

HYPERACEAE
OF
NORTH
EAST
INDIA

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

BOTANICAL SURVEY OF INDIA

CYPERACEAE OF NORTH EAST INDIA

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Howrah 711103

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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.

BOTANICAL SURVEY OF INDIA
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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.

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. uniolooides*, *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 Malabaria, 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 Malabaria, 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 Malabaria (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	—
TOTAL	173	150	92	60	116	55	24	58	11

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, dehiscent 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*, *utricule*); 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 exerted, 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 exerted (<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 utricule | ... | CAREX 14 |
| 4b. Flowers bisexual or unisexual; nuts not enclosed within a utricule. | ... | |
| 5a. Inflorescence paniculate or spicate. Flowers all unisexual. Nuts borne on a hypogynous disk | ... | SOLEBIA 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. *Torulium* 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 trifold. 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. pseudokyllin-gioides* 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 decomposed.
- 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-decomposed.

- 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, cylindrical, 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 gravely substratum, often in association with *C. brevifolius* but never dense ; 1300-2000 m.

The very short rhizomes, white cylindrical 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 ciliolate-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, subtrigonus. *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, subtrigonus, 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, mucicous, 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*. *Pycreus 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-trigonus, 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 subclaxly 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.¹

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.

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. *Pycreus 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-trigonus, *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, mucicous, 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 : Kamong. 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, cinnamomeous 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, mucicous or mucronulate, keeled, stramineous or pale ferruginous (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 ferruginous.

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, ferruginous. *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. uniolooides* R. Br. Prodr. 216. 1810. *Pycneus angulatus* Nees in Linnaea 9 : 283. 1834. *P. uniolooides* 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 exerted, 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* decomposed, 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 ferruginous; 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. An. 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-ferruginous, 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 subclaxly 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 decomposed, 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 decomposed, 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 along with 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 ferruginous, 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 supradecomposed, 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. 1. 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, mucicous 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* decomposed (rarely compound or supracomposed), 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, mucous, 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. Pflanzenz. 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 decomposed, 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, mucinous 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. Cyp.* 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, sublax, 15-20 cm across; bracts 2-5, shorter than the anthela, with spinulose 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 trifold; 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, decomposed 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 trifold. *Nuts* broadly

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

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 decomposed, 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 exerted. *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 tuberous 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, stramineous, 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 × 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. MUGHALAYA : K. & J. Hills.

2. ELEOCHARIS R. Br.

Prodr. 224. 1810 ('*Elaeocharis*', '*Eleocar*', 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 subtrigonal, 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-brisles* 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-brisles* 4, subequal, *ca* 1.5 mm long (sometimes much reduced), ferruginous ; 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-brisles* 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-ferruginous, 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*', '*Fimbristylis*' et '*Fimbrystylis*', 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 ² 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, ferruginous. 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
<i>F. globulosa</i> 24 |
| 7b. Flowering stems leafless. Styles not fimbriate | ... | |
| 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. alboviridis* 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 × 3-5 mm; glumes spiral, broadly ovate or suborbicular, 3.5-4.5 × 3.0-3.5 mm, obtuse, ferruginous. *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 × 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 × 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 × 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 × 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 × 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. Decer 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 × 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 × 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 supradercompound, 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 supradecomposed, 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 ; rachilla 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 decomposed, 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 decomposed, 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, mucous, 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 decomposed, 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* decomposed or supradecomposed, 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, decomposed or supradecomposed, 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 decomposed, rarely compound or supradecomposed, 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, mucicous, 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, mucicous, 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* sessile, 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 supradecomposed, 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 mucicous; 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* sessile, 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 supradecomposed, 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* sessile, 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* decomposed, 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 verrucose, 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 decomposed, 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, mucicous 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 verrucose.

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, decomposed, 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.

MĀGHĀLAYĀ † 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; rachilla 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, decomposed to supradecomposed, 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.

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

32. *F. fimbriatylloides* (F. v. Muell.) Druce in Rep. Bot. Exch. Cl. Brit. Isl. 1916: 623. 1917; Kern in Blumea 8: 129. 1955. *Abildgaardia fimbriatylloides* 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 denuded stream-bed, in rock-crevices; at about 700 m.

MĀGHĀLAYĀ † 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,

one-third to half as long as the stem, 1-2 mm broad, acute, sparsely hairy; sheaths castaneous, densely hairy. *Inflorescence* a solitary, terminal, globose head, *ca* 12 mm across, bearing many spikelets; bracts foliaceous, widely spreading to deflexed, hairy, lowest *ca* 2 cm long; spikelets lanceolate, compressed, 5-8 × 1.5-2.0 mm, brown, acute, 3-7-flowered; rhachilla broadly brown-winged, caducous; glumes subdistichous, ovate-lanceolate, keeled, 4.2-5.5 mm long, pubescent, acute or

mucronulate, lower 3 empty, shorter, aristate, uppermost sterile; keel green, 1-nerved, usually scabrid. *Stamens* 3; anthers 1.5-3.0 mm long, crest subulate; style slender, 3-4 mm long, glabrous; stigmas 3, 1 mm long. *Nuts* minutely stipitate, obovoid, very obtusely trigonous, *ca* 1.3 × 1.0 mm, densely verrucose, whitish stramineous, apex somewhat umbonulate, surface cells isodiametric.

NAGALAND.

4. BULBOSTYLIS Kunth

Enum. Pl. 2: 205. 1837, *nom. cons.*; *non* Steven. 1817. *Stenophyllus* Rafin. Neogenyton 4. 1825.

Annual, tufted herbs. *Stems* very slender, striate, smooth. *Leaves* several in basal clusters, almost capillary; sheaths hairy or glabrescent below, almost bearded at the mouth, sometimes the hairs falling with age. *Inflorescence* terminal, capitate or anthelate, usually bearing several to numerous spikelets but sometimes reduced to a solitary spikelet; bracts foliaceous or glumaceous; spikelets polygonal, several-many-flowered; rhachilla persistent, narrowly winged; glumes

spiral, acropetally caducous from the elongating rhachilla, cymbiform, keeled, lower 1-2 empty. *Flowers* bisexual, the terminal male or barren; perianth absent; stamens anterior, 1-3; anthers linear-oblong, mucicous or apiculate; style slender, as long as the nut, articulated with the ovary, bulbiform at the base, glabrous, style base persisting for a long time like a button on the top of the nut after rest of the style has fallen off, but ultimately decaying; stigmas 3. *Nuts* shortly stipitate, obovoid, triquetrous with obtuse angles, smooth or verrucose.

1a. Inflorescence capitate, of 10-25 spikelets ...

B. barbata 1

1b. Inflorescence anthelate, of 2-many spikelets, sometimes reduced to a solitary spikelet ...

B. densa 2

1. **B. barbata** (Rottb.) Clarke in Hook. f. Fl. Brit. Ind. 6: 651. 1893. *Scirpus barbatus* Rottb. Progr. 27. 1772 *et* in Desc. *et* Icon. 52. t.17. f.4. 1773. *Fimbristylis barbata* Benth. Fl. Austral. 7: 321. 1878.

Annuals, 4-25 cm high. *Stems* 0.3-0.7 mm thick. *Leaves* one-third as long as to subequalling the stem, *ca* 0.3 mm broad, acuminate, margins involute; sheaths white hairy at the mouth. *Inflorescence* hemi-spherical, 4-18 mm across; bracts 3 foliaceous, usually subequalling the capitula, sometimes much exceeding, up to 6 cm long; spikelets linear, polygonal, 2-9 × 1.0-1.3 mm, acute; rhachilla stout, zig-zag; glumes laxly imbricating, 1.5-2.2 mm long, mucronulate or acute (sometimes aristate), brown, glabrous or hispidulous. *Stamens* 1-3; anthers 0.5 mm long; style 0.6-1.0

mm long; stigmas 0.5 mm long, subentire. *Nuts* 0.5-0.8 × 0.4-0.7 mm, smooth, stramineous to pale brown, surface cells isodiametric (Figs. 21-21b).

Fls. & frts. : Sept. At *ca* 120 m.

ASSAM | Nowgong.

2. **B. densa** (Wall.) Hand.-Mazz. in Karsten & Schenk, Vegetationsb. 20. 7: 16. 1930. *Scirpus densus* Wall. in Roxb. Fl. Ind. 1: 231. 1820. *B. capillaris* var. *trifida* (Nees) Clarke in Hook. f. Fl. Brit. Ind. 6: 652. 1893. *Isolepis trifida* Nees in Wt. Contr. Bot. Ind. 108. 1834.

Annuals, 5-40 cm high. *Stems* 0.2-0.4 mm thick. *Leaves* one-third to three-fourth as long as the stem, *ca* 0.2 mm broad, acuminate; sheaths, white-hairy at the mouth. *Anthela* lax, simple or compound; bracts setaceous, awned, usually 2-4 mm,

sometimes up to 1 cm long; rays one-several, suberect; spikelets usually solitary, sometimes a few clustered, oblong-ovoid, polygonal, 3-6 × 1.8-2.3 mm; glumes laxly imbricating, 1.5-2.0 mm long, acute-muticous, dark brown. *Stamens* usually 2, sometimes 1; anthers 0.3 mm long; style 0.7-1.0 mm long; stigmas 0.7 mm long, slightly fimbriate. *Nuts* 0.7-0.9 × 0.5-0.8 mm, verruculose, transversely lineolate, stramineous to

ultimately brown, surface cells transversely oblong (Figs. 22-22b).

Fls. & frts.: June-Oct. In open to shady places, on sandy-loam to gravelly substratum and rock-crevices; often a common weed in the paddy-fields. It is one of the few species common in pine forests; 600-2000 m.

ASSAM, MEGHALAYA; K. & J. Hills, NAGALAND,

5. SCIRPUS L.

Sp. Pl. 47. 1753 et Gen. Pl. ed. 5. no. 62. 1754.

Aquatic or *marsh-land*, or *dry-land* perennial or annual herbs. *Rhizomes*, when present, short, or creeping. *Stems* usually erect or suberect, sometimes floating, filiform to stout, terete or angled, usually smooth. *Leaves* clustered at the base or scattered all along the stem, linear, sometimes all reduced to bladeless or shortly laminate sheaths. *Inflorescence* terminal or pseudolateral, capitate or anthelate, bearing one-numerous spikelets; bracts one-several foliaceous, or absent; spikelets solitary or clustered, terete or polygonal,

few-many-flowered; rhachilla persistent, wingless; glumes all spiral (or sometimes lower subdistichous), acropetally caducous, lower 1-3 empty. *Flowers* bisexual, uppermost frequently tabescent; perianth bristle-like; bristles 1-8, brown, usually retrorsely scabrid, sometimes plumose, rarely absent; stamens 1-3, anterior; anthers linear-oblong, crested or muticous; style uniformly slender, continuous with the ovary, usually entire, rarely sparsely fimbriate, deciduous; stigmas 2-3. *Nuts* sessile or subsessile, obovoid, oblong or ellipsoid, lenticular or trigonous, obtuse, acute or apiculate, smooth or rugulose.

- | | | |
|---|-----|-------------------------|
| 1a. Spikelets strongly squarrose by the recurved mucros of the glume; the mucro about as long as or longer than the main body | ... | <i>S. squarrosus</i> 12 |
| 1b. Spikelets not squarrose; the mucro absent, or if present then much smaller. | | |
| 2a. Inflorescence subtended by several foliaceous bracts not continuous with the stem. | | |
| 3a. Leaves all clustered at the base | ... | <i>S. grossus</i> 9 |
| 3b. Leaves scattered all along the stem. | | |
| 4a. Glumes 4-7 mm long. Nuts 2.5-4.0 mm long | ... | <i>S. maritimus</i> 8 |
| 4b. Glumes 1.2-2.5 mm long. Nuts 0.7-1.2 mm long. | | |
| 5a. Perianth-bristles in fruiting spikelets about 3-5 times longer than the nut | ... | <i>S. wichurai</i> 10 |
| 5b. Perianth-bristles in fruiting spikelets about as long as or shorter than the nut, or absent | ... | <i>S. ternatanus</i> 11 |
| 2b. Inflorescence subtended by a single bract similar to and continuous with the stem (sometimes a very small second bract also present), or bracts absent or glumaceous. | | |
| 6a. Inflorescence pseudolateral because of the stem-like erect bract appearing as though a continuation of the stem. | | |
| 7a. Glumes pubescent on the back | ... | <i>S. maritimus</i> 8 |
| 7b. Glumes glabrous. | | |
| 8a. Stem and bract transversely septate, the bract longer than the stem | ... | <i>S. articulatus</i> 4 |
| 8b. Stem and bract not septate, the bract shorter than the stem. | | |
| 9a. Perianth-bristles present. | | |
| 10a. Inflorescence anthelate | ... | <i>S. lacustris</i> 7 |
| 10b. Inflorescence capitate. | | |

11a. Stems terete or faintly 4-5-angled	...	<i>S. juncooides</i> 3
11b. Stems sharply triquetrous to almost 3-winged		<i>S. mucronatus</i> 6
9b. Perianth-bristles absent.		
12a. Glumes mucronate	...	<i>S. lateriflorus</i> 2
12b. Glumes obtuse	...	<i>S. roylei</i> 5
6b. Inflorescence reduced to a solitary terminal spikelet	...	<i>S. fluitans</i> 1

1. *S. fluitans* L. Sp. Pl. 48. 1753.

Perennials, usually submersed, sometimes terrestrial. *Stems* filiform, fascicled, sympodially branched (each superposed branch terminated by a spikelet), up to 40 cm long and floating in aquatic forms, shorter, creeping or tufted in terrestrial forms. *Leaves* numerous, 1-9 cm long, 0.5-1.0 mm broad, 3-4-nerved. *Peduncles* pseudolateral, up to 12 cm long. *Spikelets* solitary, ovoid-oblong, terete, 3-6 × 2-3 mm, acute, few-several-flowered; bracts absent; glumes laxly imbricating, membranaceous, ovate, 2.0-2.5 mm long, mucicous, midrib green, sides pale or purplish green. *Perianth* absent; stamens usually 2, sometimes 3; anthers 0.5-1.0 mm long, crest ovate, reddish; styles 0.7-1.0 mm long; stigmas 2, 0.6-0.8 mm long. *Nuts* shortly stipitate, ellipsoid-obovoid, plano-convex, 1.3-1.7 mm long, shortly apiculate, brown, smooth or obsoletely reticulate due to quadrate-hexagonal surface cells.

Fls. & frts.: Aug.-Sept. Usually found submersed in streams but sometimes also in mud after water has receded; 1400-2000 m.

MEGHALAYA † K. & J. Hills.

2. *S. lateriflorus* Gmel. Syst. Veg. 1: 127. 1791; Kern in Steenis, Fl. Males. ser. I. 7: 514. 1974. *S. supinus* var. *uninodis* Clarke in Hook. f. Fl. Brit. Ind. 6: 656. 1893, non *Isolepis uninodis* Delile.

Annuals, 1-2 dm high. *Stems* slender, tufted, subterete, 0.5-1.0 mm thick, with a node above the base. *Leaves* absent; sheaths 2-3, membranaceous, the uppermost sometimes bearing up to 2 cm long lamina. *Inflorescence* pseudolateral, capitate, bearing 2-3 spikelets or sometimes reduced to a solitary spikelet, or sometimes anthelate with

2-3 rays bearing 6-10 spikelets; axils of the basal sheaths sometimes with a solitary female flower with long exserted style; bract solitary, stem-like, erect, 4-15 cm long, sometimes a second much smaller bract also present; spikelets ovoid-oblong, subterete, 5-8 × 2.5-3.0 mm, acute; glumes rather laxly imbricating, ovate, 2.0-2.5 mm long, mucronate, stramineous with purplish dots along the midrib, midrib prominent, sides almost nerveless. *Perianth* absent; stamens 3, anthers 0.3-0.5 mm long, apiculate; style 0.6-0.9 mm long; stigmas 3, 0.8-1.0 mm long. *Nuts* sessile, broadly obovoid, trigonous, 1.2-1.4 mm long, stramineous-brownish to ultimately blackish, transversely wavy-wrinkled, rugulose (Fig. 23).

Fls. & frts.: Aug. In swamps and paddy-fields, often half submersed; at ca 200 m.

ASSAM † Nowgong.

3. *S. juncooides* Roxb. Fl. Ind. 1: 218. 1820. *S. erectus* Clarke in Hook. f. Fl. Brit. Ind. 6: 656. 1893; non Poir. 1829.

Perennials, or sometimes *annuals*, 1-8 dm high. *Rhizomes*, when present, short, woody, or sometimes creeping to 2 cm. *Stems* slender or rigid, terete, 2-3 mm thick, finely striate. *Leaves* absent; sheaths 2-3, acute or cuspidate, uppermost 3-10 cm long, sometimes shortly laminate. *Inflorescence* pseudolateral, capitate, rarely reduced to a solitary spikelet; bract solitary erect, stem-like, 2-16 cm long with a callous tip; spikelets usually 2-4, sometimes up to 8, ovoid-oblong, terete, 7-25 × 3.0-5.5 mm, obtuse, many-flowered; glumes tightly imbricating, broadly ovate to suborbicular, 3-4 mm long, mucronate, stramineous-brownish, broadly scarious margined. *Perianth-bristles* 5-6, unequal, retrorsely scabrid, longest shorter than to as long as the nut; stamens 3-2, anthers 1.0-1.5 mm long,

crest ovate-lanceolate, brown; style 1.0-1.3 mm long; stigmas 2 in lower flowers, 3 in uppermost flowers, 1.5-1.8 mm long. *Nuts* sessile, broadly obovoid, plano-convex with a faint dorsal ridge, 1.7-2.2 mm long, apiculate, smooth or faintly transversely wavy-wrinkled, black (Figs. 24-24a).

Fls. & frts.: March-Jan. Common in marshy places, along streams, ponds and ditches, frequently half-submersed during rains; a common weed in the paddy-fields; 100-200 m.

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

4. *S. articulatus* L. Sp. Pl. 47. 1753.

Perennials or *annuals*. *Stems* stout, terete, spongy, 5-15(-35) cm high, 4-8 mm thick, transversely septate. *Leaves* absent; sheaths 1-3, laxly enveloping the stem, uppermost subequalling the stem, stramineous-brownish, soon disintegrating, sometimes bearing up to 2 cm long lamina. *Inflorescence* pseudolateral, capitate, 1-3 cm across, bearing 15-60 spikelets; bract solitary, erect, stem-like, 20-50(-100) cm long, transversely septate; spikelets ovoid-oblong, terete, 8-17 × 4-6 mm, acutish, many-flowered; glumes tightly imbricating, broadly ovate to suborbicular, 3.5-5.0 mm long, acute or mucronulate, rufous. *Perianth* absent; stamens 3; anthers 0.5-1.0 mm long; style 1.5-2.0 mm long; stigmas 3, ca 1 mm long. *Nuts* sessile, obovoid, triquetrous, 1.7-2.0 mm long, apiculate, transversely wavy-wrinkled, brown or ultimately black.

Fls. & frts.: Nov. In swamps, along ponds; at about 100 m.

ASSAM: Lakhimpur.

5. *S. roylei* (Nees) Parker in Duthie, Fl. Upp. Gang. Pl. 3: 361. 1929; Beetle in Amer. J. Bot. 29: 655. 1942; Maheshwari in Sci. & Cult. 31: 195. 1965. *Isolepis roylei* Nees in Wt. Contr. Bot. Ind. 107. 1834. *S. quinquefarius* Buch.-Ham. ex Boeck. in Linnaea 36: 701. 1870.

Annuals. *Stems* rather slender, terete, 9-15 cm

high, ca 1.5 mm thick, smooth, often septate. *Leaves* absent; sheaths 2-3, loosely enveloping the stem. *Inflorescence* pseudolateral, capitate, 8-11 mm across; bract stem-like, erect, about as long as the stem; spikelets oblong-lanceolate, terete, 6-12 × 3 mm, acutish; glumes, particularly in fruits, very laxly imbricating, membranaceous, oblong-lanceolate, ca 3.5 mm long, acute, brown, several-striate. *Perianth* absent; stamens 3; anthers ca 0.2 mm long; style ca 1 mm long; stigmas 3, ca 0.7 mm long. *Nuts* sessile, narrowly obovoid, ca 1.3 mm long, trigonous, black, transversely wavy-wrinkled.

ASSAM, Griffith (n.v.); Wallich (n.v.).

6. *S. mucronatus* L. Sp. Pl. 50. 1753.

Perennials. *Rhizomes* short or creeping to 15 cm. *Stems* rigid, triquetrous to almost 3-winged above, 4-15(-20) dm high, 2.5-7.0 mm thick, striate. *Leaves* absent; sheaths 1-3, cuspidate, purplish-black, uppermost 8-25 cm long. *Inflorescence* pseudolateral, capitate (sometimes also with some slender branches bearing one or more spikelets), 1.0-2.5 cm across; bract solitary, stem-like, usually 1-5, sometimes up to 17 cm long, erect or ultimately spreading out; spikelets 2-18, ovoid-oblong, subterete, 8-20 × 3.5-4.5 mm, acute, many-flowered; glumes rather loosely imbricating, ovate to broadly ovate, 3.2-4.5 mm long, mucronulate, several-striate, pale to deep brown, margins sometimes ciliolate. *Perianth-bristles* 5-6(-8), unequal, retrorsely scabrid, longest subequalling the nut; stamens usually 3, sometimes 2-1; anthers 1-2 mm long; style 1.8-2.3 mm long, stigmas 3 (sometimes 2), 2.2-2.7 mm long. *Nuts* sessile, broadly obovoid, plano-convex with a faint dorsal ridge, 1.7-2.2 mm long, apiculate, smooth (or rugulose), chestnut brown to blackish; surface cells isodiametric.

Fls. & frts.: March-Jan. Abundant in swampy places, along streams, ponds and ditches, often half-submersed; 600-1800 m.

Vivipary has been noticed in *Panigrahi* 13485, from Manipur.

ARUNACHAL PRADESH : Subansiri. ASSAM : Sibsagar. MANIPUR. MEGHALAYA : K. & J. Hills. MIZORAM.

7. *S. lacustris* L. Sp. Pl. 48. 1753.

Perennials. *Rhizomes* shortly creeping. *Stems* rigid, terete or trigonous above, 4.5-12.0 dm high, 8-15 mm thick. *Leaves* usually absent, sometimes up to 60 cm long. *Anthela* terminal, usually compound to decomposed, 5-15 cm across, bearing many spikelets, sometimes much reduced; bracts several, glumaceous, lowest 15-25 mm long; rays several, flattened, longest 3-5 cm; spikelets solitary or in clusters of 2-4, ovoid-oblong, terete, 8-12 × 3-5 mm, acute, many-flowered; glumes tightly imbricating, ovate, 3.5-5.0 mm long, mucronate, notched at the tip, rufous, puberulus. *Perianth-bristles* 5-6, unequal, retrorsely scabrid, longest equalling or exceeding the nut (sometimes much reduced or even absent); stamens 3; anthers 1.7-2.0 mm long, crest brown, setose; style 1.0-1.3 mm long; stigmas 2-3, 1.8-2.2 mm long. *Nuts* sessile, obovoid, 2.0-2.3 mm long, beaked, smooth, black; beak ca 0.5 mm long (Figs. 25-25a).

MANIPUR, Watt (CAL).

8. *S. maritimus* L. Sp. Pl. 51. 1753; Kern in Steenis, Fl. Males. ser. I. 7 : 499. 1974. *Bulboschoenus maritimus* Palla in Koch, Syn. Deutsch. Fl. ed. 3, 2532. 1904.

Perennials. *Rhizomes* creeping, forming ovoid tubers at the nodes. *Stems* stout or slender, trigonous, 3-10 (-20) dm high. *Leaves* subcoriaceous, long sheathing, as long as the stem, (1-)4-8 (-12) mm broad, caudate-acuminate. *Anthela* terminal, very variable in development, usually simple or compound, bearing several to many spikelets, sometimes almost capitate bearing few spikelets (rarely reduced to a solitary spikelet); bracts one-several, foliaceous, exceeding the anthela, lowest 7-30 cm long; spikelets solitary or in clusters of 3-8, ovoid-oblong to subcylindric, 10-15(-40) × 4-7 mm; glumes rather laxly imbricating, ovate, 5-7 mm long, glabrous or pubescent, awned, lacerate or notched at the tip, brown; awn slightly curved, 1.5-2.0 mm long, scabrid. *Perianth-bristles* (0-)3-6, unequal, retrorsely scabrid, longest shorter

than to as long as the nut; stamens 3, anthers 2.5-4.0 mm long, crest reddish, setose; style 2-3 mm long; stigmas 2-3 (sometimes the numbers differing in flowers of the same spikelet), 2.5-3.0 mm long. *Nuts* sessile, narrowly obovoid, lenticular or trigonous, 2.5-3.5 mm long, beaked, smooth, brown to greyish black, surface cells isodiametric.

Fls. & frts. : Aug. At about 2000 m.

MEGHALAYA : K. & J. Hills.

Extremely polymorphous (see notes by Kern, l. c.). *S. maritimus* var. *affinis* (Roth) Clarke (in Hook. f. Fl. Brit. Ind. 6 : 659. 1893) may not be distinct, and needs further study.

9. *S. grossus* L. f. Suppl. 104. 1781; Clarke in Hook. f. Fl. Brit. Ind. 6 : 659. 1893; Kern in Steenis, Fl. Males. ser. I. 7 : 498. 1974.

Perennials. *Rhizomes* frequently emitting long stolons ending in small black tubers. *Stems* triquetrous below, almost 3-winged above, 1-2 m high. *Leaves* few, clustered at the base, shorter than the stem, 7-30 mm broad; sheaths long, spongy. *Anthela* terminal, dense, compound to supradecomposed, 3-40 cm across, bearing several to numerous spikelets; bracts few to several, foliaceous, lower 2-4 exceeding the anthela, lowest 4-7 (-10) dm long; rays few to several, longest 3-15 cm; spikelets solitary, ovoid-oblong, subterete, 4-10 × 2.7-3.5 mm, densely many-flowered; glumes tightly imbricating, ovate, 2.2-3.0 mm long, keeled, brown, nearly mucous to distinctly mucronate. *Perianth-bristles* 3-6, unequal, longest subequalling the nut, all plumose when young, sparsely retrorsely scabrid on maturity; stamens 3; anthers 0.7-1.2 mm long, crest truncate, brown; style 1 mm long, swollen at the base; stigmas 3, 1.2 mm long. *Nuts* sessile, oblong-obovoid, trigonous, 1.2-1.7 mm long, apiculate, brown, smooth.

Fls. & frts. : July-Oct. In swamps, along pools and ditches, and in paddy-fields; 100-1600 m.

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

var. **kysoor** (Roxb.) Clarke in Hook. f. Fl. Brit. Ind. 6 : 660. 1893 (*S. kysoor* Roxb. Fl. Ind. 1 : 235. 1820. *S. grossus* f. *kysoor* Beetle in Amer. J. Bot. 33 : 661. 1946) has been distinguished by more distinctly mucronate glumes, weaker bristles villous to almost plumose by longer weaker hairs, and stems usually scabrous at the top. According to Kern (*l.c.*) the Malesian specimens reported by Clarke under var. *kysoor* belong to *S. grossus*. Particularly in view of the above, Jenkin's collection on which Clarke (*l.c.*) reports it from Assam needs rechecking. Moreover, Haines in Bot. Bihar & Orissa (repr. ed. 3 : 971) 1924 may also be right in considering it as synonymous with *S. grossus*.

10. S. wichurai Boeck. in Linnaea 36 : 729. 1870 ; Kern in Steenis, Fl. Males. ser. I. 7 : 502. 1974. *S. eriophorum* Clarke in Hook. f. Fl. Brit. Ind. 6 : 661. 1893 ; non Michx. 1803. *S. asiaticus* Beetle in Amer. Journ. Bot. 33 : 662. 1946.

Perennials, 5-20 dm high. *Rhizomes* short, woody. *Stems* subterete or trigonous above, 5-7 mm thick. *Leaves* several, scattered all along the stem, 25-40 cm long, 5-10(-20) mm broad. *Anthela* terminal, nodding, decomposed to supradecomposed, 10-25 cm across, bearing numerous spikelets (sometimes 1-3 small axillary anthelas also present) ; bracts several foliaceous, longest subequalling to exceeding the anthela ; rays slender, suberect to drooping, longest 7-20 cm ; spikelets solitary and in clusters of 2-4, oblong-ellipsoid, terete, obtuse, 3.5 × 2.0-2.5 mm, many-flowered, mature comose due to long perianth bristles ; glumes tightly imbricating, ovate, 1.5-2.0 mm long, acute or mucronulate, brown, keeled at the tip. *Perianth-bristles* 6-5, filiform, elongating in fruits and ultimately 3-5 times as long as the nut, smooth below, slightly thickened and scaberulous at the tip ; stamens (1-)2 ; anthers 0.6 mm long ; style 1.0-1.3 mm long ; stigmas 3, ca 1.2 mm long. *Nuts* sessile, oblong-obovoid, trigonous, 1.0-1.3 mm long, beaked, smooth, brown, surface cells isodiametric.

Fls. & frts. : July-Sept. In swamps, along streams and ditches, often half submersed ; sometimes a troublesome weed in paddy-fields ; 1000-2000 m.

ARUNACHAL PRADESH ; Subansiri. MEGHALAYA ; K. & J. Hills.

11. S. ternatanus Reinw. ex Miq. Fl. Ind. Bat. 3 : 307. 1856. *S. chinensis* Munro in Seem, Bot. Voy. Herald, 423. 1857 ; Clarke in Hook. f. Fl. Brit. Ind. 6 : 662. 1893 ; non Osbeck (1757).

Perennials, 3-20 dm high. *Rhizomes* frequently stoloniferous. *Stems* almost terete below, trigonous above. *Leaves* several, scattered all along the stem, 20-40 cm long, 0.5-1.5(-2.5) mm broad ; sheaths loose, lower fuscous to castaneous. *Anthela* decomposed, 7-20 cm across, bearing numerous spikelets ; bracts 3-6 foliaceous, exceeding the anthela, lowest 25-50 cm long ; rays many, rigid, divaricate, longest 3-11 cm ; spikelets in clusters of 4-15, ovoid-oblong, terete, 2.5-6.0 × 1.5-2.0 mm, obtuse, many-flowered ; glumes tightly imbricating, ovate to suborbicular, 1.2-2.5 mm long, obtuse, brown, 3-nerved, keeled at the tip. *Perianth-bristles* absent (or 3-6, antrorsely scabrid, equalling the glume) ; stamens 2-3 ; anthers 0.6-1.0 mm long ; crest ovate, brown ; style 0.2 mm long ; stigmas 2 (rarely 3), 0.7 mm long. *Nuts* sessile, broadly obovoid, plano-convex, 0.7-1.0 mm long, scarcely apiculate, smooth (Fig. 26).

Fls. & frts. : April-June. In moist sandy to sandy-loam soil, along streams and rivers ; 600-1200 m.

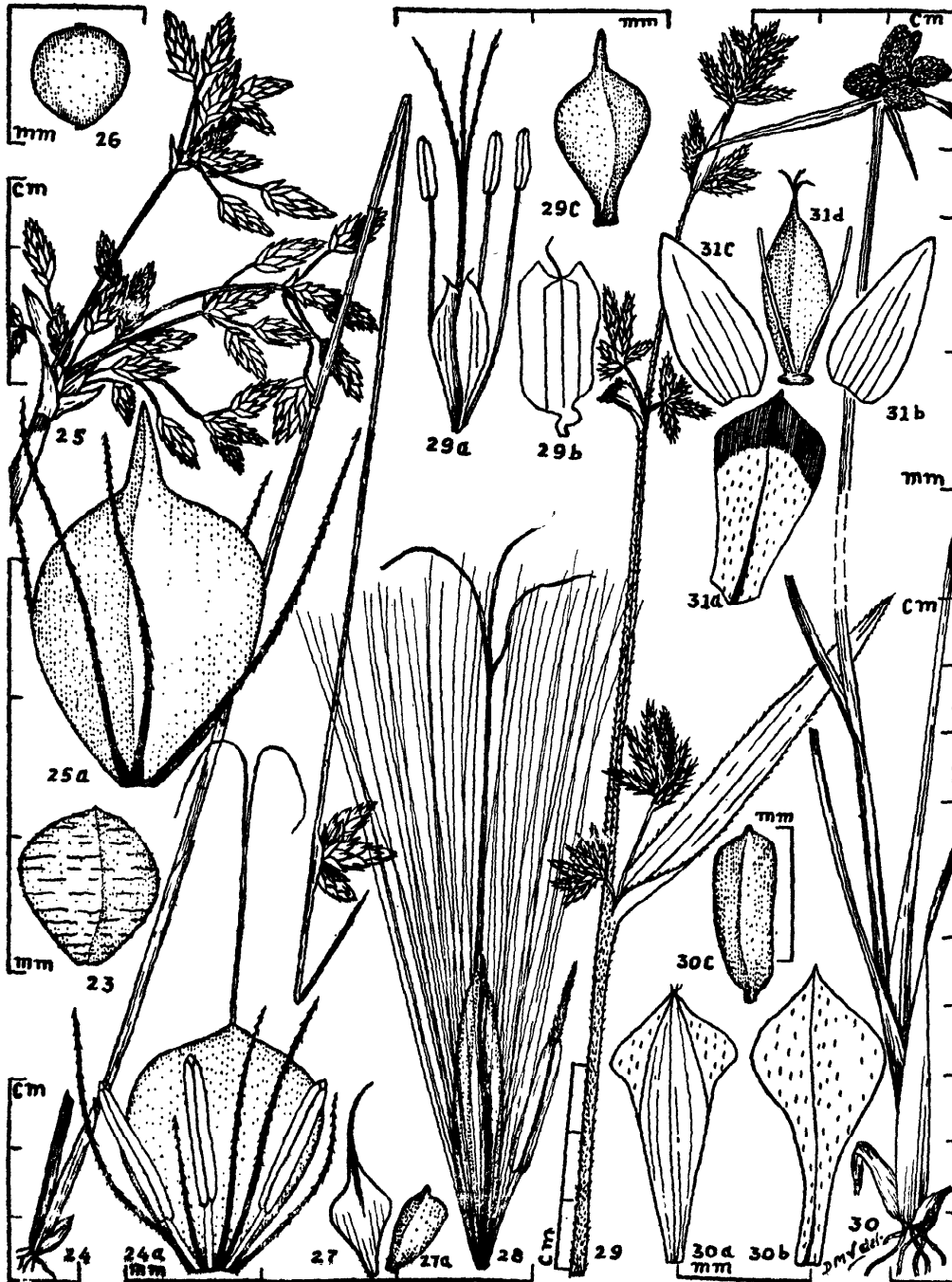
ARUNACHAL PRADESH ; Kameng ; Triap. ASSAM ; Cachar. MANIPUR. NAGALAND.

12. S. squarrosus L. Mant. 2 : 181. 1771.

Annuals, tufted, 3-15(-40) cm high. *Stems* filiform. *Leaves* 2-5 cm long, 0.5-1.0 mm broad. *Inflorescence* capitate, pseudolateral, usually bearing 2-4, sometimes 1-10 spikelets ; bracts 2-3, one stem-like, erect to flexuous, 1.5-5.0 cm long, others small, spreading ; spikelets oblong, 3-5 mm long, squarrose, many-flowered ; glumes tightly imbricating, obovate-rhomboid, aristate, brown, 1.0-1.2 mm long including ca 0.7 mm long curved arista. *Perianth* absent ; stamens 1(-2) ; anthers 0.2 mm long ; style obscure ; stigmas 3, ca 0.2 mm long. *Nuts* sessile, narrowly obovoid, trigonous, ca 0.5 mm long, apiculate, smooth, brownish (Figs. 27-27a).

Fls. & frts. : Sept.

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



Figs. 23-31 : 23. *Scirpus lateriflorus* Gmel. 24-24a. *S. juncoides* Roxb. 25-25a. *S. lacustris* L. 26. *S. ternatanus* Reinw. ex Miq. 27-27a. *S. squarrosus* L. 28. *Eriophorum comosum* (Wall.) Wall. ex Nees. 29-29c. *Fuirena umbellata* Rottb. 30-30c. *Lipocarpha chinensis* (Osb.) Kern. 31a-31d. *L. sphacelata* (Vahl) Kunth.

6. ERIOPHORUM L.

Sp. Pl. 52. 1753 *et* Gen. Pl. ed. 5. no. 63. 1754.

E. comosum (Wall.) Wall. *ex* Nees in Wt. Contr. Bot. Ind. 110. 1834. *Scirpus comosus* Wall. in Roxb. Fl. Ind. 1 : 234. 1820.

Perennials, 1.5-4.5 dm high. *Rhizomes* short, woody, 3-5 mm thick. *Stems* terete below, trigonous above, 1-2 mm thick. *Leaves* clustered towards the base, equalling or exceeding the stem, 1.5-4.0 mm broad; sheaths castaneous, glossy, ultimately fibrous. *Anthela* very variable in development, usually supradecomposed, sometimes decomposed, 3.5-25.0 cm long, bearing from about 50 to numerous spikelets; bracts many foliaceous, much exceeding the anthela, glossy castaneous at the base, longest 2-16 cm; spikelets usually all solitary, sometimes a few paired, ellipsoid, subterete, 3-7 × 1.0-1.5 mm, obtuse, reddish-brown, 18-25-flowered, comose in fruits; rhachilla persistent, wingless;

glumes spirally imbricating, membranaceous, oblong-lanceolate, 2.5-3.0 mm long, keeled, acute or mucronulate, lowest empty. *Perianth* of 6 segments divided almost to the base into numerous white hairs, elongating in fruits to 7-11 mm; stamen 1, anther ca 1 mm long, crest lanceolate, 0.5 mm long, reddish, hirsute; style continuous with the ovary, uniformly slender, caducous, 1.5-2.0 mm long; stigmas 3, ca 1.3 mm long. *Nuts* sessile, ellipsoid, compressed trigonous, smooth, 2.6-2.8 mm long, glossy, dusty black, beaked (Fig. 28).

Fls. & frts. : April-Nov. In rock-crevices near streams; 300-1900 m.

Because of the numerous long hair-like perianth segments this species is popularly known as the cotton-grass, and is sometimes used for making ropes.

ARUNACHAL PRADESH : Kameng; Lohit.

7. FUIRENA Rottb.

Descr. *et* Icon. 70. t. 19. 1773.

Annuals or perennials. *Rhizomes*, when present, creeping. *Stems* erect. *Leaves* several, scattered all along the stem, linear-lanceolate, sheathing at the base; ligule membranaceous. *Inflorescence* paniculate, usually consisting of a terminal and one to several partial panicles, sometimes much reduced; spikelets clustered, terete, many-flowered; rhachilla persistent, not winged; glumes spirally imbricating, hairy, 3-nerved, usually aristate, lower 1-2 empty. *Flowers* bisexual, the upper few tabescent;

perianth 6-partite, the outer 3 (sepals or bristles) bristle-like, opposite the nut angles, sometimes reduced or absent, the inner 3 (petals or scales) scale-like, alternating with the bristles (sometimes all the 6 bristle-like or much reduced); stamens (2-)3, anterior; anthers linear-oblong, mucous; style continuous with the ovary, as long as or longer than the nut, not or scarcely thickened at the base, glabrous, caducous; stigmas 3. *Nuts* shortly stipitate, obovoid, trigonal, usually beaked, falling off enclosed by the hypogynous scales.

- | | |
|---|---------------------------|
| 1a. Annuals, 1-4 dm high. Clusters of spikelets usually congested at the tips; glumes 1.5-1.7 mm long. | |
| Perianth-scales clawed, the claw about as long as its blade | ... <i>F. ciliaris</i> 1 |
| 1b. Perennials, 3-11 dm high. Clusters of spikelets scattered all along the stem; glumes 2.0-2.5 mm long. | |
| Perianth-scales sessile or subsessile | ... <i>F. umbellata</i> 2 |

1. *F. ciliaris* (L.) Roxb. Fl. Ind. 1 : 184. 1820; *non* Nees, 1834. *Scirpus ciliaris* L. Mant. 182. 1771. *F. glomerata* Lamk. Illustr. 1 : 150. 1791,

Annuals. *Stems* rather slender, 1-2 mm thick, hairy all along or only at the top. *Leaves* 5-15 cm long, 3-8 mm broad, 3-5-nerved, margins and usually also the surfaces hairy. *Panicles* much

contracted; partial panicles usually all congested at the tips, sometimes one lower down also; spikelets in clusters of 3-10, ovoid-oblong, 5-15 × 3-4 mm, obtuse, greyish green; glumes oblong-obovate, 1.5-1.7 mm long, rounded at the tip, awned, usually hairy, awn *ca* 1 mm long, hairy, usually recurved. *Perianth* bristles usually short, sometimes as long as the nut, hispidulous, or sometimes absent; scales clawed, subquadrate, as long as the nut, cordate or hastate at the base, tridentate at the apex, 3-nerved, brown; blade *ca* 1 mm long, claw *ca* 0.7 mm long; anthers 0.3 mm long; style 0.8 mm long; stigmas 1 mm long. *Nuts* broadly obovoid, triquetrous, 0.7-1.0 mm long, apiculate, brownish, smooth or faintly transversely lineolate.

ASSAM, *Masters* (*n. v.*).

2. *F. umbellata* Rottb. *Descr. et Icon.* 70. t. 19. f. 3. 1773.

Perennials, 3-11 (-15) dm high. *Rhizomes* short, woody. *Stems* slender or stout, 4-5-angled, hairy throughout or only at the top, usually bulbous at

the base. *Leaves* 9-26 cm long, 5-17(-25) mm broad, (3-)5-nerved; margins and sometimes also the surfaces hairy. *Panicles* 15-35 cm long; partial panicles several in lower axils, the uppermost somewhat congested; peduncles villous; spikelets in clusters of 7-13, ovoid-oblong, 4-10 × 2-3 mm, acute, greenish becoming brown in age; glumes obovate-oblong, 2.0-2.5 mm long, rounded at the tip, 3-nerved, awned, hairy, awn *ca* 1 mm long, hispidulous, ultimately recurved. *Perianth-bristles* absent (or if present, very short); scales sessile or very shortly clawed, subquadrate, 1.2 mm long, mucronate, brown, 3-nerved; stamens 3; anthers 0.5-0.7 mm long, mucicous; style 0.7 mm long; stigmas 1.2 mm long. *Nuts* stipitate, obovoid, triquetrous, 1.0-1.2 mm long, excluding *ca* 0.3 mm long beak, glossy, stramineous-fuscous, smooth (Figs. 29-29c).

Fls. & frts.: June-Oct. In swamps along streams and ponds; 150-1500 m.

ARUNACHAL PRADESH † Kameng. ASSAM † Kamrup. MANIPUR. MEGHALAYA † K. & J. Hills. NAGALAND.

8. LIPOCARPHA R. Br.

Tuckey, *Narr. Exped. Congo* 459. 1818, *nom. cons.* *Cyperus* subgen. *Lipocarpa* Koyama in *Qtrly. J. Taiwan Mus.* 14: 163. 1961.

Annual or *perennial*, tufted herbs. *Stems* trigonous, smooth. *Leaves* several, clustered at the base, long, linear, eligulate. *Inflorescence* terminal, capitate, of few to several spikelets, subtended by a few foliaceous bracts; spikelets sessile, terete, obtuse, compactly numerous-flowered; rhachilla persistent, wingless, marked with lozenge-shaped

scars; glumes membranaceous, spirally imbricate, acropetally caducous, the lower 1-2 empty. *Flowers* bisexual, uppermost tabescent; *perianth* scale-like; scales 2, hyaline, antero-posteriorly placed, elliptic-oblong, the posterior scale embracing the anterior one; stamens 1-2, anthers linear-oblong; style uniformly slender, continuous with the ovary, short, caducous; stigmas (2-)3. *Nuts* sessile, dorsiventrally compressed, plano-convex, oblong or oblong-obovoid, smooth, reticulate, enveloped by the *perianth* scales; epidermal cells isodiametric.

1a. Capitula greyish-white. Style about half or more as long as the nut. Nuts about half as long as the glumes

1b. Capitula red-brown. Style very short. Nuts subequalling the glumes

... *L. chinensis* 1
... *L. sphacelata* 2

1. *L. chinensis* (Osbeck) Kern in *Blumea*, Suppl. 4: 167. 1958. *Scirpus chinensis* Osbeck, *Dagb. Ostind Resa* 220. 1757. *L. argentea* Nees in *Linnaea* 9: 287. 1834; Kunth, *Enum. Pl.* 2: 266. 1837;

Clarke in *Hook. f. Fl. Brit. Ind.* 6: 667. 1893. *L. senegalensis* Th. et Durand, *Syll. Fl. Congol.* 619. 1909; Blake in *J. Arn. Arb.* 28: 229. 1947. *S. senegalensis* Lamk. *Tabl. Encycl. Meth.* 1: 140,

1791. *Cyperus lipocarpha* Koyama in Bot. Mag. Tokyo 73 : 438. 1960 *et* in Qtrly. J. Taiwan Mus. 14 : 193. 1961.

Annuals or *perennials*, 1.0-6.5 dm high. *Rhizomes*, if present, short or up to 3 cm long. *Stems* rigid, trigonous, 1-2 mm thick, greyish green. *Leaves* rigidulous, flat or involute, one-third to one-half as long as the stem, 2-5 mm broad; sheaths reddish brown. *Inflorescence* 8-23 mm across; bracts 2-3 foliaceous, horizontally spreading to reflexed, base dilated, lowest 4-14 cm long; spikelets 3-7 (-10) ovoid to oblong-ovoid, 5-12 × 3-5 mm, glistening greyish-white; glumes spatulate, concave, with a short, erect or incurved triangular tip, 1.8-2.7 mm long, with a conspicuous midrib, sides stramineous, usually purple-streaked, faintly 1-2-nerved. *Perianth* scales 2, clasping the nut, oblong, 1.5-2.0 mm long, stramineous, purple-streaked, 5-7-nerved; stamen usually solitary, sometimes 2; anthers 0.7-1.0 mm long; stigmas (2-)3, shorter than to equalling the style. *Nuts* one-half to two-third as long as the glume, narrowly obovoid-oblong, sometimes slightly curved, 1.0-1.3 mm long, stramineous to fuscous, apiculate (Figs. 30-30c).

Fls. & frts. : April-Oct. In mud, swamps and shallow water, along roadside and streams,

frequently colonising; a common weed in paddy-fields; 100-1650 m.

ASSAM : Cachar; Kamrup; Lakhimpur; N. Cachar & Mikir Hills. MANIPUR, MEGHALAYA : K. & J. Hills. MIZORAM.

2. *L. sphacelata* (Vahl) Kunth, Enum. Pl. 2 : 267. 1837. *Hypaelyptum sphacelatum* Vahl, Enum. Pl. 2 : 283. 1806. *L. triceps* Nees in Wt. Contr. Bot. Ind. 92. 1834.

Perennials, 1.0-3.5 dm high. *Rhizomes* very short, woody, scarcely 2-7 mm long. *Stems* trigonous, 1.0-1.3 mm thick. *Leaves* flaccid, one-third to one-half as long as the stem, 2.0-3.5 mm broad; sheaths brownish. *Inflorescence* 7-15 mm across; bracts 1-3 foliaceous, spreading to reflexed, lowest 5-11 cm long; spikelets 3-8 (sometimes solitary), ovoid, 3.5-8.0 × 3.0-3.5 mm, reddish-brown; glumes obovate, cuspidate, 1.5-1.8 mm long, uniformly reddish-brown at the tip, reddish-brown striolate below. *Perianth-scales* 2, clasping the nut, ovate-oblong, 1.3-1.5 mm long, 5-nerved; stamens 2; style divided almost to the base; stigmas 3, ca 0.3 mm long. *Nuts* subequalling the glumes, broadly stipitate, narrowly oblong, triquetrous, 1.2-1.5 × 0.5 mm, castaneous, apiculate (Figs. 31a-31d).

ASSAM, *Masters*.

9. RHYNCHOSPORA Vahl

Enum. Pl. 2 : 229. 1806, *nom. cons.* ('*Rynchospora*' *et* '*Rhinchospora*', sphalm.).

Perennial or *annual* herbs. *Stem* solitary, or several, tufted, erect, trigonous. *Leaves* clustered at the base or scattered along the stem, linear, flat or canaliculate. *Inflorescence* a solitary terminal head or a raceme or a panicle of corymbiform anthelas; bracts foliaceous; spikelets solitary or in clusters, usually few-flowered; glumes 5-8, spiral or subdistichous, imbricate, lower 3-4 empty, shorter.

Flowers all bisexual, or the lowest bisexual and the upper ones male or sterile, or the lowest female and the upper one(s) male; *perianth-bristles* in bisexual or female flowers usually 3-6, sometimes more, or sometimes absent, in male flowers usually fewer, or absent; stamens (1-) 2-3; anthers linear; style long, slender, base dilated, articulated with the ovary and persisting as a beak on the nut, subtire to deeply bifid. *Nuts* sessile or shortly stipitate, compressed biconvex, obovoid-oblong or subglobose.

- | | | |
|---|-----|-----------------------|
| 1a. Stem leafy only at the base. Inflorescence capitate, consisting of a solitary terminal subglobose head | ... | <i>R. rubra</i> 1 |
| 1b. Stem leafy throughout. Inflorescence paniculate, consisting of a solitary or more corymbiform anthelas. | | |
| 2a. Style subtire or very shallowly bifid. | | |
| 3a. Nut without a stipe or a neck; nut-beak grooved on both sides | ... | <i>R. corymbosa</i> 2 |
| 3b. Nut with a distinct stipe and a neck; nut-beak not grooved | ... | <i>R. hookeri</i> 3 |

2b. Style bifurcated to about half-way down.

4a. Perianth-bristles absent

4b. Perianth-bristles present

... *R. gracillima* 4
... *R. rugosa* 5

1. *R. rubra* (Lour.) Makino, Bot. Mag. Tokyo 17 : 180. t. 7. f. 1a-b. 1903. *Schoenus ruber* Lour. Fl. Cochinch. 1 : 41. 1790. *R. wallichiana* Kunth, Enum. Pl. 2 : 289. 1837.

Perennials, tufted, 1.3-6.0(-12.0) dm high. *Rootstock* short, woody, ca 5 mm thick, blackish. *Stems* rigid, triquetrous, striate, 0.7-1.5 mm thick. *Leaves* 4-8, clustered at the base, rigid, flat, usually one-third to one-half as long as, sometimes subequalling the stem, 1.5-3.0(-5.0) mm broad. *Inflorescence* a single, terminal, subglobose head, 7-20 mm across; bracts 4-8, stellately spreading to reflexed, base dilated, margins white-ciliate below, scabrid upwards, lowest 2.5-8.0 cm long; spikelets numerous, 5-8 mm long, reddish-brown to blackish with age; glumes 5-7, sub-distichous, keeled, lower 3(-4) empty, ovate, mucronate; floral glumes ovate-lanceolate, 4-5 mm long, acute. *Perianth-bristles* 0-3, sometimes up to 6, much shorter than the nut (rarely subequalling); stamens 3-2, anthers 2 mm long, apiculate; style 7-10 mm long, notched. *Nuts* sessile, obovoid, truncate, 1.5-2.0 mm long, brown or ultimately blackish, hispidulous; beak pyramidal, 0.5 mm long, punctulate, pale greenish (Figs. 32-32d).

Fls. & frts.: June-Oct. In moist to dry habitats, on gravelly to clayey soil, sometimes colonising on hillocks; 100-1300 m.

The solitary, terminal, brown heads, with stellately spreading bracts are quite characteristic.

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

2. *R. corymbosa* (L.) Britt. in Trans. New York Acad. Sci. 11 : 84. 1892. *Scirpus corymbosus* L. Cent. Pl. 2 : 7. 1756. *R. aurea* Vahl, Enum. Pl. 2 : 229. 1806.

Perennials, 6-12 dm high. *Rootstock* short. *Stems* triquetrous, smooth or scabrid upwards. *Leaves* rigid, 25-80 cm long, 8-20 mm broad,

marginal nerve conspicuous on the upper surface. *Panicles* 20-40 cm long, consisting of 2-5 distant corymbiform anthelas; peduncles stout, obliquely to horizontally spreading; bracts 4-6, foliaceous; spikelets 2-7 together, 7-10 mm long, rufous, with one bisexual and 1 (-2) male flowers; glumes 6-7, lower 3-4 empty, mucronate; nut bearing glume oblong, 5.0-6.5 mm long, acute. *Perianth-bristles* 4-6, subequal, or few much shorter, brown, longest slightly exceeding the nut, 4.5-5.0 mm; stamens 3, anthers 2.0-2.5 mm, apiculate; style 6-8 mm long, scarcely notched. *Nuts* sessile, obovoid or oblong-obovoid, truncate, 2.5-3.5 mm long, greyish-brown, punctate; beaks conical, 4-5 mm long, conspicuously furrowed, pale greenish (Figs. 33-33a).

Fls. & frts.: June-Jan. In swamps; 100-1650 m.

Easily recognised by its robust nature and grooved beak of the nut.

ASSAM : Goalpara; Lakhimpur. MEGHALAYA : K. & J. Hills. NAGALAND. TRIPURA.

3. *R. hookeri* Boeck. in Linnaea 37 : 621. 1873.

Perennials, 4.5-9.0(-15.0) dm high. *Stems* rather slender, trigonous, striate. *Leaves* 20-45 cm long, 4-10 mm broad. *Panicles* 25-40 cm long; consisting of 1-4 distant corymbiform anthelas, terminal anthela much branched, frequently drooping; spikelets 2-6 together, suberect, 5-7 mm long, ferruginous, with one bisexual and sometimes also with one male flower; glumes 5-7, lower 3 empty, mucronate; nut-bearing glume oblong-lanceolate, 5-6 mm long, acute. *Perianth-bristles* 6-8, very unequal, longest 4.0-5.5 mm; stamens 3, anthers 2 mm long, apiculate; style 6-9 mm long, scarcely notched. *Nuts* stipitate, broadly obovoid to suborbicular, 4-5 mm long, apex contracted into a neck, blackish brown, hirsute on shoulders and neck; stipe and neck each ca 0.5 mm long; beak



Figs. 32-37 : 32-32d. *Rhynchospora rubra* (Lour.) Makino. 33-33a. *R. corymbosa* (L.) Britt. 34. *R. hookeri* Boeck. 35-35b. *R. gracillima* Thw. 36-36b. *R. rugosa* (Vahl) Gale. 37-37a. *R. rugosa* var. *griffithii* (Boeck.) Verma & Chandra.

narrow, conical, *ca* 2.5 mm long, greenish stramineous (Fig. 34).

ASSAM : Sibsagar, Clarke 40748 (*n.v.*). NAGALAND.

4. *R. gracillima* Thw. Enum. Pl. Zeyl. 435. 1864.

Perennials, tufted, 3-5 dm high. *Stems* flexuous, subterete, 0.3 mm thick. *Leaves* setaceous, 10-25 cm long, 0.5-1.0 mm broad; sheaths brownish. *Inflorescence* very lax and narrow, consisting of 1-3 distant corymbiform anthelas; bracts setaceous, lowest 7-12 cm long; spikelets linear-lanceolate, 5.0-7.5 × 1.5 mm, usually bearing a solitary, sometimes two, nuts; glumes 5-7, obovate-oblong, acute or mucronate, finely brown veined, lower 3-4 empty, nut bearing glume 3-5 mm long. *Perianth* absent; style 1.7 mm long; stigmas 2, *ca* 1.8 mm long. *Nuts* sessile, obovoid-globose, 1.5-1.8 × 0.7 mm, ashy-white, transversely wavy wrinkled; beak very short, depressed, about as broad as the nut, blackish (Figs. 35-35b).

MEGHALAYA : K. & J. Hills.

5. *R. rugosa* (Vahl) Gale in Rhodora 46 : 275. t. 835. f.1A-B. 1944. *Schoenus rugosa* Vahl, Eclog. Am. 2 : 5. 1798. *R. glauca* Vahl, Enum. Pl. 2 : 233. 1806, *nom. illegit.*; Clarke in Hook. f. Fl. Brit. Ind. 6 : 671. 1893. *R. chinensis* Nees in Wt. Contr. Bot. Ind. 115. 1834. *R. glauca* var. *chinensis* Clarke, *l. c.*

Perennials, 2.7-7.8(-10.0) dm high. *Rootstocks* short, woody. *Stems* slender, trigonous, striate. *Leaves* rigid, canaliculate, 15-50 cm long, 1-3(-5) mm broad. *Panicles* narrow, 20-33 cm long;

consisting of 3-4(-6) corymbiform anthelas, lateral peduncles often long exserted, ascending; spikelets solitary or in clusters, ovate-lanceolate, 3-6 mm long, ferruginous, with 1-2 bisexual flowers and sometimes with one male flower; glumes 5-6, spiral, ovate-oblong, keeled, mucronate, nut bearing glume 4-5 mm long. *Perianth-bristles* 5-6, unequal shorter than the nut or sometimes subequalling the nut beak, brown; stamens (1-)2-3, anthers *ca* 1.5 mm long, mucicous; style 3 mm long, bifid to about half-way down. *Nuts* sessile, obovoid, about three-fourth to as broad as long, 1.5-2.0 × 1.0-1.8 mm, faintly to prominently wavy-wrinkled, brown; beak conical, 0.8-2.0 mm long, greyish stramineous (Figs. 36-36b).

Fls. & frts. : June-Aug. Scattered in swamps, 1000-1500 m.

MEGHALAYA: K. & J. Hills. MIZORAM. NAGALAND.

var. *griffithii* (Boeck.) D. M. Verma *et* V. Chandra in Bull. Bot. Surv. India 22 : 129. 1982. *Rhynchospora griffithii* Boeck. in Linnaea 38 : 404. 1874; Clarke in Hook. f. Fl. Brit. Ind. 6 : 672. 1893. *R. glauca* Vahl var. *griffithii* (Boeck.) Kuekenth. in Bot. Jahrb. 75 : 149. 1952.

Perianth-bristles subequalling or exceeding the nut beak. *Nuts* oblong, about half as broad as long, pale brown, almost smooth to faintly wavy-wrinkled; beak about three-fourth or as long as the nut (Figs. 37-37a).

Fls. & frts. : July-Nov. 1000-1400 m.

MEGHALAYA : K. & J. Hills.

10. MACHAERINA Vahl

Enum. Pl. 2 : 238. 1806.

M. rubiginosa (Spreng.) Koyama in J. Fac. Sci. Univ. Tokyo III, 8 : 123. 1961 *et* in Natur. Canad. 88 : 249. 1961. *Fuirena rubiginosa* Spreng. Mant. Prima Fl. Hal. 29. 1807. *Baumea crassa* Thw. Enum. Pl. Zeyl. 353. 1864. *Cladium riparium* Benth. var. *crassa* Clarke in Hook. f. Fl. Brit. Ind.

6 : 675. 1894. *Cladium crassum* Kuekenth. in Bull. Jard. Bot. Buitenz. ser. 3. 16 : 311. 1940.

Perennial herbs, 4-10 (-18) dm high. *Rhizome* short, emitting long creeping stolons. *Stems* stout, erect, compressed-biconvex to subterete, (2-) 4-6 mm thick. *Leaves* spongy, distichous; basal shorter than to about as long as the stem, bicon-

vex, ca 5 mm broad; cauline long sheathing with short blades. *Panicles* erect, narrow, (10-)25-40 (-50) cm long with 3-5(-7) fascicles of branches; lower branches distant, often solitary, upper ones 2-4 together, approximate, their bracts gradually shorter; spikelets usually clustered, ovate-lanceolate, ca 5 mm long, compressed, cinnamonaceous, 2-3-flowered, maturing 1 (-2) nuts; rhachilla persistent with very short internodes; glumes 5, distichous, ovate-lanceolate, long ciliate, those of the fertile flowers 5-6 mm long. *Perianth*

absent; stamens 3, anthers linear; style 1.7 mm long, base swollen, continuous with the nut, persistent, villous; stigmas 3, ca 5.5 mm long. *Nuts* sessile, ellipsoid or ellipsoid-oblong, trigonous, 2.5-4.0 mm long, smooth, glossy, orange to reddish-brown, crowned by the style-base which is sometimes only discernable by a slight discolouration (Figs. 38-38c).

MEGHALAYA † K. & J. Hills. Shillong, Clarke 38228 (CAL).

11. HYPOLYTRUM L. C. Rich.

Pers. Synop. 1 : 70. 1805 ('*Hypaelyptum*', '*Hypelytrum*', '*Hypelythrum*' et '*Hypolythrum*', sphalm.).

H. nemorum (Vahl) Spreng. Syst. 1 : 233. 1825. *Schoenus nemorum* Vahl, Symb. Bot. 3 : 8. 1794 et Enum. Pl. 2 : 227. 1806. *H. latifolium* L. C. Rich. in Pers. Synop. 1 : 70. 1805. *Hypaelyptum nemorum* P. Beauv. Fl. Owar. 2 : 13. 1810.

Perennial herbs, 5-10 dm high. *Rhizome* short, woody, purplish. *Stem* arising from the centre of a tuft of basal leaves, triquetrous, 3-5 mm thick. *Leaves* several in a basal cluster and a few higher up on the stem, subcoriaceous, linear-lanceolate, 25-120 cm long, 1.5-3.0 cm broad; mid-costa raised beneath, two lateral costae raised above. *Panicle* terminal, almost corymbosely much branched, dense or lax, 3-13 cm across, branches rigid, divaricate, compressed; bracts 2-4 foliaceous, lowest 20-40 cm long; spikelets terete, nearly all solitary, young obovoid-oblong, 2-3 mm long, fruiting subglobose, 4-6 mm long; glumes membranaceous, spiral, tightly imbricating, obovate-suborbicular, 1.3-2.0 mm long, obtuse, brown. *Flowers* several, bisexual; perianth-scales 2, lateral, appressed to the nut, hyaline, narrowly oblanceo-

late, 1.2-1.7 mm long, slightly keeled; stamens 2, in the axils of the perianth scales, anthers linear-oblong, 0.5 mm long, mucous; ovary terminal; style continuous with the ovary, 0.3 mm long; stigmas 2, ca 1.2 mm long. *Nuts* sessile, broadly ovoid to suborbicular, biconvex, 2.0-2.7 mm long, shortly beaked, brown, smooth or rugulose, sometimes empty and then smaller than the ovoid, spongy beak (Figs. 39-39d).

Fls. & frts. : Throughout the year. In moist to swampy places, sometimes half submerged, in shade and under forest canopy, 100-1000 m.

A polymorphic species about which Clarke (in Hook. f. Fl. Brit. Ind. 6 : 678. 1894) remarked "The seven Indian spp. here described might be treated as *H. latifolium* with five varieties." Fischer (in Gamble, Fl. Pres. Madras 1931, repr. ed. 3 : 1161. 1956) treated *H. wightianum* Boeck. as synonymous with the former. Kern (in Blumea 9 : 218. 1958) considered *H. wightianum* as distinct but later (in Fl. Males. ser. I. 7 : 491. 1974) opined that it cannot be separated specifically from *H. nemorum*. Obviously, the genus in India needs further investigation.

ARUNACHAL PRADESH : Lohit. ASSAM : Cachar; Darrang; Lakhimpur. MEGHALAYA : K. & J. Hills. TRIPURA.

12. MAPANIA Aubl.

Hist. Pl. Gui. Franc. 1 : 47. t. 17. 1775.

M. palustris (Hassk. ex Steud.) F. Vill. Nov. App. 309. 1882; Clarke in Hook. f. Fl. Brit. Ind.

6 : 681. 1894; Kern in Fl. Males. ser. I. 7 : 477. 1974. *Pandanophyllum palustre* Hassk. ex Steud. Syn. Pl. 2 : 134. 1855. *M. silhetensis* Clarke, l.c.



Figs. 38-40 : 38-38c. *Machaerina rubiginosa* (Spreng.) Koyama. 39-39d. *Hypolytrum nemorum* (Vahl) Spreng. 40-40d. *Mapania palustris* (Hassk. ex Steud.) F.-Vill.

Perennial herbs, 3-5 dm high. *Rhizomes* long creeping, *ca* 1 cm thick. *Stems* lateral, from the axils of the lower leaves, with some basal sheaths, stout, trigonous, *ca* 3 mm thick, ribbed. *Leaves* several in basal tufts, subcoriaceous, linear-lanceolate, up to 2 m long, 2-6 cm broad, 3-costate. *Inflorescence* capitate; capitula subglobose, *ca* 3 cm broad; bracts several, glumaceous, ovate-oblong, 1.5-2.0 cm long; spikelets ellipsoid, 1.5-2.0 cm long; glumes several, spiral, coriaceous, elliptic-oblong, obtuse, 10-15 mm long, stramineous, brown speckled, some lower ones empty. *Flowers* bisexual, dorso-ventrally compressed; perianth scales 6, almost

biseriate, membranaceous, linear-lanceolate, 10-13 mm long, stramineous, 1-nerved, sometimes ciliolate, the lower two lateral with a single stamen each, the rest empty; ovary terminal; style continuous with the ovary, 6-8 mm long, almost coiled; stigmas 3, *ca* 2 mm long. *Nuts* shortly stipitate, narrowly ovoid, subterete to trigonous, rather fleshy, (4-)6-8 mm long, shortly beaked, greyish black, smooth (Figs. 40-40d).

Fls. & frts. : June. At about 150 m.

ASSAM : Lakhimpur, in Pawai forest, G. K. Deka 17715 (ASSAM).

13. SCLERIA Berg.

Kongl. Vet. Acad. Handl. Stockh. 26 : 142. t. 4, 5. 1765. *Diplacrum* R. Br. Prodr. 240. 1810.

Perennial or *annual*, monoecious (rarely *dioecious*) herbs. *Rhizomes*, when present, short or long creeping. *Stems* erect, nodding, scrambling over bushes, or decumbent, triquetrous. *Leaves* usually alternate and scattered all along the stem, sometimes in pseudo-whorls, linear, 3-costate, mid-costa raised beneath, laterals raised above; sheaths closed, frequently 3-winged, its mouth on the ventral side truncate or produced into a contraligule (ligule, antiligule or pseudoligule). *Inflorescence* usually paniculate, consisting of a terminal and one or more lateral partial panicles, sometimes glomerate-spiceform, sometimes reduced to a few axillary clusters; primary bracts usually foliaceous, secondary setaceous, sometimes all glumaceous; spikelets all bisexual or bisexual and male, or all unisexual, in the latter two cases, generally in pairs or 3-together with the upper one or two male (uppermost terminal) and the basal (lateral) bisexual or female; bisexual spikelets: glumes subdistichous, lower 2-4 empty (lowest a

prophyll), next containing a female flower (terminal), next upper (bract of the branch bearing male flowers) enclosing an empty one (prophyll) which envelops several to many hyaline glumes containing male flowers (lateral in position), uppermost tabescent; male spikelets: usually peduncled, linear-lanceolate, lower 2-4 glumes empty, otherwise like the male part of the preceding; female spikelets: sessile, linear-lanceolate in flowers, obovate in fruits, like the female part of the bisexual spikelets but the glume above the female flower may be empty or containing 1 or 2 small glumes (the reduced male part). *Flowers* unisexual; perianth absent; stamens 1-3, anthers usually crested; style continuous with the ovary, not dilated at the base, stigmas 3. *Nuts* broadly ovoid to subglobose, terete or very obtusely trigonous, usually apiculate, borne on a hypogonium (cupula or gynophore) which is dilated at the apex into a disc, adhering to and falling with the nut; pericarp crustaceous, often deciduously hairy, usually shining white, smooth or reticulately sculptured; hypogynous disc usually 3-lobed, sometimes many-lobed, or reduced to only a band.

1a. Inflorescence spiciform; spikelets in clusters.

- 2a. Leaves 1-5 cm long. Clusters of spikelets subtended by foliaceous bracts; female glumes tridentate ...
 2b. Leaves 7-17 cm long. Clusters of spikelets subtended by glumaceous bracts; female glumes entire ...

S. caricina 7

S. pergracilis 1

- 1b. Inflorescence paniculate, of a terminal and usually also of lateral partial panicles ; spikelets solitary or in clusters.
- 3a. Middle leaves and lower bracts clustered in groups of 3-5 forming pseudo-whorls. Hypogynous disc cyathiform, about half as long as to almost equalling the nut, shallowly 3-lobed ; lobes denticulate ... *S. sumatrensis* 12
- 3b. Leaves and bracts all somewhat evenly distributed, not forming pseudo-whorls. Hypogynous discs various, not as above.
- 4a. Hypogynous disc many-toothed ... *S. bracteata* var. *assamica* 14
- 4b. Hypogynous disc 3-lobed, entire, or obsolete.
- 5a. Glumes beset with long patent hairs ... *S. rugosa* 6
- 5b. Glumes glabrous or puberulous.
- 6a. Nut bearing spikelets bisexual. Hypogynous disc obsolete, reduced to a narrow band.
- 7a. Leaves 1-5 mm broad. Partial panicles very loose, with almost spiciform branches ... *S. lithosperma* 2
- 7b. Leaves 7-25 mm broad. Partial panicles dense, corymbiform ... *S. corymbosa* 3
- 6b. Nut bearing spikelets uni- or bisexual. Hypogynous disc well developed, 3-lobed.
- 8a. Inflorescence consisting of a solitary terminal panicle ; bracts all glumaceous ; spikelets solitary ... *S. poaeformis* 10
- 8b. Inflorescence consisting of a terminal and usually also of one to several lateral partial panicles ; bracts, at least the lower, foliaceous ; spikelets in clusters of 2-4.
- 9a. Hypogynous disc lobes hemi-spherical ; broadly rounded at the top.
- 10a. Nuts ovoid or globose, about as long as or longer than broad ... *S. terrestris* 9
- 10b. Nuts depressed-globose, broader than long ... *S. oblata* 13
- 9b. Hypogynous disc lobes ovate-lanceolate, acute, mucronulate or notched.
- 11a. Annuals. Terminal partial panicles 2-4 cm long. Nuts cancellate.
- 12a. Nut beaks white ... *S. parvula* 4
- 12b. Nut beaks purplish black ... *S. levis* 8
- 11b. Perennials. Terminal partial panicles 4-13 cm long. Nuts smooth or faintly reticulate.
- 13a. Nuts with a distinct beak ... *S. biflora* 5
- 13b. Nuts beakless, obtuse ... *S. benthamii* 11

1. *S. pergracilis* (Nees) Kunth, Enum. Pl. 2 : 354. 1837. *Hypoporum pergracile* Nees in Edinb. New Phil. J. 17 : 267. 1834 et in Wt. Contr. Bot. Ind. 118. 1834.

Annuals, 25-55 cm high. *Stems* flexuous, 0.5-1.0 mm thick. *Leaves* 7-17 cm long, 0.5-1.5(-2.0) mm broad ; sheaths wingless, glabrous or hairy, mouth truncate or with a minute membranous appendage. *Inflorescence* spiciform, of 7-22 distinct clusters of spikelets on the rhachis ; rhachis smooth or scabrid ; clusters sessile, of 2-5 spikelets, lower *ca* 1 cm apart, upper gradually closer ; bracts glumaceous, equalling the cluster ; spikelets bisexual, obovate, 2.5-3.5 mm long, brown ; glumes oblong-obovate, keeled, acute, fruiting glumes *ca* 2.5 mm

long. *Stamens* 2, anthers 0.8 mm long, crest reddish, setose ; style 0.3 mm long, stigmas 1 mm long. *Nuts* obovoid, subterete, *ca* 1.2 mm long, apiculate, rugose, glossy white ; hypogynous disc reduced to a triquetrous, *ca* 0.5 mm long stipe (Figs. 41-41e).

Fls. & frts. : Sept. ; at 1400 m.

The species is reported to be highly odorous, edible, and of medicinal use (*cf.* Kern in Blumea 11 : 196. 1961).

NAGALAND.

2. *S. lithosperma* (L.) Swartz, Prodr. 18. 1788. *Scirpus lithospermus* L. Sp. Pl. 51. 1753.

Perennials, 4-9 dm high. *Rhizomes* woody,

short or long creeping, *ca* 2 mm thick. *Stems* slender, erect, 1-2 mm thick. *Leaves* all scattered or somewhat aggregated in the middle, 1-5 mm broad, glaucescent, glabrous or puberulous; sheaths wingless, usually pubescent; contraligule ovate, ciliate. *Inflorescence* paniculate, up to 30 cm long, narrow, of a terminal and 2-3 lateral partial panicles; branches ascending; primary bracts foliaceous; spikelets bisexual (sometimes a few male also), solitary or 2-3 together, each with one female flower and few to several male flowers, 3-5 mm long; glumes ovate-lanceolate, mucronulate, pale brown to ferruginous. *Stamens* 1-2, anthers 0.7-1.5 mm long. *Nuts* oblong-ovoid, trigonous, 2-3 × 1.5-2.0 mm, acutish, smooth, glossy ferruginous; hypogynous disc reduced to a narrow, brown, minutely glandular band.

MEGHALAYA: K. & J. Hills, Clarke 42860 (*n. v.*).

3. *S. corymbosa* Roxb. Fl. Ind. 3: 574. 1832; Clarke in Hook. f. Fl. Brit. Ind. 6: 686. 1894; Kern in Blumea 11: 189. 1961. *S. ridleyi* Clarke, *l. c.*

Perennials, up to 2 m high. *Rhizomes* creeping. *Stems* erect, *ca* 1 mm thick. *Leaves* subcoriaceous, 7-25 mm broad, obtusish; sheaths wingless, smooth; contraligule ovate with broad scarious fuscous margins. *Inflorescence* paniculate, often copious, up to 75 cm long, of a terminal and few to several lateral partial panicles, laterals usually 2-3-together, corymbiform, on up to 10 cm long peduncles; primary bracts foliaceous, usually overtopping the panicle; spikelets bisexual and male, 4-5 mm long, stramineous to dark brown; bisexual, spikelets broadly obovoid, male spikelets lanceolate. *Stamens* 3, anthers 2 mm long, crest subulate. *Nuts* ovoid, 3.0-3.5 × 2.0-2.5 mm, acute, glossy white, sometimes discoloured; hypogynous disc reduced to a narrow, reddish brown band.

MEGHALAYA † Khasi hills, Hook. f. & Thom. (CAT, *acc. no.* 511986).

4. *S. parvula* Steud. Syn. Cyper. 174. 1855; Nelmes in Kew Bull. 1956: 105. 1956. *S. tessellata* Boeck. in Linnaea 38: 470. 1874. *p. p.*; Clarke in Hook. f. Fl. Brit. Ind. 6: 686. 1894 *p. p.*; *non* Willd. 1805.

BSI—8

Annuals, tufted, (1.0-) 2.5-12.0 dm high. *Stems* 1.0-1.5 mm thick. *Leaves* 20-50 cm long, 2-5 mm broad; sheaths wingless to narrowly winged, glabrous or hairy, scaberulous; contraligule rounded or truncate, ciliate. *Inflorescence* paniculate, of a terminal and 1-3 lateral partial panicles; terminal 2-4 cm long, laterals rather shorter, on slender, up to 7 cm long peduncles; rhachis smooth or scaberulous; primary bracts foliaceous, equalling to exceeding the panicle; spikelets unisexual; male spikelets 4-5 mm long, on 1-3 mm long peduncles; female spikelets 6-7 mm long; glumes ovate-lanceolate, fruiting glumes 5.0-5.5 mm long, keeled. *Stamens* 2(-3), anthers 1.0-1.5 mm long, crest subulate, reddish, ciliate; style 3 mm long, stigmas 2 mm long. *Nuts* obovoid, subterete, 2.2-2.5 × 1.8-2.0 mm, apiculate, cancellate, glabrous or deciduously hairy, glossy white, sometimes discoloured, brown; hypogynous disc rather fleshy, 3-lobed, greenish yellow; lobes ovate, 0.5-0.7 mm high, obtusish, sometimes notched.

Fls. & frts.: May-Oct. In dry to moist wastelands, on gravelly substratum; 100-1700 m.

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

5. *S. biflora* Roxb. Fl. Ind. 3: 573. 1832. *S. tessellata* Nees in Wt. Contr. Bot. Ind. 118. 1834; *non* Willd. 1805.

Annuals, tufted, 1.5-4.0(-7.5) dm high. *Roots* shallow, strongly aromatic. *Stems* slender, erect, *ca* 1 mm thick. *Leaves* 7-15 cm long, 2-5(-8) mm broad, glabrous or hairy; sheaths narrowly winged, smooth or scaberulous; contraligule rounded, ciliate. *Inflorescence* paniculate, of a terminal and 2-3 lateral partial panicles, terminal 2-4 cm long, laterals rather shorter, on 1-4 cm long, solitary or binate, compressed peduncles; primary bracts foliaceous, shorter than to equalling the panicle; spikelets all unisexual or sometimes male and bisexual; male spikelets sessile or on up to 2.5 mm long peduncles, linear-lanceolate, *ca* 3 mm long; female spikelets obovoid, *ca* 4.5 mm long; glumes ovate, mucronulate, brown, fruiting glumes 3.5 mm long, keeled. *Stamens* 2-3; anthers 1 mm

long, crest reddish, spinulose; style 1.2 mm long, stigmas 1.8 mm long. *Nuts* globose, terete, 2.0-2.5 mm broad, beaked, cancellate, white, hairy; beaks purplish-black; hypogynous disc deeply 3-lobed, stramineous to brown; lobes lanceolate, ca 1 mm long, acute (Figs. 42-42c).

Fls. & frts. : July-Aug. In open, moist, shallow depressions, on gravels; 100-600 m.

In Java (*cf.* Kern in *Blumea* 11 : 197. 1961) the young aromatic plants are eaten with rice.

6. *S. rugosa* R. Br. Prodr. 240. 1810; Blake in J. Arn. Arb. 35 : 226. 1954. *S. zeylanica* Clarke in Hook. f. Fl. Brit. Ind. 6 : 687. 1894, *excl. syn.* *S. thwaitesiana*; *non* Poir. 1806. *S. flaccida* Clarke, *l.c.*; *non* Steud. 1855.

Annuals, 0.5-4.0 dm high. *Stems* suberect or decumbent, 0.5-1.5 mm thick. *Leaves* 2-4 mm broad, acuminate, glabrous to pilose; sheaths wingless to broadly winged; contraligule rounded, ciliate. *Inflorescence* paniculate, of a terminal (pseudo-lateral) and 1-2 lateral partial panicles; laterals single or binate, on stout, winged peduncles; primary bracts erect, foliaceous, exceeding the panicle, uppermost as though a continuation of the stem; spikelets unisexual; male spikelets lanceolate, 2 mm long; female spikelets 3-4 mm long; glumes ovate, acute-mucronulate, keel usually ciliate. *Stamen* 1; anther 0.5-0.7 mm long, crest ovate. *Nuts* globose, terete, 1.3-1.8 mm in dia., apiculate, smooth, or rugulose to lacunose, glossy white, sometimes greyish; hypogynous disc thick, shallowly 3-lobed; lobes almost hemi-spherical, broadly rounded at tip.

ASSAM : Sibsagar; Golaghat, Clarke 40744 (*n.v.*).

7. *S. caricina* (R. Br.) Benth. Fl. Austral. 7 : 426. 1878; Clarke in Hook. f. Fl. Brit. Ind. 6 : 688. 1894; Kern in *Blumea* 11 : 208. 1961. *Diplacrum caricinum* R. Br. Prodr. 241. 1810; Clarke in J. Linn. Soc. 36 : 267. 1903; Blake in J. Arn. Arb. 35 : 233. 1954.

Annuals, tufted, 0.5-1.0(-3.5) dm high. *Stems* ca 0.5 mm thick. *Leaves* 1.0-3.5(-5.0) cm long, 1.0-1.5(-3.0) mm broad, acute; sheaths wingless but

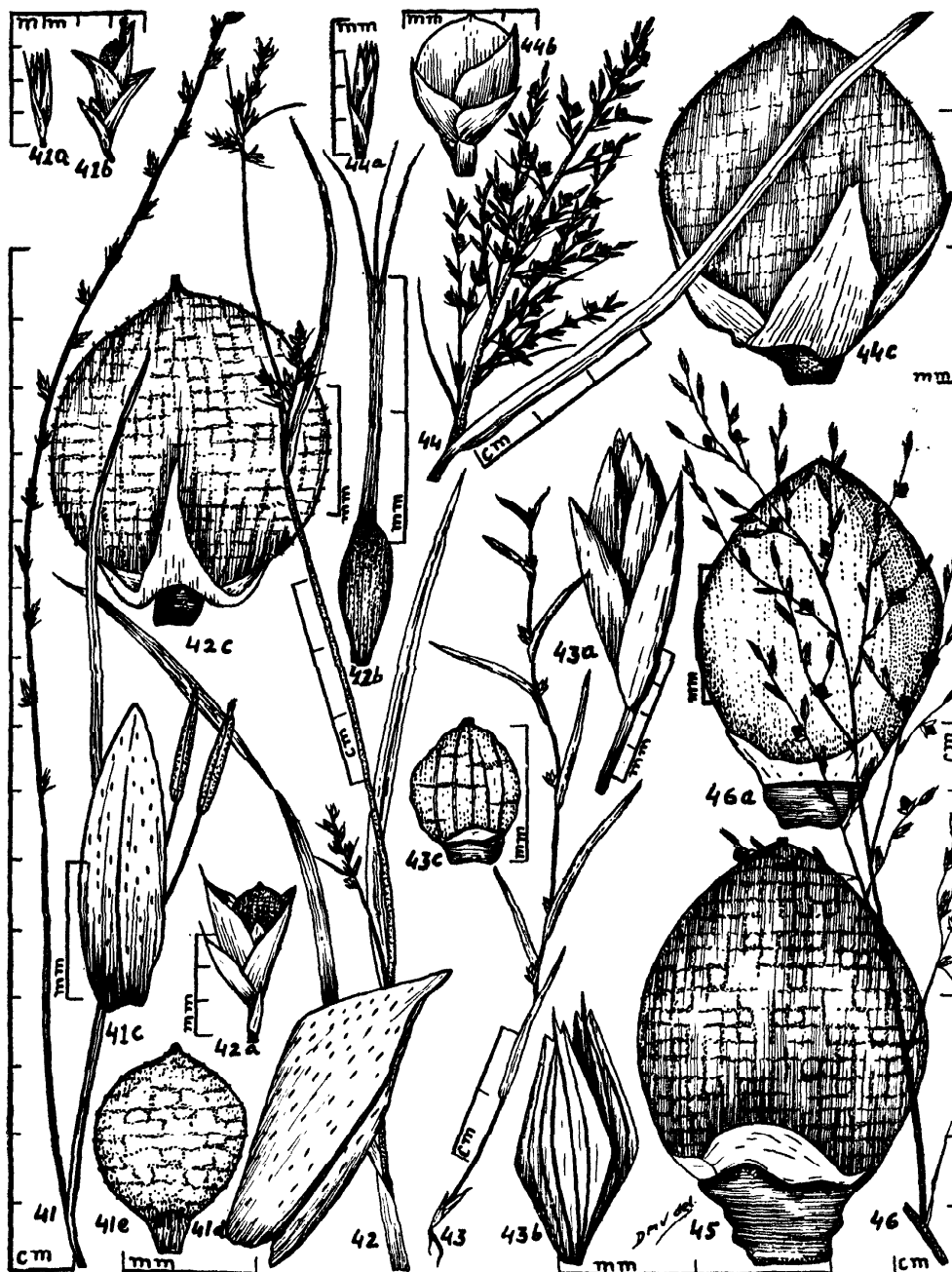
widened upwards; contraligule absent. *Inflorescence* of 7-12(-20) axillary clusters of spikelets; clusters 2-3 mm long with a terminal female and a few lateral male spikelets; male spikelets shortly peduncled, narrowly obovate, 1.5-2.0 mm long; female spikelets ovoid-oblong, 2.5-3.0 mm long; glumes 2, subopposite, connivent and falling with the nut, ovate-oblong, several-nerved, shortly 3-lobed at the tip, central lobe herbaceous, cuspidate, laterals shorter, membranaceous, acute. *Stamen* 1, anther oblong, 0.3 mm long. *Nuts* ovoid-globular, subterete, (0.7-)1.0 mm long, apiculate, ribbed, the vertical ribs more prominent than the transverse ones, glabrous or hispidulous at the top, white or somewhat discoloured; hypogynous disc reduced to a narrow, 3-angled band (Figs. 43-43c).

ASSAM : Kamrup.

Robert Brown (*l.c.*) distinguished his monotypic genus *Diplacrum* on the basis of the pair of female glumes falling with the nut. There have been conflicting opinions among the Cyperologists in keeping it as a distinct genus. Blake (*l.c.*) held *Diplacrum* as a distinct genus, broadening the original diagnosis with some additional characters and transferred a few more spp. of *Scleria* to it. We have followed Kern (*l.c.*) who reduced *Diplacrum* to a section of *Scleria* with due explanatory notes for his conclusion.

8. *S. levis* Retz. Observ. 4 : 13. 1786; Blake in J. Arn. Arb. 35 : 226. 1954; *non* Clarke, 1894. *S. zeylanica* Poir. Encyclop. 7 : 3. 1806; *non* Clarke, 1894. *S. hebecarpa* Nees in Wt. Contr. Bot. Ind. 117. 1834; Clarke in Hook. f. Fl. Brit. Ind. 6 : 689. 1894. *S. hebecarpa* var. *pubescens* Clarke, *l.c.*

Perennials, usually scrambling over bushes, 3-10 dm high. *Rhizomes* woody, creeping to 7 cm. *Stems* solitary or 2-3 approximate, 1-3 mm thick, glabrous or villous. *Leaves* 20-40 cm long, 4-8 mm broad, acute, usually glabrous, sometimes villous; sheaths triquetrous or with up to 2 mm broad wings; contraligule ovate, ciliate. *Inflorescence* paniculate, of a terminal and 1-2 lateral partial



Figs. 41-46 : 41-41e. *Scleria pergracilis* (Nees) Kunth. 42-42c. *S. biflora* Roxb.
 43-43c. *S. caricina* (R. Br.) Benth. 44-44c. *S. levis* Retz.
 45. *S. terrestris* (L.) Fass. 46-46a. *S. poaeformis* Retz.

panicles ; terminal 4-10 cm long, 2.0-3.5 cm broad, laterals shorter, on 3-8 cm long scabrid peduncles ; rhachis hispidulous ; primary bracts foliaceous, equalling to overtopping the panicles ; spikelets unisexual ; male spikelets on 1-5 mm long peduncle, lanceolate, 3-4 mm long ; female spikelets 4-6 mm long ; glumes ovate, acute-mucronulate, stramineous to pale brown, fruiting glumes 3.5-4.0 mm long. *Stamens* 3, anthers 1.5 mm long, crest reddish, setose ; style *ca* 0.7 mm long, stigmas *ca* 2 mm long. *Nuts* subglobose, subterete, 2.0-2.5 mm long, apiculate, smooth or faintly reticulate, usually glossy white, sometimes bluish-black, sparsely deciduously hairy ; hypogynous disc deeply 3-lobed, lobes thin, ovate-lanceolate, 1.0-1.5 mm long, acute or notched, brown (Figs. 44-44c).

Fls. & frts. : March-Oct. In open moist places amidst tall grasses and bushes ; 100-700 m.

Blake (*l. c.*) has shown that *S. levis* Retz. and *S. hebecarpa* Nees are conspecific. He gave a new name, *S. oblata*, for the plants described by Willdenow, Nees, Clarke and others as *S. levis* ('*laevis*', sphalm.).

ARUNACHAL PRADESH ; Kameng, ASSAM : Goalpara ; Kamrup ; Nowgong ; Sibsagar. MEGHALAYA ; K. & J. Hills. NAGALAND.

9. *S. terrestris* (L.) Fass. in *Rhodora* 26 : 159. 1924 ; Blake in *J. Arn. Arb.* 35 : 228. 1954 ; Kern in *Blumea* 11 : 170. 1961. *Zizania terrestris* L. Sp. Pl. 991. 1753. *S. radula* Hance in *Ann. Sc. Nat. Bot.* 18 : 232. 1862 ; Clarke in *Hook. f. Fl. Brit. Ind.* 6 : 691. 1894. *S. elata* Thw. *Enum. Pl. Zeyl.* 353. 1864 ; Clarke, *l. c.* 690. *S. melanostoma* Nees *ex* Boeck. in *Linnaea* 38 : 514. 1874 ; Clarke, *l. c.* 692. *S. rinkiana* Boeck. *Cyp. Nov.* 2 : 30. 1890 ; Clarke, *l. c.* 694. *S. elata* var. *latior* Clarke, *l. c.* 690. *S. elata* var. *decolorans* Clarke, *l. c.* *S. chinensis* var. *biauriculata* Clarke, *l. c.*

Perennials, erect or scrambling over bushes, 1-4 dm high. *Rhizomes* woody, creeping to 10 cm. *Stems* 2-8 mm thick, glabrous or villous, angles smooth or scaberulous. *Leaves* 15-75 cm long, 4-22 (-40) mm broad ; sheaths wingless or with up to 5 mm broad wings, glabrous to villous ; con-

triligule rounded, glabrous or ciliate. *Inflorescence* paniculate, of a terminal and 2-5 lateral partial panicles ; terminal 4-15 × 1.5-10.0 cm, laterals as large or smaller, on 1-4 cm long peduncles ; peduncles compressed, solitary or binate ; rhachis villous throughout or with tufts of hairs at nodes, or almost glabrous ; branches ascending to divaricate, villous to glabrescent, sometimes glabrous ; primary bracts foliaceous, usually equalling or exceeding, sometimes slightly shorter than the panicle ; spikelets unisexual, solitary or 2-3-together, stramineous to purplish ; male spikelets on 1-4 mm long peduncles, linear-lanceolate, 3.0-4.5 mm long ; female spikelets 3.5-5.0 mm long ; glumes ovate, acute-mucronulate, ciliolate, fruiting glumes *ca* 4 mm long. *Stamens* 2-3, anthers 1.2-2.3 mm long, crest subulate, purplish, setose ; style 0.7-1.0 mm long, stigmas 4-6 mm long. *Nuts* ovoid-subglobose, terete or trigonous, 2.5-3.0 mm long, 2-3 mm broad, apiculate, usually cancellate, sometimes smooth, usually glossy white, sometimes purplish black on ripening, young sometimes hispidulous ; hypogynous disc 3-lobed ; lobes thick, somewhat hemispherical, 0.3-0.4 mm long, broadly rounded at the tip, entire (or sometimes denticulate), yellowish, purplish striolate (Fig. 45).

Fls. & frts. : Feb.-Dec. Common on varied habitats, in open to shady, dry to marsh lands, on sandy alluvium to gravelly soil, or in rock-crevices ; 100-1700 m.

Its polymorphic nature, particularly with reference to presence or absence of wings on the leaf-sheaths, has confused and led several earlier Cyperologists to the creation of numerous names (*cf.* Blake, *l. c.* & Kern, *l. c.*, for a comprehensive synonymy). This character is highly unreliable and often varies even in the same plant. Further more, two more species need to be mentioned here. *S. thomsoniana* Boeck. (in *Linnaea* 38 : 479. 1874) noted by Clarke (*l. c.* 690) to be "Most easily distinguished from *S. elata* (= *S. terrestris*) by the glabrous rhachis of the panicle" does not appear to be so 'easily distinguished', as in our observations the hairiness is highly variable. Similarly, *S. hookeriana* Boeck.

(l.c. 498) was originally distinguished from *S. elata* by its panicle being contracted into a dense ellipsoid-oblong compound spike, to which Clarke (l.c. 692) added "Most easily known from *S. elata* by the panicle-branches ascending (not divaricate)" and further "in well evolute examples, the panicle is large compound—the lower partial panicles several, 8 inches apart." Our observations which confirm the high variability makes us puzzled as to how Clarke, notwithstanding even his own observations, could have concluded it as distinct. We strongly feel, subject to study of authentic material, that both the Boeckler's species, *S. thomsoniana* and *S. hookeriana* are probably nothing but *S. terrestris* (L.) Fass.

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

10. *S. poaeformis* Retz. Observ. 4 : 13. 1786 ; Fischer in Kew Bull. 1931 : 265. 1931. *S. oryzoides* Presl, Rel. Haenk. 1 : 201. 1828.

Perennials, 1-2 m high. *Rhizomes* woody, creeping. *Stems* erect or ascending and rooting at the lower nodes, ca 1 cm thick. *Leaves* several in a basal cluster and a few upwards on the stem, 20-50 cm long, 8-25 mm broad ; sheaths wingless or narrowly winged, lower spongy, purplish, mouth subtruncate, narrowly membranous-margined. *Inflorescence* of a solitary terminal panicle ; panicles 10-20 cm long, 5-10 cm broad, subtended by a glumaceous or setaceous bract ; ultimate branches flexuous, spiciform due to distantly placed solitary spikelets ; spikelets unisexual ; male spikelets oblong, 4-5 mm long ; female spikelets ca 5 mm long, glumes ovate, acute-mucronulate, brown, uppermost usually enclosing a sterile male glume (sometimes with 2 stamens), fruiting glumes ca 3 mm long, keeled. Stamens 3, anthers 1.5 mm long, with rather broad connective produced into a subulate reddish setose crest ; style 1 mm long, stigmas 3 mm long. *Nuts* ovoid-oblong, faintly trigonous ca 2.5 × 2.0 mm, obtuse, smooth, glossy white ; hypogynous disc shallowly 3-lobed, ca 0.5 mm high ; lobes thick, ovate, acute (Figs. 46-46a).

Fls. & frts. : July ; at about 100 m.

ASSAM : Lakhimpur.

11. *S. benthamii* Clarke in Kew Bull. Add. ser. 8 : 58. 1908 ; Kern in Blumea 11 : 166, 168. f. 3i. 1961. *S. khasiana* Clarke in Hook. f. Fl. Brit. Ind. 6 : 692. 1894.

Perennials, 4.5-12.0 dm high. *Stems* tufted, erect, 1-3 mm thick. *Leaves* rather abruptly narrowed to an obtusish tip, glabrous or villous, (2-)3-7 mm broad ; sheaths wingless to rather broadly winged, glabrous to villous ; contraligule short, rounded or truncate. *Inflorescence* paniculate, of a terminal and 1-2 lateral partial panicles, terminal 1.5-5.0 cm long, laterals smaller, solitary or binate, on short or up to 5 cm long peduncle ; primary bracts foliaceous, subequalling the panicle ; spikelets unisexual, shortly peduncled ; male spikelets linear-lanceolate, 3.0-4.5 mm long ; female spikelets 4-5 mm long ; glumes ovate, acute or mucronulate. *Stamens* 3, anthers ca 2 mm long, crest reddish, scabrid. *Nuts* ovoid, obtusely trigonous, rounded at the tip, 2.3-2.5 × 2.0-2.2 mm, rugulose or obscurely cancellate, sparsely pubescent or finally glabrescent, glossy white ; hypogynous disc shallowly 3-lobed, thick, with about 0.3 mm broad, reflexed margins, yellowish, the lobes with a short erect, subulate mucro.

MEGHALAYA : K. & J. Hills, Clarke 44613, 44683, 44798 (n. v.).

12. *S. sumatrensis* Retz. Observ. 5 : 19. t. 2. 1789.

Perennials, erect or scrambling over bushes, up to 4 m high. *Rhizomes* thick, woody. *Stems* smooth or scaberulous, up to 8 mm thick. *Leaves* rigid, middle ones and lower bracts clustered in groups of 3-5, thus forming pseudo-whorls, up to 13 mm broad ; sheaths winged or wingless ; contraligule short, rounded, ciliate. *Inflorescence* paniculate, of a terminal and 2-3 lateral partial panicles ; terminal up to 25 cm long, laterals shorter, on long exerted peduncles, panicle branches rigid, spreading ; primary bracts foliaceous, shorter than to equalling the panicle ;

spikelets unisexual, 4-5 mm long; male spikelets peduncled, lanceolate; female spikelets: glumes ovate, stramineous to purplish. *Stamens* 3, anthers 2 mm long, crest long, bristly. *Nuts* depressed globose, terete, ca 2 mm across, umbonulate, cancellate, glossy olivaceous-brown to greyish-black, deciduously hairy; hypogynous disc cyathiform, enveloping the lower half to almost whole of the nut, shallowly 3-lobed, yellowish-red; lobes subtruncate, crenulate.

MIZORAM: Demagiri, Lister; Lungsin, Gage.

13. *S. oblata* Blake in *Blumea* 11: 219. 1961. *S. levis* Willd. Sp. Pl. 4: 314. 1805 ('*laevis*', sphalm.); Clarke in Hook f. Fl. Brit. Ind. 6: 694. 1894; non Retz. 1786.

Perennials, up to 10 dm high. *Rhizomes* woody, creeping. *Stems* 2-3 mm thick. *Leaves* rigid, upper ones distant, middle approximate, 4-9 mm broad, upper surface puberulus towards the base; sheaths wingless, usually puberulus; contraligule up to 1 mm long, ciliate. *Inflorescence* paniculate, of a terminal and 2-5 lateral partial panicles, almost contiguous or the lower somewhat distant; peduncles of lower ones shortly exerted, solitary

or binate; primary bracts foliaceous, overtopping the panicle; spikelets unisexual, in clusters of 2-3; males: peduncled, oblong-lanceolate, 3.5-4.0 mm long; females: 4.0-4.5 mm long; glumes ovate, acute-mucronulate, purplish-brown, ciliolate. *Nuts* depressed globose, shorter than the glume, broader than long, ca 2.0 × 2.5-2.8 mm, smooth, at first blackish, ultimately glossy white; hypogynous disc deeply 3-lobed; lobes broadly ovate, 1.0-1.2 mm long, obtuse, entire or denticulate, stramineous.

ASSAM: Masters (n.v.).

14. *S. bracteata* var. *assamica* Clarke in Hook. f. Fl. Brit. Ind. 6: 694. 1894.

Perennial, robust, hairy herbs. *Inflorescence* paniculate, of several partial panicles, upper male with numerous small spikelets, lower female with fewer larger spikelets. *Nuts* globose, tessellate; hypogynous disc with many triangular or sometimes with narrow, almost lanceolate, teeth.

Clarke (*l.c.*) remarks "It is not easy to conjecture how it could be introduced into Assam; but I believe it to be only a form of the purely American *S. bracteata* Cav. nevertheless."

ASSAM: Masters (n.v.).

14. CAREX L.

Sp. Pl. 972. 1753 et Gen. Pl. ed. 5. no. 928. 1754.

Perennial, monoecious herbs. *Rhizomes* short, or long creeping. *Stems* usually central and arising among the leaves, sometimes lateral and distinct from the leafy shoots. *Leaves* in basal clusters or scattered all along the stem, or basal and scattered, linear, usually 3-costate; sheaths usually closed. *Inflorescence* paniculate, racemose, spiciform or reduced to a solitary terminal spikelet; bracts foliaceous or setaceous-glumaceous, branchlets, if present, and the lateral spikelets, often surrounded at the base by a utriculiform or ocreiform bract (cladoprophyll); spikelets unisexual, or androgynous (male above and female below) or gynaeandrous (male below and female above), or mesogynous (male below and above and female in the middle); glumes spiral. *Flowers* unisexual; perianth absent; male flowers: stamens 3 (rarely 2), anthers linear; female flowers: pistil

solitary, ovary enclosed in a sac-like organ (utricle or perigynium), style continuous with the ovary, deciduous or the base persistent, stigmas 2-3. *Nuts* sessile or stipitate, trigonous or lenticular, falling with the utricule; utricles membranaceous or coriaceous, sometimes inflated, sometimes marginate or winged, rostrate or erostrate.

The apparent units of the inflorescence *i.e.* the ultimate axes on which the flowering glumes are arranged have been termed as 'spikes' by Clarke (in Hook. f. Fl. Brit. Ind. 6: 699. 1894), Nelmes (in Reinwardt. 1: 221. 1951), Ohwi (in Fl. Jap. 215. 1965), as 'spikelets' by Kuekenenthal (in Engl. Pflanzenr. heft 38: 67. 1909), Koyama (in J. Fac. Sci. Univ. Tokyo, Bot. 8: 149. 1962) and Backer (in Fl. Java 3: 487. 1968), and as spikelike structure by Eiten (in Ann. Miss. Bot. Gard. 63: 106. 1976). In the following treatment these have been termed as 'spikelets'.

- 1a. Spikelets solitary, terminating the stem.
- 2a. Leaves longer than the stem, 2-8 mm broad. Utricles 4.5-5.5 mm long ... *C. speciosa* 35
- 2b. Leaves shorter or longer than the stem, 0.4-1.0 mm broad. Utricles 2-3 mm long.
- 3a. Spikelets 15-20 mm long. Utricles *ca* 3 mm long ... *C. rara* 14
- 3b. Spikelets 7-10 mm long. Utricles *ca* 2 mm long ... *C. capillacea* 15
- 1b. Spikelets two-numerous on the stem.
- 4a. Inflorescence spicate; terminal spikelet male at the top and the base, female in the middle. Stigmas persistent ... *C. scitula* 30
- 4b. Inflorescence various; terminal spikelet wholly male, or male at the base or the top only. Stigmas deciduous or persistent.
- 5a. Inflorescence paniculate-fasciculate, with two-numerous spikelets in the axils of all, or at least the lower bracts; spikelets all androgynous, or when numerous, sometimes mixed with a few wholly male or wholly female ones (except *C. alopecuroides* where terminal spikelet male or gynaeandrous).
- 6a. Spikelets 5-6, terminal male or gynaeandrous, laterals female ... *C. alopecuroides* 39
- 6b. Spikelets 2-numerous, all androgynous, sometimes mixed with a few wholly male or wholly female ones.
- 7a. Stigmas 2. Utricles and nuts lenticular.
- 8a. Stigmas not or scarcely exerted from the utricle. Utricles scabrid upwards along the margins only ... *C. longipes* 4
- 8b. Stigmas long exerted from the utricle. Utricles hispidulous.
- 9a. Female glumes all acute, 2.3-2.7 mm long. Style, including the stigmas, *ca* 5.5 mm long ... *C. lenta* 5
- 9b. Female glumes lower awned or mucronate, upper acute, 3.5-5.0 mm long. Style, including the stigmas, *ca* 8 mm long ... *C. tetnogyna* 6
- 7b. Stigmas 3. Utricles and nuts trigonal.
- 10a. Leaves evenly distributed throughout the stem, lower reduced to bladeless sheaths, upper with gradually well developed blades ... *C. insignis* 31
- 10b. Leaves with fully developed blades clustered at the base, sometimes one or two leaves upwards on the stem also.
- 11a. Spikelets in each bract axil 1-3 only.
- 12a. Leaves longer than the stem ... *C. repanda* 24
- 12b. Leaves shorter than the stem ... *C. oligostachya* 25
- 11b. Spikelets in most of the axils several to numerous.
- 13a. Plants 1-2 dm high. Inflorescence of a terminal panicle only or sometimes also with an additional partial panicle ... *C. parvigluma* 19
- 13b. Plants usually exceeding 2 dm in height. Inflorescence of three or more partial panicles or several fascicles.
- 14a. Female glumes prominently awned, lower with their awn about as long as or even longer than their main body.
- 15a. Spikelets 2-4 cm long. Utricles throughout hairy ... *C. daltonii* 33
- 15b. Spikelets 0.2-1.2 cm long. Utricles glabrous or hispidulous only along the beak-margins.
- 16a. Female glumes stramineous, reddish-brown dotted and striolate ... *C. indica* 16
- 16b. Female glumes uniformly fuscous ... *C. distracta* 17
- 14b. Female glumes acute-mucronate.
- 17a. Spikelets all or almost all 2-6 cm long.
- 18a. Utricles throughout villous ... *C. composita* 28
- 18b. Utricles glabrous or scaberulous only along beak-margins.
- 19a. Utricles broadly obovoid or subglobose, mature bright red ... *C. baccans* 26
- 19b. Utricles ellipsoid or narrowly obovoid, mature pale yellowish green or brownish.

- 20a. Peduncles solitary in a bract axil ; male part of the spikelets 3-25 mm long, conspicuously narrower and distinct from the female part ... *C. spiculata* 27
- 20b. Peduncles one to four in a bract axil ; male part of the spikelets 2-3 mm long, as thick as and indistinct from the female part ... *C. polycephala* 32
- 17b. Spikelets all or almost all 0.3-1.5 cm long.
- 21a. Female glumes whitish stramineous without reddish brown dots and streaks.
- 22a. Peduncles solitary in a bract axil, each with several to numerous spikelets ... *C. stramentitia* 21
- 22b. Peduncles one to four in a bract axil, each with only one to three spikelets ... *C. polycephala* 32
- 21b. Female glumes reddish-brown, or stramineous with reddish-brown dots and streaks.
- 23a. Utricles throughout villous ... *C. vesiculosa* 20
- 23b. Utricles glabrous or scaberulous only along beak-margins.
- 24a. Peduncles 1-4 in a bract axil, each with only 1-3 spikelets.
- 25a. Peduncles each bearing only a solitary spikelet ; glumes castaneous ... *C. munipoorensis* 34
- 25b. Peduncles lower bearing two-three spikelets ; glumes glossy stramineous or brown-tinged ... *C. polycephala* 32
- 24b. Peduncles 1-2 in a bract axil, almost all with several to numerous spikelets.
- 26a. Lowest partial panicle almost reduced to a solitary spikelet. Utricles almost nerveless or faintly 1-2-nerved on each face ... *C. ecostata* 23
- 26b. Lowest partial panicle well developed, with several to numerous spikelets. Utricles conspicuously several-nerved on each face.
- 27a. Female glumes all mucronate or mucronulate, stramineous with reddish brown dots and streaks. Styles swollen at the base. Utricles slightly to strongly inflated, 1.2-1.7 mm broad ... *C. cruciata* 18
- 27b. Female glumes almost all acute, a few sometimes mucronulate, uniformly reddish-brown. Styles uniformly slender. Utricles not or scarcely inflated, 0.5-0.8 mm broad ... *C. filicina* 22
- 5b. Inflorescence racemose or spicate with a solitary spikelet in the axil of each bract, androgynous, gynaeandrous or wholly male or female.
- 28a. Leaves evenly distributed throughout the stem, lower reduced to bladeless sheaths, upper with gradually well developed blades.
- 29a. Leaves abruptly narrowed into a long acumen ... *C. ligulata* 47
- 29b. Leaves gradually acuminate ... *C. hebecarpa* 48
- 28b. Leaves with fully developed blades clustered at the base, sometimes one or two leaves upwards on the stem also.
- 30a. Spikelets all androgynous.
- 31a. Spikelets ovoid or subglobose, sessile, cladoprophylls absent.
- 32a. Utricles 1.9-2.2 mm long, scarcely beaked ... *C. thomsonii* 45
- 32b. Utricles 3.0-4.5 mm long, distinctly beaked.
- 33a. Leaves 1.5-3.0 mm broad. Styles uniformly slender. Utricles several-nerved ... *C. nubigena* 1
- 33b. Leaves 3-6 mm broad. Styles swollen at the base. Utricles nerveless ... *C. wallichiana* 2
- 31b. Spikelets cylindrical, at least the lower, long peduncled (subsessile in *C. speciosa*) ; cladoprophylls present.
- 34a. Inflorescence of 1-4 spikelets ; spikelets sub-sessile, 1-2 cm long. Stigmas 3 ... *C. speciosa* 35

- 34b. Inflorescence of 4-several spikelets ; spikelets, at least the lower, long peduncled, often longer. Stigmas 2-3.
- 35a. Utricles throughout hairy.
- 36a. Utricles broadly obovoid or subglobose, 1.7-2.0 mm long ... *C. composita* 28
- 36b. Utricles ellipsoid, 4.2-5.5 mm long ... *C. teinogyna* 6
- 35b. Utricles glabrous or scaberulous only along the beak-margins.
- 37a. Stigmas 2. Utricles and nuts lenticular ... *C. longipes* 4
- 37b. Stigmas 3. Utricles and nuts trigonal ... *C. desponsa* 29
- 30b. Spikelets terminal wholly male or gynaeandrous, laterals androgynous, gynaeandrous or wholly male or female.
- 38a. Spikelets ovoid-subglobose, sessile ... *C. alta* 7
- 38b. Spikelets cylindrical, sessile or peduncled.
- 39a. Spikelets upper 3-4 gynaeandrous, the remaining laterals female ... *C. dimorpholepis* 9
- 39b. Spikelets terminal wholly male or gynaeandrous, the rest all wholly male or female, or androgynous with only male apices.
- 40a. Spikelets upper 2-3 wholly male.
- 41a. Utricles glabrous or puberulous. Nuts long beaked, beak-tips with a nodular swelling ... *C. fuscifructus* 42
- 41b. Utricles villous. Nuts scarcely apiculate, not beaked ... *C. fedia* 46
- 40b. Spikelets terminal wholly male or gynaeandrous, laterals all female or androgynous with short male apices.
- 42a. Utricles villous. Stigmas 3.
- 43a. Robust herbs, 3-10 dm high. Leaves 4-8 mm broad. Spikelets 4-7 cm long. Utricles long beaked ; beaks 1.2-1.7 mm long ... *C. nemostachys* 45
- 43b. Rather slender herbs, 0.8-3.0 dm high. Leaves 1.5-3.0 mm broad. Spikelets 1-3 cm long. Utricles short beaked ; beaks ca 0.5 mm long.
- 44a. Leaves shorter than to exceeding the stem. Styles swollen at the base. Utricles several-nerved ... *C. royleana* 44
- 44b. Leaves exceeding the stem. Styles uniformly slender. Utricles nerveless ... *C. inanis* 43
- 42b. Utricles glabrous. Stigmas 2-3.
- 45a. Stigmas 2. Utricles and nuts lenticular.
- 46a. Styles, including the stigmas, 7-8 mm long ... *C. rubrobrunnea* 12
- 46b. Styles, including the stigmas, 2.3-3.0 mm long.
- 47a. Female glumes obtuse ... *C. eleusinoides* 49
- 47b. Female glumes awned.
- 48a. Female glumes at awn base abruptly truncate or cordate.
- 49a. Low herbs, 1.5-2.0 dm high. Spikelets 2-4, 1.3-2.5 cm long ... *C. praelonga* var. *angustior* 8
- 49b. Low or tall herbs, 2-12 dm high. Spikelets 4-6, all or at least some 3.5 cm or more long ... *C. phacota* 10
- 48b. Female glumes at awn base gradually acute or obtuse.
- 50a. Female glumes (excluding the awns) ca 1.5 mm long. Utricles inflated ; beak bidentate. Nuts ovoid, 0.8-1.0 mm broad ... *C. prescottiana* 13

50b. Female glumes (excluding the awns) 2.8-3.3 mm long. Utricles not or scarcely inflated ; beak entire. Nuts subglobose, 1.4-1.7 mm broad ...	<i>C. pruinosa</i> 11
45b. Stigmas 3. Utricles and nuts trigonal.	
51a. Utricles long beaked ; beaks about as long as the main body of the utricle.	
52a. Leaves longer than the stem. Female glumes aristate ...	<i>C. desponsa</i> 29
52b. Leaves shorter than the stem. Female glumes acute or mucronulate.	
53a. Styles swollen at the base. Utricle mouth deeply oblique ...	<i>C. finitima</i> 38
53b. Styles uniformly slender. Utricle mouth not or scarcely oblique ...	<i>C. jackiana</i> 37
51b. Utricles short beaked ; beaks half or less as long as the main body of the utricle.	
54a. Utricles ferruginous-papillose ...	<i>C. maculata</i> 36
54b. Utricles smooth.	
55a. Stem angles for the most part winged. Spikelets fastigiate. Utricles yellowish green ...	<i>C. alopecuroides</i> 39
55b. Stem angles acute or obtuse. Spikelets lower distant, upper gradually approximate. Utricles fuscous-olivaceous.	
56a. Female glumes 1.8-2.5 mm long, distinctly awned or mucronate, stramineous. Styles swollen at the base ...	<i>C. oedorrhampa</i> 40
56b. Female glumes 3.3-4.5 mm long, long acuminate, stramineous, with reddish brown flush on either side. Styles uniformly slender ...	<i>C. olivacea</i> 41

1. *C. nubigena* D. Don in Trans. Linn. Soc. 14 : 326. 1825 ; Clarke in Hook. f. Fl. Brit. Ind. 6 : 702. 1894. *C. nubigena* var. *fallax* Clarke in J. Linn. Soc. (Bot.) 36 : 301. 1904.

Perennials, tufted, 1.3-7.0(-10.0) dm high. *Rhizomes* short, woody. *Stems* erect or suberect, trigonous, 1.0-2.5 mm thick. *Leaves* clustered at the base, shorter than the stem, 1.5-3.0 mm broad ; sheaths stramineous-ferruginous, ultimately fibrous. *Inflorescence* spicate, 1.0-5.5 cm long ; lower 1-2 bracts foliaceous, equalling or exceeding the stem, lowest 2-15 cm long ; spikelets *ca* 5-20, contiguous in an ellipsoid to cylindrical cluster or the lower few somewhat distant, androgynous, usually with only 2-4, sometimes with 1-8 male flowers at the tip, and many female flowers below, ovoid to subglobose, 5-9 × 5.5-7.5 mm ; male glumes ovate-lanceolate, *ca* 3 mm long, acute, greenish-white, hyaline with three green nerves ; female glumes ovate or oblong-lanceolate, 2.3-3.5 mm long, acute-mucronulate, greenish-white or brown tinged. *Stamens* 2-3, anthers 1.5 mm long, crest setulose ; style 2 mm long, uniformly slender, persistent ; stigmas 2, *ca* 2 mm long. *Utricles* membranaceous, spreading, shortly stipitate, not inflated, ovoid-ellipsoid, compressed-biconvex, 3.0-4.0(-4.5) × 1.2-1.8 mm, gradually beaked,

slenderly several-nerved, greenish, narrowly winged ; wings often incurved ; beaks *ca* 1 mm long, bidentate, scaberulous. *Nuts* stipitate, suborbicular, plano-convex, *ca* 1.5 × 1.0 mm, castaneous.

Fls. & frts. : May-Sept. Common in wastelands, in dry, moist or muddy places ; 1000-2700 m.

Very variable in stature and spike development. While the dry land plants are usually small with only a few spikelets, those in the marshy places are very robust bearing several spikelets forming cylindrical spikes.

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

2. *C. wallichiana* Spreng. Syst. 3 : 812. 1826 ; *non* Presc. *ex* Nees, 1834, *nec* Clarke, 1894. *C. foliosa* D. Don in Trans. Linn. Soc. 14 : 327. 1825 ; Fischer in Gamble, Fl. Pres. Madras repr. ed. 3 : 1168 ; *non* All. 1785. *C. muricata* var. *foliosa* Clarke in Hook. f. Fl. Brit. Ind. 6 : 703. 1894.

Perennials, 1-9 dm high. *Rhizome* short, caespitose. *Stems* triquetrous. *Leaves* usually shorter than the stem, rarely longer, 3-6 mm broad, brown-margined. *Inflorescence* spicate, 2-10 cm long ; bracts very short, filiform, rarely the lowest

up to 5 cm long ; spikelets 6-14 (or more), lower distant, upper crowded, androgynous, ovoid, 5-12 mm long ; glumes ovate, 2.5-3.0 mm long, acuminate-mucronate, pale brown. *Style* swollen at the base ; stigmas 2. *Utricles* membranaceous, suberect, shortly stipitate, ovate-lanceolate, plano-convex, ca 3.5 mm long, gradually beaked, nerveless, scaberulous-margined, pale greenish ; beaks slender, deeply bifid. *Nuts* ovoid.

MEGHALAYA : K. & J. Hills ; Cherrapunji, Hook. f. 1117 (n.v.) ; Khasi hills, Griffith Kew no. 6067 (n.v.).

3. *C. thomsonii* Boott, Illustr. 1 : 1. t. 1. 1858.

Perennials, 2-3 dm high. *Rhizome* woody, caespitose. *Stems* rigid, trigonous, blackening with age (not rarely rooting at the top and throwing a cluster of stems the next season). *Leaves* scattered all along and exceeding the stem, 2-4 mm broad, acuminate ; sheaths ultimately black fibrous. *Inflorescence* spicate, 4.5-7.0(-12.0) cm long ; lowest bract foliaceous, 6-17 cm long, upper much reduced ; spikelets ca 25-40, contiguous, spreading, androgynous, with 4-5 male and several female flowers, ovate-oblong, 4-8 × 3-4 mm ; male glumes ovate, acute, 2.5 mm long, closely purplish red streaked and dotted ; female glumes broadly ovate, 2.5-3.0 mm long, lower mucronulate, upper acute, purplish red dotted and streaked. *Stamens* 3 ; style 1 mm long, uniformly slender ; stigmas 2, 1.5-2.0 mm long. *Utricles* rather herbaceous, spreading, shortly stipitate, broadly ovoid, plano-convex, 1.9-2.2 × 1.0-1.2 mm, scarcely beaked, denticulate-winged in the upper half, obsoletely nerved, closely purplish red dotted and streaked ; beak 0.3 mm long, bifid to the base. *Nuts* shortly stipitate, obovoid, ca 1.3 mm long, deep brown (Figs. 47-47b).

Fls. & frts. : April.

ASSAM : Lakhimpur. MEGHALAYA : K. & J. Hills, Hook. f. & Thom. (n.v.). MANIPUR, Watt. (n.v.).

4. *C. longipes* D. Don in Trans. Linn. Soc. 11 : 329. 1825 ; Nelves in Reinwardt. 1 : 361. 1951. *C. longipes* var. *racemosa* Kuekenth. in Bot. Jahrb. 70 : 467. 1940.

Perennials, 3-7 dm high. *Rhizome* woody, up to

3 cm long. *Stems* slender, trigonous, ca 1 mm thick. *Leaves* clustered at the base, much shorter than to as long as the stem, 2-3 mm broad, acute to long acuminate ; sheaths brown, ultimately fibrous. *Inflorescence* flexuous, 20-45 cm long ; bracts long sheathed, lower 2-3 foliaceous, lowest 10-15 cm long with 1.5-4.0 cm long sheath ; spikelets 4-7, solitary, on long exerted filiform peduncles, androgynous, 1.5-5.5 cm long ; male part 5 × 1 mm, glumes lanceolate, 4.5-5.0 mm long, awned, pale ferruginous ; female part 10-15 × 4-6 mm, glumes ovate-lanceolate, 2.7-3.2 mm long, excluding 1.4 mm long scaberulous awn, pale ferruginous. *Stamens* 3 ; style 1 mm long, swollen at the base ; stigmas 2, ca 2.5 mm long. *Utricles* membranaceous, ascending, sessile, not inflated, ovoid, lenticular, 5.5-6.0 × 2 mm, gradually beaked, 7-9 nerved on each face, scaberulous upwards along the margins, greenish or brownish ; beak 2.5 mm long, bidentate, scabrid. *Nuts* stipitate, somewhat trapezoid, lenticular, 2.0-2.3 × 1.5 mm, brown.

Fls. & frts. : May-Aug. Along streams, in shady places ; 1300-2000 m.

MEGHALAYA : K. & J. Hills. NAGALAND.

var. *dissitiflora* Clarke in Hook. f. Fl. Brit. Ind. 6 : 705. 1894.

Leaves 4-5 mm broad. *Spikelets* on shortly exerted peduncles, solitary or binate at each node, 4-8 cm long, with 9-22 mm long male part, sometimes bearing an additional smaller spikelet at the base. *Utricles* 6.5-7.0 mm long.

MEGHALAYA : K. & J. Hills. NAGALAND.

5. *C. lenta* D. Don in Trans. Linn. Soc. 14 : 327. 1825 ; Koyama in J. Fac. Sci. Univ. Tokyo, Bot. 8 : 165. 1962. *C. brunnea* Clarke in Hook. f. Fl. Brit. Ind. 6 : 705. 1894 ; Kuekenth. in Engl. Pflanzenr. heft 38 : 599. 1909 p. p., incl. t. 102A-E ; non Thumb. 1784.

Perennials, 5-12 dm high. *Rhizome* short, woody. *Stems* slender, triquetrous, 1.0-1.5 mm thick. *Leaves* several clustered at the base and 1-2 also upwards on the stem, shorter than the stem, 2-3 mm broad, acuminate ; sheaths fuscous.

Inflorescence flexuous of interrupted fascicles of spikelets, 20-40 cm long; lower 2-4 bracts foliaceous, long sheathing, shorter than to equalling the stem, lowest 20-30 cm long with 2-3 cm long sheath; spikelets 2-3 together, on long exerted filiform peduncles, androgynous, 15-40 mm long; male part 5-10×0.7 mm, glumes lanceolate, 2.8-3.2 mm long, acute, ferruginous; female part 10-25×3-4 mm, glumes ovate, 2.3-2.7 mm long, acute, ferruginous. *Style* 1.5 mm long, slightly swollen at the base; stigmas 2, *ca* 4 mm long. *Utricles* membranaceous, ascending, stipitate, not inflated, ovoid, lenticular, 4.0-4.5×1.3 mm, rather abruptly beaked, faintly several-nerved, hispidulous, castaneous; beak 1.3 mm long, bidentate. *Nuts* shortly stipitate, broadly ovoid-oblong, lenticular, 3.0×1.3 mm, acute, brown.

Fls. & frts. : Nov. At *ca* 1200 m.

Koyama (*l. c.*) has shown that *C. brunnea* as understood by Clarke (*l. c.*) and Kuekenh. (*l. c.*) contained three distinct species, viz. *C. brunnea* Thunb. (from China, Japan & Indo-china); *C. hattoriana* Nakai (from Japan, Malaya & Australia) and *C. lenta* D. Don (from Himalayas, China & Japan).

MANIPUR.

6. *C. teiogyna* Boott, *Illustr.* 1 : 60. t. 158. 1858; Kuekenh. in *Engl. Pflanzenrch. heft* 38 : 602. 1909 ('*teiogyna*', sphalm.). *C. teiogyna* var. *scabriculum* Kuekenh. *l. c.*

Perennials, 2.0-3.5(-6.0) dm high. *Rhizome* short, slender. *Stems* trigonous, 0.5-0.8 mm thick, smooth or scaberulous at the top. *Leaves* clustered at the base, as long as the stem, 1.2-2.2(-4.0) mm broad, acuminate; sheaths fuscous, ultimately fibrous. *Inflorescence* usually spicate, sometimes with a tendency to become paniculate; bracts 3-5 foliaceous, shorter than the stem, long sheathed, lowest 4-11 cm long with 1-2 cm long sheath; spikelets at each node usually solitary, sometimes 2-3, androgynous, (5-)10-30 mm long, sometimes bearing an additional spikelet at the base; male part 5-9×0.5 mm, glumes lanceolate, 4.5-5.5 mm long, castaneous; female

part 5-21×2.5 mm, glumes oblong-lanceolate, 3.5-5.0×1.2-1.5 mm, acute, mucronate or with up to 1 mm long awn, castaneous. *Stamens* 2; style 1 mm long, slightly swollen at the base; stigmas 2, *ca* 0.7 mm long. *Utricles* membranaceous, spreading on maturity, stipitate, not inflated, ellipsoid, lenticular, (3.5-)4.2-5.5×1.0-1.3 mm, rather abruptly beaked, faintly several-nerved, hispidulous throughout, castaneous; beak 1.8-2.3 mm long, bidentate. *Nuts* sessile, ellipsoid, lenticular, 1.8-2.2×1.0-1.2 mm, acute, castaneous (Figs. 48-48a).

Fls. & frts. : Nov. At *ca* 1300 m.

MEGHALAYA : K. & J. Hills.

7. *C. alta* Boott in *Proc. Linn. Soc.* 1 : 254. 1845; in *Trans. Linn. Soc.* 20 : 130. 1846 *et Illustr.* 1 : 59. t. 153. 1858 (excl. utricle); Clarke in *Hook. f. Fl. Brit. Ind.* 6 : 707. 1894 *p. p.*; Nelmes in *Reinwardt.* 1 : 438. 1951. *C. remota* subsp. *alta* var. *brizopyrum* Kuekenh. in *Engl. Pflanzenrch. heft* 38 : 602. 1909.

Perennials, 1.5-5.5 dm high. *Stems* slender, trigonous, 1.0-1.5 mm thick. *Leaves* several in the lower part of the stem, shorter than to exceeding the stem, 1.0-3.5 mm broad; sheaths brown, ultimately fibrous. *Inflorescence* spicate, 6-15 cm long; bracts not sheathing, equalling to exceeding the stem, lowest 9-16 cm long; spikelets 6-14(-21), ascending to obliquely spreading, gynaeandrous with scarcely 3-4 male flowers at the base and numerous female flowers above, 5-12×2-4 mm; male glumes ovate-lanceolate, 2.3-3.0 mm long, hyaline; female glumes similar to the male, 2.2-2.8 mm long. *Stamens* 3; style 0.8 mm long, swollen at the base; stigmas 2, *ca* 1.5 mm long. *Utricles* membranaceous, spreading, shortly stipitate, ellipsoid-oblong, lenticular, 2.7-3.0×1 mm, scarcely beaked, denticulate-winged in the upper half, obsolete nerved, pale green to brownish; beak 0.3 mm long, bifid to the base. *Nuts* shortly stipitate, obovoid-oblong, lenticular, 1.3-1.5×0.8 mm, yellowish brown (Figs. 49-49a).

Fls. & frts. : March-July. In muddy places; 1600-1800 m.

ARUNACHAL PRADESH : Kameng ; Tirap. MANIPUR. MEGHALAYA : K. & J. Hills.

8. C. praelonga Clarke var. **angustior** Clarke in Hook. f. Fl. Brit. Ind. 6 : 707. 1894.

Perennials, 1.5-2.0 dm high. *Rhizome* creeping, ca 3 mm thick. *Stems* several together in linear succession, triquetrous, 1 mm thick. *Leaves* clustered at the base, shorter than to as long as the stem, 2-3 mm broad ; sheaths fuscous. *Inflorescence* racemose, 3.5-6.5 cm long ; lower 1-2 bracts foliaceous, subequalling the stem, lowest 5.5-7.5 cm long ; spikelets 2-4, on capillary peduncles, cylindric, 1.3-2.5 × 0.25-0.32 cm ; terminal male, lower androgynous with 2-3 mm long male tips, or wholly female ; male glumes oblanceolate with broad subtruncate shoulders, 3.7-4.2 mm long, shortly awned, rufous ; female glumes obovate with broad truncate to slightly cordate shoulders, excl. the awns, 1.5-1.8 mm long, rufous, awns 0.8-1.7 mm long, scaberulous. *Stamens* 3, anthers 2-3 mm long ; style 1.5 mm long, uniformly slender ; stigmas 2, ca 1.3 mm long. *Utricles* spreading to divaricate, not inflated, shortly stipitate, ovoid, biconvex, 2.2-2.5 × 1.2-1.5 mm, subabruptly shortly beaked, nerveless, ferruginous-papillose. *Nuts* shortly stipitate, obovoid, biconvex, 1.5-1.0 mm, brownish.

Fls. & frts. : March. In paddy-fields ; at ca 1400 m.

MEGHALAYA : K. & J. Hills.

9. C. dimorpholepis Steud. Synop. Cyper. 214. 1855 ; Ohwi, Fl. Jap. 231. 1965. *C. cernua* Boott, Illustr. 4 : 171. t. 578. 1867, incl. var. *minor* ; Clarke in Hook. f. Fl. Brit. Ind. 6 : 708. 1894 ; *non* Gmel. 1791.

Perennials, stoloniferous, 4.0-5.5 dm high. *Stems* triquetrous, 2 mm thick. *Leaves* clustered at the base, subequalling the stem, 3-6 mm broad ; sheaths fuscous, ultimately ladder-fibrillose splitting. *Inflorescence* racemose, 10-15 cm long ; lower 2-3 bracts foliaceous, much exceeding the inflorescence, lowest 23-32 cm long ; spikelets 5-8, lower rather distant and nodding, cylindric, 2.5 × 0.5-0.6 cm ; terminal gynaecandrous with

its male part ca as long as the female, next 2-3 lower also gynaecandrous but with much smaller male part, the rest wholly female ; peduncles slender, spinulose ; male glumes oblanceolate with truncate to cordate shoulders, 2.5-3.2 mm long, excluding 0.8-1.2 mm long awn, stramineous, reddish-brown streaked and dotted ; female glumes similar to the male but 2.0-2.3 mm long. *Stamens* 3, anthers 2.5 mm long ; stigmas 2. *Utricles* spreading to divaricate, membranaceous, slightly inflated, shortly stipitate, ovoid, lenticular, 3.0-3.3 × 1.5-1.8 mm, scarcely beaked, ferruginous-granular, nerveless. *Nuts* stipitate, ovoid, biconvex, 2.0-2.2 × 1.3 mm, apiculate, brownish.

ASSAM.

10. C. phacota Spreng. Syst. 3 : 826. 1826. *C. lenticularis* D. Don in Trans. Linn. Soc. 14 : 331. 1824 ; *non* Michx. 1803.

Perennials, 3-12 dm high. *Rhizome* short. *Stems* triquetrous, 1-3 mm thick. *Leaves* several in a basal cluster and sometimes also 1-2 upwards on the stem, shorter than to exceeding the stem, 2-8 mm broad ; sheaths reddish-brown, ultimately fibrous. *Inflorescence* racemose, 10-16 cm long ; lower 2-3 bracts foliaceous, exceeding the inflorescence, lowest 20-30 cm ; spikelets 4-6, all approximate at the tip or the lower distant, on slender peduncles, cylindric, 2.9 × 0.35-0.5 cm ; terminal male, lower usually androgynous with 2-5 mm long male tips, sometimes wholly female ; male glumes oblanceolate with truncate shoulders, 3.5-4.5 mm long, mucronate, stramineous, reddish-brown striolate ; female glumes narrowly obovate-oblong with truncate or cordate shoulders, excluding the awn, 1.5-2.5 mm long, stramineous-ferruginous, reddish-brown striolate, awn 0.5-2.0 mm, smooth or scaberulous. *Stamens* 3 ; anthers 2 mm long ; style 1.5 mm long, uniformly slender, base persistent ; stigmas 2, ca 1.3 mm long. *Utricles* obliquely spreading, subcoriaceous, scarcely inflated, shortly stipitate, obovoid, lenticular, 2.5-3.0(-3.5) × 1.5-2.0 mm, apiculate, obscurely nerved, usually densely ferruginous papillose, sometimes pale reddish papillose. *Nuts*

stipitate, obovoid, lenticular, 1.8-2.0 × 1.5 mm, apiculate, stramineous to brownish.

Fls. & frts. : March-April. Along streams ; 300-1300 m.

ASSAM : Cachar ; Sibsagar. MEGHALAYA : Garo Hills ; K. & J. Hills.

11. *C. pruinosa* Boott in Proc. Linn. Soc. 1 : 255. 1855 *et* Illustr. 1 : 65. t. 174. 1858.

Perennials, 3.5-6.0(-9.0) dm high. *Stems* trigonous, 1.5-2.0 mm thick. *Leaves* several in the lower half of the stem and shorter to exceeding it, 2-5 mm broad, margins revolute ; sheaths brown, not splitting. *Inflorescence* racemose, 5-8 cm long ; lower 1-2 bracts foliaceous, exceeding the stem, lowest 8-30 cm long ; spikelets 3-6, peduncled, lower subcernuous, cylindrical, 2.5-5.0 cm long ; terminal male, laterals wholly female, or androgynous with 2-3 mm long male apices ; male glumes oblong-lanceolate, 3.5-4.0 mm long, acute or mucronate, brownish stramineous ; female glumes elliptic-lanceolate, excluding the awns, 2.8-3.3 mm long, stramineous, red-brown dotted and striolate, awns up to 1.8 mm long in lower glumes. *Stamens* 3 ; style 1.5 mm long, almost uniformly slender ; stigmas 2, *ca* 1.5 mm long. *Utricles* obliquely spreading, subcoriaceous, not inflated, shortly stipitate, ovoid, lenticular, 2.8-3.5(-4.0) × 1.7-2.0(-2.3) mm, abruptly beaked, faintly few-nerved, brownish, densely white-papillose ; beak entire. *Nuts* stipitate, suborbicular, lenticular, 1.8-2.0 × 1.4-1.7 mm, apiculate, stramineous.

Fls. & frts. : March-May. In swamps ; 1300-1700 m.

MEGHALAYA : K. & J. Hills.

12. *C. rubro-brunnea* Clarke in Hook. f. Fl. Brit. Ind. 6 : 710. 1894.

Perennials, 2-6 dm high. *Rhizome* short, woody. *Stem* triquetrous, 1.5-2.0 mm thick. *Leaves* exceeding the stem, several in a basal cluster and 1-3 upwards on the stem, 2-4 mm broad ; sheaths stramineous-fuscous, ultimately reticulately splitting. *Inflorescence* racemose, 7-10 cm long ; lower 2-3 bracts foliaceous, exceeding the stem ; spikelets 4-6, sessile or subsessile, all approximate at the

tip, suberect, cylindrical, usually 6-10 × 0.3-0.4 cm, sometimes 1-2 shorter, terminal male, laterals usually wholly female, sometimes androgynous with a few mm long male tips ; male glumes lanceolate, 4.0-4.5 mm long, acute-acuminate, stramineous-fuscous. *Stamens* 2 ; anthers 1.5 mm long ; style 0.3 mm long, uniformly thick ; stigmas 2, 7-8 mm long, red-brown. *Utricles* ascending, membranaceous, not inflated, stipitate, ovoid, lenticular, 2.5-3.0 × 1.0-1.2 mm, abruptly beaked, faintly striate, bright brown ; beak 0.8 mm long, bidentate, smooth or scaberulous. *Nuts* sessile, ovoid, lenticular, 2 × 1 mm, apiculate, stramineous to brownish (Figs. 50-50b).

Fls. & frts. : March-April. Colonising open wet places along streams ; 1300-2000 m.

Easily recognised by its bright brown fastigate spikelets and very long, reddish-brown persistent styles divided almost to the base.

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

13. *C. prescottiana* Boott in Proc. Linn. Soc. 1 : 286. 1846 *et* Illustr. 1 : 45. t. 115. 1858 (excl. pl. Hawaica).

Perennials, 4-8 dm high. *Rhizomes* shortly creeping. *Stems* triquetrous, *ca* 2 mm thick. *Leaves* several in a basal cluster and 1-2 upwards on the stem, about as long as the stem, 3.5-7.0 (-10.0) mm broad ; sheaths cinnamomeous to castaneous, ultimately ladder-fibrillose splitting. *Inflorescence* racemose, 9-12 cm long ; lower 1-2 bracts foliaceous, slightly exceeding the stem, lowest 10-15 cm long ; spikelets 4-6, shortly peduncled, more or less approximate at the tip, cylindrical, 3-5(-8) × 0.3-0.35 cm ; terminal male (rarely gynaeandrous), laterals female ; male glumes obovate, 4.5-5.5 mm long, mucronate, brownish stramineous ; female glumes obovate, 1.8-2.3 mm long, mucronate, pale ferruginous. *Style* 1.5 mm long, uniformly slender ; stigmas 2, *ca* 1.5 mm long. *Utricles* widely spreading, membranaceous, inflated, shortly stipitate, ovoid, lenticular, 2.5-3.2 × 1.5-1.8 mm, abruptly short beaked, faintly striate, ferruginous, punctulate ;



Figs. 47-54 : 47-47b. *Carex thomsonii* Boott. 48-48a. *C. teinogyna* Boott. 49-49a. *C. alta* Boott. 50-50b. *C. rubrobrunnea* Clarke. 51. *C. prescottiana* Boott. 52-52c. *C. vesiculosa* Boott. 53-53d. *C. repanda* Clarke. 54. *C. baccans* Nees.

beak bidenticulate. *Nuts* shortly stipitate, ovoid, lenticular, 1.5×0.8-1.0 mm, apiculate, brownish (Fig. 51).

Fls. & frts. : June. Colonising open wet places along streams ; at ca 1800 m.

MEGHALAYA : K. & J. Hills.

14. *C. rara* Boott in Proc. Linn. Soc. 1 : 284. 1845 et Illustr. 1 : 44. t. 109. 1858.

Perennials, 2-4 dm high. *Rhizomes* short, slender. *Stems* filiform, trigonous. *Leaves* filiform, shorter than the stem. *Spikelets* solitary, terminal, androgynous, linear-oblong, 15-20 mm long ; male part 8-10×1 mm, male glumes ovate, 2 mm long, acute, ferruginous ; female part as long as the male part, 3-4 mm thick ; female glumes ovate, usually acute, sometimes mucronulate, 1.5-2.0 mm long, rufus. *Stamens* 3, anthers 1.5 mm long ; stigmas 3. *Utricles* obliquely spreading, shortly stipitate, subinflated, ovoid, trigonous, 3.0×1.2 mm, apex produced into a short conic beak, several-nerved, olivaceous. *Nuts* stipitate, ovoid.

MEGHALAYA : K. & J. Hills.

15. *C. capillacea* Boott, Illustr. 1 : 44. t. 110. 1858. *C. rara* subsp. *capillacea* Kuekenh. in Engl. Pflanzenrch. heft 38 : 102. 1909.

Perennials, 6-40 cm high. *Rhizome* short, slender. *Stems* filiform, trigonous, 0.5 mm thick. *Leaves* few, filiform, clustered at the base, usually shorter than, sometimes equalling or exceeding the stem ; sheaths reddish-green, ultimately fibrous. *Spikelets* solitary, terminal, androgynous, 7-10 mm long ; male part 4-7×0.7 mm, glumes oblong, 2.3-2.7 mm long, acute, rufus ; female part 3×3-4 mm, 4-6-flowered, glumes obovate-oblong, 1.3-1.5 mm long, mucicous or mucronulate, rufus. *Stamens* 3, anthers 1.2 mm long ; style slightly swollen at the base ; stigmas 3. *Utricles* membranaceous, divaricate on maturity, sessile, somewhat inflated, ovoid-oblong, trigonous, 2.0-2.2×1.0-1.3 mm, gradually beaked, faintly few-nerved, greenish stramineous, sometimes red dotted ; beak 0.3 mm long. *Nuts* sessile, ellipsoid,

triquetrous, 1.7-2.0×1.0 mm, long beaked, stramineous or brownish.

Fls. & frts. : March-Sept. At about 1500 m.

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

16. *C. indica* L. Mant. 2 : 574. 1771 ; Nelmes in Reinwardt. 1 : 271. 1951.

Perennials, 5-10 dm high. *Rhizome* short. *Stems* trigonous, ca 3 mm thick. *Leaves* coriaceous, all along and exceeding the stem, 4-10(-14) mm broad ; sheaths dark brown. *Panicles* 25-40 cm long ; partial panicles single or binate, erect, oblong, 3-10 cm long, lower on long exserted peduncles ; rachis hispidulous ; lower bracts foliaceous, much exceeding the panicle, upper setaceous. *Spikelets* numerous, divaricate, androgynous, 8-12(-22) mm long ; cladophylls utriculiform ; male part much longer than the female part, glumes lanceolate, 3.0-3.5 mm long, mucronate, stramineous, female part few-flowered, glumes ovate-lanceolate, long awned, excluding the awn, 1.5-2.5(-3.0) mm long, stramineous with brown tinge, awn of the lower glume 1.5-3.5 mm long, those of the upper shorter. *Style* thickened at the base ; stigmas 3. *Utricles* sessile, rather inflated, ellipsoid to subglobose, obscurely trigonous, 3.5-4.5×1.5-2.3 mm, abruptly beaked, strongly many-nerved, olive brown, ultimately spreading ; beak 1.5 mm long, glabrous or hispidulous. *Nuts* scarcely stipitate, triquetrous, obovoid-subglobose, 2.0-2.5×1.5-2.0 mm, apiculate (Figs. 57-57a).

Fls. & frts. : Aug. At ca 1500 m.

MEGHALAYA : K. & J. Hills.

17. *C. distracta* Clarke in Hook. f. Fl. Brit. Ind. 6 : 715. 1894.

Perennials, 4-6 dm high. *Rhizome* obliquely descending. *Stems* triquetrous, 1.5-2.0 mm thick. *Leaves* coriaceous, clustered towards the base, subequalling the stem, 5-10 mm broad ; sheaths fuscous, ultimately fibrous. *Panicles* 10-25 cm long ; partial panicles 5-7, solitary, ellipsoid, 2-8×1.5-2.5 cm broad, lower on long exserted

peduncles; rhachis hispidulous; lower bracts foliaceous, much exceeding the panicle, lowest 35-50 cm long; spikelets linear-oblong, lower 4-6 mm apart, androgynous, 6-10 mm long, ultimately divaricate; cladophylls utriculiform; male part 3-4 × 1 mm, glumes ovate, 2.8-3.2 mm long, mucronate, fuscous; female part 4-7 × 2 mm, glumes ovate-oblong, 3.0-3.5 mm long, awned, fuscous, awn 0.8-1.4 mm long. *Stamens* 3, anthers 1.3 mm long; style 1 mm long, swollen at the base, stigmas 3, ca 1.5 mm long. *Utricles* sessile, subinflated, ovoid, trigonous, 3.5-4.0 × 1.0-1.3 mm, subabruptly beaked, several-nerved, yellowish green; beaks 1.5-1.8 mm long, bidentate, hispidulous. *Nuts* sessile, ellipsoid, triquetrous, 2.2 × 1.0 mm, brown.

Fls. & frts. : April. At ca 120 m.

ASSAM : Sibsagar.

18. *C. cruciata* Wahlenb. in Vet. Akad. Handl. Stockh. 24 : 149. 1803; Clarke in Hook. f. Fl. Brit. Ind. 6 : 715. 1894; Kuekenth. in Engl. Pflanzenrch. heft 38 : 265. 1909; Nelmes in Reinwardt. 1 : 277. 1951; Koyama in J. Fac. Sci. Univ. Tokyo, Bot. 8 : 153. 1962. *C. condensata* Nees in Wt. Contr. Bot. Ind. 123. 1834; Clarke, l.c. 716. *C. cruciata* var. *argocarpus* Clarke, l.c. 716.

Perennials, 3-15 dm high. *Rhizomes* short or up to 20 cm long. *Stems* trigonous, 3-5 mm thick. *Leaves* coriaceous, all along and exceeding the stem, 4-13 mm broad; sheaths reddish brown, ultimately fibrous. *Panicles* 15-45(-58) cm long; partial panicles (3-)5-11, single or binate, oblong-lanceolate or subpyramidal, 4-10 × 2.5-5.0 cm, lower on long exerted peduncles; rhachis hispidulous; branchlets suberect to almost divaricate; lower bracts foliaceous, equalling to much exceeding the panicle, lowest 25-60 cm; spikelets numerous, sessile, spreading, androgynous, 6-15 mm long; cladophylls utriculiform; male part 3-7 × 1 mm, glumes ovate, 3.0-3.7 mm long, stramineous, purplish brown streaked, acute or mucronulate; female part 3-9 × 3 mm, glumes ovate, 2.0-3.2 × 1.5-2.0 mm, lower mucronate or

mucronulate, upper mucronulate or acute, stramineous or brownish, purplish brown streaked, awn up to 1 mm long. *Stamens* 3, anthers 2.5 mm long; style 1.5 mm long, slightly swollen at the base; stigmas 3, ca 3 mm long. *Utricles* sessile, slightly or strongly inflated, ellipsoid, ovoid-oblong or subglobose, subtrigonous, 3.0-4.5 × 1.2-1.7 mm, abruptly beaked, few-nerved, glabrous or hispidulous, whitish stramineous, sometimes red spotted, ultimately spreading; beaks bidentate, smooth or scaberulous-margined. *Nuts* sessile, ellipsoid, trigonous-triquetrous, 1.5-2.2 mm long, acute or apiculate, blackish brown.

Fls. & frts. ; May-March. Common along forest margins and in wastelands, in dry or moist places, frequently hanging from the hill-slopes; 100-2000 m.

Clarke (l.c.) described *C. cruciata* var. *nagpo-rens* and var. *argocarpus*, and treated *C. condensata* Nees as distinct. Kuekenth (l.c.) whom we have followed here considered the former as doubtfully distinct and the latter two as synonymous with *C. cruciata*. Haines (in Bot. Bihar & Orissa 1924; repr. ed. 3 : 978-979. 1961) also expressed a similar opinion. Koyama (l.c.) considered *C. condensata* Nees as belonging to *C. cruciata* var. *rubro-brunnea* Ohwi (in Cyper. Jap. 1 : 461. 1936), which he characterized by hispid utricles. The characters hitherto used for distinguishing the above taxa such as development, nature and colour of the inflorescence, and inflation, shape, size, nervation and pubescence of the utricles have all been found to be highly variable. A study of populations from its wide range of distribution, with reference to protologue, should prove helpful in resolving this complex.

ARUNACHAL PRADESH : Kameng; Lohit; Subansiri; Tirap. ASSAM : Lakhimpur. MEGHALAYA : K. & J. Hills. NAGALAND.

19. *C. parvigluma* Clarke in Hook. f. Fl. Brit. Ind. 6 : 716. 1894.

Perennials, 1-2 dm high. *Rhizome* creeping. *Stems* stout, triquetrous. *Leaves* coriaceous, much exceeding the stem, 5-14 mm broad. *Panicle*

usually solitary terminal, 5-8 cm long, rarely with an additional, nearly basal, partial panicle; spikelets divaricate, ovate-oblong, 6-7 mm long, androgynous; male part shorter than the female part; female glumes elliptic, aristate, ferruginous with green keel. *Stigmas* 3. *Utricles* subinflated, ovoid-subglobose, trigonous, much longer than the glume, *ca* 3 mm long, abruptly beaked, many-striate, glossy olive-brown, obliquely spreading; beak about three-fourth as long as the utricle, bidentate.

At *ca* 500 m.

ARUNACHAL PRADESH: Tirap.

20. *C. vesiculosa* Boott, *Illustr.* 3: 107. t. 323. 1862.

Perennials, 3-10 dm high. *Rhizome* creeping, up to 5 cm long. *Stem* trigonous, 1.5-2.0 mm thick. *Leaves* coriaceous, all along and shorter than to subequalling the stem, 2-6 mm broad, upper surface usually covered with minute glands; sheaths yellowish brown, ultimately ladder-fibrillose splitting. *Panicles* narrow, 10-40 cm long, partial panicles 5-9, single or the lower binate, oblong-lanceolate, 2-6 × 1-2 cm, lower on long exerted peduncles; rhachis scabrid; lower bracts foliaceous, subequalling the panicle, lower 12-35 cm long; spikelets numerous, ascending to divaricate, androgynous, 5-12 × 1.5-2.5 mm; cladoprophylls utriculiform; male part 4-7 mm long, glumes oblong-lanceolate, 3.5-4.0 mm long, yellow brown, red-streaked; female part 1-5 mm long, bearing 1-5 nuts, glumes ovate-lanceolate, 3-4 mm long, yellow-brown, red-streaked, acute. *Stamens* 3, anthers 2.0-2.5 mm long; style 0.5 mm long, swollen at the base, stigmas 3, *ca* 2.7 mm long. *Utricles* subsessile, not inflated, ellipsoid, triquetrous, 3.3-4.0 × 1 mm, gradually beaked, faintly few-nerved, villous all over, stramineous-fuscous, obliquely spreading; beak 1.5-2.0 mm long, deeply bidentate. *Nuts* stipitate, ellipsoid, triquetrous, 1.8-2.0 × 1.0 mm, yellowish brown, stipe 0.3-0.4 mm long (Figs. 52-52c).

Fls. & frts.: June-Dec. In dry to moist, open places, among boulders; 1000-1700 m.

MEGHALAYA: K. & J. Hills.

var. cogesta Kuekenh. in *Engl. Pflanzenrch. heft* 38: 283. 1909.

Secondary panicles dense; glumes hairy upwards.

MEGHALAYA: K. & J. Hills, *Clarke* 45163 (T. n. v.).

21. *C. stramentitia* Boott *ex* Boeck. in *Linnaea* 40: 351. 1876.

Perennials, 4-10(-13) dm high. *Rhizome* creeping, up to 4 cm long. *Stems* trigonous, 1.5-3.0 mm thick, smooth (or sometimes bristly below the panicle). *Leaves* coriaceous, all along and exceeding the stem, 7-16(-20) mm broad, acuminate; sheaths fuscous, ultimately fibrous. *Panicles* (9-)15-35 cm long, mildly scented; partial panicles 2-5, solitary, lanceolate to pyramidal, 3-6(-9) × 1.0-4.0(-6.5) cm, lower on long exerted peduncles; rhachis scabrid; lower bracts foliaceous, much exceeding the panicle, lowest 25-55 cm long; spikelets numerous, androgynous, 5-15 mm long; cladoprophylls utriculiform; male part 3-9 × 1.5-2.0 mm, glumes ovate-lanceolate, 3.8-4.5 mm long, acute, stramineous; female part 2-6 × 2-4 mm, glumes ovate-oblong, 2.0-2.7 mm long, mucronate, glabrous (rarely hispidulous), whitish stramineous. *Stamens* 3; anthers 1.5 mm long; style 1.2 mm long, thickened at the base; stigmas 3, *ca* 2 mm long. *Utricles* subsessile, slightly inflated, obovoid, trigonous, 3.7-4.5 × 1.5-1.8 mm, abruptly beaked, several-nerved, greenish, almost divaricate, beak 1.5-2.0 mm long, usually glabrous, sometimes hispidulous, bidentate. *Nuts* subsessile, ovoid-ellipsoid, triquetrous, 2.3-2.8 mm long, yellowish brown.

Fls. & frts.: Dec.-May. In open moist places, along streams and rivers; 100-1300 m.

ARUNACHAL PRADESH: Assam.

22. *C. filicina* Nees in *Wt. Contr. Bot. Ind.* 123. 1834.

Perennials, 6-17 dm high. *Rhizomes* short, or long and branched. *Stems* slender or stout, triquetrous, 1.5-4.0 mm thick. *Leaves* shorter than to as long as the stem, 3-12(-20) mm broad; sheaths reddish brown, ultimately fibrous. *Panicles* 9-43(-60) cm long; partial panicles single or binate, ovate-lanceolate, 2.5-12.0 × 1.5-6.0 cm; rhachis hispidulous; lower bracts foliaceous, shorter than

to equalling the panicle, lowest 15-37 cm long; spikelets numerous, sessile, almost divaricate, androgynous, mostly 4-15 mm long, but a few sometimes up to 30 mm long; cladophylls utriculiform; male part 2.5×1 mm; female part mostly 3-12 mm long, sometimes up to 27 mm long, glumes ovate-lanceolate, 1.2-2.0 mm long, 0.5-1.2 mm broad, usually all acute, sometimes a few lower mucronulate, greenish brown with pale reddish brown streaks or ferruginous. *Stamens* 3, anthers 1.8 mm long; style 1 mm long, almost uniformly slender, stigmas 3, *ca* 3 mm long. *Utricles* divaricate, subsessile, not or scarcely inflated, ellipsoid, trigonous, 2.5-3.8(-5.0)×0.6-0.8 mm, rather gradually beaked, prominently nerved, greenish stramineous, beak about half as long as the utricule, usually smooth, sometimes hispidulous. *Nuts* subsessile, ellipsoid, trigonous, 1.2-1.6×0.5-0.8 mm, apiculate, brownish black.

Fls. & frts.: May-Aug. In wastelands and along streams, in moist to swampy places; 900-1600 m.

ARUNACHAL PRADESH: Kameng; Siang; Subansiri. MEGHALAYA: Garo Hills; K. & J. Hills. NAGALAND.

var. *minor* Boott, Illustr. 3: 106. t. 318. 1862.

Perennials, 2-7 dm high. *Leaves* 1-5 mm broad. *Partial panicles* 1-5 cm long. *Utricle* beak one-third to one-fourth as long as the utricule.

Fls. & frts.: June-Jan. Along roadside; 1600-2000 m.

MEGHALAYA: K. & J. Hills.

var. *leptocarpus* (Clarke) Kuekenth. in Engl. Pflanzenrch. heft 38: 274. 1909. *C. leptocarpus* Clarke in Hook. f. Fl. Brit. Ind. 6: 719. 1894.

Panicles and *spikelets* very lax; glumes narrower, acuminate-aristate, pale ferruginous.

MANIPUR, Watt 6728 (T. n.v.).

23. *C. ecostata* Clarke in Hook f. Fl. Brit. Ind. 6: 720. 1894.

Stems rather slender, triquetrous, *ca* 6 dm high. *Leaves* coriaceous, shorter than the stem, *ca* 5 mm broad. *Panicles ca* 20 cm long; partial

panicles 6, binate, narrowly oblong, lowest nearly reduced to a solitary spikelet, long peduncled; rhachis scabrid; bracts foliaceous, exceeding the panicle; spikelets androgynous, *ca* 8 mm long, male part shorter than to equalling the female part; female glumes ovate, acute or mucronulate, densely fuscous striolate. *Stigmas* 3. *Utricles* not inflated, ellipsoid, trigonous, 3 mm long, beaked, almost nerveless on one side and slenderly 1-2-nerved on other faces, glabrous, olive-brown, obliquely spreading; beak about two-third as long as the body of the utricule.

NAGALAND: Jakpho, 3200 m, Clarke 41317, 41357 (T. n.v.).

24. *C. repanda* Clarke in Hook. f. Fl. Brit. Ind. 6: 720. 1894. *C. wightiana* var. *repanda* Kuekenth. in Engl. Pflanzenrch. heft 38: 288. 1909.

Perennials, *ca* 5 dm high. *Rhizome* creeping. *Stems* trigonous, 1.5 mm thick. *Leaves* scattered all along and much exceeding the stem, 2.5-5.0 mm broad; lower sheaths ultimately fibrous. *Panicles* pyramidal, *ca* 4 cm long; rhachis hispidulous; spikelets few, androgynous, 6-9 mm long, ultimately divaricate; cladophylls utriculiform; male part 2.5-4.0 mm long, glumes ovate-lanceolate, 3 mm long, stramineous, pale brown streaked, aristate; female part 3-5 mm long, glumes ovate-oblong, 2.5-3.0×1.0 mm, awned, stramineous, pale brown streaked, awn 0.7-1.2 mm long. *Styles* swollen at the base; stigmas 3. *Utricles* subsessile, slightly inflated, trigonous, 3.0×0.7 mm, gradually narrowed into a beak, several-nerved, yellowish green, almost divaricate, beak 1.2 mm long, smooth or hispidulous, straight or curved (Figs. 53-53d).

Fls. & frts.: June; 1000-1700 m.

MEGHALAYA: K. & J. Hills.

25. *C. oligostachya* Nees ex Hook. in Kew J. Bot. 6: 29. 1854; Nelmes in Reinwardt. 1: 244. 1951. *C. rhizomatosa* Steud. Syn. Cyp. 206. 1855; Clarke in Hook. f. Fl. Brit. Ind. 6: 721. 1894.

Perennials, 2.0-4.5(-8.0) dm high. *Rhizome* short, creeping. *Stems* lateral, from the side of the sterile leafy shoots, trigonous, 1.0-1.5 mm thick,

with a few scattered leaves. *Leaves* much shorter than the stem, 2.5-4.0 mm broad; basal sheaths fuscous, ultimately fibrous. *Panicles* 10-20(-47) cm long; partial panicles 6(-12), lower single, upper binate, small, oblong to subglobose, each bearing only 1-3(-5) spikelets; rhachis hispidulous; lower bracts foliaceous, much shorter than the stem, lowest 6-9 cm long; spikelets ascending, androgynous, ovoid-subcylindric, 6-9 × 2-3 mm; cladophylls utriculiform, male part 3 mm long, glumes oblong-lanceolate, 3.8-4.2 mm long, mucronate-acute, stramineous, brown streaked; female part 3-6 mm long, glumes ovate-lanceolate, 4-5 mm long, glabrous or hispidulous, mucronate to awned, stramineous, reddish-brown streaked; awn up to 1.3 mm long. *Stamens* 3, anthers 2.0-2.5 mm long; style 1 mm long, stigmas 3, *ca* 7 mm long. *Utricles* subsessile, slightly inflated, ellipsoid, trigonous, 2.5-4.0 × 1.5-2.0 mm, rather abruptly beaked, strongly 10-12-nerved, glabrous or hispidulous, greenish brown; beak bidentate, glabrous or hispidulous. *Nuts* shortly stipitate, obovoid-ellipsoid, triquetrous, 2.0-2.5 mm long, shortly beaked, pale brown.

Fls. & frts. : April. At *ca* 600 m.

MANIPUR. MEGHALAYA : K. & J. Hills.

26. *C. baccans* Nees in Wt. Contr. Bot. Ind. 122. 1834.

Perennials, 7-20 dm high. *Rhizome* short. *Stems* erect or nodding, 4-8 mm thick. *Leaves* coriaceous, scattered all along and exceeding the stem, 5-13 mm broad; lower sheaths ladder-fibrillosely splitting. *Panicles* 30-85 cm long; partial panicles 5-11, single, ellipsoid, 6-16(-30) cm long, 3-5 cm broad, lower on long exerted peduncles, usually bearing numerous spikelets, sometimes reduced to a solitary spikelet; rhachis smooth or scaberulous; lower bracts foliaceous, much exceeding the panicle, lowest 6-11 dm long; spikelets androgynous, 2.5-5.5 cm long; cladophylls utriculiform; male part 0.7-2.5 × 0.12 cm, glumes ovate-oblong, 3.3-3.8 mm long, mucronate, stramineous, reddish brown striolate; female part 1.0-3.5 × 0.4 cm, glumes ovate-oblong, 3-4 mm long, mucronate,

glabrous or hispidulous, stramineous, reddish-brown striolate. *Stamens* 3, anthers 2.0-2.5 mm long; style 0.8 mm long, stigmas 3, *ca* 0.8 mm long. *Utricles* subsessile, coriaceous, inflated, broadly obovoid to subglobose, 3.3-4.0 × 2.0-2.5 mm, abruptly beaked, prominently nerved, young greenish, mature bright red or ultimately blackening; beak bidentate, hispidulous. *Nuts* shortly stipitate, triquetrous, ellipsoid, 2.5-2.8 mm long, rostrate, dark brown (Fig. 54).

Fls. & frts. : Sept.-March. Common along roadside and forest margins; 400-2000 m.

The mature plants are readily recognised by large panicles loaded with bright red globose fruits.

ARUNACHAL PRADESH : Kameng; Lohit; Siang; Subansiri. MEGHALAYA : Garo Hills; K. & J. Hills. MIZORAM.

var. *siccifructus* Clarke in Hook. f. Fl. Brit. Ind. 6 : 723. 1894.

Ripe utricles ovoid, somewhat inflated, strongly many nerved, pale, scabrid near top; beak straight, short, bifid.

MEGHALAYA : K. & J. Hills; Umwai, 3500 ft, Clarke 15868 (*n.v.*); Khasi hills, Hook. f. (*T. n.v.*).

27. *C. spiculata* Boott in Proc. Linn. Soc. 1 : 288. 1845, in Trans. Linn. Soc. 20 : 139. 1846 *et* Illustr. 1 : 3. t. 7. 1858. *C. myosurus* ssp. *spiculata* Kuekenh. in Engl. Pflanzenrch. heft 38 : 259. 1909.

Perennials, 4.5-9.0 dm high. *Rhizome* short. *Stems* erect, 2-3 mm thick. *Leaves* coriaceous, scattered all along and much exceeding the stem, 4-12 mm broad; lower sheaths fuscous, ladder-fibrillosely splitting. *Panicles* rigid to rather slender, narrow, 13-40 cm long, of 3-5 axillary spikes each bearing several spikelets; spikes single, oblong-lanceolate, 5-8 × 2.0-3.5 cm, lower exerted; rhachis scaberulous; bracts foliaceous, much exceeding the panicle, lowest 35-55 cm long; spikelets androgynous, 1.5-5.5 cm long; male part 3-25 × 1.0-1.5 mm, glumes linear-oblong, 4.5-5.0 mm long, mucronate, stramineous, brown streaked;

female part 10-30 × 4-5 mm, glumes linear-lanceolate, 4.0-4.5 mm long, lower mucronate, upper acuminate, stramineous, brown streaked. *Stamens* 3; style 1 mm long; stigmas 3, ca 2.5 mm long. *Utricles* subsessile, subcoriaceous, not inflated, ellipsoid, trigonous, 3.0-3.3 × 1.0 mm, gradually beaked, 5-8-nerved on each face, scabrid-margined, bidentate, greenish. *Nuts* shortly stipitate, ellipsoid, triquetrous, ca 2 mm long, deep brown (Fig. 55).

Fls. & frts. : Aug.-March. Along roadsides and streams; 900-1200 m.

Kuekenthal (*l.c.*) described a new variety *C. myosurus* ssp. *spiculata* var. *gracilior* based on two collections from Khasi hills, Clarke 14745 and Kurz, *s.n.*, characterizing it by slender inflorescence, the distinctiveness of which is very much doubtful. However, if after population study, with reference to the Type, it is proved distinct, it requires a new combination.

MEGHALAYA : Garo Hills; K. & J. Hills.

var. *nobilis* (Boott) Clarke in Hook. f. Fl. Brit. Ind. 6 : 724. 1894. *C. nobilis* Boott, Illustr. 1 : 4. t. 9-11. 1858. *C. myosurus* ssp. *spiculata* var. *nobilis* Kuekenth. in Engl. Pflanzenrch. heft 38 : 259. 1909.

Panicles large, much branched, consisting of several partial panicles.

Fls. & frts. : Aug.-Sept. At ca 1000 m.

28. *C. composita* Boott, Illustr. 1 : 3. t. 8. 1858.

Perennials, 5-10 dm high. *Rhizome* creeping, up to 5 cm long. *Stems* slender, erect or nodding, 2-3 mm thick. *Leaves* scattered all along and exceeding the stem, 2.5-4.0 mm broad, long acuminate; lower sheaths reddish brown, ladder-fibrillosely splitting. *Panicles* 15-30 cm long, bearing 6-17 spikelets; spikelets solitary, axillary and one to several bearing 1-3 smaller (sometimes scarcely distinguishable) spikelets at the base, lower shortly, upper scarcely exerted, androgynous, 2.0-5.5 cm long; lower bracts foliaceous, exceeding the panicle, lowest 30-70 cm long; cladophylls utriculiform; male part 10-30 × 2 mm, glumes oblong-lanceolate, 3.3-3.7 mm long, acuminate or mucronate, stramineous, red-streaked; female part

10-30 × 4-5 mm, glumes ovate, 3.0-3.5 mm long, aristate, stramineous, red-streaked. *Stamens* 2-3, anthers 1.7-2.0 mm long; style 1.2 mm long, stigmas 3, ca 2.5 mm long. *Utricles* shortly stipitate, membranaceous, broadly obovoid to subglobose, compressed-trigonous, 1.7-2.0 × 1.0-1.3 mm, abruptly beaked, villous, scarcely nerved, yellowish green or brownish, obliquely spreading. *Nuts* sessile, ellipsoid, triquetrous, 1.0-1.3 mm long, brown (Figs. 56-56b).

Fls. & frts. : Jan. Along roadside and streams; 900-1600 m.

While in the whole of the inflorescence usually some of the spikelets are solitary in each bract axil, other axillary spikelets bear 1-3 smaller additional spikelets at their bases thus making the inflorescence paniculate. There are specimens in which only one of the several solitary spikelets has another small or almost vestigial spikelets at its base, thus making the inflorescence appear almost spicate, and in this way very nearly approaching the following, forma *simplicior*.

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

f. *simplicior* Kuekenth. in Engl. Pflanzenrch. heft 38 : 260. 1909.

Inflorescence spicate, bearing few spikelets.

MEGHALAYA : K. & J. Hills; Dingling, 5000 ft, Clarke 18450 (*n. v.*); Khasi hills, Clarke 14799 (*n. v.*).

29. *C. desponsa* Boott, Illustr. 2 : 82. t. 228. 1860.

Perennials, 3-10 dm high. *Rhizome* woody. *Stems* trigonous, scaberulous above. *Leaves* clustered at the base, exceeding the stem, 4-5 mm broad. *Inflorescence* racemose; lower bracts foliaceous; spikelets 5-7, erect, lower distant, long peduncled, upper subsessile, usually all androgynous, sometimes terminal wholly male, or the lowest wholly female, simple or rarely the lowest bearing a short branch at the base, cylindrical, 3-5 cm long; female glumes ovate, truncate, scabrous, aristate, reddish. *Style* slightly thickened at the base, stigmas 3. *Utricles* subsessile, suberect, membranaceous, ellipsoid,

trigonus, ca 6 mm long, beaked, prominently several-nerved, reddish-green; beak about as long as the main body, bidentate, scabrid. *Nuts* small, ellipsoid.

MEGHALAYA: K. & J. Hills; Mawphlong & Mairang forests, *Hook. f. & Thom.* 1417 (T. n. v.).

30. *C. scitula* Boott, *Illustr.* 4: 177. t. 600. 1867.

Perennial, stoloniferous, 1-3 dm high. *Stems* trigonus, 0.3-0.5 mm thick. *Leaves* several, filiform, clustered at the base, longer than the stem, 0.8-1.7 mm broad; sheaths stramineus-ferruginous, ultimately ladder-fibrillose splitting. *Inflorescence* racemose, 4.0-7.5 cm long; bracts foliaceous, much exceeding the raceme, lowest 13-17 cm long; spikelets 3-6, comose due to very long persistent styles, lower shortly exerted, suberect, oblong, 10-20 × 3.5 mm, dense-flowered, terminal male at the top and the base, female in the middle, laterals androgynous with short male apices; male glumes oblanceolate, 3.5-4.0 mm long, mucronate reddish brown; female glumes narrowly lanceolate, 3.0-3.3 mm long, aristate-mucronate, reddish brown. *Stamens* 1-2, anthers 1.8-2.0 mm long; style 0.5 mm long, uniformly slender; stigmas 3, 7-8 mm long, reddish brown. *Utricles* obliquely spreading, stipitate, oblong-ellipsoid, trigonus, 1.8-2.5 mm long, 0.6 mm broad, subabruptly beaked, nerveless, pubescent, stramineus; beak 0.7 mm long, bidentate, scabrid. *Nuts* shortly stipitate, ellipsoid, triquetrous, 0.8-1.0 × 0.3-0.4 mm, brown.

Fls. & frts.: Dec. At about 1200 m.

ARUNACHAL PRADESH: Lohit.

31. *C. insignis* Boott, *Illustr.* 1: 5. t. 14. 1858.

Perennial, stoloniferous, 3-13 dm high. *Stems* triquetrous, 3-4 mm thick. *Leaves* several, almost evenly scattered throughout the stem, lower reduced to bladeless sheaths, upper gradually with well developed blades, 10-26 cm long, 3-6 mm broad; sheaths purplish. *Inflorescence* paniculate, of several fascicles of simple or few-branched spikelets, 20-40 cm long; bracts subequalling the stem; spikelets numerous, ascending, linear,

somewhat tortuous, 30-50 × 1-2 mm, mostly androgynous with short or long male apices and few wholly male or female, all intermixed together; peduncles capillary; male glumes oblanceolate, 4.7-5.2 mm long, mucronate, stramineus-fuscous; female glumes obovate-oblanceolate with broad erose shoulders, mucronate, stramineus-fuscous, excluding the mucro, 2.2-2.5 mm long; mucro 0.3-0.8 mm long, scabrid. *Stamens* 3; style 1.5 mm long, slightly swollen at the base; stigmas 3, ca 2.5 mm long. *Utricles* obliquely spreading, not inflated, subsessile, ellipsoid, trigonus, 3.0-3.5 × 1.3 mm, subabruptly beaked, striate, greenish stramineus or purple tinged; beak 1.3 mm long, subentire or notched, smooth or scabrid-margined. *Nuts* shortly stipitate, narrowly obovoid, triquetrous, 2.0-2.3 × 0.8-1.0 mm, brownish stramineus.

Fls. & frts.: July-Aug.; 1500-1800 m.

MEGHALAYA: K. & J. Hills. NAGALAND.

32. *C. polycephala* Boott, *Illustr.* 1: 4. t. 12. 1858.

Perennials, 2-5 dm high. *Rhizome* shortly creeping. *Stems* trigonus, 2-3 mm thick. *Leaves* rigid, several clustered at the base, exceeding the stem, 3-10 mm broad; sheaths shining brownish stramineus. *Inflorescence* paniculate-fasciculate, 12-20 cm long; peduncles 1-4 from each axil, lower 3-10 cm long, bearing 1-3 spikelets, upper shorter, usually bearing a solitary spikelet; bracts foliaceous, much exceeding the stem, lowest 30-50 cm long; spikelets suberect or nodding, androgynous with short male tips, subcylindric, 15-30 × 3-6 mm; male glumes lanceolate, 4.5-5.5 mm long, acute, stramineus; female glumes lanceolate, 3.7-5.2 mm long, acute, shining stramineus or brown tinged. *Stamens* 3, anthers 1.2 mm long; style 1 mm long, slightly swollen at the base, stigmas 3, ca 2.5 mm long. *Utricles* subsessile, ascending, membranaceous, obovoid-ellipsoid, trigonus, 3.5-4.0 × 1.2 mm, abruptly beaked, striate, brownish green; beak 2 mm long, bidentate. *Nuts* stipitate, obovoid, triquetrous.

Fls. & frts.: March-June. Scattered, in ever-green forests; 2000-3000 m.

ARUNACHAL PRADESH : Kameng. NAGALAND.

33. *C. daltonii* Boott, Illustr. 1 : 5. t.16. 1858.

Perennials, 4-8 dm high. *Stems* erect, trigonous, 3 mm thick. *Leaves* many clustered below and exceeding the stem, 6-8 mm broad; sheaths purplish. *Inflorescence* of about 6 partial panicles, 40-50 cm long; partial panicles solitary, oblong, 7-10 × 2-5 cm, lower on 5-6 cm long exerted peduncles; bracts foliaceous, much exceeding the stem; spikelets numerous, linear, 20-40 × 2.0-2.5 mm, mostly androgynous, mixed with some wholly female ones; male glumes ovate, 4.2-4.7 mm long, mucronate, fuscous (-pale yellowish); female glumes ovate, glabrous or puberulous, aristate-mucronate, fuscous (-pale yellowish), main body 2.8-3.2 mm long, arista 1-2 mm long. *Stamens* 3, anthers 2 mm long; style 1 mm long, uniformly thick, stigmas 3, 1.8-2.5 mm long. *Utricles* ascending, rather coriaceous, shortly but stoutly stipitate, ellipsoid-oblong, trigonous, 2.5-3.5 × 1.0-1.3 mm, abruptly beaked, striate, stramineous (ultimately fuscous), pubescent all over; beak 0.8-1.2 mm long, deeply bifid, scabrid margined. *Nuts* obovate-oblong.

Fls. : Oct.

ARUNACHAL PRADESH : Kameng.

34. *C. munipoorensis* Clarke in Hook. f. Fl. Brit. Ind. 6 : 729. 1894.

Perennials, 1.5-2.0 dm high. *Stems* stout, triquetrous. *Leaves* clustered at the base, exceeding the stem, 3-4 mm broad. *Inflorescence* fasciculate; peduncles 1-4 from each axil, each bearing a solitary spikelet; bracts foliaceous, lower exceeding the stem; spikelets 12-24, suberect, androgynous, cylindric, 1.0-1.5 cm long; female glumes large, oblong-lanceolate, acuminate-mucronate, castaneous. *Style* slightly swollen at the base, stigmas 3. *Utricles* (immature) ovate-lanceolate, shorter than the glume, ca 3.5 mm long, enerved, long-beaked; beak bidentate. *Nuts* stipitate, ovoid.

MANIPUR : Jopoo, 3150 m, Watt 6894 (T. n.v.).

35. *C. speciosa* Kunth, Enum. Pl. 2 : 504.

1837; Boott, Illustr. 1 : 53. 1858; Nelmes in Reinwardt. 1 : 390. 1951. *C. speciosa* var. *angustifolia* Boott, l.c. *C. concolor* Nees in Wt. Contr. Bot. Ind. 125. 1834; non R. Br. 1801. *C. speciosa* var. *abscondita* Kuekenth. in Bull. Jard. Bot. Buitenz. ser. 3. 16 : 316. 1940.

Perennials, 0.5-4.0 (-5.5) dm high. *Rhizome* short or up to 7 cm long. *Stems* rather slender, 0.5-1.0 mm thick, angles acute or sometimes winged. *Leaves* several, clustered at the base, longer than the stem, 2-8 mm broad; sheaths ultimately splitting into strong fuscous fibres. *Inflorescence* racemose, consisting of usually 2, very distant, rarely 1-4, subsessile to shortly exerted spikelets; lower bracts foliaceous, equalling to exceeding the stem; spikelets subcylindric, androgynous, 1-2 cm long; male parts 3-7 × 1.0-1.5 mm, glumes oblong, 2.3-2.8 mm long, mucous, stramineous; female part 4-6 mm thick, glumes ovate-oblong, 3.0-3.5 mm long, mucous, stramineous. *Stamens* 3, anthers 0.7 mm long; style 1.0-1.3 mm long, swollen at the base; stigmas 3, ca 0.7 mm long. *Utricles* ultimately widely spreading, subcoriaceous, slightly inflated, subsessile, ellipsoid, triquetrous, 4.5-5.5 × 1.8-2.3 mm, subabruptly beaked, many-nerved, greenish stramineous, hispidulous; beak 0.5 mm long, notched. *Nuts* shortly stipitate, narrowly obovoid-ellipsoid, triquetrous, 3.3-3.8 × 1.8-2.2 mm, shortly beaked, stramineous or ultimately brown.

Fls. & frts. : May-Jan. Scattered, from dry open places to wet humus-clad forest floors; 1000-1700 m.

A very leafy perennial; the slender stems bearing greenish spikelets are almost hidden among the leaves.

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

var. *courtallensis* (Nees ex Boott) Kuekenth. in Engl. Pflanzenr. heft 38 : 481. 1909. *C. courtallensis* Nees ex Boott, Illustr. 1 : 52. t. 138. 1858.

Perennials, 3.5-8.0 dm high. *Leaves* three-fourth as long as to subequalling the stem, 13-16 mm broad. *Spikelets* usually 5, rarely 3; terminal

5-7 cm long, laterals 3-5 cm long; female glumes 3.3-3.8 mm long. *Utricles* 5-6 mm long.

Fls. & frts.: Oct. On hill slopes, in shade; 2000-2500 m.

ARUNACHAL PRADESH: Kameng, NAGALAND.

36. *C. maculata* Boott in Trans. Linn. Soc. 20: 128. 1846 et Illustr. 1: 9. t. 26. 1858.

Perennials, 2-5 dm high. *Rhizome* short. *Stems* trigonous, 1.2-2.3 mm thick. *Leaves* several clustered at the base and one to few also higher up on the stem, shorter to equalling the stem, 2-8 mm broad; sheaths brownish. *Inflorescence* racemose; lower bracts foliaceous, exceeding the stem; spikelets 3-6; terminal male, 1.5-4.5 cm long, 1-2 mm thick, laterals female or rarely with short male apices, cylindrical, 7-40 × 2.5-5.0 mm; male glumes oblong, 3.0-3.5 mm long, acuminate, pale reddish; female glumes ovate-oblong, 1.7-2.0 mm long, acute or mucronulate, castaneous. *Style* uniformly thickened or slightly swollen at the base; stigmas 3. *Utricles* subsessile, spreading, membranaceous, ellipsoid, trigonous, 2-3 × 1.0-1.8 mm, subabruptly beaked, several-nerved, densely ferruginous-papillose; beak 0.2-0.5 mm long, subentire. *Nuts* subsessile, ellipsoid, obovoid or suborbicular, triquetrous, 1.5-2.0 × 1.0-1.3 mm, apiculate, densely alveolate, ultimately dark brown.

MEGHALAYA: K. & J. Hills.

37. *C. jackiana* Boott in Proc. Linn. Soc. 1: 260. 1846 et Illustr. 1: 9. t. 25. 1858.

Perennials, 3-7(-10) dm high. *Rhizome* short. *Stems* trigonous, 1-2 mm thick, angles usually hyaline-winged. *Leaves* few, clustered at the base, sometimes also one higher up on the stem, shorter than the stem, 3-6(-10) mm broad, faintly transversely septate; sheaths pale brown, ultimately fibrous. *Inflorescence* racemose; bracts foliaceous, shorter than the stem; terminal spikelet ebracteate; spikelets 3-6(-9), subcylindrical, lower subsessile or peduncled; terminal male (or sometimes gynaeandrous), 13-20 × 2-3 mm, laterals wholly female or sometimes with short male apices, 7-30 × 5-7 mm; male glumes ovate-oblong, 4.7-

5.2 mm long, mucous, stramineous; female glumes ovate-oblong, (3.0-)3.5-4.2(-5.5) mm long, acute-mucronate (rarely awned), stramineous. *Stamens* 3, anthers 4 mm long; style 2 mm long, uniformly slender, stigmas 3. *Utricles* ascending, herbaceous, scarcely inflated, shortly stipitate, ellipsoid, trigonous, 4.0-5.5(-7.5) × 1.5-1.8(-2.0) mm, gradually beaked, several-nerved, yellowish green; beak 2.0-2.5(-3.0) mm long, bidentate. *Nuts* stipitate, broadly obovoid, trigonous, 2.0-2.5(-3.0) × 1.5-1.8(-2.0) mm, subtruncate on the shoulders, stramineous.

Fls. & frts.: May-Aug. Along streams; at ca 1650 m.

MEGHALAYA: K. & J. Hills.

38. *C. finitima* Boott, Illustr. 1: 44. t. 112. 1858; Koyama in J. Fac. Sci. Tokyo III. 8: 218. 1962. *C. finitima* Boott var. *attenuata* Clarke in Hook. f. Fl. Brit. Ind. 6: 736. 1894.

Perennials, 3-4 dm high. *Rhizome* short, slender. *Stems* trigonous, 0.7 mm thick. *Leaves* several clustered at the base, shorter than the stem, 1.5-2.5 mm broad; sheaths purplish red, not splitting. *Inflorescence* racemose, 12-23 cm long; bracts foliaceous, shorter than the stem, lowest 5-11 cm long; spikelets 4-5 on capillary peduncles; terminal male, 18.0 × 1.5 mm, laterals female, 17.43 × 4 mm; male glumes oblong-lanceolate, 3.0-3.5 mm long, stramineous; female glumes ovate-oblong or oblong-lanceolate, 2.5-3.3 mm long, stramineous or brown tinged. *Style* 2.5 mm long, slightly swollen at the base; stigmas 3, ca 2 mm long. *Utricles* stipitate, suberect, membranaceous, not inflated, ellipsoid, trigonous, 6.0-6.7 × 1.2-1.5 mm, abruptly beaked, few-nerved, greenish fuscous; beak 3 mm long, bidentate, mouth very oblique. *Nuts* stipitate, ellipsoid, trigonous, apiculate, 3 × 1 mm, brown.

Fls. & frts.: May. At ca 1500 m.

MEGHALAYA: K. & J. Hills.

39. *C. alopecuroides* D. Don in Trans. Linn. Soc. 14: 332. 1825; Clarke in J. Linn. Soc. (Bot.) 36: 271. 1903. *C. japonica* var. *alopecuroides* Clarke in Hook. f. Fl. Brit. Ind. 6: 737. 1894;

Kuekenth. in Engl. Pflanzenrch. *heft* 38 : 621. 1909.

Perennials, 3-8 dm high. *Rhizome* slender, creeping. *Stems* trigonous, 1.7-2.5 mm thick, narrowly winged. *Leaves* several clustered at the base, sometimes also one higher up on the stem, subequalling to exceeding the stem, 3-6 mm broad. *Inflorescence* racemose, 7-10 cm long; lower bracts foliaceous, far exceeding the stem, lowest 15-22 cm long; spikelets 5-6, fastigiate, lower on up to 1 cm long peduncles; terminal usually male, sometimes gynaeandrous, 35-50 × 2.0-2.5 mm, laterals female, sometimes the lowest with a short branch at the base, all cylindrical, 35-60 × 4 mm; male glumes oblanceolate, brownish stramineous, main body 2.3-2.7 mm long, awn 1.0-1.5 mm long, hispidulous; female glumes oblong-lanceolate, 1.8-2.5 mm long with a hispidulous mucro, stramineous. *Style* 0.7 mm long, uniformly slender, stigmas 3. *Utricles* sessile, divaricate, membranaceous, slightly inflated, ellipsoid, trigonous, 2.3-3.0 × 1.0 mm, subabruptly beaked, several-nerved, yellowish green; beak 0.7 mm long, bidentate. *Nuts* subsessile, ellipsoid, triquetrous, 1.5-1.7 × 1.0 mm, deep brown (Figs. 58-58a).

Fls. & frts. : Aug.-Sept. In rock-crevices; at ca 1450 m.

ARUNACHAL PRADESH : Kameng; Tirap. MANIPUR. MEGHALAYA : K. & J. Hills.

var. *chlorostachys* Clarke, *l.c.*; Backer, Fl. Java 3 : 490. 1968. *C. chlorostachys* D. Don, *l.c.* 330. 1825; *non* Stev. 1813. *C. doniana* Spreng. Syst. 3 : 825. 1826; Nelmes in Reinwardt. 1 : 399. 1951. *C. japonica* Clarke in Hook. f. Fl. Brit. Ind. 6 : 736. 1894; *non* Thunb. 1764. *C. japonica* var. *chlorostachys* Kuekenth. *l.c.* 620. p-p.

Leaves (5-)7-11 mm broad. *Female glumes* ca 3 mm long.

Fls. : March. At ca 1400 m.

MEGHALAYA : K. & J. Hills.

40. *C. oedorrhapha* Nelmes in Kew Bull. 1939 : 659. 1939. *C. tumida* Boott, Illustr. 1 : 66.

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t. 181. 1858; Clarke in Hook. f. Fl. Brit. Ind. 6 : 741. 1894; *non* Beilschm. 1850.

Perennials, 5-10 dm high. *Stems* trigonous, 2-3 mm thick, smooth or the rhachis puberulous. *Leaves* several clustered at the base, and 1-2 also upwards on the stem, subequalling the stem, 4-8 mm broad. *Inflorescence* racemose, 15-40 cm long; lower bracts foliaceous, shorter than to exceeding the stem, lowest 15-22 cm long; spikelets 4-8, suberect, lower peduncled; terminal male, 35-45 × 2.0-2.5 mm, laterals female (rarely with male apices), cylindrical, 35-80 × 4-5 mm; male glumes oblong-lanceolate, 3.5-5.5 mm long with a hispidulous mucro, stramineous; female glumes ovate-lanceolate, main body 1.2-1.7 mm long, stramineous; awns up to 1.3 mm long, hispidulous. *Stamens* 2, anthers 1.3-1.5 mm long; style 1 mm long, swollen at the base, stigmas 3. *Utricles* sessile or subsessile, ultimately widely spreading, membranaceous, slightly inflated, ellipsoid-obovoid, trigonous, 2.7-3.2(-3.8) × 1.0-1.2 mm, abruptly beaked, few-nerved, fuscous; beaks 1 mm long, subterete or slightly swollen in the middle, bidentate. *Nuts* shortly stipitate, ovoid, triquetrous, 1.2-1.5(-2.2) × 0.8 mm, yellowish brown.

Fls. & frts. : April; 100-2000 m.

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

41. *C. olivacea* Boott in Proc. Linn. Soc. 1 : 286. 1845 et Illustr. 1 : 56. t. 149. 1858.

Perennials, 5-10 dm high. *Stems* compressed-trigonous, 2-5 mm thick, scabrid above. *Leaves* rather flaccid, clustered at the base, much exceeding the stem, 6-10(-20) mm broad; sheaths stramineous-brownish. *Inflorescence* racemose, 20-35 cm long; lower 1-3 bracts foliaceous, exceeding the stem, lowest 25-50 cm long; spikelets 5-9, subsessile or the lower shortly peduncled, upper 1-2 male; terminal 30-70(-160) × 3 mm, the other male, if present, 2-4 cm long; the rest of the spikelets wholly female or androgynous with short male apices, cylindrical, 4-9(-16) × 0.5-0.7 cm; male glumes linear-lanceolate, 5.5-6.3 mm long, stramineous with reddish margins; female glumes lanceolate with long attenuated hispidulous tips, 3.3-4.5 mm long,



Figs. 55-62 : 55. *Carex spiculata* Boott. 56-56b. *C. composita* Boott. 57-57a. *C. indica* L.
 58-58a. *C. alopecuroides* D. Don. 59-59b. *C. olivacea* Boott. 60-60a. *C. nemostachys*
 Steud. 61-61c. *C. ligulata* Nees. 62-62b. *C. hebecarpa* C. A. Meyen.

stramineus flushed with red-brown on either sides. *Stamens* 3, anthers 2.0-2.5 mm long; style 1.5 mm long, uniformly slender, stigmas 3, *ca* 1 mm long. *Utricles* sessile, ultimately divaricate, membranaceous, inflated, obovoid, trigonous, 3.0-4.5 × 1.5-2.0 mm, abruptly beaked, slenderly nerved, olivaceous, beak 1 mm long, bidentate. *Nuts* shortly stipitate, obovoid-oblong, triquetrous, 2.0-2.2 × 1.2 mm, stramineus (Figs. 59-59b).

Fls. & frts. : April-Aug.

ASSAM : Cachar ; Lakhimpur. NAGAALND.

42. *C. fuscifructus* Clarke in Hook. f. Fl. Brit. Ind. 6 : 742. 1894.

Perennials, 4-6 dm high. *Stems* trigonous, *ca* 3 mm thick. *Leaves* clustered at the base, much exceeding the stem, 5-8 mm broad. *Inflorescence* racemose, 20-25 cm long; lower bracts foliaceous, much exceeding the stem, lowest 30-45 cm long; spikelets 3-8, cylindrical, lower on 5-13 cm long exerted peduncles; upper 2-3 spikelets male, the rest female; terminal 35-45 × 3 mm, the other males 10-25 mm long; females 3.5-5.5 × 0.7-1.0 cm; male glumes oblong-lanceolate, mucronulate, 5.5-6.3 mm long, hispidulous at the tip, stramineus; female glumes ovate-oblong, lower awned, upper mucronulate, main body 3.3-3.7 mm long, stramineus, awn up to 2 mm long, hispidulous. *Stamens* 3; style 1 mm long, stigmas 3, *ca* 2.2 mm long. *Utricles* stipitate, ultimately divaricate, herbaceous, somewhat inflated, ovoid, trigonous, 5-6 × 2.0-2.5 mm, subabruptly beaked, prominently several-nerved, greenish-fuscous; beak 1.8-2.0 mm long, bidentate, glabrous or hispidulous. *Nuts* shortly stipitate, obovoid, long-beaked, stramineus, main body 2.3 × 1.7 mm, beak 1.5 mm long with a conspicuous nodular swelling at the tip continued into the style.

ASSAM : Lakhimpur.

43. *C. inanis* Kunth, Enum. Pl. 2 : 522. 1837.

Perennials, 1-3 dm high. *Rhizome* branched. *Stems* rigid, trigonous, 0.7-1.0 mm thick, smooth or scaberulous above. *Leaves* several clustered at the base, rigid, longer than the stem, 2-3 mm

broad; sheaths purplish, ladder-fibrillose or fibrously splitting. *Inflorescence* racemose, 4-9 cm long; bracts foliaceous, much exceeding the stem, lowest 15-25 cm long; spikelets 4-6 (-rarely up to 12), sessile, almost fastigate or the lower somewhat distant; terminal male, 20-30 × 2 mm, laterals female, 10-20 × 3-4 mm, very dense-flowered; male glumes lanceolate, 4.0-4.5 mm long, mucronulate, fuscous-striolate; female glumes ovate-oblong, 2.5-3.0 mm long, mucronulate, fuscous-striolate; mucro 0.2-0.4 mm long, hispidulous. *Stamens* 3; style 1.5 mm long, uniformly slender, stigmas 3, *ca* 1.5 mm long. *Utricles* stipitate, obliquely spreading, membranaceous, slightly inflated, broadly obovoid-oblong, trigonous, 1.8-2.5 × 1.0-1.2 mm, abruptly beaked, nerveless, villous, greenish, purple dotted; beak 0.5 mm long, bidentate. *Nuts* stipitate, obovoid-ellipsoid, trigonous, 1.5 × 0.8 mm.

Fls. & frts. : May. At *ca* 2500 m.

ARUNACHAL PRADESH : Kameng ; Lohit.

44. *C. royleana* Nees in Wt. Contr. Bot. Ind. 127. 1834; Boott, Illustr. 1 : 6. t. 19. 1858. *C. breviculmis* Clarke in Hook. f. Fl. Brit. Ind. 6 : 746. 1894; non R. Br. 1810. *C. breviculmis* subsp. *royleana* Kuekenh. in Engl. Pflanzenr. heft 38 : 469. 1909. p.p.

Perennials, 8-30 cm high. *Rhizome* short, sometimes stoloniferous. *Stems* trigonous, 0.3-0.5 mm thick, smooth or scaberulous at the top. *Leaves* several clustered at the base, usually one-half as long as, sometimes two-third as long as, rarely subequalling to exceeding the stem, 1.5-2.3 mm broad; sheaths fuscous, ultimately fibrous. *Inflorescence* racemose, 1.7-6.0 cm long; lowest bract foliaceous, up to 9 cm long, upper or sometimes all setaceous; spikelets 3-5, ascending, all sessile or the lower shortly exerted, subcylindrical; terminal male, 3.5-11.0 × 0.15 cm, laterals female, 4-12 × 2.5-3.0 mm; male glumes oblong-lanceolate, 3.5-4.0 mm long, lower mucronate, pale stramineus; female glumes obovate-oblong, pale stramineus, awned, main body 2.0-2.3 mm long, awn 1-2 mm long, scaberulous. *Stamens* 3, anthers 1.5 mm long;

style 0.7 mm long, base swollen; stigmas 3, *ca* 1.5 mm long. *Utricles* obliquely spreading, rather herbaceous, not inflated, stipitate, ovoid, faintly trigonous, 2.5-2.8 × 1.0 mm, gradually beaked, many-nerved, hispid throughout, brownish green; beak 0.5 mm long, bidentate. *Nuts* sessile, ovoid-oblong, 1.5 × 1.0 mm, stramineous with a discoid tip.

Fls. & frts.: March-May. In dry to moist wastelands; 1650-1850 m.

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

45. *C. nemostachys* Steud. in Flora 29: 23. 1846 et Syn. Cyper. 218. 1855.

Perennials, stoloniferous, 3-10 dm high. *Stems* triquetrous, 2-3 mm thick, scabrid at the top. *Leaves* several clustered at the base, sometimes also one upwards on the stem, as long as to longer than the stem, 4-8 mm broad; sheaths stramineous (ultimately ladder-fibrillose splitting). *Inflorescence* racemose, 10-20 cm long; lowest bract foliaceous, subequalling the stem, upper much reduced; spikelets 5-8, lower long peduncled, upper subsessile; terminal male, 45-60 × 2.5-3.0 mm, laterals female, cylindrical, 40-70 × 5-6 mm; male glumes lanceolate, 3-4 mm long, stramineous, hispidulous at the tip; female glumes linear-lanceolate, awned, main body 1.5-2.0 × 0.3 mm, pale stramineous, awn 1-2 mm, hispidulous. *Stamens* 2-3, anthers 1.3 mm long; style 1.5 mm long, uniformly slender, stigmas 3, *ca* 1 mm long. *Utricles* subsessile, widely spreading, membranaceous, subinflated, ovoid-ellipsoid, faintly trigonous, 3.3-3.8 × 1.0-1.3 mm, abruptly beaked, slenderly nerved, olivaceous, sparsely hairy; beak 1.2-1.7 mm long, bidentate. *Nuts* subsessile, obovoid-oblong, triquetrous, 1.5 × 1.0 mm, yellowish brown (Figs. 60-60a).

Fls. & frts.: Sept. At *ca* 1500 m.

MEGHALAYA: Garo Hills; K. & J. Hills.

46. *C. fedia* Nees in Wt. Contr. Bot. Ind. 129. 1834; Kreczetowicz in Komar. Fl. USSR 3: 417. 1935; Koyama in J. Fac. Sci. Univ. Tokyo, Bot. 8: 245. 1962. *C. wallichiana* Presc. ex

Nees, l. c.; Clarke in Hook. f. Fl. Brit. Ind. 6: 747. 1894; non Spreng. 1826. *C. chaetogyne* Nelmes in Mem. Mus. Nat. Hist. Paris, n. s. B. 4: 170. 1955. *C. sacerdotis* Nelmes l. c. 172.

Perennials, 3-8 dm high. *Rhizomes* stoloniferous. *Stems* triquetrous, smooth or scabrid above. *Leaves* rigid, clustered at the base, exceeding the stem, 2-5 mm broad; sheaths purplish, ladder-fibrillose splitting. *Inflorescence* racemose; bracts foliaceous; spikelets 5-7, erect, upper 2-3 approximate, male cylindrical, 2.0-3.5 cm long, lower female rather distant, cylindrical, 20-40 × 4-5 mm, long peduncled; female glumes ovate-lanceolate, 3.5 mm long, acuminate-aristate, pale brown. *Styles* uniformly slender, stigmas 3, long. *Utricles* shortly stipitate, suberect, coriaceous, not inflated, ovoid-oblong, trigonous, 3.5-4.0 mm long, abruptly beaked, several-nerved, greyish brown, villous, beak short, deeply bifid. *Nuts* stipitate, ellipsoid, trigonous.

MEGHALAYA: K. & J. Hills.

47. *C. ligulata* Nees in Wt. Contr. Bot. Ind. 127. 1834.

Perennials, *ca* 5 dm high. *Stems* trigonous, 3 mm thick, scabrid at the top. *Leaves* with well developed blades confined to and closely placed only in the upper part of the stem, passing into bracts, lower down gradually reduced to bladeless sheaths, upper ones subequalling to exceeding the stem, 4-10 mm broad, abruptly narrowed into long scabrid acumen; lower sheaths purplish, upper greenish, pubescent. *Inflorescence* racemose; bracts foliaceous, slightly exceeding the stem, lowest 23 cm long; spikelets 5-7, suberect, shortly exerted to subsessile; terminal male 1-3 cm long, laterals female, cylindrical, 15-40 × 5 mm; female glumes ovate-lanceolate, 3.3 mm long, stramineous, brown streaked, with short hispidulous mucro. *Style* 1.5 mm long, swollen at the base, stigmas 3, *ca* 0.7 mm long. *Utricles* shortly stipitate, widely spreading, membranaceous, not inflated, broadly obovoid, trigonous, 4.3-4.8 × 2.0 mm, abruptly beaked, slenderly few-nerved, tomentose, ferruginous, soon falling, beak 1.2 mm long, bidentate.

Nuts subsessile, ovoid-oblong, triquetrous, 2.7-1.7 mm, apiculate, castaneous (Figs. 61-61c).

Fls. & frts. : Aug. At ca 2000 m.

MEGHALAYA : K. & J. Hills.

48. *C. hebecarpa* C. A. Meyen in Mem. Acad. St. Peters. 1 : 223. t. 12. 1831.

Perennials, stoloniferous, 3-8 dm high. *Stems* triquetrous, 2 mm thick. *Leaves* with well developed blades confined to and closely placed in the upper part of the stem, passing into bracts, lower down gradually more distant and reduced to bladeless sheaths, upper ones much exceeding the stem, (1.5-)3.0-5.0 mm broad, gradually long acuminate into scabrid tips; sheaths purplish green, pubescent. *Inflorescence* racemose, ca 15 cm long; bracts foliaceous, far exceeding the stem, lowest 20-30 cm long; spikelets (5-)7-10, suberect, lower shortly exserted; terminal wholly male or gynaeandrous with 2-4 female flowers at the tip, cylindrical, 15-20 × 1.2 mm, laterals female, cylindrical, 15-35(-40) × 3.5-4.0 mm; male glumes ovate, 2.0-2.3 mm long, lower mucronulate, upper acute, stramineous, brown streaked; female glumes ovate, awned, stramineous, brown streaked, main body 1.5-1.8 mm long; awn 0.5 mm long. *Stamens* 3, anthers 2 mm long; style 0.7 mm long, swollen at the base, stigmas 3, ca 0.7 mm long. *Utricles* stipitate, widely spreading, membranaceous, not inflated, ovoid-ellipsoid, trigonous, 3.5 × 1.3 mm, abruptly beaked, faintly striate; tomentose, cinnamonaceous, soon falling; beak 0.7 mm long, bidentate. *Nuts* subsessile, narrowly obovoid-ellipsoid, triquetrous, 2.0 × 1.2 mm, yellowish brown (Figs. 62-62b).

Fls. & frts. : March-June. Along forest margins; 100-1900 m.

ARUNACHAL PRADESH; Tirap. ASSAM: Sibsagar. MANIPUR.

49. *C. eleusinoides* Turcz. ex Kunth, Enum. Pl. 2 : 407. 1837; Boott, Illustr. 4 : 132. t. 428. f. 1. 1867; Kuekenh. in Engl. Pflanzenr. heft 38 : 299. 1909.

Perennials, 15-26 cm high. *Rhizome* short, creeping. *Stems* compressed-trigonous, scaberulous on the angles, 1 mm thick. *Leaves* mainly clustered at the base, subequalling the stem, 1.5-2.0 mm broad; sheaths castaneous, ultimately fibrous. *Inflorescence* racemose or spicate; lower 1-2 bracts foliaceous, subequalling to shortly exceeding the stem; spikelets 4-6, suberect, congested at the tip, cylindrical, 10-20 × 2-4 mm, all sessile or the lower shortly peduncled; terminal female at the top, male at the base, laterals wholly female; male glumes oblong, obtuse, 3.5-3.8 × 1.5-1.8 mm, deep purple or castaneous, with three green nerves reaching about half way up the glume; female glumes elliptic-oblong, obtuse, 2.5-3.0 × 0.8-1.0 mm, deep purple or castaneous, with three green nerves ending just below the tip. *Stamens* 3, anthers 1.0-1.5 mm long; style 1 mm long, stigmas 2, ca 1.3 mm long. *Utricles* shortly stipitate, compressed or plano-convex, membranaceous, ovate-oblong, 2.0-2.5 mm long, faintly nerved, greenish stramineous to purple tinged; beak short, entire with a concave mouth. *Nuts* (mature not seen) ovate-oblong, punctate.

ARUNACHAL PRADESH : Lohit.

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