo Hills ; K. & J. Hills. NAGALAND.

**26. *C. distans* L. f. Suppl. 103. 1781.**

*Perennials*, tufted, 2-10 dm high. *Rhizomes* short, bearing short, stout stolons. *Stems* rigid, triquetrous, 1.5-3.5 mm thick, base swollen. *Leaves* 6-12, subequalling the stem, 3-10 mm broad. *Anthela* decompound (rarely compound or supradecompound), lax, 10-25 cm across ; bracts 4-8 foliaceous, lowest 15-30(-60) cm long ; rays 4-12, slender or rigid, obliquely spreading, longest 8-20 cm ; secondary rays 3-6, longest 2.5-8.0 cm ; spikes pyramidal, lax, bearing 5-20 spikelets ; spikelets first ascending, ultimately divaricate or deflexed, linear, almost acicular, 6-60 mm long, *ca* 1 mm thick, 6-50-flowered ; rhachilla flexuous, internodes *ca* 1 mm long ; wings narrowly lanceolate, white hyaline, soon caducous ; glumes remote, appressed, elliptic, 1.5-2.0 mm long, muticous, reddish brown or sometimes yellowish, 3-5-nerved, scarcely keeled ; margins slightly inrolled. *Stamens* 3 ; anthers 0.5 mm long, crest pyramidal, red ; style short ; stigmas 3. *Nuts* ellipsoid ; trigonous, 1.3-1.6 mm long, apiculate, deep brown.

*Fls. & frts.* : Throughout the year. Common along streams and in moist ditches, on sandy loam to clayey soil, often forming large patches ; 100-1300 m.

The large reddish brown inflorescence with divaricate acicular spikelets are quite distinctive.

ASSAM : Cachar ; Darrang ; Goalpara ; Lakhimpur ; N. Cachar & Mikir Hills ; Nowgong ; Sibsagar. MEGHALAYA : Garo Hills ; K. & J. Hills. NAGALAND.

*var. pseudonutans* Kuekenh. in Engl. Pflanzenr. heft 101 : 137. 1935.

*Spikelets*, even in fruit, suberect, thus forming subpenicillate spikes.

*Fls. & frts.* : August.

MEGHALAYA : K. & J. Hills.

Very similar to *C. nutans* Vahl ; distinguishable by the remote, not imbricate, glumes with nerveless sides.

**27. *C. nutans* Vahl, Enum. Pl. 2 : 363. 1806.**

*Perennials*, tufted, 5-7 (-15) dm high. *Rhizomes* short, bearing short stolons. *Stems* stout, trigonous below, triquetrous above, 3-5(-10) mm thick, base swollen. *Leaves* several, coriaceous, shorter than to subequalling the stem, 6-10 (-15) mm broad. *Anthela* compound or decompound, lax ; rays 6-10, obliquely spreading, compressed ; bracts 4-6 foliaceous, lowest 20-45(-75) cm long ; spikes dense, penicilliform, often somewhat nodding, 3.0-4.5 cm long, 5-10 mm broad ; with 15-25 spikelets ; spikelets suberect, linear-oblong, compressed, 5-14 × 2 mm, 8-16-flowered ; rhachilla flexuous, wings lanceolate, whitish hyaline, *ca* 0.3 mm broad ; internodes *ca* 0.7 mm long ; glumes laxly imbricating, elliptic, 2.0-2.5 × 1 mm, mucronulate, margins broadly scarious in the upper half, soon incised at the tip and mucronulate by the excurrent midrib, 7-nerved ; keel greyish green, sides pale fuscous. *Stamens* 3 ; anthers 0.7 mm long, crest quadrate, red papillose ; style trifid almost to the base. *Nuts* narrowly obovoid-oblong, triquetrous, *ca* 1.5 × 0.5 mm, apiculate, brown.

*Fls. & frts.* : May. In swamps and shallow water ; at about 100 m.

ASSAM : Cachar, Keenan (n. v.) ; Kamrup ; Lakhimpur ; Sibsagar.

*var. eleusinoides* (Kunth) Haines, Bot. Bihar & Orissa 5 : 898. 1924 ; Kern in Steenis, Fl. Males. ser. I. 7 : 610. 1974. *C. eleusinoides* Kunth, Enum. Pl. 2 : 39. 1837.

*Inflorescence* less compound ; primary rays suberect, the secondary ones often beset with spikelets almost to the base ; spikes shorter, denser ; spikelets usually fewer-flowered ; internodes of the rhachilla *ca* 0.5 mm long. *Nuts* broader, 1.1-1.3 × 0.6-0.7 mm.

*Fls. & frts.* : June-July. In swamps and shallow water, 200-700 m.

ASSAM : Kamrup. MEGHALAYA : K. & J. Hills. NAGALAND, *s. l.*, Clarke 41527 (*n.v.*).

28. *C. thomsonii* Boeck. in *Linnaea* 36 : 294. 1870.

*Perennials*, tufted, 2-6 dm high. *Rhizomes* short, woody. *Stems* rigid, compressed trigonous, 2.0-2.5 mm thick, conspicuously swollen at the base. *Leaves* 2-4, coriaceous, subequalling to exceeding the stem, 4-10 mm broad, margins revolute. *Anthela* usually simple, sometimes compound, dense or lax; bracts 2-4 foliaceous, suberect, lowest 10-25 cm long; rays 2-7, longest 2-4 (-14) cm; spikes dense, broadly ovate, 2-3(-5) cm long and equally broad, bearing many spikelets; spikelets in clusters of 8-20, widely spreading to almost divaricate, linear-lanceolate, compressed-quadrangular, 10-20 × 2.5-3.0 mm, 8-18(-24)-flowered; rhachilla slender, green, wings narrow, hyaline; glumes rather remote, ascending, elliptic, 4.0-4.5 mm long, acute or mucronulate, stramineous, red-dotted, several nerved, broadly scarious-margined. *Stamens* 3; anthers 0.5 mm long, crest red; style 1.3 mm long; stigmas 3, *ca* 2 mm long, red-dotted. *Nuts* shortly stipitate, ellipsoid-oblong, trigonous, *ca* 1.5 mm long, apiculate, glossy, black.

ASSAM : Cachar; Sibsagar.

29. *C. pilosus* Vahl, *Enum. Pl.* 2 : 354. 1806; Clarke in Hook. f. *Fl. Brit. Ind.* 6 : 609. 1893; Kern in Steenis, *Fl. Males. ser. I.* 7 : 611. 1974. *C. obliquus* Nees in *Wt. Contr. Bot. Ind.* 86. 1834. *C. hebes* Steud. *Syn. Cyp.* 315. 1855. *C. pilosus* var. *obliquus* Clarke in *Journ. Linn. Soc. (Bot.)* 21 : 151. 1884. *C. pilosus* var. *muticus* Boeck. in *Linnaea* 35 : 599. 1868; Kuekenh. in *Engl. Pflanzenr. heft* 101 : 92. 1935.

*Perennials*, tufted, 2-9 dm high. *Rhizomes* stoloniferous; stolons long, slender, up to 7 cm long, *ca* 1 mm thick. *Stems* stout, compressed-triquetrous, 2.5-5.0 mm thick, angles scabrid above. *Leaves* coriaceous, shorter than the stem, 6-10 mm broad. *Anthela* compound, lax, 9-40 cm across; bracts 3-5 foliaceous, spreading, lowest 30-65 cm long; rays 2-11, rather rigid, spreading, longest 6-22 cm; spikes sessile, 3-7 together, diverging,

2-5 cm long; rhachis yellow-hispidulous; spikelets subdistichous, divaricate or the lower deflexed, linear, 6-12 × 1.5-2.0 mm, 7-20 (-50)-flowered; rhachilla hyaline-margined; glumes loosely imbricating, ovate-elliptic, 1.5-2.0 mm long, muticous or mucronulate, yellowish or reddish brown, 5-7-nerved, margins broadly white hyaline, inrolled. *Stamens* 3; anthers 0.5 mm long, crest ovate, reddish; style short, deeply trifid, red dotted. *Nuts* shortly stipitate, obovoid, triquetrous, 1.0-1.3 mm long, apiculate, blackish (Figs. 6-6b).

*Fls. & frts.* : May-Nov. Common in marshy places, on sandy loam to clayey soil, frequently forming large patches, also occurring in paddy-fields; 100-1500 m.

ARUNACHAL PRADESH : Kameng; Lohit; Subansiri; Tirap. ASSAM : Cachar; Goalpara; Kamrup; Lakhimpur; Nowgong; Sibsagar. MANIPUR. MEGHALAYA : Garo Hills; K. & J. Hills. NAGALAND.

30. *C. babakan* Steud. *Syn. Cyper.* 6. 1854, '*babakensis*', sphalm.

*Perennials*, (3-)6-10 dm high. *Rhizomes* stoloniferous; stolons up to 8 cm long, *ca* 3 mm thick. *Stems* stout, compressed-triquetrous, 4-7 mm thick. *Leaves* 2-3 coriaceous, shorter than the stem, 5-10 mm broad, somewhat septate. *Anthela* simple, usually dense; bracts 3-4 foliaceous, spreading, lowest 40-60 cm long; rays 3-5, rigid, suberect, longest 2-7 (-10) cm long; spikes dense, broadly ovate to subglobose, 2-3(-5) cm long; rhachis hispidulous; spikelets many, almost clustered, ultimately divaricate to reflexed, linear-oblong, 8-23 mm long, 2.5-3.0 mm broad, 14-44-flowered; rhachilla rigid, hyaline-margined; glumes subdensely imbricating, ovate, 2.5-3.0 mm long, acute, purplish yellow, 9-11-nerved; keel scabrid. *Stamens* 2-3; anthers 1 mm long, crest red; style 1 mm long, reddish brown dotted; stigmas 3, *ca* 1.5 mm long. *Nuts* shortly stipitate, ellipsoid-obovoid, triquetrous, 1.2-1.5 mm long, apiculate, blackish.

*Fls. & frts.* : June.

ARUNACHAL PRADESH : Kameng.

31. *C. corymbosus* Rottb. Descr. et Icon. 42. t. 7. f. 4. 1773.

*Rhizomes* long creeping, ca 5 mm thick. *Stems* terete below, trigonous above, spongy, faintly septate, 5-10 dm high, 5-8 mm thick. *Leaves* absent, or solitary, up to 13 cm long, 4-6 mm broad. *Anthela* compound, subtax, 15-20 cm across; bracts 2-5, shorter than the anthela, with spinulous revolute margins, lowest 2-10 cm long; rays 6-10(-15), slender, suberect, longest 6-15 cm; spikelets clustered, 4-8 together, linear, subterete, often curved, 6-40 × 1 mm, 8-40-flowered; rhachilla wings linear, hyaline; glumes appressed, lower somewhat remote, upper congested, ovate-oblong, 2.5-3.0 mm long, obtuse, 3-5-nerved, stramineous, reddish brown striolate along the nerves. *Stamens* 3; anthers 1 mm long, crest subulate, reddish; style 1.2 mm long; stigmas 3, ca 2.5 mm long. *Nuts* narrowly obovoid-ellipsoid, trigonous, ca 1.5 mm long, apiculate, black.

ASSAM. *s. l.*, Griffith 1459, 6197 *p.p.* (*n.v.*).

*var. longispiculatus* (O. Ktze.) Kuekenh. in Engl. Pflanzenr. heft 101: 82. 1935. *C. enodis* var. *longispiculatus* O. Ktze. Rev. Gen. 2: 749. 1891. *C. tegetiformis* Roxb. Hort. Beng. 6. 1814, *nomen.*; Kunth, Enum. Pl. 2: 56. 1837; Clarke in Hook. f. Fl. Brit. Ind. 6: 612. 1893.

*Stems* triquetrous at tip. *Spikelets* narrower, divaricate, even in flowers.

ASSAM, *s. l.*, Griffith 6204 (*n.v.*).

32. *C. macer* Clarke in J. Linn. Soc. (Bot.) 21: 160. 1884.

*Perennials*, 3-8 dm high. *Rhizomes* short, creeping, up to 3 cm long, 3-5 mm thick. *Stems* several together, slender, trigonous or sometimes triquetrous, 2.0-2.5 mm thick, base slightly swollen. *Leaves* 2-4, much shorter than the stem, longest 5-12 cm long, 1.5-2.5 mm broad. *Anthela* usually simple, sometimes subcompound; bracts 2-3 foliaceous, lowest 4-8 cm long; spikelets subdigitate, 3-5 together, linear, subcompressed, 6-20 × 1.5-2.0 mm, 8-20-flowered; rhachilla wings narrow, hyaline,

red-streaked; glumes remote, obliquely spreading, ovate-oblong, ca 3 mm long, obtuse, keeled, red dotted, 5-7-nerved, margins inrolled. *Stamens* 3; filaments red dotted; anthers ca 1 mm long, crest ovate, red papillose; style trifid almost to the base, red dotted. *Nuts* obovoid-oblong, trigonous, about half as long as the glumes, apiculate, black.

ASSAM: Goalpara; at about 200 m.

33. *C. pangorei* Rottb. Descr. et Icon. 31. t. 7. f. 3. 1773; *non* Clarke in Hook. f. Fl. Brit. Ind. 6: 612. 1893 (as *C. corymbosus* var. *pangorei*). *C. tegetum* Roxb. Fl. Ind. 1: 208. 1832; Clarke, l. c. 613.

*Perennials*, 4-9 dm high. *Rhizomes* long creeping, woody, 6-9 mm thick, strongly aromatic, bearing several stolons; stolons 10-20 cm long, ca 2 mm thick. *Stems* subcylindric below, trigonous above, 4-5 mm thick. *Leaves* usually all reduced to bladeless sheaths, sometimes the upper one bearing a blade up to 20 cm long and 4-7 mm broad. *Anthela* compound (or decompound), lax, 18-34 cm across; bracts 3-5 foliaceous, spreading, lowest 45-65 cm long; rays 4-12, flexuous, longest 8-15 cm; prophylls denticulate; secondary rays 3-4 (-8); spikelets clustered, 4-9 together, obliquely spreading, linear, 12-28 × 2.5-3.0 mm, 14-34-flowered; rhachilla wings lanceolate, white hyaline to sanguineous, caducous; glumes spreading, laxly imbricating, elliptic-oblong, ca 3 mm long, muticous, keeled; keel 3-5-nerved, green; sides reddish (sometimes decolouring); margins inrolled. *Stamens* 3; anthers 1.5 mm long, crest subquadrate, crenulate, reddish; styles deeply trifid; stigmas long exserted. *Nuts* narrowly obovoid, trigonous, ca 1.5 mm long, scarcely apiculate, blackish brown.

*Fls. & frts.*: August. Along streams, on sandy soil; at about 1000 m. Stems locally used for making mats.

MANIPUR, Clarke 41974 (*n.v.*). MEGHALAYA: K. & J. Hills.

34. *C. tenuiculmis* Boeck. in Linnaea 36: 286. 1870; Kern in Reinwardtia 3: 30. 1954. *C. zollingeri* Clarke in Hook. f. Fl. Brit. Ind. 6: 613.

1893; *non* Steud. 1854. *C. lucidulus* Clarke in Journ. Linn. Soc. (Bot.) 21 : 99. 1884; *non* Klein, 1820. *C. zollingeri* var. *condensatus* Kuekenh. in Engl. Pflanzenr. heft 101 : 134. 1935.

*Annuals* or *perennials*, tufted, 1.5-3.0 dm high. *Rhizomes*, if present, short, woody. *Stems* slender or stout, triquetrous, grooved, 1.0-2.5 mm thick, base swollen. *Leaves* 5-8 (sometimes absent), usually half to three-fourth as long as the stem, 2-6 mm broad, margins revolute. *Anthela* simple or compound, lax, 8-20 cm across; bracts 3-6(-9) foliaceous, lower 1-2 usually much exceeding but sometimes subequalling the anthela, lowest 10-20 cm long; rays 3-10, suberect, longest 7-20 cm; spikes broadly ovate; spikelets shortly spicate in clusters of 2-15, suberect to spreading, linear-lanceolate, compressed-quadrangular, 1-3 cm long, 1.5-2.0 mm broad, 6-16-flowered; rhachilla flexuous, black, wings oblong, hyaline, brown streaked, soon caducous; glumes rather remote, ascending, elliptic-lanceolate, 3-4 mm long, muticous, uniformly stramineous to fulvous, 7-9-nerved. *Stamens* 3; anthers 1 mm long, crest rotundate; style deeply trifid; stigmas long exserted, red dotted. *Nuts* obovoid, triquetrous with broad obtuse angles, 1.5-2.0 mm long, acute, blackish (Figs. 5-5a).

*Fls. & frts.* : June-Sept. In marshy to dry places, in paddy-fields and wastelands, or among boulders; it is one of the few species found as an undergrowth in the pine-forests of K. & J. Hills; 700-1700 m.

The lax anthelas with almost quadrangular yellowish brown spikelets and black rhachillas are quite distinctive.

ASSAM † Cachar; Lakhimpur. MANIPUR, Meebold (n. v.). MEGHALAYA : K. & J. Hills. MIZORAM, Parry 697 (n. v.). NAGALAND.

35. *C. rotundus* L. Sp. Pl. 45. 1753.

*Perennials*, 1-4 (-15) dm high. *Stolons* long, slender, with intermittent ellipsoid aromatic tubers. *Stems* solitary or 2-3 together, compressed-trigo-

nous, sometimes tortuous, 1-2 mm broad, base tuberous. *Leaves* several, usually shorter than, sometimes subequalling the stem, 2-4 (-6) mm broad. *Anthela* usually simple, sometimes compound, lax; bracts 2-4 foliaceous, spreading, lowest 4-15(-30) cm long; rays 3-9, slender, spreading, longest 3-10 cm; secondary rays, if present, few; spikelets 3-10 together, linear-lanceolate, 10-35 × 1.5-2.0 mm, frequently curved, 12-40-flowered; rhachilla wings lanceolate, hyaline or red streaked; glumes tightly imbricating, broadly ovate, 3.0-3.5 mm long, muticous or mucronulate, keeled, red or deep brown, 3-5-nerved. *Stamens* 3; anthers 2 mm long, crest ovate, red; style long exserted. *Nuts* obovoid-ellipsoid, trigonous, 1.5-1.7 mm long, glossy black.

*Fls. & frts.* : May-Sept. Along roadsides and drains in partly shaded places, colonising wherever it occurs. Though a common weed in other parts of the country, in Assam its distribution appears to be sporadic.

ARUNACHAL PRADESH : Kameng. ASSAM : Lakhimpur. MEGHALAYA † K. & J. Hills.

36. *C. exaltatus* Retz. Observ. 5 : 11. 1789. *C. tokiensis* Clarke in Kew Bull. Add. Ser. 8 : 9. 1908. *C. elatus* var. *laxus* E. G. Camus in Le-Comte, Fl. Indoch. 7 : 70. 1912.

*Perennials*, tufted, 3-15 dm high. *Rhizomes* short, woody. *Stems* stout, triquetrous, 2-6 mm thick, base swollen. *Leaves* subequalling the stem, 3-10 mm broad. *Anthela* lax, decompound or sometimes compound; bracts 3-6 foliaceous; rays 5-10, suberect or spreading, compressed-trigonous, up to 18 cm long; secondary rays 1-5 cm long; spikes dense or lax, 2-6 cm long; rhachis flexuous; spikelets numerous, distichous or subdistichous, laxly arranged, linear-lanceolate, 3-10 × 1.5-2.0 mm, 8-30-flowered; rhachilla wings long persistent, linear-lanceolate, white-hyaline or ultimately fuscous; glumes ovate, 1.5-2.2 mm long, keeled, mucronate, glossy, castaneous-fuscous, 3-5-nerved. *Stamens* 3; anthers 1 mm long, crest ovate, denticulate, red; style trifid. *Nuts* broadly

stipitate, ellipsoid-ovate, trigonous, *ca* 0.8 mm long, apiculate, stramineus.

MEGHALAYA : K. & J. Hills.

37. *C. digitatus* Roxb. Fl. Ind. 1 : 205. 1832.

*Rhizomes* woody, shortly creeping. *Stems* stout, trigonous-triquetrous, 5-15 dm high, 3-7 mm thick, base slightly swollen. *Leaves* coriaceous, flat or plicate, subequalling the stem, 4-10 (-15) mm broad. *Anthela* compound or decompound, 25-40 cm across ; bracts 3-8 foliaceous, spreading, lowest 45-70 cm long ; rays 6-10, rigid, longest 11-16 cm ; secondary rays very short to 5 cm long ; spikes cylindric, 3-6 × 1-2 cm ; rhachis rigid ; spikelets numerous, divaricate, linear, subcompressed-angular, 5-20 × 1.0-1.5 mm, 8-24-flowered ; rhachilla wings lanceolate, yellowish ; glumes half-imbricating, elliptic-oblong, 2.0-2.3 mm long, keeled, muticous or cuspidate, stramineous-rufous, 3-5-nerved. *Stamens* 2 ; anthers 0.5 mm long ; style long, deeply trifid ; stigmas long exserted. *Nuts* oblong-ellipsoid, trigonous, 1.0-1.3 mm long, apiculate, yellowish brown.

*Fls. & frts.* : May-Dec. Common in swamps & paddy-fields ; 100-700 m.

ARUNACHAL PRADESH : Tirap. ASSAM : Darrang ; Kamrup ; Lakhimpur ; N. Cachar & Mikir Hills. MANIPUR. MIZORAM.

var. *khasiana* (Clarke) A. S. Rao et D. M. Verma, *comb. nov.* *Cyperus auricomus* var. *khasiana* Clarke in Journ. Linn. Soc. (Bot.) 21 : 189. 1884. *C. digitatus* var. *hookeri* Clarke in Hook. f. Fl. Brit. Ind. 6 : 618. 1893.

*Spikelets* densely spicate, rigid, slightly broader ; glumes ultimately bright brown. *Nuts* a little more acuminate.

MEGHALAYA : K. & J. Hills. NAGALAND.

38. *C. paniceus* (Rottb.) Boeck. in Linnaea 36 : 381. 1870 *p. p.* *Kyllinga panicea* Rottb. Descr. et Icon. 15. t. 4. f. l. 1773. *C. umbellatus* var. *panicea* Clarke in Journ. Linn. Soc. (Bot.) 20 : 296. 1883. *Mariscus paniceus* Vahl, Enum. Pl. 2 : 373. 1806 *p. p.* ; Clarke in Hook. f. Fl. Brit. Ind. 6 : 620. 1893.

*Perennials*, 1.0-3.5 dm high. *Rhizomes* emitting long, slender, creeping stolons. *Stems* slender, trigonous, slightly tuberos at the base. *Leaves* few, shorter than the stem, 1-2 mm broad. *Anthela* simple, contracted ; bracts 3-5 foliaceous, spreading, much longer than the anthela ; rays short, 3-5 ; spikes cylindric, 8-10 × 4-6 mm ; spikelets numerous, congested, linear-lanceolate, slightly curved, *ca* 3.0 × 0.5 mm, maturing a solitary nut, ultimately spreading ; rhachilla winged ; glumes ovate-lanceolate, *ca* 3 mm long, stramineus, red striolate, several-nerved, margins inrolled. *Stamens* 3 ; anthers linear, crested ; style 1 mm long ; stigmas 3, *ca* 1 mm long. *Nuts* oblong, trigonous, sometimes slightly curved, *ca* 2.3 mm long, apiculate, reddish brown.

ASSAM.

var. *roxburghianus* (Clarke) Kuekenh. in Engl. Pflanzenr. heft 101 : 526. 1936.

*Stolons* more robust. *Stems* stouter, up to 6 dm high. *Leaves* 2-3 mm broad. *Bracts* 5-7 ; anthela rays up to 4 cm long ; spikes 8-15 × 4-6 mm ; spikelets 2.5-3.5 × 0.7-1.0 mm.

ASSAM, Griffith 6242 *p. p.* (n. v.).

39. *C. cyperinus* var. *bengalensis* (Clarke) Kuekenh. in Engl. Pflanzenr. heft 101 : 520. 1936. *Mariscus cyperinus* var. *bengalensis* Clarke in Hook. f. Fl. Brit. Ind. 6 : 621. 1893.

*Perennials*, 2.5-7.0 dm high. *Rhizomes* short, woody, aromatic. *Stems* rigid, trigonous, 2.5-4.5 mm thick, base swollen. *Leaves* several, shorter than to almost equalling the stem, 2.5-10.0 mm broad. *Anthela* simple, usually capitately contracted, sometimes evolute with rays up to 5 cm long ; bracts 7-11 foliaceous, spreading, lowest 20-45 cm long ; spikes cylindric, 10-25 × 6-13 mm ; spikelets obliquely spreading, 6-10 × 0.8-1.0 mm, bearing 1-4 nuts, sometimes when fully mature, almost divaricate ; rhachilla winged ; glumes subchartaceous, tightly clasping the nut, ovate-oblong, 3-4 mm long, greenish, several-nerved. *Stamens* 3 ; style trifid. *Nuts* ellipsoid, trigonous, 1.8-2.5 mm long, apiculate, brown.

*Fls. & frts.* : May-Nov. Sporadically found along streams and forest margins ; on sandy loam to clayey soil ; 100-1300 m.

ARUNACHAL PRADESH : Kameng ; Subansiri ; Tirap. ASSAM : Goalpara ; Lakhimpur ; N. Cachar & Mikir Hills ; Nowgong ; Sibsagar. MEGHALAYA : K. & J. Hills.

40. *C. cyperoides* (L.) O. Ktze. Rev. Gen. Pl. III. 2 : 333. 1898. *Scirpus cyperoides* L. Mant. 2 : 181. 1771. *Mariscus umbellatus* Vahl, Enum. Pl. 2 : 376. 1806 *p. p.* *M. sieberianus* Nees in Linnaea 9 : 286. 1834, *nomen.* ; Clarke in Hook. f. Fl. Brit. Ind. 6 : 622. 1893. *M. cyperoides* Urb. in Symb. Antill. II. 1 : 164. 1900.

*Perennials*, 1-11 dm high. *Stems* rigid, trigonous, 2-5 mm thick, base slightly swollen. *Leaves* 3-10, shorter than to equalling the stem, 2.5-10.0 mm broad. *Anthela* simple, usually evolute, sometimes contracted ; bracts spreading, lowest 13-45 cm long ; rays 4-18, obliquely spreading, longest 1.5-9.0 cm long ; spikes cylindrical, 7-40 × 6-13 mm ; spikelets linear-lanceolate, 3-5 mm long, acuminate, flowering obliquely spreading, fruiting divaricate or the lower even deflexed, usually maturing two nuts, sometimes only a solitary nut, sometimes *ca* 6 mm long and maturing three, or rarely four nuts ; rhachilla winged ; glumes membranaceous, ovate-oblong, tightly clasping the nut, greenish-stramineous, sometimes red striolate, several-nerved. *Stamens* 3 ; stigmas 3. *Nuts* linear-oblong, trigonous, slightly curved, *ca* 2.2 × 0.5 mm, apiculate, young yellowish brown, mature deep brown (Figs. 7-7b).

*Fls. & frts.* : March-Dec. Common in wastelands, cultivated fields, stream-beds, along forest margins ; 100-2000 m.

ARUNACHAL PRADESH : Kameng ; Lohit ; Siang ; Subansiri ; Tirap. ASSAM : Cachar ; Darrang ; Goalpara ; Kamrup ; Lakhimpur ; Sibsagar. MEGHALAYA : Garo Hills ; K. & J. Hills. NAGALAND.

41. *C. compactus* Retz. Observ. 5 : 10. 1789. *C. dilutus* Vahl, Enum. Pl. 2 : 357. 1806. *Mariscus microcephalus* Presl, Reliq. Haenk. 1 : 182. 1828.

*Perennials*, 2-10 dm high. *Stems* spongy, trigonous or subterete, 2-6 mm thick, base swollen. *Leaves* 5-7, canaliculate at the base, 3-11 mm broad, with transverse nervules more or less raised and distinct ; margins and midrib beneath spinulose ; sheaths spongy, septate, reddish brown. *Anthela* compound or decompound, 5-10 cm across, greenish when young, bright reddish brown with age ; bracts several foliaceous, lowest up to 1 m long ; rays 6-14, rigid, up to 18 cm long ; secondary rays 3-13, setaceous, spreading, up to 4 cm long ; spikes subglobose, 1.5-2.0 cm dia. ; spikelets several to numerous, digitate, stellately spreading, linear-lanceolate, subterete, or slightly compressed, 6-12 (-15) × 1.0-1.5 mm, 4-14-flowered ; rhachilla hyaline winged ; glumes adpressed, oblong-lanceolate, 3-4 mm long, obtuse, keel green, 3-nerved, sides reddish brown on maturity, 2-3 striate. *Stamens* 3 ; anthers linear, crest red ; styles long, trifid. *Nuts* linear-oblong, trigonous, slightly curved, 1.5-2.0 mm long, apiculate-rostrate, densely punctulate, deep brown.

*Fls. & frts.* : May-Jan. Along rivers, streams, and in roadside ditches, often colonising on moist sandy alluvium ; 100-1000 m.

The numerous glossy reddish brown globose spikes would at once strike the eyes, even at a distance.

ARUNACHAL PRADESH : Kameng ; Tirap. ASSAM : Cachar ; Goalpara ; Kamrup ; Lakhimpur ; Nowgong ; Sibsagar. MANIPUR, MEGHALAYA : Garo Hills ; K. & J. Hills. MIZORAM.

42. *C. pseudokyllingioides* Kuekenh. in Engl. Pflanzenr. heft 101 : 501. 1936. *Kyllinga cyperoides* Roxb. Fl. Ind. 1 : 182. 1832. *Courtoisia cyperoides* Nees in Wt. Contr. Bot. Ind. 92. 1834 ; Clarke in Hook. f. Fl. Brit. Ind. 6 : 625. 1893 ; *non Cyperus cyperoides* (L.) O. Ktze. 1898.

*Annuals*, tufted, 0.8-5.0 dm high. *Roots* purplish. *Stems* slender, trigonous, 1.5-3.0 mm thick. *Leaves* 1-3, flaccid, as long as the stem, 1.5-4.0 mm broad. *Anthela* compound or subcompound ; bracts 3-7, rather distantly placed, foliaceous, spreading, lowest 15-40 cm long ; rays 3-10, slender, suberect or



diverging, sometimes curved, longest 3-14 cm ; secondary rays 2-3, up to 3 cm long ; spikes subglobose, 5-8 mm dia. ; spikelets many, congested, elliptic-oblong, strongly compressed,  $3-4 \times 1.2-1.5$  mm, 1-2-flowered ; rhachilla slender, winged ; glumes elliptic, 2.5-3.0 mm long, cellulose-reticulate, shortly but stoutly mucronate, keel yellow, broadly winged, sides brown, grooved. *Stamens* 3 ; styles 0.5 mm long ; stigmas 3, 0.7 mm long. *Nuts* fusiform, trigonous, about four-fifth as long

as the glume, 2.3-2.7 mm long, long apiculate, glossy, deep brown, punctulate.

*Fls. & frts.* : Oct.-Nov. In wastelands and orchards ; 100-1600 m.

The glossy brown globose spikes in compound anthelas, with much compressed spikelets are very characteristic (Figs. 8-8c).

ARUNACHAL PRADESH : Kameng. ASSAM : Goalpara ; Lakhimpur. MEGHALAYA : K. & J. Hills.

## 2. ELEOCHARIS R. Br.

Prodr. 224. 1810 ('*Elaeocharis*', '*Eleocaris*', et '*Heleocharis*', sphalm.).

*Annuals* or *perennials*. *Rhizomes*, when present, short or long creeping. *Stems* terete or angular, sometimes spongy septate, all fertile or with some sterile ones appearing like leaves. *Leaves* reduced to a solitary or few basal sheaths ; sheaths membranaceous, tubular, truncate or cuspidate, sometimes shortly laminate. *Inflorescence* reduced to a solitary terminal spikelet, rarely a few additional branchlets terminated by smaller spikelets ; bracts absent ; spikelets terete, or angular (rarely compressed), few-many-flowered ; rhachilla persistent ; glumes membranaceous or coriaceous, spiral, or the lower

sometimes subdistichous, caducous ; lower 1-3 usually empty, sometimes nut-bearing, more persistent and usually longer than the other glumes but shorter than the spikelets. *Flowers* bisexual, the upper few tabescent ; perianth of usually 5-7, sometimes 4-8(-10), retrorsely scabrid bristles (sometimes absent) ; stamens 1-3, anterior ; anthers linear, oblong-lanceolate or ovate, crested or muticous ; style about as long as the nut, usually glabrous, dilated at the base with a constriction above the nut ; base persistent ; stigmas 2-3 (-rarely 4). *Nuts* obovoid, orbicular or pyriform, lenticular or trigonal, crowned by the persistent style base, smooth, reticulate, trabeculate or cancellate, usually black.

- |                                                                                                                                       |     |                          |
|---------------------------------------------------------------------------------------------------------------------------------------|-----|--------------------------|
| 1a. Stems somewhat stout, 2-10 mm thick. Spikelets about as thick as the stems, subcylindric ; glumes coriaceous, 4-8 mm long.        |     |                          |
| 2a. Stems terete, transversely septate. Nuts smooth                                                                                   | ... | <i>E. dulcis</i> 1       |
| 2b. Stems terete or angled, not septate. Nuts trabeculate or cancellate.                                                              |     |                          |
| 3a. Stems triquetrous throughout. Nuts constricted at the apex forming a neck below the style-base                                    | ... | <i>E. acutangula</i> 3   |
| 3b. Stems terete or subtrigonus below the spikelet. Nuts gradually narrowed towards the apex, not forming a neck                      | ... | <i>E. ochrostachys</i> 2 |
| 1b. Stems slender, 0.2-1.5 mm thick. Spikelets markedly thicker than the stems, ovoid-oblong ; glumes membranaceous, 1.0-4.5 mm long. |     |                          |
| 4a. Stems tetraquetrous                                                                                                               | ... | <i>E. tetraquetra</i> 8  |
| 4b. Stems terete or subterete.                                                                                                        |     |                          |
| 5a. Stigmas 2. Nuts lenticular.                                                                                                       |     |                          |
| 6a. Spikelets 3-5 mm long. Nuts ca 0.5 mm long ; style-base like a minute button, scarcely 0.05 mm long                               | ... | <i>E. atropurpurea</i> 4 |
| 6b. Spikelets 5-20 mm long. Nuts 1.2-1.7 mm long ; style-base oblong-conic, 1.2-1.5 mm long                                           | ... | <i>E. palustris</i> 5    |
| 5b. Stigmas 3. Nuts trigonal.                                                                                                         |     |                          |
| 7a. Spikelet bearing only 1-4 nuts. Nuts cancellate                                                                                   | ... | <i>E. retroflexa</i> 6   |
| 7b. Spikelet bearing several to numerous nuts. Nuts smooth or obscurely reticulate.                                                   |     |                          |

8a. Perianth-bristles 4. Nuts 1.2-1.7 mm long ; style-base oblong-conic, 1.2-1.5 mm long	...	<i>E. palustris</i> 5
8b. Perianth-bristles 6-7. Nuts 0.7-1.2 mm long ; style-base ovoid, ca 0.3 mm long	...	<i>E. congesta</i> 7

1. *E. dulcis* (Burm. f.) Henschel, Vita Rumph. 186. 1833. *Andropogon dulce* Burm. f. Fl. Ind. 219. 1768. *E. plantaginea* R. & S. Syst. 2 : 150. 1817 ; Clarke in Hook. f. Fl. Brit. Ind. 6 : 625. 1893. *Scirpus plantaginoides* Rottb. Descr. et Icon. 45. t. 15. f. 2. 1773. *S. plantagineus* Retz. Observ. 5 : 14. 1789.

*Perennials*, 4-15 dm high. *Stolons* 3-4 mm thick, sometimes bearing tubers. *Stems* terete, 2-10 mm thick, glaucous green, transversely septate. *Leaf-sheaths* membranaceous, 5-20 cm long, usually reddish. *Spikelets* terete, 15-60 × 3-6 mm, acutish ; glumes coriaceous, rather densely imbricating, ovate-oblong, (4-)5-8 mm long, acute, stramineous, red dotted, several-nerved, broadly scarious-margined. *Perianth-bristles* 6-9, subequal, or 6 well developed and 3 only small, thread-like, yellowish, retrorsely scabrid, the longest as long as to longer than the nut ; stamens 3 ; anthers 2.3-3.0 mm long, crest subulate, red ; style 2.8-3.0 mm long ; stigmas usually 3, sometimes 2, 1.5-2.0 mm long. *Nuts* obovoid, biconvex, truncate at the top, 1.5-2.7 mm long, glossy, yellowish brown, obscurely reticulate ; style base pyramidal, about half as long as and about two-third as broad as the nut.

ASSAM, *s.l.*, Jenkins.

2. *E. ochrostachys* Steud. Syn. 2 : 80. 1855 ; Kern in Steenis, Fl. Males. ser. I. 7 : 528. 1974. *E. laxiflora* (Thw.) Pfeiff. in Mitt. Inst. Bot. Hamb. 7 : 169. 1928. *Scirpus laxiflorus* Thw. Enum. Pl. Zeyl. 435. 1864. *E. variegata* (Poir.) Presl var. *laxiflora* Clarke in Hook. f. Fl. Brit. Ind. 6 : 626. 1893 ; Svenson in Rhodora 31 : 156. 1929.

*Perennials*, stoloniferous, 3-6 dm high. *Stems* slender, terete or subtrigonus, ca 2 mm thick, striate. *Leaf-sheaths* tightly enveloping the stem, acute, purplish at base. *Spikelets* terete or subterete, 10-20 × 4 mm, many-flowered ; glumes

coriaceous, lanceolate, ca 5 mm long, greenish stramineous or pale brown. *Perianth-bristles* 6-7, subequal, exceeding the style-base, retrorsely scabrid ; stamens 3 ; stigmas usually 3, sometimes 2. *Nuts* obovoid, gradually narrowed towards the apex, 1.5-1.8 mm long, brownish, trabeculate, the surface cells arranged in about 20 vertical rows on each face ; style-base lanceolate, 1.0-1.2 mm long, about half as broad as the nut, brown.

ASSAM † Kamrup.

3. *E. acutangula* (Roxb.) Schult. in R. & S. Syst. Mant. 2 : 91. 1824. *Scirpus acutangulus* Roxb. Fl. Ind. 1 : 216. 1820. *E. fistulosa* (Poir.) Link in Spreng. Jahrb. Gewach heft 3 : 78. 1820 ; Clarke in Hook. f. Fl. Brit. Ind. 6 : 626. 1893. *S. fistulosus* Poir. Encycl. 6 : 749. 1805 ; non Forssk. 1775.

*Perennials*, 3-8 dm high, usually bearing ca 2 mm thick stolons. *Stems* slender or stout, triquetrous, concave on one side, 2-6 mm thick. *Leaf-sheaths* 2-3, loose, purplish, acute, oblique at the mouth, soon disintegrating, uppermost 7-20 cm long. *Spikelets* terete, as thick as or slightly thicker than the stem, 1.0-3.5 cm long, 2.5-4.0 mm thick, acute, glaucous green or stramineous, 8-32-flowered ; glumes coriaceous, tightly imbricating, ovate-oblong, 4.0-5.5 mm long, scarious-margined, stramineous, red-brown dotted, several-striate. *Perianth-bristles* 6, very unequal, brown, smallest half to two-third as long as the nut, longest equalling to rather exceeding the beak ; stamens 2-3 ; anthers 2.0-2.5 mm long ; style 2.2-3.5 mm long ; stigmas 3, 1-2 mm long, fimbriate. *Nuts* broadly obovoid, biconvex, 1.5-2.0(-2.5) × 1.2 mm, constricted at the apex into a short but distinct neck, glossy, brownish stramineous, surface cells transversely oblong in 15-20 vertical rows on each face ; style-base ovoid-conic, 0.5-1.0 × 0.4-0.8 mm, brown (Figs. 9-9a).



Figs. 7-12 : 7-7b. *Cyperus cyperoides* (L.) O. Ktze. 8-8c. *C. pseudokyllingioides* Kuekenh. 9-9a. *Eleocharis acutangula* (Roxb.) Schult. 10-10a. *E. congesta* D. Don. 11-11a. *E. tetraquetra* Nees. 12. *E. retroflexa* (Poir.) Urb.

*Fls. & frts.* : June-Oct. In swamps along streams, paddy-fields, ponds and ditches, often half submersed, usually forming large patches ; 100-1200 m.

The higher altitude specimens are comparatively more robust.

ASSAM : Kamrup ; N. Cachar & Mikir Hills ; Sibsagar. MEGHALAYA : K. & J. Hills.

4. *E. atropurpurea* (Retz.) J. & K. Presl, Rel. Haenk. 1 : 196. 1828, *excl. specim. cit.* *Scirpus atropurpureus* Retz. Observ. 5 : 14. 1789.

*Annuals*, 5-17 cm high. *Stems* nearly capillary, *ca* 0.2 mm thick. *Leaf-sheaths* obliquely truncate at the mouth, 5-15 mm long. *Spikelets* ovoid-oblong, subterete, 3-5 × 1.5-2.5 mm, acute, many-flowered ; glumes membranaceous, loosely imbricating, elliptic-oblong, 1.0-1.5 mm long, muticous ; keel green, sides with purplish bands. *Perianth-bristles* 4-7, slender, white, translucent, scaberulous, shorter than to equalling the nut, sometimes much reduced or absent ; stamens 1-2 ; anthers 0.3 mm long ; style 0.5 mm long ; stigmas 2, *ca* 0.6 mm long. *Nuts* obovoid, biconvex, 0.5 mm long, smooth, glossy, brownish black, surface cells obscure, subquadrate ; style-base like a minute button, scarcely 0.05 mm long.

ASSAM.

5. *E. palustris* (L.) R. Br. Prodr. 224. 1810. *Scirpus palustris* L. Sp. Pl. 47. 1753.

*Perennials*, 1-4 dm high. *Rhizomes* long creeping and rooting at nodes, blackish. *Stems* terete, 1.0-1.5 mm thick. *Leaf-sheaths* 2, reddish brown, upper one truncate or sometimes shortly laminate. *Spikelets* ovoid or subcylindric, (5-) 7-15 (-20) × 3-5 mm, acutish, densely many-flowered ; glumes membranaceous, ovate-lanceolate, (3.0-) 3.5-4.0 mm long, muticous, brownish, lower 2-3 empty. *Perianth-bristles* 4, subequal, *ca* 1.5 mm long (sometimes much reduced), ferrugineous ; stamens 3 (sometimes 1-2) ; anthers 2 mm long, apiculate ; style 1.5 mm long ; stigmas 2 (rarely 3), 2 mm long. *Nuts* obovoid, biconvex, 1.2-1.7 mm long,

smooth, glossy, stramineous-brownish ; style-base lanceolate, 1.2-1.5 mm long.

*E. uniglumis* (Link) Schult. considered by Clarke (in Hook. f. Fl. Brit. Ind. 6 : 628. 1893) to be synonymous with the above, has been shown as distinct by Fernald & Brackett (in Rhodora 31 : 59. 1929).

MEGHALAYA : K. & J. Hills.

6. *E. retroflexa* (Poir.) Urb. Symb. Ant. 2 : 165. 1900 ; Kern in Steenis, Fl. Males. ser. I. 7 : 534. 1974. *Scirpus retroflexus* Poir. in Lamk, Encycl. 6 : 753. 1804. *Cyperus setaceus* Retz. Observ. 5 : 10. 1789, *non E. setacea* R. Br. Prodr. 225. 1810. *E. chaetaria* R. & S. Syst. Veg. 2 : 154. 1817 ; Clarke in Hook. f. Fl. Brit. Ind. 6 : 629. 1893.

*Annuals* or sometimes *perennials*, usually 3-10 cm, sometimes up to 25 cm high. *Stolons*, if present, filiform, 2-5 cm long. *Stems* slender, subterete, ribbed, erect or flexuous, *ca* 0.3 mm thick. *Leaf-sheaths* membranaceous, lax, reddish, inner 0.5-2.5 cm long, sometimes shortly laminate. *Spikelets* ovoid-ellipsoid, terete or subcompressed, 1.5-4.0 × 1.5-3.0 mm, obtuse, 6-8-flowered but maturing only 1-4 nuts ; glumes membranaceous, laxly imbricating, lower subdistichous, upper spiral, ovate-oblong, 2.5-3.2 mm long, obtuse with 3 green nerves on the back and hyaline sides with reddish brown bands. *Perianth-bristles* six or fewer, very unequal, pale brown, scabrid, the longest usually equalling the nut ; stamens 3 ; anthers 0.5-0.7 mm long, apiculate ; style 1 mm long ; stigmas 3, *ca* 1.7 mm long. *Nuts* obovoid, triquetrous, truncate with the acute angles slightly projecting at the shoulders, 1.0-1.3 mm long, pale stramineous, cancellate, the surface cells subquadrate, in 6-10 vertical rows on each face ; style-base depressed-conic, triquetrous, *ca* 0.4 mm long (Fig. 12).

*Fls. & frts.* : Oct. In swamps and paddy-fields ; at about 100 m.

ASSAM : Kamrup ; Lakhimpur.

7. *E. congesta* D. Don, Prodr. 41. 1825 ; Clarke in Hook. f. Fl. Brit. Ind. 6 : 630. 1893 ;

Kern in Steenis, Fl. Males. ser. I. 7 : 532. 1974. *E. afflata* Steud. Syn. Cyper. 76. 1854 ; Clarke in Hook. f. Fl. Brit. Ind. 6 : 629. 1893. *E. japonica* Miq. Ann. Mus. Bot. Lugd. Bat. 2 : 142. 1856. *E. subvivipara* Boeck. in Linnaea 36 : 424. 1870 ; Clarke in Hook. f. Fl. Brit. Ind. 6 : 629. 1893. *E. chaetaria* var. *subvivipara* Fischer in Gamble, Fl. Madras Pres. 1931 (repr. ed. 3 : 1145. 1956). *E. congesta* var. *subvivipara* Koyama in Journ. Fac. Sci. Univ. Tokyo III. 8 : 90. 1962.

*Annuals* or *perennials*, 1-4 dm high. *Stems* capillary and nodding to firm and erect, subterete, 0.3-1.5 mm thick, 5-9-striate. *Leaf-sheaths* tightly clasping, reddish brown with truncate mouth and acute or mucronate tips, inner 2.0-5.5 cm long. *Spikelets* subcylindric to narrowly ovoid, terete, 2.5-11.0 × 1.5-3.0 mm, acute, several-numerous-flowered, sometimes bearing 1-5 branchlets from the axil of the lowest glume terminated by a smaller spikelet ; branchlets spreading, up to 4.5 cm long ; glumes membranaceous, spiral, elliptic-oblong, 1.5-3.0 mm long, obtuse, midrib green, sides hyaline with purplish-red bands. *Perianth-bristles* 6-7, subequal, whitish-ferrugineous, scabrid above, longest exceeding the style-base ; stamens 2 ; anthers 0.3-1.0 mm long, apiculate ; styles 0.5-1.2 mm long ; stigmas 3, 0.8-1.2 mm long, sparsely fimbriate. *Nuts* obovoid, compressed trigonous, 0.7-1.0 mm long, constricted above into a very short neck, glossy stramineous, smooth ; style-base ovoid, compressed-trigonous, ca 0.3 mm long (Figs. 10-10a).

*Fls. & frts.* : Jan.-Nov. Common in swamps

and shallow water, sometimes also in the paddy-fields ; 100-2000 m.

The higher altitude plants are comparatively more robust with longer bristles and larger nuts.

ASSAM : Lakhimpur. MANIPUR. MEGHALAYA : K. & J. Hills.

8. *E. tetraquetra* Nees in Wt. Contr. Bot. Ind. 112. 1834.

*Perennials*, 2-7 dm high, sometimes stoloniferous. *Stems* rather firm, tetraquetrous, 1.0-1.5 mm thick. *Leaf-sheaths* 2, reddish brown, inner tightly clasping the stem, 8-10 cm long, cuspidate. *Spikelets* erect to slightly inclined, ovoid-lanceolate, 8-15 × 3-5 mm, acute, many-flowered ; glumes membranaceous, rather laxly imbricating, ovate-lanceolate, 3-4 mm long, obtuse, 1-nerved, stramineous, brown striolate. *Perianth-bristles* 6 (sometimes 5), subequal, rather coarse, as long as the style-base, densely scabrid throughout ; stamens 2-3 ; anthers 1.0-1.5 mm long, muticous ; style 1.5-1.8 mm long ; stigmas 3, 0.8-1.0 mm long. *Nuts* narrowly or broadly obovoid with a short neck, biconvex with a faint dorsal ridge, 1.5-2.0 mm long, smooth, stramineous or pale brown ; style-base compressed-trigonous, furrowed, 0.6-0.8 mm long and equally broad, fuscous (Figs. 11-11a).

*Fls. & frts.* : Nov. In swamps ; at about 1300 m.

The tetraquetrous stems are quite distinctive.

ARUNACHAL PRADESH : Kameng ; Subansiri.

### 3. FIMBRISTYLIS Vahl

Enum. Pl. 2 : 285. 1806 ('*Fimbristyles*', '*Fimbristilis*' et '*Fimbristylis*', sphalm.). *Abildgaardia* Vahl, l.c. 296 ('*Abildgardia*' et '*Abilgardia*', sphalm.). *Pogonostylis* Bertol. Fl. Ital. 1 : 312. 1833.

*Annuals* or *perennials*, usually tufted. *Rhizomes*, when present, woody, usually short, sometimes long, creeping. *Stems* 3-5-angled, or compressed. *Leaves* clustered at the base, some-

times few or all reduced to bladeless sheaths ; ligules absent, or membranaceous, or a dense fringe of short-hairs. *Inflorescence* usually anthelate, sometimes capitate or reduced to a solitary spikelet ; bracts foliaceous or glumaceous ; spikelets solitary or in clusters, few-several-flowered ; rhachilla persistent or rarely caducous along with the glumes, sometimes winged ; glumes usually all spiral, some-

times all or only the lower distichous or subdistichous, acropetally falling from the elongating rhachilla, lower 1-3, rarely more, empty. *Flowers* usually all bisexual, sometimes upper 1-3 male or barren; perianth absent; stamens 1-3, anterior; gynophore sometimes well developed; style articulated with the ovary, dilated at the base, usually fimbriate, ultimately deciduous; stigmas 2-3. *Nuts*

sessile or stipitate, lenticular or trigonal, orbicular, obovoid, oblong or linear, smooth, verruculose or tuberculate, rarely glandular, sometimes vertically trabeculate due to transversely oblong surface cells being regularly superimposed in several vertical rows or reticulate due to rounded or polygonal surface cells.

- |                                                                                                                                                                                                                                                        |     |                           |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---------------------------|
| 1a. Nuts linear with almost parallel sides.                                                                                                                                                                                                            |     |                           |
| 2a. Leaves present. Glumes aristate                                                                                                                                                                                                                    | ... | <i>F. dipsacea</i> 6      |
| 2b. Leaves absent. Glumes muticous                                                                                                                                                                                                                     | ... | <i>F. tetragona</i> 1     |
| 1b. Nuts obovoid or suborbicular.                                                                                                                                                                                                                      |     |                           |
| 3a. Stigmas 2. Nuts lenticular.                                                                                                                                                                                                                        |     |                           |
| 4a. Stems bearing 1-3 spikelets.                                                                                                                                                                                                                       |     |                           |
| 5a. Nuts transversely wavy-ridged.                                                                                                                                                                                                                     |     |                           |
| 6a. Stems quadrangular. Spikelet erect on the stem, ovoid-oblong or lanceolate, 2.0-3.5 mm thick, stramineous or brown tinged. Anthers 0.7-1.2 mm long. Nuts with 5-8 transverse ridges                                                                | ... | <i>F. acuminata</i> 2     |
| 6b. Stems terete. Spikelets more or less oblique on the stem, broadly ovoid, 3-5 mm thick, ferrugineous. Anthers 1.5-2.0 mm long. Nuts with 3-5 transverse ridges                                                                                      |     | <i>F. nutans</i> 3        |
| 5b. Nuts smooth or trabeculate.                                                                                                                                                                                                                        |     |                           |
| 7a. Flowering stems leafy. Styles fimbriate.                                                                                                                                                                                                           |     |                           |
| 8a. Nuts trabeculate.                                                                                                                                                                                                                                  |     |                           |
| 9a. Leaves hirsutely hairy throughout, 0.5-0.7 mm broad. Glumes with 0.4-0.5 mm long arista. Nuts usually covered with pluricellular tubercles on the margins and sometimes on the surface, surface cells arranged in 12-14 vertical rows on each face | ... | <i>F. circumciliata</i> 8 |
| 9b. Leaves glabrous or pubescent beneath, 1.5-5.0 mm broad. Glumes acute or mucronulate. Nuts smooth or sometimes verruculose, surface cells arranged in 5-10 vertical rows on each face                                                               | ... | <i>F. dichotoma</i> 10    |
| 8b. Nuts not trabeculate.                                                                                                                                                                                                                              |     |                           |
| 10a. Spikelets 4-8 mm long, 3.0-4.5 mm thick, stramineous or red-tinged; glumes 2.5-3.3 mm long. Anthers 0.5-0.7 mm long; styles 1.2-1.5 mm long                                                                                                       | ... | <i>F. schoenoides</i> 4   |
| 10b. Spikelets 7-20 mm long, 3.5-6.0 mm thick, brown; glumes 5-6 mm long. Anthers 1.5-2.5 mm long; styles 2.5-4.0 mm long                                                                                                                              | ... | <i>F. tristachya</i> 5    |
| 7b. Flowering stems leafless. Styles not fimbriate                                                                                                                                                                                                     | ... | <i>F. globulosa</i> 24    |
| Stems bearing 4-numerous spikelets.                                                                                                                                                                                                                    |     |                           |
| 11a. Spikelets subglobose; glumes broadly scarious-margined, its midrib ending below the tip                                                                                                                                                           | ... | <i>F. globulosa</i> 24    |
| 11b. Spikelets linear-lanceolate, ellipsoid or ovoid-oblong; glumes narrowly scarious margined, its midrib reaching the tip or produced beyond it.                                                                                                     |     |                           |
| 12a. Glumes aristate; arista about as long as the main body. Style-base with long pendent hairs                                                                                                                                                        | ... | <i>F. squarrosa</i> 7     |
| 12b. Glumes acute or mucronate, or if aristate, the arista about one-fourth as long as the main body. Style-base glabrous or with short spreading hairs.                                                                                               |     |                           |
| 13a. Glumes 1.2-1.5 mm long. Nuts 0.5-0.7 mm long.                                                                                                                                                                                                     |     |                           |
| 14a. Leaves ligulate. Nuts trabeculate                                                                                                                                                                                                                 | ... | <i>F. bisumbellata</i> 9  |
| 14b. Leaves not ligulate. Nuts not trabeculate.                                                                                                                                                                                                        |     |                           |
| 15a. Leaves 0.5-1.0 mm broad, usually hairy                                                                                                                                                                                                            | ... | <i>F. aestivalis</i> 12   |
| 15b. Leaves 1-2 mm broad, glabrous                                                                                                                                                                                                                     | ... | <i>F. griffithii</i> 13   |
| 13b. Glumes 2.0-4.2 mm long. Nuts 0.7-1.5 mm long.                                                                                                                                                                                                     |     |                           |

- 16a. Spikelets almost all in clusters of 2-6, sometimes a few solitary, linear-lanceolate, scarcely broader than their pedicels ... *F. hookeriana* 18
- 16b. Spikelets all solitary or sometimes a few rather clustered, ellipsoid or ovoid-oblong, several times broader than their pedicels.
- 17a. Leaves ligulate.
- 18a. Perennial herbs. Rhizomes slender, long creeping ... *F. stolonifera* 11
- 18b. Annual or perennial herbs. Rhizomes, if present, woody, short.
- 19a. Surface cells of the nut arranged in 5-10 vertical rows on each face ... *F. dichotoma* 10
- 19b. Surface cells of the nut arranged in 12-24 vertical rows on each face.
- 20a. Spikelets 2.0-2.5 mm thick ; glumes 3-nerved. Nuts obovoid, on 0.1-0.15 mm long stipe ... *F. albobiridis* 16
- 20b. Spikelets 3-4 mm thick ; glumes several-nerved. Nuts suborbicular, on 0.3-0.5 mm long stipe.
- 21a. Leaf-sheaths glabrous. Rhachilla winged *F. carpopoda* 15
- 21b. Leaf-sheaths hairy. Rhachilla not winged ... *F. tomentosa* 14
- 17b. Leaves not ligulate.
- 22a. Glumes aristate, the arista 0.4-0.5 mm long ... *F. circumciliata* 8
- 22b. Glumes acute ... *F. rigidula* 17
- 3b. Stigmas 3. Nuts trigonal.
- 23a. Inflorescence capitate with many sessile stellately spreading spikelets ; rhachilla of the spikelets caducous ; glumes persistent, the spikelets thus falling off as a whole ... *F. yunnanensis* 33
- 23b. Inflorescence anthelate with distinct rays or reduced to a solitary spikelet, or if capitate then only of 2-5 spikelets ; rhachilla of the spikelets persistent ; glumes acropetally caducous.
- 24a. Flowering stems leafy.
- 25a. Stems bearing 1-3 spikelets. Nuts 2-3 mm long ... *F. ovata* 30
- 25b. Stems bearing 1-numerous spikelets. Nuts 0.4-1.5 mm long.
- 26a. Annuals, 2-6 cm high. Leaves strongly falcate in one direction. Glumes hairy ... *F. fimbriatylloides* 32
- 26b. Annuals or perennials, 10-100 cm high. Leaves straight or sometimes irregularly curved. Glumes glabrous or sometimes hispidulous (in *F. cinnamometorum*).
- 27a. Leaves equitant, laterally flattened ... *F. littoralis* 23
- 27b. Leaves not equitant, dorso-ventrally flattened.
- 28a. Glumes, at least the lower ones of most of the spikelets, distichous.
- 29a. Leaves 2-3 mm broad. Spikelets 5-15 mm long ; glumes glabrous. Nuts broadly obovoid, 0.8-1.0×0.6-0.8 mm ... *F. eragrostis* 29
- 29b. Leaves 0.5-1.2 mm broad. Spikelets 4-6 mm long ; glumes hispidulous. Nuts linear-oblong or narrowly obovoid, 0.8-1.0×0.3-0.4 mm ... *F. cinnamometorum* 31
- 28b. Glumes all spiral.
- 30a. Spikelets all in clusters of 2-5, or sometimes a few solitary ... *F. falcata* 27
- 30b. Spikelets all solitary.

- 31a. Cauline leaves with well-developed blades.
- 32a. Glumes about 1.3 mm long ... *F. tenera* var. *oxylepis* 19
- 32b. Glumes 2.0-4.5 mm long.
- 33a. Leaves ligulate.
- 34a. Stems strongly compressed.  
Glumes 2.0-2.5 mm long, 3-nerved ... *F. complanata* 25
- 34b. Stems 3-5-angled. Glumes 3-4 mm long, many-nerved ... *F. thomsonii* 26
- 33b. Leaves not ligulate ... *F. pierotii* 20
- 31b. Cauline leaves, at least the upper one reduced to bladeless sheaths.
- 35a. Nuts smooth ... *F. filifolia* 21
- 35b. Nuts verruculose ... *F. miliacea* 22
- 24b. Flowering stems leafless.
- 36a. Anthela simple or compound, bearing 2-15 spikelets; spikelets subglobose; glumes broadly scarious margined, its midrib ending below the tip ... *F. globulosa* 24
- 36b. Anthela decomposed or supradecomposed, bearing 10-numerous spikelets; spikelets ellipsoid; glumes narrowly scarious-margined, its midrib reaching the tip or produced beyond it.
- 37a. Nuts densely verruculose, surface cells in 4-6 vertical rows on each face ... *F. miliacea* 22
- 37b. Nuts smooth or sparsely verruculose, surface cells in 9-12 vertical rows on each face.
- 38a. Spikelets about 6×3 mm; glumes scarcely keeled. Nuts smooth ... *F. filifolia* 21
- 38b. Spikelets 3-4×2 mm; glumes strongly keeled. Nuts smooth or slightly verruculose ... *F. salbundia* 27

# 1. *F. tetragona* R. Br. Prodr. 226. 1810.

*Annuals* or *perennials*, 1-6 dm high. *Stems* tetragonous, 0.8-1.2 mm thick. *Leaves* absent; sheaths 2-3, pale or chestnut brown (sometimes the uppermost with a short blade). *Spikelet* solitary, terminal, erect, ovoid-globose, terete, 6-18×4-6 mm, acute, many-flowered; glumes spiral, tightly imbricating, ovate-oblong, 3-5 mm long, obtuse or rounded at the tip, stramineous or brown tinged, 3-nerved. *Stamens* 1-2, or sometimes 3; anthers 1.5 mm long, crest ovate; style 2 mm long, sparsely fimbriate upwards; stigmas 2-3, ca 0.5 mm long. *Nuts* long stipitate, linear-oblong with almost parallel sides, 1.5-2.0×0.5 mm, stramineous, trabeculate due to surface cells being arranged in about 9 vertical rows (Figs. 13-13a).

*Fls. & frts.*: Nov.; 300-1000 m.

The leafless quadrangular stems with solitary spikelets and linear-oblong nuts are very distinctive.

MEGHALAYA: K. & J. Hills.

# 2. *F. acuminata* Vahl, Enum. Pl. 2; 285. 1806.

*Perennials*, 5-30 cm high. *Rhizomes* short. *Stems* obtusely quadrangular. *Leaves* absent. *Spikelet* solitary, terminal, ovoid-oblong or lanceolate, terete, 6-12×2.0-3.5 mm, acute; glumes spiral, ovate-oblong, slightly keeled, 3.5-5.0×2-3 mm, acute or mucronulate, stramineous or brown tinged. *Stamens* 2-3; anthers 0.7-1.2 mm long; style 2-3 mm long, entire or fimbriate upwards; stigmas 2. *Nuts* shortly stipitate, broadly obovoid or suborbicular, biconvex, 1.2-1.7×1.0-1.5 mm, stramineous or brownish, with 5-8 brownish ridges.

ASSAM.

# 3. *F. nutans* (Retz.) Vahl, Enum. Pl. 2; 285. 1806. *Scirpus nutans* Retz. Observ. 4: 12. 1786.

*Perennials*, 2-5 dm high. *Rhizomes* short, creeping. *Stems* terete, 1.0-1.5 mm thick. *Leaves* absent



or the uppermost sheath produced into a short, ovate lamina. *Spikelet* solitary, terminal, more or less obliquely placed on the stem, broadly ovoid, terete,  $8-12 \times 3-5$  mm; glumes spiral, broadly ovate or suborbicular,  $3.5-4.5 \times 3.0-3.5$  mm, obtuse, ferrugineous. *Stamens* 3; anthers 1.5-2.0 mm long; style *ca* 3 mm long, *ca* 0.5 mm broad; stigmas 2. *Nuts* shortly stipitate, obovoid, biconvex,  $1.2-1.5 \times 1.0-1.2$  mm, whitish, with 3-5 transverse ridges (Figs. 14-14a).

MEGHALAYA : K. & J. Hills.

4. *F. schoenoides* (Retz.) Vahl, Enum. Pl. 2 : 286. 1806; Clarke in Hook. f. Fl. Brit. Ind. 6 : 634. 1893 *p.p.* *Scirpus schoenoides* Retz. Observ. 5 : 14. 1789.

*Perennials*, 0.4-4.0 dm high. *Rhizomes* short, woody. *Stems* 0.3-1.0 mm thick. *Leaves* canaliculate, shorter than to equalling the stem, 0.5-1.0 mm broad, obtuse, ligulate. *Anthela* reduced to a solitary terminal spikelet, or simple, bearing 2-3 spikelets; bracts 1-2, setaceous or foliaceous, 0.4-3.0 cm long; rays, if present, slender, often curved, up to 17 mm long; spikelets broadly ovoid or ovoid-oblong, terete,  $4-8 \times 3.0-4.5$  mm, acutish; rhachilla narrowly winged; glumes spiral, broadly ovate or suborbicular, 2.5-3.3 mm long, mucronate or mucronulate, glossy, stramineous, sometimes red tinged, sides 8-10-striate. *Stamens* 3, or sometimes 2; anthers 0.5-0.7 mm long; style 1.2-1.5 mm long, fimbriate upwards; stigmas 2, 0.5-0.8 mm long. *Nuts* stipitate, obovoid, biconvex,  $1.2-1.7 \times 0.9-1.2$  mm, umbonulate, stramineous; stipe 0.2-0.4 mm long, somewhat lobed.

*Fls. & frts.* : July-Oct. Frequent in wastelands and fallow paddy-fields, on moist clayey-loam soil; 100-1100 m.

Clarke (*l.c.*) remarked "The large Khasi form, with rusty-brown spikelets 1.5 cm long, is by Boeckeler added (perhaps rightly) to *F. subbispicata* Nees et Meyen." These actually belong to the following species—*F. tristachya* R. Br.

ASSAM : Darrang; Goalpara; Kamrup; Lakhimpur; Sibsagar. MANIPUR. MEGHALAYA : K. & J. Hills.

5. *F. tristachya* R. Br. Prodr. 226. 1810; Kern in Blumea 8 : 131. 1955; *non* Thw. 1864, *nec.* Clarke in Hook. f. Fl. Brit. Ind. 6 : 649. 1893. *F. schoenoides* Clarke, *l.c.* 634 *p.p.*

*Perennials*, 2.5-5.0 (-10.0) dm high. *Rhizomes* short or up to 3 cm long. *Stems* trigonous, 0.7-1.0 mm thick. *Leaves* canaliculate, half to three-fourth as long as the stem, 0.7-1.2 mm broad; ligule a fringe of hairs. *Anthela* reduced to 1-2(-11) spikelets; bracts setaceous, 5-17 mm long; rays, when present, slender, often curved, up to 17 mm long; spikelets ovoid or ovoid-oblong, terete,  $7-20 \times 3.5-6.0$  mm, acute; rhachilla scarcely winged; glumes spiral, broadly ovate, 5-6 mm long, mucronulate, glossy, brown, sides 6-8-striate. *Stamens* 3; anthers 1.5-2.5 mm long; style 2.5-4.0 mm long, fimbriate upwards; stigmas 2, 0.5-1.0 mm long. *Nuts* stipitate, obovoid, biconvex,  $1.2-1.5 \times 0.9-1.0$  mm, umbonulate, whitish-stramineous, smooth, surface cells hexagonal; stipe *ca* 0.3 mm long (Fig. 15).

*Fls. & frts.* : June-Oct. Common in marshy places; 600-1300 m.

MEGHALAYA : K. & J. Hills.

6. *F. dipsacea* (Rottb.) Clarke in Hook. f. Fl. Brit. Ind. 6 : 635. 1893. *Scirpus dipsaceus* Rottb. Decr. et Icon. 56. t. 12. f. 1. 1773. *Isolepis dipsacea* R. & S. Syst. 2 : 119. 1817.

*Annuals*, tufted, 2-15 cm high. *Stems* slender, *ca* 1 mm thick. *Leaves* capillary, shorter than to as long as the stem, 0.2-0.3 mm broad. *Anthelas* simple or compound, lax, 2-8 cm across, bearing several (sometimes only a solitary) spikelets; bracts foliaceous, as long as to longer than the anthela; spikelets solitary, oblong-subglobose, terete,  $3.0-6.5 \times 2-3$  mm, squarrose; glumes spiral, oblong-lanceolate, *ca* 1 mm long, aristate, stramineous. *Stamens* 1-2; anthers 0.3 mm long, apiculate; style 0.2 mm long, smooth with somewhat bulbous base; stigmas 2, *ca* 0.6 mm long. *Nuts* subsessile, linear-oblong with almost parallel sides and two rows of glands when young, biconvex,  $0.5-0.7 \times 0.1$  mm, faintly transversely lineolate, brownish (Figs. 16-16b).

The squarrose spikelets and linear-oblong glandular nuts are characteristic.

MEGHALAYA : K. & J. Hills.

7. *F. squarrosa* Vahl, Enum. Pl. 2 : 289. 1806. *F. aestivalis* var. *squarrosa* Koyama in Journ. Fac. Sci. Univ. Tokyo III, 8 : 116. 1962.

*Annuals*, 5-10 (-33) cm high. *Stems* trigonous, 0.3-0.5 mm thick. *Leaves* shorter than to equalling the stem, 0.5-1.0 mm broad, acute, glabrous or hairy; sheaths usually white ciliate, sometimes glabrous. *Anthela* compound, rather dense, 2-6 cm across, bearing 11-19 (-53) spikelets; bracts 3-4 foliaceous, subequalling the anthela; rays 7-11, slender, spreading, longest 15-35 mm long; spikelets solitary, linear-oblong, polygonal, squarrose, 3-7 (-13) × 2 mm; rhachilla narrowly winged; glumes spiral, ovate-oblong, keeled, aristate, 2.0-2.5 mm long including ca 1 mm long arista, pale brown, lower sometimes hairy, 3-nerved. *Stamen* 1; anthers 0.3-0.5 mm long, apiculate; style 1.0-1.2 mm long with long white pendent hairs from the base covering the upper half of the nut; stigmas 2, ca 0.2 mm long. *Nuts* shortly stipitate, obovoid, biconvex, 0.6-0.8 × 0.5 mm, stramineous, smooth.

*Fls. & frts.* : May-June. In open marshy places, near streams and ditches; 100-1100 m.

ASSAM : Lakhimpur. MEGHALAYA : K. & J. Hills.

8. *F. circumciliata* Govindarajulu in Proc. Ind. Acad. Sci. 79 : 163. 1974.

*Annuals*, 10-15 cm high. *Stems* tetragonous, ribbed, 0.5-0.6 mm thick. *Leaves* 1-3, shorter than the stem, 0.5-0.7 mm broad, acuminate, hirsutely hairy; sheaths hirsutely hairy. *Anthela* simple, lax, bearing 3-5 spikelets; rays 2-4, 1.5-2.0 cm long; bracts 3 foliaceous, suberect, up to 5 cm long; spikelets solitary, ovate-lanceolate, angular, 5-7 × 1.5-2.0 mm, 10-16-flowered; glumes ovate, membranaceous, 2.6-2.8 (incl. arista) × 1.0-1.2 mm, aristate, stramineous or yellowish brown; arista 0.5 mm long; rhachilla winged. *Stamen* 1; anther 0.5 mm long, apiculate; style flat with dilated pyramidal base, fimbriately hairy throughout

with a ring of short pendent hairs at base, 1 mm long; stigmas 2, 0.5 mm long. *Nuts* stipitate, broadly ovoid, biconvex, usually covered with pluricellular tubercles on the margins and sometimes on the surface, 1.0-1.1 × 0.8-0.9 mm, brown; outer cells in upper half prominently impressed (trabeculate), transversely oblong, in 12-14 longitudinal rows on each face.

ASSAM : Sibsagar.

9. *F. bisumbellata* (Forsk.) Bubani in Dodec. 30. 1850; Fischer in Gamble, Fl. Pres. Madras 1931 (repr. ed. 3 : 1151. 1957). *Scirpus bisumbellatus* Forsk. Fl. Aeg.-Arab. 1 : 15. 1775. *F. dichotoma* Vahl, Enum. Pl. 2 : 287. 1806 p. p.; Clarke in Hook. f. Fl. Brit. Ind. 6 : 635. 1893.

*Annuals*, 1-2 dm high. *Stem* compressed-trigonous, ca 1 mm thick. *Leaves* several, flat, usually falcate, shorter than to subequalling the stem, 1.5-2.5 mm broad, glabrous or pubescent beneath; sheaths hairy. *Anthela* compound to supradecomposed, lax to rather dense, 2-6 cm across, bearing few to numerous spikelets; bracts foliaceous, as long as to exceeding the anthela; rays slender, suberect to spreading; spikelets solitary, polygonal, narrowly ovoid-oblong or lanceolate, 3-8 × 1.0-1.5 mm; rhachilla wingless; glumes spiral, broadly ovate, 1.2-1.5 mm long, sharply keeled, mucronate, yellowish brown. *Stamens* 1-3; anthers 0.5 mm long, apiculate; style slightly flattened, 0.7-1.0 (-1.3) mm long, fimbriate upwards; stigmas 2, ca 1 mm long. *Nuts* shortly stipitate, broadly obovoid, 0.6-0.7 mm long, umbonulate, whitish-stramineous, smooth or verruculose, trabeculate by the surface cells being arranged in 5-9 vertical rows on each face.

*Fls. & frts.* : Feb.-July. Frequent in moist sandy-loam, along roadside and river-banks; 100-200 m.

ASSAM : Goalpara; Darrang; Kamrup; Lakhimpur; Nowgong.

10. *F. dichotoma* (L.) Vahl, Enum. Pl. 2 : 287. 1806 p. p.; Fischer in Gamble, Fl. Pres. Madras

1931 (repr. ed. 3 : 1151. 1957) ; Blake in Journ. Arn. Arb. 35 : 213. 1954. *Scirpus dichotomus* L. Sp. Pl. 50. 1753. *F. diphylla* Vahl, l.c. 289 ; Clarke in Hook. f. Fl. Brit. Ind. 6 : 636. 1893. *F. annua* var. *diphylla* Kuekenh. in Bot. Jahrb. 59 : 47. 1924. *Scirpus diphyllus* Retz. Observ. 5 : 15. 1789.

*Annuals* or *perennials*, 1-8(-12) dm high. *Rhizomes*, if present, short, woody. *Stems* trigonous, compressed below the anthela, 1.0-1.5 mm thick. *Leaves* one-third to one-half as long as the stem, 1.5-5.0 mm broad, glabrous or pubescent beneath, sometimes glaucescent ; ligule a fringe of hairs. *Anthela* (simple-) compound to supradecompound, dense or lax, 3-8 cm across, bearing few to numerous spikelets ; bracts 2-4 foliaceous, shorter than to exceeding the anthela, pilose at base, pubescent upwards ; rays up to 6 cm long ; spikelets ovoid-globose, terete, 4-11(-20) × 2-3(-5) mm, acute ; rhachilla winged ; glumes spiral, ovate-oblong, 2-3(-5) mm long, acute or mucronulate, glossy chestnut, 3-nerved. *Stamens* 1-3 ; anthers 0.5-1.2(-1.7) mm long ; style 1.5-2.5 mm long ; stigmas 2, 0.5-1.0 mm long. *Nuts* shortly stipitate, obovoid, 0.9-1.2 × 0.7-0.9 mm, apiculate, pale stramineous, ultimately brownish, smooth or sometimes verruculose, trabeculate due to the surface cells being arranged in 5-10 vertical rows on each face (Fig. 17).

*Fls. & frts.* : March-Dec. Widely spread in open to shady, dry to swampy places, on sandy-loam, clayey or gravelly soil and in rock-crevices ; 100-2000 m.

A polymorphic species about which Clarke (in Thiselt.-Dyer, Fl. Trop. Afr. 8 : 416. 1902) states "Some closely allied plants, esteemed mere forms of *F. diphylla* (= *F. dichotoma*) by Kunth and Boeckeler, are here regarded as distinct ; even thus narrowed down, our *F. diphylla* has 140 names."

ARUNACHAL PRADESH : Kameng ; Lohit ; Subansiri ; Tirap. ASSAM : Cachar ; Kamrup ; Lakhimpur ; Sibsagar. MEGHALAYA : Garo Hills ; K. & J. Hills. NAGALAND. TRIPURA,

11. *F. stolonifera* Clarke in Hook. f. Fl. Brit. Ind. 6 : 637. 1893.

*Perennials*, 1-6 dm high. *Stolons* 1-3, slender, creeping, up to 7 cm long, 1-2 mm thick, hardening into wiry rhizomes. *Stems* slender, ca 1.5 mm thick. *Leaves* several, one-half as long as to equalling the stem, 1.5-2.0 mm broad, glabrous or hairy beneath, ligulate ; sheaths usually hairy. *Anthela* simple or compound, lax, 2-5 cm across, bearing 4-16 spikelets, sometimes reduced to a solitary spikelet ; bracts 2-3 foliaceous, suberect, shorter than to as long as the anthela, base sometimes hairy, lowest 1.5-10.0 cm long ; rays 3-8, longest 1.5-3.5 cm long ; spikelets solitary, linear-oblong, terete, 5-8 × 2.0-2.5 mm, acute ; glumes spiral, broadly ovate, 2.8-3.2 mm long, muticous, dark blackish brown with 3 green nerves. *Stamens* 3 ; anthers ca 1.5 mm long, crest rotundate ; style 1.5 mm long, fimbriate upwards ; stigmas 2, or rarely 3, ca 2 mm long. *Nuts* stipitate, broadly obovoid, ca 1.0 × 0.8 mm, stramineous-brownish, trabeculate due to the surface cells being arranged in 12-14 vertical rows on each face (Figs. 18-18b).

*Fls. & frts.* : June. In moist places along forest margins ; 1800-1900 m.

MEGHALAYA : K. & J. Hills.

12. *F. aestivalis* (Retz.) Vahl, Enum. Pl. 2 : 288. 1806 ; Clarke in Hook. f. Fl. Brit. Ind. 6 : 637. 1893 p.p. *Scirpus aestivalis* Retz. Observ. 4 : 12. 1786.

*Annuals*, 3-20 cm high. *Stems* 0.3-0.5 mm thick, ribbed. *Leaves* 1-3, subequalling the stem, 0.5-1.0 mm broad, hairy or glabrous, eligulate ; sheaths usually villous to hairy, sometimes glabrous. *Anthela* compound or decompound, lax, 1.0-4.5 cm across, bearing 8-52 spikelets ; bracts several, filiform with broad and usually hairy bases, about as long as the anthela ; rays 5-8, longest 0.8-2.7 cm long ; spikelets solitary, polygonal, oblong-lanceolate, 2.5-6.0 × 1.0-1.5 mm, acute, many-flowered ; glumes spiral, ovate, keeled, ca 1.5 mm long, pale brown, lower 2-4 aristate, hairy, upper mucronate or mucronulate, glabrous. *Stamen* 1,



Figs. 13-22 : 13-13a. *Fimbristylis tetragona* R. Br. 14-14a. *F. nutans* (Retz.) Vahl. 15. *F. tristachya* R. Br. 16-16b. *F. dipsacea* (Rottb.) Clarke. 17. *F. dichotoma* (L.) Vahl. 18-18b. *F. stolontifera* Clarke. 19-19a. *F. hookeriana* Boeck. 20-20a. *F. eragrostis* (Nees) Hance. 21-21b. *Bulbostylis barbata* (Rottb.) Clarke. 22-22b. *B. densa* (Wall.) Hand.-Mazz.

or sometimes 2 ; anthers *ca* 0.3 mm long ; style 0.7 mm long, glabrous or sparsely fimbriate upwards ; stigmas 2, *ca* 0.5 mm long. *Nuts* shortly stipitate, obovoid, biconvex, *ca* 0.5 × 0.3 mm, stramineous, smooth.

*Fls. & frts.* : Sept.-Feb. In open wet places, along streams and ditches, usually colonising ; a common weed of the paddy-fields ; 100-1700 m.

ARUNACHAL PRADESH : Kameng ; Subansiri. ASSAM : Lakhimpur ; Nowgong. MEGHALAYA : Garo Hills.

13. *F. griffithii* Boeck. in Flora 43 : 241. 1860 ; Kern in Blumea 8 : 142. 1955. *F. aestivalis* Clarke in Hook. f. Fl. Brit. Ind. 6 : 637. 1893 *p.p.*

*Annuals*, (3-) 10-22 cm high. *Stems* 0.7-1.0 mm thick, ribbed. *Leaves* 1-2, one-half to three-fourth as long as the stem, 1-2 mm broad, eligulate, glabrous. *Anthela* usually decompound, rarely supra-decompound, lax, 2-7 cm across, bearing 30-90 spikelets ; bracts 2-3 foliaceous, equalling or exceeding the anthela ; rays slender, longest 15-27 mm long ; spikelets solitary, oblong-ovoid, polygonal, 4-11 × 1 mm, acute, many-flowered ; glumes spiral, broadly lanceolate, keeled, 1.2-1.5 mm long, mucronulate, pale brown. *Stamens* 1 (-2) ; anthers 0.2-0.3 mm long ; style 0.7 mm long ; stigmas 2, 0.3 mm long. *Nuts* shortly stipitate, obovoid, biconvex, 0.5-0.7 × 0.5 mm, glossy stramineous, smooth.

*Fls. & frts.* : May. Along streams ; at about 120 m.

ASSAM : Lakhimpur.

14. *F. tomentosa* Vahl, Enum. 2 : 290. 1806 ; Kern in Steenis, Fl. Males. ser. I. 7 : 576. 1974. *F. podocarpa* Nees et Meyen ex Nees in Wt. Contr. Bot. Ind. 98. 1834 *p.p. type* ; Clarke in Hook. f. Fl. Brit. Ind. 6 : 638. 1893 ; Hooper in Saldanha & Nicolson, Fl. Hassan dist. 680. 1976. *F. diphylla* var. *pluristriata* Clarke, *l.c.* 637. *F. annua* var. *podocarpa* Kuekenh. in Bot. Jahrb. 59 : 48. 1924. *F. diphylla* var. *podocarpa* Kuekenh. *l.c.* 69 : 257. 1938.

*Annuals*, 1.5-5.5 dm high. *Stems* slender, nodding, trigonous, 1.0-1.5 mm thick, angles scaberulous below the anthela. *Leaves* several,

sometimes falcate, half to three-fourth as long as the stem, 2.0-3.5 mm broad, glabrous or pubescent beneath ; ligule a fringe of hairs ; sheaths hairy. *Anthela* compound, lax, 2-4 cm across, bearing 6-15 spikelets ; bracts foliaceous, lowest 4.0-8.5 cm long, base villous ; rays 4-6, spreading, longest 2.0-3.5 cm ; spikelets solitary, ovoid-oblong, terete, 6-11 × (2-) 3-4 mm, acute, 10-20-flowered ; glumes spiral, broadly ovate, 3.0-3.5 mm long, mucronulate, pale brown with a green midrib and several lateral nerves. *Stamens* 2 ; anthers 0.7 mm long, apiculate ; style 1.2-1.5 mm long, fimbriate throughout ; stigmas 2, 0.5 mm long. *Nuts* long stipitate, suborbicular, lenticular with obtuse thickened edges, 1.0-1.5 mm long, stramineous, smooth or sometimes verruculose, trabeculate due to the surface cells being arranged in 16-24 vertical rows on each face ; stipe 0.3-0.5 mm long.

*Fls. & frts.* : Aug.-Sept. In shade, along forest margins ; 100-1500 m.

ARUNACHAL PRADESH : Kameng. ASSAM : Goalpara. MEGHALAYA : K. & J. Hills.

15. *F. carpopoda* Govindarajulu in Proc. Ind. Acad. Sci. 79 : 160. 1974.

*Perennials*. *Rhizomes* indistinct. *Stems* tufted, 1-3, ribbed, flat below the anthela, 3-4 dm high, 1.6 mm thick. *Leaves* 3-4, about half as long as the stem, 2-3 mm broad, ligulate, margins slightly thickened. *Anthela* compound, bearing 10-16 spikelets, 2.0-4.5 cm across ; bracts foliaceous, hairy at the base, 4.5-6.0 cm long ; spikelets ovoid-lanceolate, terete, acute, 6-12 × 3-4 mm ; rachilla winged ; glumes spiral, chartaceous, broadly ovate, 3.0-3.4 mm long, mucronate, glossy cinnamomeous or dark brown, 15-17-nerved in each half. *Stamens* 2 ; anthers 0.6-0.7 mm long ; style flat, not dilated at the base, gradually narrowing upwards, fimbriate throughout, 1.3 mm long ; stigmas 2, 1.0-1.2 mm long. *Nuts* stipitate, suborbicular, biconvex, 1.6-1.8 × 1.0-1.1 mm, yellow, shining, with smooth or undulate margins, surface cells in upper half quadrately hexagonal, occurring in 18-20 (-22) vertical rows on each face.

NAGALAND, Bor 11184, 2600 m (*n. v.*).

16. *F. alboviridis* Clarke in Hook. f. Fl. Brit. Ind. 6 : 638. 1893.

*Annuals*, 1.5-2.5(-4.0) dm high. *Stems* compressed-trigonous, ca 1 mm thick. *Leaves* several, shorter than to equalling the stem, 1-2 mm broad ; ligule a fringe of hairs. *Anthela* compound or decompound, lax, 2.0-4.5 cm across, bearing 5-27 spikelets ; bracts foliaceous, spreading, lowest 3.5-8.0 cm long ; rays 4-7, longest 12-25 mm long ; spikelets solitary, ovoid, terete, 4-11 × 2.0-2.5 mm, subacute ; glumes spiral, broadly ovate, 2.0-2.5 mm long, muticous, greyish green or brown tinged, 3-nerved. *Stamens* 1-2 ; anthers 0.7 mm long, crest ovate ; style 1.0-1.5 mm long, fimbriate ; stigmas 2, 0.7-1.0 mm long. *Nuts* shortly stipitate, obovoid, biconvex, 1.0-1.2 × 0.8 mm, stramineous, verruculose, trabeculate due to the surface cells being arranged in 12-16 rows on each face.

*Fls. & frts.* : Sept. Scarce, in wastelands ; 100-1500 m.

ASSAM : Goalpara ; Sibsagar. MEGHALAYA : K. & J. Hills.

17. *F. rigidula* Nees in Wt. in Contr. Bot. Ind. 99. 1834.

*Perennials*, 1.0-5.5 dm high. *Rhizomes* short, creeping. *Stems* closely uniseriate, 1.0-1.5 mm thick, swollen at the base. *Leaves* one-third to two-third as long as the stem, 1.5-2.5 mm broad, glabrous or pubescent. *Anthela* simple or compound, lax, 2-13 cm across, bearing 5-20 spikelets ; bracts short, lowest scarcely 1-2 cm long ; rays 5-9, longest 1.5-5.0 cm long ; spikelets all solitary or a few in pairs, ovoid-ellipsoid, terete, 5-12 × 3-5 mm, obtuse ; glumes spiral, ovate-oblong, 3.5-4.0 mm long, acute, chestnut, 3-nerved. *Stamens* 3 ; anthers 1.3 mm long ; style 2-3 mm long, fimbriate ; stigmas 2, 1.7 mm long. *Nuts* stipitate, obovoid, lenticular, 1.3-1.5 × 1.2 mm, stramineous faintly trabeculate with surface cells arranged in 20-30 vertical rows on each face.

MANIPUR, Watt 7414 (n. v.).

18. *F. hookeriana* Boeck. in Linnaea 37 : 22. 1871.

*Annuals*, 0.5-4.5 dm high. *Stems* trigonous, 1-2 mm thick, slenderly ribbed. *Leaves* several, rather slightly exceeding the stem, 1.5-2.5 mm broad ; ligule membranaceous. *Anthela* compound or decompound, rarely simple in depauperated plants, 2-18 cm across, bearing 4-27 spikelets ; rays 3-9, rigid, subcompressed, longest 2.5-17.0 cm long ; bracts foliaceous, lowest 3-35 cm long ; spikelets usually in clusters of 2-6 with a few solitary ones, but sometimes all solitary on up to 10 cm long pedicels, linear-lanceolate, 5-12 × 1.5-2.0 mm, acute ; glumes oblong, keeled 3.5-5.0 mm long, mucronate, rusty-green. *Stamens* 2 ; anthers 0.7 mm long, crest ovate ; style 2.7-3.3 mm long, fimbriate throughout ; stigmas 2, 0.8 mm long. *Nuts* shortly stipitate, obovoid, lenticular, 1.1-1.3 × 0.8-1.0 mm, yellowish brown, tubercled on shoulders, slenderly longitudinally ribbed due to the surface cells being arranged in 12-15 vertical rows (Figs. 19-19a).

*Fls. & frts.* : Aug.-Sept. In dry to moist places among boulders ; it is one of the pioneer species on sandstones ; 1000-1300 m.

MEGHALAYA : K. & J. Hills.

19. *F. tenera* Schult. var. *oxylepis* (Steud.) Clarke in Hook. f. Fl. Brit. Ind. 6 : 642. 1893. *F. oxylepis* Steud. Syn. Cyper. 110. 1855. *F. tenera* var. *verrucaenum* Clarke ex Haines, Bot. Bihar & Orissa 1924 (repr. ed. 3 : 961. 1961).

*Annual*, tufted herbs, 1.5-3.0 dm high. *Stems* slender, 4-5-angled. *Leaves* ca half as long as the stem, flat, narrow. *Anthela* subcompound, bearing 7-9 spikelets ; bracts setaceous, up to 2.5 cm long ; spikelets solitary, linear-lanceolate, 3-6 mm long, pale brown ; glumes ovate, ca 1.3 mm long, mucronate, glabrous, 3-nerved. *Style* long, glabrous, base pyramidal ; stigmas 3. *Nuts* obovoid, trigonous, yellowish brown, verrucose.

ASSAM, Griffith (n. v.).

20. *F. pierotii* Miq. in Ann. Mus. Lugd. Bat. 2 : 145. 1865. *F. pinetorum* Merr. in Philip. Journ. Sci. (Bot.) 9 : 266. 1914.

*Perennials*, 2-3 dm high. *Rhizomes* rather slender, 2-5 cm long, ca 2 mm thick. *Stem* solitary,

triquetrous, *ca* 1 mm thick, smooth or the angles scaberulous. *Leaves* about half as long as the stem, 1-2 mm broad, acute. *Anthela* simple or once compound, 2-4(-7) cm across, bearing 5-7(-14) spikelets; bracts setaceous, lowest 8-10 mm long; rays 4-5, longest 1.0-1.5 (or more) cm long; spikelets solitary, oblong-ellipsoid, 5-8(-15) × 2.5-3.0(-4.0) mm, 8-10 (or more)-flowered; glumes broadly ovate, keeled, 3.8-4.5(-6.0) mm long, muticous, castaneous, with a few round glands in the upper part; keel green, 3-nerved. *Stamens* 3; anthers 1.7-2.5 mm long, crest ovate; style 2 mm long, glabrous; stigmas 3, *ca* 3 mm long. *Nuts* shortly stipitate, obovoid, triquetrous, 1.0-1.5 × 0.8-1.0 mm, whitish stramineous, smooth or sparsely tubercled.

ASSAM.

**21. *F. filifolia*** Boeck. in *Linnaea* 37 : 32. 1871.

*Stems* quadrangular, *ca* 6 dm high. *Leaves* shorter than to as long as the stem, narrow, convolute, sometimes absent. *Anthela* decompound or supradecompound, 10-30 cm broad, bearing numerous (up to 250) spikelets; bracts 1-5 cm long; spikelets solitary, ellipsoid, *ca* 6 × 3 mm, acute; glumes spiral, ovate, obtuse, brown with 3 green nerves. *Style* as long as the nut, slightly villous at the tip; stigmas 3, long. *Nuts* obovoid, trigonous, about two-fifth as long as the glume, stramineous, smooth; surface cells in *ca* 12 vertical rows on each face.

MEGHALAYA : K. & J. Hills, *Clarke* 7285 (*n.v.*); J. D. Hooker 1065 (*n.v.*).

**22. *F. miliacea*** (L.) Vahl, *Enum. Pl.* 2 : 287. 1806; Kern in Steenis, *Fl. Males. ser. I.* 7 : 552. 1974. *Scirpus miliaceus* L. *Syst. Veg. ed.* 10. 868. 1759. *S. quinquangularis* Vahl, *l.c.* 279. *F. quinquangularis* Kunth, *Enum. Pl.* 2 : 229. 1837; Clarke in Hook. f. *Fl. Brit. Ind.* 6 : 644. 1893.

*Annuals or perennials*, 2-9 dm high, with many flowering shoots and a few sterile leafy shoots. *Rhizomes*, if present, short, woody. *Flowering stems* leafless or with a solitary basal leaf, acutely 5-angled, 1.5-2.5 mm thick, deeply grooved. *Leaves* of the sterile shoots several, 2-3 mm broad,

margins cartilaginous; sheaths of the flowering stems inflated, with a short acute tip. *Anthela* lax, decompound or supradecompound, rarely compound, 2-9 cm broad, usually bearing about 100-300, sometimes only 10-15 spikelets; bracts usually short, setaceous, sometimes longer, foliaceous, lowest 2-5 cm long; rays few to many, longest 2-10 cm; spikelets all or nearly all solitary, ovoid or ovoid-oblong, subterete or angular, 2-5 × 1.2-2.0 mm, acutish, 6-16 flowered; rhachilla winged; glumes spiral, ovate, 1-2 mm long, mucronulate, pale or dark brown, 3-5-nerved. *Stamens* 1-2; anthers 0.4-0.8 mm long; style 0.5-0.7 mm long, glabrous or fimbriate upwards; stigmas 3, 0.5-0.8 mm long. *Nuts* shortly stipitate, obovoid or suborbicular, trigonous, 0.4-0.8 × 0.3-0.5 mm, densely verruculose, stramineous to pale brown, faintly transversely lineolate with the surface cells being transversely linear in 4-6 vertical rows on each face.

*Fls. & frts.* : May-Nov. Common in moist to swampy places or in shallow water, along ditches, drains and streams; a common weed of the paddy-fields; 100-1000 m.

ARUNACHAL PRADESH : Kameng; Tirap. ASSAM : Goalpara; Kamrup; Lakhimpur; Sibsagar. MEGHALAYA : K. & J. Hills.

**23. *F. littoralis*** Gaudich. in Frey. *Voy. Bot.* 413. 1826; Kern in Steenis, *Fl. Males. ser. I.* 7 : 551. 1974. *F. miliacea* Vahl, *Enum. Pl.* 2 : 287. 1806, *excl. basion.*; Clarke in Hook. f. *Fl. Brit. Ind.* 6 : 644. 1893.

*Annuals or perennials*, 1.0-4.5(-9.0) dm high. *Rhizomes*, if present, short, woody. *Stems* 4-5-angled, 1.0-1.7 mm thick. *Leaves* several, equitant, usually more or less distichous, laterally flattened, as long as the stem, 1-3 mm broad, frequently yellowish green, finely several striate but lacking a midrib; outer margin thin, inner thick, grooved; upper two cauline leaves reduced to bladeless sheaths. *Anthela* lax or rather dense, usually decompound, rarely compound or supradecompound, bearing (12-)30-80 spikelets; bracts spreading, lowest 0.5-3.0 cm long; rays 7-15, longest (1-)4-5

cm long; spikelets solitary, terete, subglobose, 2.5 × 1.5-2.5 mm, obtuse, 8-21-flowered; glumes spiral, ovate-oblong, 1.0-1.5 mm long, muticous, 3-nerved. *Stamens* 1-2; anthers 0.3-0.5 mm long; style 0.6-0.8 mm long, sparsely fimbriate at tip; stigmas 3, *ca* 0.3 mm long. *Nuts* shortly stipitate, narrowly obovoid, trigonous, 0.6-0.7 × 0.3-0.4 mm, stramineous, verruculose, transversely lineolate.

*Fls. & frts.*: June-Sept. Common in open, moist to swampy places, along roadside ditches, drains and streams; a common weed of paddy-fields; 100-1000 m.

Readily distinguished by the equitant laterally flattened leaves and small globose spikelets.

ASSAM: Cachar; Kamrup; Lakhimpur; Nowgong; Sibsagar. MEGHALAYA: Garo Hills; K. & J. Hills. NAGALAND.

**24. *F. globulosa* (Retz.) Kunth, Enum. Pl. 2: 231. 1837. *Scirpus globulosus* Retz. Observ. 6: 19. 1791. *F. assamica* Clarke ex Guha Bakshi in Bull. Bot. Soc. Beng. 24: 111. 1970.**

*Perennials*, 1.5-6.0 (-12.0) dm high. *Stems* rather stout, obtusely 4-5-angled, 1.5-3.0 mm thick, smooth or scaberulous at the tip. *Cauline leaves* reduced to sheaths; sheaths 3-5, innermost 2.5-15.0 cm long, acute, leaves of the sterile shoots flat or canaliculate, 1.5 mm broad; ligule absent. *Anthela* simple or compound, lax, bearing (1-)2-15 (-many) spikelets; bracts very short, lowest 4-8 mm long; rays 1-8, ascending, longest 8-25 mm; spikelets solitary, subglobose, terete, 4-6(-8) mm long, obtuse, numerous-flowered; rhachilla winged; glumes spiral, ovate, 2.0-2.5 mm long, muticous, brown, 3-nerved, the midrib ending somewhat below the tip; margins broadly scarious; sometimes the upper glumes sterile and much elongated. *Stamens* usually 3, sometimes 2; anthers 0.6 mm long; style 0.8-1.0 mm long, glabrous; stigmas 3, or sometimes 2, 0.8 mm long. *Nuts* subsessile, obovoid, trigonous, or sometimes lenticular, 0.7-1.0 × 0.7 mm, verruculose, apiculate, stramineous; surface cells in 12-15 vertical rows on each face.

*Fls. & frts.*: June-Sept. In marshy places, sometimes colonising; 100-1500 m.

The leafless culms bearing large globular spikelets are quite characteristic. In Java the stems of a stout cultivated form are being used for making mats and baskets etc.

ASSAM: Goalpara; Nowgong. MEGHALAYA: Garo Hills; K. & J. Hills.

**25. *F. complanata* (Retz.) Link, Hort. Berol. 1: 292. 1827. *Scirpus complanatus* Retz. Observ. 5: 14. 1789.**

*Annuals* or *perennials*, 2-10 dm high. *Stems* strongly compressed, 1-2 mm broad, smooth or scabrid upwards. *Leaves* usually much shorter than to almost equalling the stem, 3-5 mm broad, abruptly narrowed into a triangular tip; ligule a fringe of hairs. *Anthela* compound to supradecom-pound, rather lax, 2-8 cm broad, bearing 12-90 spikelets; bracts erect, lowest foliaceous, 2-8 cm long; rays 5-9, flattened, suberect to spreading, longest 3.5-6.0 cm; spikelets solitary, oblong-lanceolate, polygonal, 5-7 × 2 mm, obtuse; glumes spiral, ovate-oblong, keeled, 2.0-2.5 mm long, lower mucronate, upper muticous; keel green, 3-nerved, sides deep brown. *Stamens* 3; anthers 0.7-1.0 mm; style 1-2 mm long, glabrous; stigmas 3, *ca* 1.5 mm long. *Nuts* subsessile, broadly obovoid, trigonous, 0.7-1.2 × 0.5-1.0 mm, whitish stramineous, verruculose.

*Fls. & frts.*: June-Sept. In dry to swampy wastelands; 1000-2000 m.

MEGHALAYA: K. & J. Hills. NAGALAND.

**26. *F. thomsonii* Boeck. in Linnaea 37: 37. 1871; Clarke in Hook. f. Fl. Brit. Ind. 6: 646. 1893.**

*Annuals* or *perennials*, 1.5-8.0 dm high. *Stems* obtusely 3-5-angled, 0.5-1.2 mm thick. *Leaves* half as long as to longer than the stem, 2.0-5.5 mm broad, abruptly narrowed to a triangular tip; ligule a fringe of hairs. *Anthela* compound to supradecom-pound, 3-10 cm broad, usually bearing 20-50, sometimes up to 80 spikelets; bracts 2-5 foliaceous, lowest 2-10 cm long; rays 5-9, suberect or obliquely spreading, longest 2-10 cm; spikelets all or nearly all solitary, ellipsoid, 5-10 × 2.0-2.5 mm,



acute ; glumes spiral, ovate-oblong, 3-4 mm long, acute or mucronulate, castaneous, 5-9-nerved. *Stamens* 3 ; anthers 1.5 mm long ; style 1.5-2.5 mm long, thickened at the base, glabrous ; stigmas 3, 1.8-3.0 mm long. *Nuts* subsessile, obovoid, trigonous, 1.0-1.2 mm long, stramineous or brownish, verrucose.

*Fls. & frts.* : Feb.-June. In wastelands and plantation ; 100-1500 m.

ASSAM : Goalpara. MEGHALAYA : K. & J. Hills.

We are unable to distinguish *F. multinervia* Govindarajalu (in J. Bomb. Nat. Hist. Soc. 69 : 162. 1972) from *F. thomsonii*. Regarding the characters used to distinguish the former it may be stated that in both the species the culms are smooth, the leaves many-nerved, the bracts glabrous, the lowest in the former (2-) 4-6 cm long and in the latter 2-10 cm long, in both the spikelets are many-flowered and tannin bearing, the glumes obliquely erect and several-nerved, and nuts tubercled with several rows of outer cells on each face. In fact, among the Types of *F. multinervia*, Kurz 637, 628 & 636 ; Brandis 1018 ; Prazer s. n. & Anon. (two sheets), all from Burma, and Prain 226 from Kohima in Nagaland, Clarke (in J. Linn. Soc. Bot. 34 : 69. 1898) has cited Kurz 637, 628 & 636 and Brandis 1018 under *F. thomsonii* only.

**27. *F. salbundia*** (Nees) Kunth, Enum. Pl. 2 : 230. 1837. *Trichelostylis salbundia* Nees in Wt. Contr. Bot. Ind. 105. 1834.

*Perennials*, 4-9 dm high. *Rhizomes* very short, obliquely descending. *Stems* acutely 4-5-angled, deeply grooved. *Leaves* absent. *Anthela* decompound, dense, 4-8 cm across, bearing numerous spikelets ; bracts short, setaceous, lowest 8-20 mm long ; rays suberect ; spikelets solitary, ellipsoid-ovoid, polygonal, 3-4 × 2 mm, ca 10-flowered ; glumes spiral, ovate, ca 2 mm long, obtuse, prominently keeled ; margins broadly scarious ; keel green, sides brown. *Stamens* 2-3 ; anthers 0.7-1.0 mm long ; style 1 mm long, glabrous ; stigmas 3. *Nuts* stipitate, broadly obovoid, 0.9 × 0.7 mm, yellowish brown, smooth

or verruculose, surface cells transversely elliptic-oblong, in 9-11 vertical rows on each face.

MEGHALAYA : K. & J. Hills, Lemann (n.v.).

**28. *F. falcata*** (Vahl) Kunth, Enum. Pl. 2 : 239. 1837 ; Kern in Blumea 8 : 113. 1955. *Scirpus falcatus* Vahl, Enum. Pl. 2 : 275. 1806. *F. junciformis* Kunth, l.c. ; Clarke in Hook. f. Fl. Brit. Ind. 6 : 647. 1893.

*Perennials*, 1-4 dm high. *Rhizomes* short, woody, or sometimes long, creeping. *Stems* 4-5-angled. *Leaves* several, usually short, sometimes half to two-third as long as the stem, 2-4 mm broad, obtuse. *Anthela* compound or decompound, 2.5-10.0 cm broad, usually bearing 20-30, sometimes only 3-5 clusters of spikelets ; bracts 2-4, foliaceous, short ; spikelets in clusters of 2-5, sometimes a few solitary, oblong, 3-6 mm long ; glumes spiral, broadly ovate, 2.0-2.7 mm long, muticous or mucronulate, fuscous or castaneous, broadly scarious margined. *Stamens* 3 ; anthers linear, crest setulose ; style slender, fimbriate in the upper part ; stigmas 3. *Nuts* shortly stipitate, obovoid, trigonous, 0.8-1.0 × 0.8 mm, whitish stramineous, smooth or verruculose.

ASSAM, Griffith 1584 (n.v.) ; Simon (n.v.).

**29. *F. eragrostis*** (Nees) Hance in Journ. Linn. Soc. (Bot.) 13 : 132. 1873 ; Kern in Steenis, Fl. Males. ser. I. 7 : 567. 1974. *Abildgaardia eragrostis* Nees in Wt. Contr. Bot. Ind. 95. 1834. *F. nigrobrunnea* Thw. Enum. Pl. Zeyl. 434. 1864 ; Clarke in Hook. f. Fl. Brit. Ind. 6 : 648. 1893.

*Perennials*, 2-6 dm high. *Rhizomes* short, woody. *Stems* 4-5-angled, 0.5-2.5 mm thick, smooth or scaberulous at the tip. *Leaves* numerous, coriaceous, 2-5 mm broad with a triangular tip. *Anthela* usually compound, sometimes simple, decompound, or subcapitate, 2.5-5.0 cm across, bearing 2-35 spikelets ; rays suberect, lowest 1-5 cm long ; bracts small, foliaceous, lowest 8-20 mm long ; spikelets solitary or in clusters of 2-4, ellipsoid, compressed or subterete, often contorted, 5-15 × 2-4 mm, acute ; lower glumes in many of the spikelets distichous or subdistichous, upper

spiral, in rest of the spikelets all spiral, ovate, 3-5 mm long, mucronulate, brown. *Stamens* 2-3; anthers 1.0-1.5(-2.0) mm long; style 2-3 mm long; stigmas 3, 2-3 mm long. *Nuts* shortly stipitate, obovoid, trigonous, 0.8-1.1 × 0.6-1.1 mm, verrucose, brownish or stramineous (Figs. 20-20a).

*Fls. & frts.*: April-Sept. On open hillocks and moist to swampy places; 900-1800 m.

MĀGHALAYA † K. & J. Hills.

**30. *F. ovata*** (Burm. f.) Kern in Blumea 15 : 126. 1967. *Carex ovata* Burm. f. Fl. Ind. 194. 1768. *F. monostachyos* Hassk. Pl. Rar. Jav. 61. 1848 ('*monostachya*', sphalm.); Clarke in Hook. f. Fl. Brit. Ind. 6 : 649. 1893. *Cyperus monostachyos* L. Mant. 2 : 180. 1771.

*Perennials*, 1-3(-6) dm high. *Rhizomes* short, woody. *Stems* slightly swollen at the base, trigonous or rather flattened at the top, smooth or the angles scabrid. *Leaves* several, one-third to half as long as the stem, 0.5-1.0 mm broad. *Anthela* reduced to a solitary (-3) spikelets; bracts 1-3, setaceous, lowest 5-10 mm long; spikelets compressed in the lower half, subterete in the upper half, ovate-lanceolate, 6-17(-30) × 3-6 mm, yellowish stramineous, often ultimately twisted; rhachilla winged; lower glumes distichous, upper spiral, broadly ovate-oblong, keeled, 4.5-6.0(-7.5) mm long, mucronate, 3-5-nerved. *Stamens* 2-3; anthers 1.5-3.0 mm long, crest rotundate; style 2-4 mm long, fimbriate throughout; stigmas 3, *ca* 1.3 mm long. *Nuts* stipitate, obovoid, trigonous, 2-3 × 1.2-2.0 mm, apiculate, yellowish white or brown tinged, tuberculate.

ASSAM.

**31. *F. cinnamometorum*** (Vahl) Kunth, Enum. Pl. 2 : 229. 1837; Kern in Blumea 8 : 123. 1955. *Scirpus cinnamometorum* Vahl, Enum. Pl. 2 : 278. 1806. *F. cyperoides* R. Br. Prodr. 228. 1810; Clarke in Hook. f. Fl. Brit. Ind. 6 : 650. 1893. *F. cyperoides* var. *cinnamometorum* (Vahl) Clarke, l. c.

*Perennials*, 20-75 cm high. *Rootstock* short. *Stems* slender, subterete, channeled, smooth or scaberulous at the top. *Leaves* several, about half as long as to equalling the stem, 0.5-1.2 mm broad,

acute. *Anthela* lax, decompound to supradecom-  
pound, with slender spreading rays, longest ray 2.5-7.5 cm; bracts 1-2 foliaceous, the rest setaceous, lowest 3.5-7.0 cm long; spikelets numerous, solitary, linear-oblong, compressed, 4-6 × 0.8-1.2 mm, few-flowered; glumes subdistichous, oblong-lanceolate, acute, 3.0-3.7 × 1.3 mm, hispidulous, 3-nerved, stramineous, densely red-dotted. *Stamens* 3; anthers 1.5 mm long, crest subulate, red; style 2.5-3.0 mm long, glabrous; stigmas 3, 0.5 mm long. *Nuts* shortly stipitate, linear-oblong or narrowly obovoid, trigonous, 0.8-1.0 × 0.3-0.4 mm, deep brown, smooth or sparsely tubercled on maturity.

MĀGHALAYA † K. & J. Hills; 800-1200 m.

**32. *F. fimbristylloides*** (F. v. Muell.) Druce in Rep. Bot. Exch. Cl. Brit. Isl. 1916 : 623. 1917; Kern in Blumea 8 : 129. 1955. *Abildgaardia fimbristylloides* F. v. Muell., Fragm. Phyt. Austral. 8 : 273. 1874.

*Annuals*, 2-6 cm high. *Roots* 1-2 cm long. *Stems* triquetrous, 0.3-0.5 mm thick. *Leaves* numerous in a basal rosette, all strongly curved either clockwise or anti-clockwise, flat, 3-7 cm long, *ca* 2 mm broad, abruptly acute to a triangular tip. *Anthela* simple or compound, 1-3 cm long, bearing 3-7 spikelets; bracts 2-4 foliaceous, lowest 8-13 mm long; rays 2-5, suberect; spikelets solitary, lanceolate, compressed, 3-5 × 1.5-2.0 mm, deep brown or ultimately blackish; glumes subdistichous, ovate-lanceolate, 2.5-3.0 mm long, acute or mucronulate, hairy. *Stamens* 2-3; anthers 0.5-0.7 mm long. *Nuts* shortly stipitate, obovoid, abruptly truncate at the base, *ca* 0.7 × 0.5 mm, smooth or verruculose, surface cells hexagonal.

Colonising denudated stream-bed, in rock-crevices; at about 700 m.

MĀGHALAYA † K. & J. Hills.

**33. *F. yunnanensis*** Clarke in J. Linn. Soc. (Bot.) 36 : 247. 1903; Kern in Blumea 10 : 648. f. 3 J-S. 1960.

*Perennials*, *ca* 3.5 (-8.0) dm high. *Rhizomes* short, woody. *Stems* *ca* 0.7 mm thick, 4-5-striate, sparsely hairy. *Leaves* canaliculate at the base,