

FLORA OF ASSAM

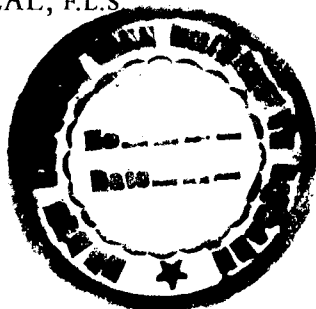


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FLORA OF ASSAM

U. N. KANJILAL, F.L.S.



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GRAMINE Æ

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FOREWORD

This account of the Gramineæ of Assam is based upon the collections housed in the herbaria at Kew, Calcutta, Dehra Dun and Shillong which have been examined through the courtesy of the Directors. Capt. Kingdon-Ward, the explorer botanist, when touring in the Balipara Frontier Tract was good enough to put together a collection of grasses which he sent to the author at Dehra Dun. This gathering added many new records to the known grass flora. It can with confidence be stated that the systematic collection of these interesting plants in the higher regions of the Eastern Himalaya will add appreciably to the number of species which have been described in this book.

In the descriptions of genera and species I have had no hesitation in borrowing from others where an excellent description of a species or genus was in existence. In this respect I am much indebted to the giants of old, Eduard Hackel and Otto Stapf and, of the modern agrostologists, to A. Camus and C. E. Hubbard. The latter has always been ready to answer my repeated and often tedious questions. His exhaustive treatment of the *Gramineae* in Hutchinson's Families of Flowering Plants, Vol. II, has been a real source of inspiration and guidance and I have borrowed largely from it. Mr. V. Narayanaswami of the Botanical Survey of India, has placed his knowledge of the literature relating to grasses at my disposal and I have made full use of it. The Curator of the Herbarium, Royal Botanic Garden, Sibpur, has been most kind in sending me sheets of material which I wished to examine.

N. L. Bor.

FLORA OF ASSAM

GRAMINEÆ.

Annual or perennial herbs, rarely shrubs or trees; stems erect, ascending or prostrate and creeping, usually branched at the base, in perennials forming sterile shoots (innovations) and flowering stems (culms), in annuals only the latter present; culms cylindrical, rarely flattened, jointed, usually hollow in the internodes, closed at the nodes. *Leaves* solitary at the nodes, sometimes crowded at the base of the stems, alternate and two-rowed, consisting of sheath, ligule, and blade; sheaths encircling the culm, with the margins free and over-lapping or more or less connate, frequently swollen at the base (sheath-node); ligule placed at the junction of the sheath and blade, membranaceous or reduced to a fringe of hairs, rarely absent; blades usually long and narrow, rarely broad, usually passing gradually into the sheath, rarely with a petiole-like base, flat, convolute or involute or terete, parallel-nerved. *Flowers* usually hermaphrodite, sometimes unisexual, small and inconspicuous, usually consisting of stamens and pistil and of 2 or 3 minute hyaline or fleshy scales (lodicules) representing the perianth, sub-sessile between two bracts (lemma and palea), the whole forming a floret or false flower. *Florets* one to many, distichous, sessile on a short or minute slender axis (rhachilla) and bearing at the base two empty bracts (upper and lower glume), the florets and glumes forming a spikelet. *Spikelets* pedicelled in open or contracted panicles or racemes, or sessile in spikes. *Stamens* hypogynous, 1 to 6, rarely more, usually 3, with delicate filaments and 2-celled anthers, the latter opening usually by a longitudinal slit; ovary 1-celled, with one anatropous ovule often adnate to the adaxial side of the carpel; styles usually 2, rarely 1 to

3; stigmas generally plumose; fruit mostly a caryopsis with a thin pericarp adnate to the seed, or rarely a nut or a berry or a utricle with a free pericarp, with starchy endosperm and a small embryo at the base on the abaxial face.

Key to the sub-families of the Gramineæ.

Spikelets 1- to many-flowered, breaking up at maturity above the more or less persistent glumes, or if falling entire then not 2-flowered with the lower floret male or barren and the upper hermaphrodite, usually more or less laterally compressed or terete. **Pooideæ.**

Spikelets 2-flowered, falling entire at maturity, usually with the upper floret fertile and the lower male or barren and in the latter case often reduced to the lemma, all alike or different in size, shape and structure, frequently dorsally compressed. **Panicoideæ.**

Key to the tribes of the Pooideæ (after Hubbard).

- A. Shrubs or trees with woody often tall persistent culms; leaf-blades flat, many-nerved, often with transverse veins, usually with a petiole-like base which is articulated with the sheath; spikelets bi-sexual; lemmas 5- to many-nerved, usually awnless; lodicules usually 3; stigmas mostly 2 or 3. **1. Bambuseæ.**
- AA. Perennial or annual herbs; leaf-blades usually sessile and not articulated with the sheaths.
 - B. Spikelets borne in open or contracted or spike-like panicles, less often in racemes or spikes, and then with the lower or both glumes suppressed if on opposite sides of a continuous rhachis, or with 2 or more fertile florets if on one side of the rhachis.
 - C. Spikelets usually with 2 or more fertile florets, or if with 1 fertile floret then with sterile florets above it.
 - D. Lemma and rhachilla glabrous or hairy, in the latter case with the hairs not enveloping the lemma or if so then with the lemma bearing a geniculate awn; low or moderately tall grasses.
 - E. Glumes usually shorter than the lowest floret and with the upper florets distinctly exerted, rarely longer and then usually with firm dull margins like the lemmas; lemmas awnless or with a straight or curved awn from the entire or bifid apex, or several-awned or lobed.
 - F. Lemmas usually 5- to many-nerved.
 - G. Leaf-blades broad, many-nerved with transverse veinlets. **2. Centotheceæ.**
- GG. Leaf-blades flat, convolute or involute without transverse veins. **3. Festuceæ.**
- FF. Lemmas 1- to 3-nerved. **6. Eragrostææ.**

- EE. Glumes usually as long as or longer than the lowest floret, often as long as the spikelet and enclosing the florets; lemma awnless or more often awned from the back or the sinus of the 2-lobed tip; the awn usually geniculate; glumes or lemmas or both frequently with thin shining margins. **9. Aveneæ.**
- DD. Lemmas or rhachilla joints bearing long silky hairs which envelop the lemma (at least in fertile florets); lemmas awnless or with a straight awn from the tip, often thin; tall grasses with usually large plume-like panicles. **5. Arundineæ.**
- CC. Spikelets with 1 fertile floret (male or female in unisexual 1-flowered spikelets) with or without 1 or 2 male or barren florets below it.
- H. Glumes very minute or suppressed; palea 3- to 9-nerved; stamens usually 6; leaf blades not transversely veined. **14. Oryzeæ.**
- HH. Glumes usually well developed, at least the upper, rarely minute or suppressed.
- I. Spikelets with 3 florets, the lower 2 florets male or barren and the terminal hermaphrodite. **13. Phalarideæ.**
- II. Spikelets with 1 or 2 florets.
- J. Spikelets with 2 florets, the lower male or barren the upper hermaphrodite.
- K. Lower floret barren and without a palea; glumes up to half the length of the spikelet; rhachilla produced beyond the upper floret; spikelets disarticulating with part of the pedicel attached. **15. Thysanoleneæ.**
- KK. Lower floret male or barren usually with a palea; upper glume as long as the spikelet; rhachilla disarticulating below the upper floret and not produced beyond it; glumes more or less persistent. **16. Arundinelleæ.**
- JJ. Spikelets with 1 floret.
- L. Spikelets usually breaking up at maturity, the rhachilla disarticulating above the more or less persistent glumes, very rarely falling entire and then with firmly membranous, awned or 5-nerved lemmas.
- M. Lemmas hyaline or membranous at maturity, rarely indurated and then laterally compressed, awnless or awned from low down on the back or from the entire or bifid tip.
- N. Lemmas usually 3- to 5-nerved, frequently awned; glumes firmer and longer than the hyaline lemma or if shorter than the lemma, herbaceous-membranous and dull; grain usually with an adhering pericarp. **10. Agrostæ.**
- NN. Lemmas 1- to 3-nerved, awnless; glumes and lemma very similar in texture, hyaline or thinly membranous, shining; grain usually with a free pericarp. **7. Sporoboleæ.**
- MM. Lemmas indurated and rigid at maturity, terete or dorsally com-

pressed, with involute or convolute margins, tightly enveloping the grain, with a terminal awn or sometimes awnless.

11. Stipeæ.

LL. Spikelets falling entire at maturity, either singly or in clusters from the axis of slender spike-like panicles or racemes; lemma delicate, 1- to 3-nerved.

12. Zoysieæ.

BB. Spikelets sessile or shortly pedicelled along one side of the rhachis of solitary, digitate or scattered spikes or spike-like racemes (with 1 fertile floret and 1- to 3-nerved lemmas), or on the opposite sides of the rhachis of solitary spikes or racemes.

O. Spikelets on opposite sides of the rhachis of solitary spikes.

4. Hordeæ.

OO. Spikelets in one or two rows on one side of the usually continuous rhachis of digitate spikes.

8. Chlorideæ.

Key to the tribes of the *Panicoideæ*.

A. Spikelets all hermaphrodite, with male or barren or hermaphrodite spikelets mixed in the same inflorescence and so arranged that a male or barren spikelet is near a hermaphrodite spikelet, if unisexual then the lemma of the fertile floret indurated.

B. Spikelets solitary or paired, more or less similar; glumes usually membranous, the lower usually smaller or sometimes suppressed; lower lemma mostly resembling the upper glume in texture; upper lemma papery to very tough and rigid, usually awnless.

17. Paniceæ.

BB. Spikelets often paired, with one sessile and the other pedicelled, those of each pair similar or more often dissimilar, rarely solitary and all alike; glumes as long as the spikelet and enclosing the florets, more or less rigid and firmer than the lemmas which are both hyaline or membranous; upper lemma usually awned.

18. Andropogoneæ.

AA. Male and female spikelets in separate inflorescences or in different parts of the same inflorescence and of different appearance; lemmas hyaline or membranous and thinner than the glumes.

19. Maydeæ.

1. BAMBUSEÆ.

Shrubs or trees, very rarely perennial herbs; culms erect or sometimes climbing, often tall, usually woody, rarely herbaceous, bearing sheaths with reduced blades; leaf-blades flat, usually linear or oblong-lanceolate, many-nerved, mostly with a petiole-like base and frequently articulated with the sheath; spikelets all alike, 1 to many-flowered, arranged in panicles, racemes, dense clusters, or

terminal heads; glumes usually 2 or sometimes more; lemmas resembling the glumes and exerted from them, awnless or rarely awned from the tip, 5- to many-nerved, herbaceous to coriaceous; paleas 2-keeled or keelless or suppressed; lodicules usually 3, rarely more or less; stamens 3, 6, or more, with the filaments free or more or less connate; styles mostly 2 or 3; fruit a nut, berry, or a caryopsis.

Key to the genera of *Bambuseæ*.

- | | |
|--|-----------------------------|
| A. Stamens 3, rarely 6. | |
| B. Styles short. | |
| C. Leaves more or less tessellate. Shrubby bamboos. Ultimate branches of the inflorescence without bracts at the base. | |
| D. Style 1, trifold. | |
| E. Culm-sheaths persistent. | 11. Arundinaria. |
| EE. Culm-sheaths deciduous. | 12. Semiarundinaria. |
| DD. Styles 2, free or connate at the base. | |
| F. Glumes tessellate, smooth. | 14. Sinobambusa. |
| FF. Glumes not tessellate, with raised longitudinal nerves. | 13. Chimonobambusa. |
| CC. Leaves not tessellate. Ultimate branches of the inflorescence with bracts at the base. | 15. Thamnocalamus. |
| BB. Styles long. | 16. Phyllostachys. |
| AA. Stamens six, rarely more. | |
| G. Pericarp thin, adnate to the grain, adhering to the hilum only. | |
| H. Stamens 6 with free filaments. | 8. Bambusa. |
| I. Paleas of the upper florets indistinctly or not keeled: spikelets 1-3-flowered. | 10. Oxytenanthera. |
| II. Paleas of all the florets strongly keeled. | 9. Gigantochloa. |
| GG. Pericarp crustaceous or fleshy, separable from the grain. | |
| J. Paleas 2-keeled. | |
| K. Spikelets with 2-5 central florets hermaphrodite. | |
| L. Spikelets with 2-3 central florets female or hermaphrodite; pericarp of fruit crustaceous. | 1. Dendrocalamus. |
| LL. Spikelets with 3-5 central hermaphrodite florets; lodicules 3. | |
| M. Fruit globose. | 2. Pseudostachyum. |
| MM. Fruit elongated. | 3. Teinostachyum. |
| KK. Spikelets with 1 central floret hermaphrodite; lodicules 3. | 4. Cephalostachyum. |
| JJ. Palea similar to the lemma. | |
| N. Filaments connate into a tube. | 5. Neohouzeaua. |
| NN. Filaments free. | |
| O. Fruit large pyriform. | 7. Melocanna. |
| OO. Fruit small. | 6. Dinochloa. |

1. DENDROCALAMUS Nees.

Spikelets ovate or oblong; acute or obtuse, few- to many-flowered, with concealed rhachilla, which is scarcely articulate and often produced; lower florets imperfect, 1-2, reduced to the lemma; 2-3 florets hermaphrodite with lemma and palea; terminal floret rudimentary or absent; glumes 2-3, often gemmiparous, membranous or rigid, muticous or mucronate, the upper often with a ciliate keel; lemmas papyraceous or membranous, subulate or mucronate at the apex, sometimes spinescent, back glabrous, hirsute or silky, margins glabrous or ciliate, many-nerved; paleas narrow, obtuse, those of the lowest florets 2-keeled, ciliate on the keels, those of the terminal floret rounded on the back. *Lodicules* absent. *Stamens* 6: filaments free; anthers mucronate or with tufted hairs; ovary sub-globular or ovoid, hairy above; style filiform, hairy: stigmas 1-2-3, subulate, papillose. *Caryopsis* with a crustaceous pericarp.

Arborescent bamboos often of large size. Inflorescence a large compound panicle, the spikelets usually congested in groups along the nodes of the floriferous branches.

Key to the species of *Dendrocalamus*.

- Spikelets in spinous, congested, spicate heads; leaves usually narrow. 1. *D. strictus*.
- Spikelets in large, soft, congested heads.
- Spikelets acute, culm-sheaths very hairy.
- Heads large, dark coloured: leaf and culm-sheaths conspicuously fringed. 2. *D. sikkimensis*.
- Heads small, pale; leaf sheaths naked; culm-sheaths little fringed. 3. *D. hookeri*.
- Spikelets blunt, culm-sheaths glabrous or nearly so.
- Culm- and leaf-sheaths not fringed. 4. *D. hamiltonii*.
- Culm- and leaf-sheaths long fringed. 5. *D. patellaris*.
- Spikelets few, in small heads, many sterile.
- Spikelets long, ovate-acute. 6. *D. giganteus*.
- Spikelets short, blunt; culm-sheaths long, thin. 7. *D. longispathus*.

1. *Dendrocalamus strictus* Nees, in *Linnaea* IX (1834) 476.

A deciduous, densely-tufted bamboo. *Culms* hollow in wet, solid in dry climates, 6-20 m. tall, 2.5-7.5 cm. in dia-

meter, glaucous-green when young, dull-green or yellowish when old; nodes somewhat swollen; internodes 30-45 cm. long. *Culm-sheaths* variable, 7.5-30 cm. long, covered on the back with golden-brown, stiff hairs, sometimes glabrous, striate, rounded at the top, very slightly auricled, ciliate on the margins; imperfect blade triangular, subulate, hairy on both sides; ligule narrow. *Leaves* linear-lanceolate, 2.5-25 cm. long, 5 mm.-3 cm. broad, rounded at the base into a short petiole, terminating above in a sharply acuminate, twisted point, rough and often hairy above, softly hairy below, scabrous on the margins; leaf-sheaths striate, hairy, ending in a prominent callus and short auricle with a few, wavy, deciduous cilia; ligule narrow.

Inflorescence a large branching panicle of large, dense, glabrous, spaced heads; rhachis rounded, smooth. *Spikelets* spinescent, usually hairy, the fertile mixed with many smaller, sterile ones, 7.5-12.5 mm. long, with 2-3 fertile florets. *Glumes* 2 or more, ovate, spinescent, many-nerved; lemmas ovate, ending in a sharp spine surrounded by ciliate tufts of hair; palea ovate or obovate, emarginate, lower 2-keeled, ciliate on the keels, uppermost not keeled, often nearly glabrous, 6-8-nerved. *Stamens* long exerted; anthers yellow, shortly apiculate. *Ovary* turbinate, stalked, hairy above; style long, ending in a purple feathery stigma. *Caryopsis* brown shining, ovoid to sub-globose, 7.5 mm. long, beaked.

Cultivated in the plains.

2. *Dendrocalamus sikkimensis* Gamble, in Hooker Ic. Pl. t. 1770.

A large bamboo with caespitose stems and few culms. *Culms* 17-22 m., bare at the base, branchy at the top, 12-18 cm. in diameter, dark green in colour; internodes up to 45 cm. long, rough. *Culm-sheaths* 36 cm. long by 30 cm. broad, densely covered with golden-brown hairs; imperfect blade lanceolate, often as long as the sheath, recurved, decurrent into two auricles fringed with long, curved, pale bristles; ligule 5 mm. wide, sharply serrate. *Leaves* variable in size; those of the ordinary branches 15-25 cm. long by 36-50 mm. wide, oblong-lanceolate, unequal at the base, tapering to a

twisted point, shortly petiolate, thick, smooth above strigosely hirsute and rough below, margins rough; those of young shoots up to 30 cm. long by 7.5 cm. broad, elliptic-acuminate; leaf sheaths smooth, glabrous, furnished at the edges with falcate, hairy auricles fringed with stiff bristles; ligule short, hairy, fimbriate.

Inflorescence a large panicle with stiff nodose branches, bearing large, red-brown, globose heads usually 5 cm. apart and 3.75 cm. in diameter; rhachis dull brown, sparsely pubescent. *Spikelets* lanceolate, often rounded, 13-19 mm. long. *Glumes* 3-4, empty, broadly ovate rounded with ciliate keels. *Hermaphrodite* florets 2-3; lemmas ovate-acute, glabrous mucronate, ciliate; palea of the lowest floret 2-keeled, densely hairy on the keels, many-nerved, shortly bifid; upper floret sterile and reduced to a chaffy scale. *Stamens* six. *Ovary* sub-globular, hairy, with a short, thick, hairy style and club-shaped hairy stigma. *Caryopsis* obovate, depressed, apiculate, shining above with a few hairs.

Very common in the NAGA HILLS and also in the GARO HILLS.

3. *Dendrocalamus hookeri* Munro, in Trans. Linn. Soc. XXVI (1868) 151.

A large bamboo with caespitose stems and long curving branches. *Culms* 15-20 m. tall, often naked at the base, 10-15 cm. in diameter; internodes 40-50 cm. long, the lower sometimes rough, hairy. *Culm-sheaths* very broad at the base, narrower on the young shoots and on the upper branches, covered on the outside with dense, black or brown hairs, glabrous inside, furnished with small, rounded auricles covered with long stiff cilia, ciliate on the edges; imperfect blade rounded at the base, triangular or long-cuspidate, 7.5-17 cm. long, hairy at the top; ligule glabrous. *Leaves* large, oblong-lanceolate, acuminate, ending in a twisted point, rounded at the base, shortly petioled, smooth above, rough below, hairy towards the base, with scabrid margins; median nerve brilliant yellow; sheaths striate, hairy at the base; ligule glabrous.

Inflorescence a large, compound panicle bearing at intervals of 5-7.5 cm. dense glabrous heads of spikelets, 2.5 cm.

in diameter; rhachis dull grey-green, striate, somewhat hirsute. *Spikelets* 8-10 mm. long, by 2.5 mm. broad, ovate, acute, slightly pubescent, with 2-3 fertile flowers. *Glumes* 2, ovate-obtuse; lower lemma ovate-acute; upper many-nerved, nerves anastomosing; palea acute, 2-keeled, hairy on the keels; upper palea hardly keeled, ciliate at the top. *Stamens* 6, hardly exerted; anthers long, ending in a penicillate point. *Ovary* narrowly ovoid, acuminate, hairy, surmounted by a hairy style ending in a twisted plumose stigma. *Caryopsis* hairy at the base.

NAGA HILLS and KHASI HILLS; very common.

4. *Dendrocalamus hamiltonii* Nees et Arn. ex Munro, in Trans. Linn Soc. XXVI (1868) 151. Local names :—*Kakua*, Assam; *Pecha*, Bengali.

A large bamboo with caespitose culms, sometimes growing tall and erect, but more often sending out its stems at an angle or curved downwards. *Culms* large, 12-20 m. or up to 25 m. tall, usually naked below, much branched above; 10-18.5 cm. in diameter, greyish-white when young with dense appressed pubescence, dull green when old; nodes marked with root scars; internodes 30-50 cm. long, wall 1.25 cm. thick. *Culm-sheaths* long and stiff, variable in size, those of the lower part of large culms 35-45 cm. long, about 20 cm. broad, glabrous, shining within, rough, glabrous or with scanty patches of stiff brown hairs without, truncate at the top; imperfect blade about $\frac{3}{4}$ the top of the sheath, broad, often 30 cm. long, narrow, ovate-lanceolate, sides incurved, glabrous without, closely covered with thick, black, sharp hairs within at the base; ligule smooth, entire. *Leaves* variable, small on side branches, but on new shoots reaching 37.5 cm. long 3.75 cm. broad, rounded at the base into a short thick petiole, broadly lanceolate, ending in an acuminate, scabrous, twisted point, smooth above, rough beneath, finely serrate on the margins; leaf-sheaths covered with white, appressed, stiff hairs, glabrous above, shining on the callus, somewhat keeled; ligule long, oblique truncate and jagged.

Inflorescence a huge, much-branched panicle with many whorls of branches, bearing half-verticillate semi-globular

heads of purple flowers, supported by round scarious bracts; rhachis joints 2.5 cm. or less long, thick, fistular, scabrous and white pruinose; heads variable, 1.75-3.25 cm. in diameter. *Spikelets* purple, ovoid, depressed, 10 mm. long, glabrous. *Glumes* usually two, short, rounded, nerved; lemmas broad, orbicular, somewhat recurved, ciliate on the edges; paleas of lower flowers, 2-keeled, ciliate on the keels and bifid at the acute apex, many-nerved. *Stamens* exserted, pendulous; anthers purple, the connective produced into a long, black, hairy, twisted point. *Ovary* sub-orbicular, hairy; style long hairy; stigmas 3, plumose. *Caryopsis* broadly ovoid, beaked, glabrous or hairy above.

The commonest bamboo in the ASSAM VALLEY where it is in great demand for constructing temporary huts, basket and mat work etc. Also occurs in the KHASI HILLS and the SURMA VALLEY.

5. *Dendrocalamus patellaris* Gamble, Bamb. Brit. Ind. (1896) 86.

A rather soft, evergreen, caespitose bamboo. *Culms* 7-10 m. tall, 2.5-3.75 cm. in diameter, dull green, striate; nodes marked by a projecting, softly hairy ring; internodes 30-45 cm. long, whitish below the nodes; walls thin. *Culm-sheaths* long persistent, 25-30 cm. long, 7.5 cm. broad at the base, sparsely covered with appressed, brown, stiff hairs outside, glabrous within, attenuate at the top; margins membranous, lacinate; imperfect blade lanceolate, 15 cm. long, usually recurved; ligule long, fimbriate. *Leaves* variable, 20-40 cm. long by 2.5-10 cm. broad, unequal at the base, shortly petioled, terminating above in a twisted scabrous point, smooth above, rough below, scaberulous on the margins; leaf-sheaths striate, keeled, fringed on the margins; ligule very long, long fimbriate.

Inflorescence a huge compound panicle with spicate branches bearing distant distichous heads, heads 1.25-2.5 cm. in diameter, supported by hard shining bracts, many-spiculate; rhachis dull greenish brown, rough, fistular. *Spikelets* dark brown, depressed, 10 mm. long. *Empty glumes* 1 or 2, many-nerved, membranous; florets 2-3, usually all fertile; lemmas orbicular, cuspidate, ciliate on the edges

and densely tomentose within, 9-11-nerved; palea much shorter, ovate-lanceolate, ciliate on the keels, 2-nerved between the keels, densely tomentose within; rhachilla prolonged, bistle-like. Lodicules 0 or 2, narrow linear-lanceolate, long ciliate. *Stamens* exserted; anthers purple, tip conical, hairy, apiculate. *Ovary* broadly ovate, hairy above; stigmas 3, short, plumose. *Caryopsis* rounded, shining, hairy above.

Common in the AKA HILLS at 5,000 ft. also in the NAGA HILLS about Kohima and Wokha.

6. *Dendrocalamus giganteus* Munro, in Trans. Linn. Soc. XXVI (1868) 150.

The largest of the bamboos, densely caespitose. *Culms* over 30 m. tall, 15-25 cm. in diameter, often naked at the base, branchy above; nodes hairy; internodes 37-40 cm. long, covered with white, waxy scurf when young. *Culm-sheaths* as broad at the base as at the summit, 25-50 cm. long; glabrous within, clothed without with golden or brown hairs, or glabrescent but rough, caducous; imperfect limb lanceolate, 15-35 cm. long, often recurved, decurrent into two narrow, wavy auricles. *Leaves* large, broadly-lanceolate, rounded at the base, cuspidate-acuminate, ending in a twisted point, 30-50 cm. long, 10-11 mm. broad, at first hairy, afterward glabrous; sheaths striate, glabrescent, hairy at the throat, with two lateral small auricles; ligule long.

Inflorescence a large panicle with long, slender, curved branches, bearing lax heads of few spikelets, sometimes leafy at the top; heads of spikelets up to 2.5 cm. in diameter. *Spikelets* 12-20 mm. long, ovate-acute, many-flowered, the lowest 2-3 florets reduced to the lemma, the next 2-4 with lemma and palea, sometimes female with more or less aborted stamens, the next 1-2 hermaphrodite the terminal rudimentary. *Glumes* ovate, mucronate, striate; lemma of the female flowers convex on the back, mucronate, many-nerved, clothed with appressed hairs, those of the hermaphrodite flowers flat on the back, shortly acute, spiny; paleas hairy dorsally, acute or cuspidate at the top, 2-keeled, keels long-fimbriate. *Stamens* 6; anthers acuminate-mucronate at the top. *Ovary* long-rostrate; style

simple or bifid. *Caryopsis* oblong, obtuse, 8 mm. long, hairy on the top.

Cultivated in the plains of ASSAM.

7. *Dendrocalamus longispathus* Kurz, Forst. Flor. Burm. II (1877) 561.

A large caespitose bamboo. *Culms* 20 m. tall, naked at the base, leafy above, glaucous or white when young, then turning yellow or yellowish green; internodes 25-60 cm. long, 7.5-10 cm. in diameter. *Culm-sheaths* papyraceous, 35-50 cm. long, 12-17 cm. broad, covered on the back with dense, stiff, appressed brown or black hairs, sides parallel almost to the top; imperfect limb lanceolate-acuminate, recurved, 30-45 cm. long, 25-36 mm. broad, densely hairy on the back; ligule toothed or fimbriate. *Leaves* oblong-lanceolate or linear-lanceolate, acuminate, shortly petioled, glabrous above, rough and glabrescent below, scabrid on the margins; median nerve yellow; sheaths smooth, glabrous, with 2 small auricles; ligule narrow, fringed.

Inflorescence a large panicle or of interrupted spicate clusters of spikelets situated at the nodes of long sinuate branches, bracteolate at the base. *Spikelets* few in each head, few to many-flowered. *Glumes* 2-3, obovate, blunt; joints of rhachilla short; florets 2-3, fertile; lemmas obovate, rounded, obtuse or truncate, cucullate, many-nerved, ciliate on the margins; palea ovate-truncate, feebly 2-keeled, finely pubescent, with 2 intracarinial nerves. *Stamens* short; anthers yellow, ending in a blackish mucro. *Ovary* broadly ovoid, sometimes acute. *Style* long, hairy, terminating in a short hairy stigma. *Caryopsis* ovoid, crowned by the persistent base of the style.

Very common in SYLHET.

2. PSEUDOSTACHYUM Munro.

Spikelets small, 1-flowered; rhachilla produced ending in a terminal imperfect floret. *Glumes* usually only one, broad, mucronate; lemma similar to the glume; palea much convolute, 2-keeled; lodicules 3-5, persistent. *Stamens* 6; anthers apiculate; ovary rigid; style glabrous; stigmas 2;

caryopsis glabrous, depressed-globose; pericarp crustaceous.

A large shrubby bamboo with single culms from a creeping rhizome; leaves large, glabrous. *Inflorescence* a large leafy panicle of drooping bracteate spikes; rhachis wiry.

***Pseudostachyum polymorphum* Munro**, in Trans. Linn. Soc. XXVI (1868) 142.

A large shrubby bamboo with single culms from a long creeping, jointed rhizome. *Culms* 17 m. tall, thick-walled, smooth; nodes not swollen; internodes 22 cm. long, 35 mm. in diameter, glaucous at first, afterwards dark green. *Culm-sheaths* shorter than the internodes, triangular truncate in outline, very shortly auricled with a tuft of short bristles; imperfect blade long-acuminate on the young culms; short, obscure triangular on the others, striate and furnished with purplish transverse nerves: ligule short, narrowly dentate. *Leaves* oblong-lanceolate, unequally rounded at the base into a short petiole, attenuate at the top into a long twisted point, smooth on both surface, scabrid on one margin; leaf-sheaths faintly white-pubescent, glabrescent; ligule short.

Inflorescence a very large leafy panicle, composed of branches fascicled at the nodes, pendulous or curved. *Spikelets* small, 5 mm. long, with 1 fertile floret; rhachilla produced bearing glumes or an incomplete floret. *Glume* one, broad mucronate, 7-nerved; lemma similar to the glume, finely ciliate above; palea thin, much convolute, 2-keeled, ciliate on the keels. *Lodicules* 3-5, usually 4, large, acute, rounded, or truncate at the apex, ciliate, persistent. *Stamens* 6, free; filaments short; anthers apiculate. *Ovary* narrow, linear-oblong, ending in a rigid style with 2 hairy stigmas. *Caryopsis* globose-depressed, surmounted by the base of the style; pericarp crustaceous. The inflorescence is very often diseased.

This bamboo is common in the ASSAM VALLEY especially at the foot of the NAGA HILLS.

3. TEINOSTACHYUM Munro.

Spikelets many-flowered, cylindrical, long-attenuate at the top, 25-75 mm. long, with an articulate rhachilla which if often visible, the lower 1-2, and the upper 2-4 florets incomplete, sterile, of one lemma only. *Centre* florets, 3-5,

hermaphrodite, with lemma and palea. *Lemma* overlapping at the base, broadest at the middle, attenuate towards the summit, many-nerved; palea 2-keeled, ciliate on the keels. *Lodicules* 3, many-nerved, sometimes concave at the base. *Stamens* six, filaments free; anthers obtuse. *Ovary* very long, attenuate at the top. Fruit bacciform, rostrate with a crustaceous pericarp.

Shrubby or arborescent bamboo. *Culms* thin, straight below, drooping above. *Inflorescence* a spicate panicle on leaf-bearing branches, the spikelets in bracteate verticils.

***Teinostachyum griffithii* Munro**, in Trans. Linn. Soc. XXVI (1868) 143.

A straggling or sub-scandent bamboo. *Culms* erect, arching, 8-16 m. long, verticillately branched from the nodes; internodes 45-65 cm. long, scabrid at the top; walls thin. *Culm-sheaths* 15 cm. and longer, 36 mm. broad, glabrous and shining at the base, covered with appressed white hairs, ciliate on the margins, strongly convolute; imperfect blade 7.5-10 cm. long, reflexed, ovate-acuminate, rounded at the base and prolonged into a large rounded auricle at either side, with long, curved, reflexed bristles on the auricle and base, densely white-shaggy inside, transverse nerves conspicuous; ligule short, pubescent. *Leaves* oblong-lanceolate, 15-25 cm. long, 17-36 mm. broad, rounded at the base into a strong petiole, glaucous below, terminating above in a scabrous, subulate point, scabrid on the margins, glabrous except below and at the base; sheaths striate, keeled, ciliate on the margins, glabrous or covered with appressed pubescence, with two fringed auricles at the throat; ligule short, ciliate.

Inflorescence a leafy (or leafless) panicle bearing at the verticils short spikes or single spikelets, often long, whip-like, with few spikelets on a filiform rhachis. *Spikelets* very narrow, linear, 5-7.5 cm. long, often pedicelled, with 3-5 hermaphrodite florets, with 1 or more sterile both above and below; rhachilla smooth, jointed, swollen at the joints. *Glumes* 1 or 2, 7.5-10 mm. long, narrow striate, ovate-mucronate; lemmas 1.25 cm. long, ovate-acute, mucronate, 9-11-nerved, pubescent, palea somewhat longer, 2-keeled, the keels

edged half way down with a wavy fringe, ciliate near the tip, 4-nerved on either side. *Lodicules* ovate-lanceolate, concave, equal, quite glabrous, 7-9-nerved. *Stamens* exerted; anthers yellow, blunt or emarginate. *Ovary* stipitate, glabrous, ovate, narrowed into a triquetrous beak forming the style, with 2 or 3 white or purplish stigmas. *Grain* obliquely ovoid, glossy, tapering at both ends, ending in a stiff beak.

SIBSAGAR, LAKHIMPUR, KHASI and NAGA HILLS.

4. CEPHALOSTACHYUM Munro.

Spikelets in groups on the branches of the panicle; sterile spikelets often numerous, the fertile 2-flowered, the lower floret with lemma and palea, the upper rudimentary at the top of the prolongation of the rhachilla; glumes 2-4, broad, often long acuminate, sometimes gemmiparous, many-nerved, frequently hairy on the back; lemma of the fertile floret membranous, convolute, acuminate, subulate, often with a short awn; palea convolute, with two approximate keels, often 2-mucronate at the top; nerves often anastomising; lodicules 3, membranous-hyaline, nerved; stamens 6; anthers long; filaments free; ovary stipitate, ovoid; style long, thickened, rigid; stigmas 2-3, short, plumose. *Caryopsis* often rostrate, obovoid, glabrous.

Erect or shrubby bamboos, often climbing. *Culms* slender, stiff; culm-sheaths auricled. *Inflorescence* a terminal globose head, or a panicle of heads with spreading branchlets; heads bracteate, the fertile spikelets usually mixed with many imperfect ones or with empty glumes.

Key to the species of *Cephalostachyum*.

Spikelets in single, terminal, globose heads.

Heads not more than 3.75 cm. in diameter;
leaves rather small.

Palea entire at the apex, anthers blunt. 1. *C. capitatum*.

Palea bifid, anthers apiculate. 2. *C. pallidum*.

Heads more than 3.75 cm. in diameter;
leaves large.

Culm- and leaf-sheaths not fringed; palea
undivided. 3. *C. latifolium*.

Culm- and leaf-sheaths fringed; palea
bifid. 4. *C. fuchsianum*.



Spikelets in heads in interrupted, paniculate
spikes. 5. *C. pergracile*.

1. Cephalostachyum capitatum Munro, in Trans.
Linn. Soc. XXVI (1868) 139.

Culms semi-scandent, 4-10 m. long, yellow, pendulous over the branches of trees; nodes not prominent; internodes long, often 1 m., 24-30 mm. in diameter with thick walls. *Culm-sheaths* somewhat thin, papyraceous towards the top on young culms, those on the lower nodes thickened, 15-30 cm. long, 50-75 mm. wide, covered on the back with an adpressed, pale brown pubescence, truncate at the top of long sheaths, on the lower concave, with a rounded sinus; imperfect blade long, erect or recurved, covered with white hairs, rounded at the base and decurrent into two small auricles which are sometimes fringed; ligule narrow, toothed. *Leaves* pale-green, whitish beneath, ovate-lanceolate, rounded unequally at the base into a short petiole, prolonged at the top into a twisted, scabrid, setaceous tip, 10-20 cm. long, 25-50 mm. wide, glabrous on both surfaces, scabrid on the margins; sheaths glabrous, shining, fimbriate in the throat with long caducous hairs; ligule short.

Inflorescence a dense, globular, terminal or axillary, brownish head, 25-40 mm. in diameter. *Sterile* spikelets numerous, hidden by shining, scarious scales which are often keeled on the back; fertile spikelets 15-20 mm. long, few, with 1-3 sterile florets at the base. *Glumes* 2, ovate, glabrous at the top or slightly pubescent, with anastomising nerves, tip ending in a scabrous awn. *Lemma* of the fertile floret similar in shape but with a shorter awn; palea as long as the lemma, convolute, thin, 2-keeled, with approximate keels, hairy between the keels, mucronate. *Lodicules* 3, oblong-lanceolate, nerved, obtuse, attenuate and ciliate at the top. *Stamens* 6; anthers emarginate at the top. *Ovary* ovoid, furrowed, glabrous, attenuate into a twisted style, which ends in two hairy stigmas. *Caryopsis* chestnut, smooth, shining, depressed, surmounted by the remains of the style.

KHASI, JAINTIA, NAGA and AKA HILLS at altitudes between 2,000 and 8,000 ft.

2. Cephalostachyum pallidum Munro, in Trans. Linn. Soc. XXVI (1868) 140.

A shrubby bamboo. *Culms* not more than 2 m. tall (fide E.G. Camus). *Culm-sheaths* not known. *Leaves* pale green, ovate-lanceolate, unequally rounded at the base into a petiole 5 mm. long, which is often wrinkled; suddenly narrowed above into a scabrous, subulate point ending in a long hair-like tip, 2.5-12.5 cm. long, 1.25-2.5 cm. broad, glabrous on both surfaces or minutely pubescent below, rough on the margins, which are somewhat cartilaginous; leaf-sheaths striate, ciliate on the margins, ending in a short rounded auricle furnished with a few, very early deciduous cilia; ligule long, sometimes ciliate.

Inflorescence a pale, terminal head about 2.5 cm. in diameter, supported by a leaf and broad, rounded, glabrous, sheath-like bracts, and consisting of many long, aristate, empty glumes or sterile spikelets, with a few exerted fertile spikelets. *Spikelets* 17.5-20 mm. long; empty glumes sessile, or with a few empty bracts at the base, 12.5-15 mm. long, ovate, concave, ending in an awn 5 mm. long, many-nerved, sometimes pubescent on the back below the awn. *Lemmas* similar but with a shorter awn; palea as long as the lemma thinner in texture, many-nerved, tessellate, closely 2-keeled, bifid-mucronate at the apex, hairy below the keels and at the tip; rhachilla produced, short. *Lodicules* lanceolate or spatulate-lanceolate, 3-5-nerved, minutely papillose, pubescent, ciliate at the tip. *Stamens* exerted; filaments long; anthers long apiculate. *Ovary* ovoid-lanceolate; style conical; stigmas 2, hairy. *Caryopsis* chestnut, glabrous, ovoid-globose.

KHASI HILLS, MISHMI HILLS, PATKAI RANGE and MANIPUR, ascending to 5,000 ft.

3. Cephalostachyum latifolium Munro, in Trans. Linn. Soc. XXVI (1868) 140.

A small scrambling bamboo. *Culms* 2-3 m. tall, dark green in colour, whitish below the nodes. *Culm sheaths* thin, papyraceous, straw-coloured, 15-22 cm. long, 50-75 mm. wide, not attenuate but rounded at the top into a concave sinus,

furnished with 2 small, triangular, erect auricles; imperfect blade 10-12.5 cm. long, 8-12 mm. broad, acuminate-subulate, somewhat attenuate at the base; ligule broad. *Leaves* very broad, ovate or ovate-lanceolate, oblique at the base or rounded and abruptly narrowed into a short petiole, ending above in a scabrid, setaceous point. *Sheaths* striate, ciliate, ending in an emarginate callus, rounded at the top; ligule long.

Inflorescence composed of groups of spikelets in globular heads 5 cm. in diameter, at the tips of leafy branches; some spikelets sterile, some fertile seated in the axils of broad keeled bracts. *Spikelets* 1-flowered, acuminate, long-aristate, 12-20 mm. long; glumes 14 mm. long, ovate-lanceolate, long-aristate, glabrous except on the keel, striate, somewhat keeled. *Lemma* lanceolate-acuminate, with a shorter arista and anastomosing nerves; palea membranous, tessellately nerved, rounded at the summit, convolute. *Lodicules* ovate-lanceolate or spatulate, ciliate, 3-nerved, pubescent. *Stamens* exerted; filaments long; anthers mucronate at the apex. *Ovary* ovoid, attenuate into a long flattened style, with 2 short plumose stigmas. *Grain* blackish-brown, shining, broadly ovoid, grooved, terminated by the persistent base of the style surrounded by the persistent lemma palea and lodicules.

NAGA HILLS and MANIPUR, 7,000 ft.

4. *Cephalostachyum fuchsianum* Gamble, Bamb. Brit. India (1896) 107.

A medium-sized, arborescent, semi-scandent bamboo. *Culms* thin walled, soft, pale, verticillately branched from the nodes. *Culm-sheaths* thin, striate and reticulately veined at the edges, sides nearly parallel, rounded at the top on each side into a deep (often 2.5 cm. deep and 1.25 broad at the bottom) concave, long-bristly-fringed sinus, 30 cm. long by 10 cm. broad, clothed on the back with appressed light brown pubescence; imperfect blade inserted at the base of the sinus, reflexed, subulate, 15-20 cm. long, 17.5-20 mm. broad, closely pubescent below; ligule small. *Leaves* large ovate-lanceolate, angled or rounded at the base with a long (12.5-15 mm.) petiole, cuspidately acuminate, ending in a scabrous twisted point, glabrous on both surfaces, scabrous on the margins;

leaf-sheath soft, dark green, striate, thickly long-ciliate on the edges ending in a rounded callus and produced at the top into an elongated auricle thickly clothed with stiff, white bristles; ligule moderately long, ciliate.

Inflorescence a dense, globular, terminal head, 3.25 cm. in diameter, or else an elongated, densely packed, terminal, congested spike of superposed heads, consisting of many, fertile spikelets among empty, aristate bracts or sterile, smaller spikelets. *Spikelets* elongate, 2.2-5 cm. long, glabrous. *Glumes* 15-17.5 mm. long, ovate at the base, long-scabrous-aristate above, glabrous; striate, 17-19-nerved; lemmas similar, but more elongate and more shortly aristate, 21-23-nerved, tessellate; palea rather longer than the lemma, thin, ovate-lanceolate, bifid at the apex, mucronate-tipped, pubescent, 2-keeled, keels close together, 5-6-nerved; rachilla produced, short. *Lodicules* linear-lanceolate or spatulate, blunt, 3-5-nerved, minutely ciliate above and papillose on the sides. *Stamens* long-exserted, pendulous; anthers sharply apiculate or forked at the tip. *Ovary* narrowly ellipsoid; style thick; stigmas 2, short. *Caryopsis* chestnut-brown.

DAPHLA HILLS; NAGA HILLS near Birema. Flowered in the Naga Hills in 1935. The caryopses were produced in great numbers and were collected in large quantities by the Kacha Nagas and used as food.

5. *Cephalostachyum pergracile* Munro, in Trans. Linn. Soc. XXVI(1868) 141.

A deciduous, arborescent, tufted bamboo. *Culms* erect, glaucous-green, somewhat whitish-puberulous below the nodes, 10-13 m. tall, 5-7.5 cm. in diameter; nodes scarcely thickened; internodes 30-45 cm. long, walls very thin. *Culm-sheaths* much shorter than the internodes, 10-15 cm. long, 15-20 cm. broad, densely covered with black, stiff, deciduous hairs, afterward polished, chestnut-brown; imperfect blade 5 cm. long, ovate, cordate, cuspidate, densely hairy within, decurrent into a wavy fringe bordering the top of the sheath and ending on either side in a rounded auricle; both fringe and auricle edged with long, stiff, curved, white bristles; ligule very narrow entire. *Leaves* variable, linear-lanceolate, 15-35

cm. long, by 2.5-3.25 cm. wide, or even 6.25 cm., thin, rounded or cuneate at the base into a short petiole, terminating above in a subulate, scabrous, acuminate point, rough on the margins and on the surfaces, glaucescent beneath; leaf-sheaths glabrous, faintly striate, ending in a small, ciliate callus, auricled at the mouth with a few, early-caducous cilia; ligule very narrow, entire.

Inflorescence a large panicle with verticils of long drooping, filiform spikes bearing distant broad heads of spikelets supported by small, chaffy, sheathing bracts; rhachis very slender, wiry, 3.25-5 cm. between the clusters. *Spikelets* in bracteate clusters, 1.25-1.75 cm. long, without glumes, but 1-2 sterile florets, followed by a fertile floret, ending in a terminal sterile floret or filiform, produced-rhachilla. *Lemma* 1.25-1.75 cm. long, ovate-lanceolate, many-nerved, densely pale-hairy, long-mucronate; palea as long, 2-keeled, the keels close together, ciliate, apex deeply bifid, mucronate. *Lodicules* 2, narrow, lanceolate, obtuse and ciliate at the tip 3-5-nerved, persistent. *Anthers* purple. *Ovary* smooth, sub-globular; style 3-cornered; stigmas 2-3, stout, recurved. *Caryopsis* obovate-oblong, shining, 1.25 cm. long, furrowed on one side, ending in a beak 1.25 cm. long.

Plains of ASSAM, SIBSAGAR, LAKHIMPUR. Flowered in Dibrugarh in 1936.

5. NEOHOUEAUA A. Camus.

Inflorescence an elongate panicle. *Fertile* spikelets 1-flowered; glumes 3-4, mucronate, often gemmiparous; lemma involute, mucronate, subaristate; palea elongate, involute, without keels, 2-aristate at the top; lodicules 0 or very small. *Stamens* 6, filaments connate; anthers obtuse at the apex. *Ovary* oblong; style long; stigmas 3, exerted.

Medium-sized bamboos with culms growing in large tufts, often somewhat scandent, unarmed.

Key to the species of *Neohouzeaua*.

- | | | | |
|------------------------------------|----|----|---------------------|
| Branches erect; panicle spiciform. | .. | 1. | <i>N. dullooa</i> . |
| Panicle of spaced heads. | .. | 2. | <i>N. helferi</i> . |

1. *Neohouzeaua dullooa* A. Camus, in Bull. Mus. Paris (1922) 100. Syn. *Teinostachyum dullooa* Gamble, Bamb. Brit. Ind. (1896) 101.

A middle-sized bamboo. *Culms* erect, 4-9 m. tall, whitish below the nodes; nodes hardly prominent; internodes 4-1 m. long with thin walls. *Culm-sheaths* varying in size according to the internodes, from 15-30 cm. long and 10 cm. broad, to 30 cm. long and 25 cm. broad, striate, with scattered white hairs, prominent above, rounded at the top, concavely truncate and loose-fringed with stiff bristles; limb narrow, subulate, recurved, hairy within, 7.5-15-cm. long, 8-17 mm. wide at the base; ligule prominent, long-fimbriate. *Leaves* variable, oblong-lanceolate, acuminate, rounded, often unequally, at the base into a short petiole, terminating in a twisted, subulate point, rough on the upper surface, minutely softly pubescent beneath of glabrescent, rough on the margins; sheaths striate, ciliate on the margins; callus ciliate or glabrous; ligule long, hairy.

Inflorescence a panicle with spiciform branches, furnished with long, truncate bracts, with softly hairy, imperfect, caducous limbs. *Spikelets* rather close, few in number, 1.25-2.5 cm. long, slender, cylindrical-fusiform, acute, softly hairy with one fertile floret; glumes 2-4, ovate-acute, long-mucronate, subaristate, the upper resembling an empty lemma. *Fertile floret*, lemma 12-14 mm. long, convolute, acute, subaristate, many-nerved, pubescent at the top; palea convolute, lanceolate, keelless or very obscurely keeled at the top, many-nerved, hairy at the top, terminating in two awns, which are scabrid and 1-1.5 mm. long. *Filaments* connate; anthers obtuse. *Ovary* glabrous; style forming a beak 12-14 mm. long; stigmas short.

Common in both VALLEYS.

2. *Neohouzeaua helferi* Gamble, in Kew Bull. (1923) 91. Syn. *Teinostachyum helferi* Gamble, Bamb. Brit. Ind. (1896) 102.

An evergreen, tufted bamboo forming large impenetrable thickets. *Culms* 6-12 m. tall, 2.4-3.6 cm. in diameter; spreading in all directions; internodes greyish to green in

youth, walls thin; nodes somewhat inflated, whitish; culm-sheaths 20-25 cm. long, persistent, thick, brittle when young, bearing a few appressed bristles which leave a scar when they fall, rough towards the base, truncate at the top; imperfect blade nearly as long as the sheath, recurved, lanceolate, acuminate, glabrous or shortly hispid, rounded at the base and decurrent as a very narrow long-fringed band at the top of the sheath; ligule narrow, fringed with stiff hairs. *Leaves* variable, oblong-lanceolate, 15-45 cm. long, 2.5-7.5 cm. broad, unequal at the base, shortly petiole, cuspidate-acuminate, ending in a long, scabrous twisted point, margins rough, glabrous and glaucescent beneath; leaf-sheaths glabrous, smooth, striate, ending in a smooth callus and a short long-fringed auricle; ligule narrow, fringed.

Distant heads of spikelets often up to 5 cm. in diameter, usually less. *Spikelets* paired; glumes 2, 5 and 8 mm. long; lemma 12-25 mm. long; palea convolute. *Stamens* 6; filaments connate. *Caryopsis* over 5 cm. long.

GARO, KHASI and JAINTIA HILLS, 3-4,000 ft.

6. *DINOCHLOA* Buse.

Spikelets minute, very numerous, in sub-globose sessile heads on short branchlets, 1-flowered; rhachilla short, inarticulate, not produced. *Empty glumes* 1-4, broad, very obtuse, muticous, gradually larger upwards. *Lemmas* similar; palea convolute, equal to, or larger than, the lemma, not keeled. *Lodicules* none. *Stamens* 6, free, short. *Ovary* ovoid, glabrous; style short. *Caryopsis* ovoid-acuminate.

Lofty climbing bamboos, with zigzag culms. *Culm-sheaths* thick, loosely-clasping, wrinkled at the base, where a broad leathery ring remains after the sheath falls. *Leaves* rather large, soft, tessellately nerved. *Inflorescence* a large, compound panicle of thin, spicate clusters of spikelets.

Key to the species of *Dinochloa*.

- | | | |
|---|----|------------------------------|
| Culm-sheaths leathery; pubescence golden-brown. | .. | 1. <i>D. maclellandii</i> . |
| Culm-sheaths brittle; pubescence white. | .. | 2. <i>D. compactiflora</i> . |

1. *Dinochloa maclellandii* (Munro) Kurz, in Journ. As. Soc. Beng. XLII (1873) 253.

An evergreen, lofty, often scandent bamboo. *Culms* up to 30 m. long, if climbing; shorter and straggling if growing unsupported, 2.5-5 cm. in diameter, zigzag-geniculate, covered by the persistent loose sheaths, grey-green, walls thin; nodes swollen; internodes 15-20 cm. long, often angled when young, scabrous with brown appressed pungent hairs. *Culm-sheaths* cylindrical, the base often dark, leathery persistent, 15-22.5 cm. long, 17.5-22.5 broad at the base, 5.7-5 cm. wide at the top, covered with densely appressed, golden-brown pubescence, ending above in a narrow dark glabrous margin edging the whole of the truncate top outside the base of the imperfect blade; imperfect blade lanceolate-acuminate, rounded at the base and decurrent on to the sheath, 15-30 cm. long, 2.5-6.25 cm. broad, recurved or spreading, glabrous outside, densely brown hairy within; ligule short, entire or faintly serrate. *Leaves* large to very large, broadly oblong-lanceolate, acuminate, unequal at the base, rounded into a short thick petiole up to 1.25 cm. long, ending in an acuminate, setaceous, scabrous, twisted tip; leaf-sheath striate, transversely veined, produced at the mouth into a naked, rounded auricle, keeled at the back, appressed hairy when young, afterwards glabrous; ligule often broad, entire or serrate.

Inflorescence unknown.

CACHAR and SYLHET.

2. *Dinochloa compactiflora* (Kurz) McClure, in Kew Bull. (1936) 251. Syn. *Melocalamus compactiflorus* Benth. in Journ. Linn. Soc. Bot. XIX (1882) 134. Syn. *Pseudostachyum compactiflorum* Kurz, in Jour. As. Soc. Beng. XLII (1873) 252.

An evergreen tufted arborescent bamboo. *Culms* greyish green, rough, scandent, spreading and arching, 5-8 m. and more tall, sometimes even up to 30 m. and climbing over tall trees, up to 2.5 cm. in diameter; nodes thickened; internodes 35-60 cm. long. *Culm-sheaths* persistent, hard, brittle, cylindrical, smooth or covered with long, white, appressed hairs, truncate at the mouth, dilated at the base,

about 15 cm. long by 7.5 cm. broad; imperfect blade as long as or longer than the sheath, recurved, long-acuminate, rounded at the base and then spreading out into a narrow, dark, reflexed, crescent shaped auricle, fringed with stiff bristles, hispidly hairy towards the base; ligule narrow, entire. *Leaves* large, oblong-lanceolate, rounded at the base into a short, hairy petiole, terminating in a subulate, acuminate, penicillate, scabrous, twisted point, scabrous on one margin, 15-25 cm. long by 2.5-5 cm broad; leaf-sheaths striate, appressed white hairy when young, glabrescent, somewhat keeled, truncate at the mouth, furnished with a lunate reflexed auricle fringed with stiff, early caducous bristles; ligule narrow, entire.

Inflorescence a large, compound, interrupted panicle of small, sub-globose heads, bearing several fertile and many sterile spikelets often leaf bearing; the rhachis very pubescent, flexuose, flattened on one side; heads 7.5-12.5 mm. in diameter. *Spikelets* very small, 2.5 mm. long, and as broad, glabrous, blunt or truncate, 2-cleft, with 2 fertile flowers and 1 empty terminal on a produced rhachilla. *Glumes* 2, broadly ovate, ventricose, very shortly mucronate; lemma similar, often ciliate on the edges; palea as long as the lemma, broadly boat shaped, shortly and bluntly 2-toothed, 2-keeled, ciliate on the keels and 4-5-nerved between. *Lodicules* 3, large, ovate, blunt, long ciliate. *Stamens* free; filaments short; anthers yellowish, bluntly acute at the tip. *Ovary* glabrous, ovoid-globose, surmounted by a short thick style; stigmas 2 or 3, short plumose. *Caryopsis* large, sub-globular, 2.5-3.75 cm. in diameter, summit depressed.

CACHAR and SYLHET plains. Used for basket work.

7. MELOCANNA Trinius.

Spikelets 2 to 3, fasciculate in bracts in the axils of the spikes, acuminate, with one fertile and one or more sterile florets. *Empty glumes* indefinite, acuminate, mucronate, striate. *Lemmas* similar to the empty glumes; palea similar, convolute, not keeled. *Lodicules* 2, narrow. *Stamens* 5 to 7; filaments free or irregularly joined. *Ovary* glabrous; style

elongate; stigmas 2 to 4, shortly hairy. *Caryopsis* very large, pea-shaped, long-beaked; pericarp very thick.

Arborescent bamboo, unarmed. *Culms* erect, distant, single from the ramifications of an underground rhizome. *Culm-sheaths* often persistent, brittle, short, with short auricles; imperfect blade very long. *Leaves* broad, petioled, smooth. *Inflorescence* a large compound panicle of spicate, secund spikelets.

Melocanna bambusoides Trin. *apud Spreng.*, Neue Entd. II (1821) 43.

Culms single, distant, green when young, straw-coloured when older, clothed with the persistent sheaths, unbranched till near the top, up to 20 m. tall; nodes marked by a thin ring; internodes smooth, 30-50 cm. long; walls thin. *Culm-sheaths* yellowish-green when young, yellow when old, brittle, striate, covered with whitish appressed hairs, 12.5-15 cm. long, 15-30 cm. broad at the base, straight for two-thirds of the way up then once or twice waved, cut off straight or concavely below the imperfect blade, the edges produced upwards into rounded often long-fringed auricles; imperfect blade up to 30 cm. long, recurved, subulate-acuminate, the base decurrent into a narrow strip along the top of the sheath, ligule very narrow, serrate. *Leaves* lanceolate or oblong-lanceolate with a long, scabrous, twisted point; rounded at the base into a 1.25 cm. long petiole, 15-35 cm. long, 2.5-3.25 or even 7.5 cm. broad, glabrous above, glaucescent beneath and hairy when young, both edges finely ciliate, scabrous on one margin; leaf-sheaths glabrous, smooth, ending in a pointed auricle which bears 10-12 stiff, white, deciduous bristles; margin ciliate; ligule very short.

Inflorescence a large, compound panicle of one-sided, drooping, spicate branches bearing clusters of 3-4 spikelets in the axils of short, blunt, glabrous bracts. *Spikelets* about 1.25 cm. long, glabrous, spinous. *Glumes* 2-4, sometimes gemmiparous, striate, lanceolate, shortly mucronate; lemma similar, but thinner; palea glabrous, convolute, mucronate, acuminate, not keeled. *Lodicules* 2, narrow, linear-oblong, obtuse and erose-fimbriate at the top, 3-5-nerved. *Stamens*

free at the base or irregularly joined; anthers yellow, notched at the apex. *Ovary* ovoid; style elongate; stigmas 2-4, recurved, hairy. *Caryopsis* very large, 7.5-12.5 cm. long, obliquely ovoid, fleshy, beak curved; pericarp thick, fleshy.

Very common in the SURMA VALLEY where it is gregarious over very large areas.

8. BAMBUSA Schreber.

Spikelets many-flowered, rarely few-flowered, with imperfect florets at the base or apex. *Glumes* 1-3. *Lemmas* ovate-lanceolate, usually mucronate, many-nerved, usually glabrous, coriaceous-papyraceous; paleas 2-keeled, keels ciliate or not, tips mostly entire. *Lodicules* 3, membranous, obtuse, ciliate. *Stamens* 6; filaments free, often exerted; anthers narrow, tip obtuse or apiculate or penicillate. *Ovary* oblong or obovate, hairy at the apex; style short or long. *Caryopsis* oblong or linear-oblong, acute or obtuse, furrowed on one side; pericarp thin, adherent; embryo conspicuous.

Arborescent or shrubby, or rarely climbing bamboos, sometimes thorny. *Culms* from a thick rhizome, usually caespitose, occasionally stoloniferous. *Inflorescence* usually a large leafless compound panicle.

Key to the species of *Bambusa*.

Culms without spines.

Spikelets cylindrical.

Spikelets in loose heads.

Arborescent.

Imperfect blade of culm-sheath triangular from a broad base.

Culm-sheaths with large auricles.

Palea ciliate on the keels.

Anthers obtuse. 1. *B. tulda*.

Anthers apiculate. 2. *B. nutans*.

Anthers penicillate. 3. *B. teres*.

Palea not ciliate on the keels. 4. *B. polymorpha*.

Culm-sheaths with small auricles. 5. *B. pallida*.

Imperfect blade inflated, leaf-tips

shaggy. 6. *B. khasiana*.

Shrubby. 7. *B. nana*.

Spikelets in dense heads, ovate. 8. *B. balcooa*.

Spikelets flattened.	..	..	9.	<i>B. vulgaris.</i>
Culms with spines.	..	..	10.	<i>B. arundinacea.</i>
Species with flowers not known.				
Culms scandent; leaves glabrous, leaf sheaths with long bristles.	..	..	11.	<i>B. mastersii.</i>

1. *Bambusa tulda* Roxb., Hort. Beng. (1814) 25.
Local names :—*Mirtinga* (Sylhet); *Wati* (Garo); *Wamuna*, *Wagi*, *Nalbans*, *Deobans*, *Bijli* (Assam); *Tulda*, *Jowa* (Beng).

A tufted bamboo; culms reaching a height of 22 m., 5-10 cm. in diameter, hollow, smooth, green, sometimes striped with yellow. Lower branches leafless, rigid, horizontal. *Culm-sheaths* 15-22 cm. long, by 15-25 cm. broad, smooth or covered with appressed white or brown hairs; slightly attenuate upwards and rounded or triangularly truncate at the top; imperfect blade broadly triangular reniform or cordate, cuspidate, erect, hairy within, the base decurrent into rounded, large, long-fringed auricles, or a wavy narrow-fringed band along the upper edge of the sheath; ligule narrow, entire. *Leaves* linear-oblong or lanceolate, rounded or cordate at the base, 11-32 cm. long, 17-37 mm. broad; upper surface and margins rough; sheaths striate, glabrous, ending in a smooth callus and on oblong rounded auricle, from which spring long white bristles; ligule narrow.

Inflorescence variable, usually a gigantic, leafless panicle but sometimes very short; branches spicate, bearing interrupted clusters of few (1-5) usually fertile long spikelets. *Spikelets* cylindrical at first then a little compressed, 2.5-7.5 cm. long, 7-10-12-flowered, often hirsute at the top, 1-2 empty bracts at the base, than several glumes. *Lower* 1-2 and upper 2-3 florets imperfect, male or female. *Central florets* hermaphrodite; lemmas smooth, shining, acuminate, somewhat membranous at the base, 25 mm. long; palea a little shorter or equal to the lemma in length, 2-keeled, keel ciliate, 5-7-nerved between the keels; rhachilla clavate, flattened, glabrous except on the ciliate tip, articulate. *Lodicules* 3, 2 obtuse, the third lanceolate, hyaline, fimbriate. *Stamens* 6, rarely 3 by abortion, exserted, mucicous or obtusely mucronate. *Ovary* stipitate, obovate, hairy on the top, short-

styled; *stigmas* 3, plumose. *Caryopsis* oblong or obovate, hirsute on the top.

Very common in the ASSAM VALLEY where it is much used for building and scaffolding, and for making mats and baskets.

2. *Bambusa nutans* Wallich apud Munro, in Trans. Linn. Soc. XXVI (1868) 92. Local names : *Peechli* Sylhet; *Jotia-makal*, *Deobans*, Assam; *Seringjai*, Khasi.

Very similar in habit to *B. tulda* Roxb. Culms green, smooth, not shining, white-ringed below the nodes, 7-14 m. tall, 4-8 cm. in diameter. Internodes 36-45 cm. long. Culm-sheaths 15-22 cm. long, covered on the back with appressed and scattered black hairs, the base bearing a ring of soft deciduous hairs; imperfect blade of the lower and upper sheaths 15-21.5 cm. long and very broad, that of central nodes shorter, acute, margins recurved, clothed within with appressed black hairs. decurrent into large waved auricles which bear long curved bristles; ligule short, dentate. Leaves linear-lanceolate, 15-30 cm. long, 2.5-3.75 cm. broad, rounded or attenuate at the base into a short petiole; tip a twisted scabrid point; margins scabrous; secondary veins 7-10, intermediate 8-9, pellucid glands frequent; leaf sheaths striate, hairy when young, produced into a falcate auricle with a few long bristles; ligule long, obtuse hairy.

Inflorescence similar to that of *B. tulda*. Spikelets 2-6.5 cm. long with few fertile florets, densely verticillate, sterile spikelets many. Rhachilla long, visible, articulate. Glumes 2 or 3, hermaphrodite florets 3-5, followed by 2-3 imperfect florets at the top. Lemma of the hermaphrodite florets up to 2.7 cm. long, acute or mucronate, ovate, many-nerved, minutely hairy within : palea flattened, ovate, 2-keeled, the keels covered with long white hairs. Lodicules 3, broad, obtuse, long-fimbriate. Stamens 6; anthers long spiculate or narrowly penicillate at the summit. Ovary stipitate, obovate, pubescent, on the top. Style short, pubescent; stigmas 2-3, almost glabrous or plumose. Caryopsis oblong, obtuse, hairy on the top.

Without flowers it is extremely difficult to separate this bamboo from *B. tulda*. It is fairly common in the ASSAM VALLEY.

3. *Bambusa teres* Ham. ex Wall., Cat. 5026 B.

A densely caespitose bamboo. *Culms* up to 30 m. tall, dark green, smooth, 7.5 cm. in diameter; nodes ringed by the bases of the fallen sheaths; internodes 50 cm. long; walls 8-10 mm. thick. *Culm-sheaths* 20-25 cm. long, equally broad, nearly glabrous, hardly attenuate upwards, somewhat rounded on top; imperfect blade 10-15 cm. long, broad, triangular, cuspidate, appressed hairy beneath, rounded at the base, and then again decurrent in broad wavy auricles fringed with a few deciduous bristles; ligule narrow, white-hairy outside. *Leaves* oblong-lanceolate, 30-35 cm. long, 40-45 mm. wide, unequal at the base and attenuate into a short petiole, long acuminate, ending in a setaceous point, glabrous above, pubescent beneath; margins rough; leaf sheaths glabrous or slightly hairy, truncate at the mouth; ligule short.

Inflorescence a large compound panicle with spicate branches bearing groups of fertile and sterile spikelets with chaffy bracts. *Fertile* spikelets up to 5 cm. long, dull, 7-8-flowered, of which the upper two are often imperfect; rhachilla striate, often ciliate at the top. *Glumes* ovate, mucronate. *Lemmas* of the male spikelets many-nerved, long acuminate, tip occasionally foliaceous; palea ovate-acute, scaberulous, 5-6-nerved between the scabrid or ciliate keels, long hairy at the top. *Lodicules* many-nerved, long-fimbriate. *Anthers* narrow, penicillate. *Ovary* obovate, very hairy on top, beaked; style-short; stigmas 3, hairy, long.

DARRANG. The stems are stated to be of little value as they are readily attacked by insects.

4. *Bambusa polymorpha* Munro, in Trans. Linn. Soc. XXVI (1868) 98. Local names :—*Betua, Jama*, Bengali.

A tall, tufted bamboo. *Culms* 20-27 m. tall, usually evergreen, but occasionally losing their leaves during the dry season, unarmed, curving at the top; nodes prominent; internodes 7.5-15 cm. in diameter, 30-60 cm. long, greyish-green in colour, covered with a white scurf when young. *Culm-sheaths* thick, coriaceous, shining with a few hairs within,

covered on the back with a dense, white appressed pubescence, attenuate towards the top; imperfect blade sub-reniform, concave, cuspidate, rounded at the base and widening in a long auricled band, produced beyond it into two falcate auricles, the whole being fringed with long stiff bristles; ligule narrow, entire. *Leaves* thin, linear-lanceolate, attenuate or rounded at the base into a short petiole, long acuminate at the tip, 10-18 cm. long, 10-16 mm. broad, rough on the upper, hairy on the lower surface, margins scabrous; sheaths compressed, striate, hairy, ending in a callus and a minute auricle furnished with a few long deciduous bristles; ligule very short.

Inflorescence a much-branched panicle, with curving racemes of frequent heads, bearing few spikelets surrounded by brownish, glabrous, mucronate, chaffy bracts; rachis smooth, the upper part covered with white appressed pubescence, wiry. *Spikelets* shining, often brownish, 10-12.5 mm. long, in lower heads 5-6, number gradually decreasing upwards, somewhat pedicellate and enclosed in a long, curved, glabrous bract. *Empty* glumes 1-3, ovate-mucronate, then 2-3 fertile flowers, then a terminal imperfect flower; rachilla produced, long, flattened, glabrous; lemmas ovate-mucronate, many-nerved; paleas somewhat longer, lanceolate, acute at the top, keels not ciliate. *Lodicules* 3, sub-obicular, short-fimbriate, 3-5-nerved, one smaller than the other two. Anthers purple, obtuse, sometimes apiculate. *Ovary* obovate, hairy at the top; style with 3 short white-hairy stigmas. *Caryopsis* ovate, 5 mm. long, depressed, flattened on one side, hairy above, ending in a short hairy mucro.

Found in SYLHET.

5. *Bambusa pallida* Munro, in Trans. Linn. Soc. XXVI (1868) 97. Local names:—*Makal* Assam; *Burwal* Cachar.

A caespitose bamboo growing in thick clumps. *Culms* smooth, fistular, 12-20 m. tall, 5.4-7.5 cm. in diameter, olive-green in colour; internodes 50-80 cm. long, walls thin. *Culm-sheaths* 17.5-30 cm. long, by 25 cm. broad, straight-

truncate at the top, glabrous or covered with appressed white hairs when young; imperfect blade very long, usually longer than the sheath, up to 35 cm., triangular-acuminate from a broad base, furnished with small round auricles, the auricles and lower parts fringed with bristles, sparsely black-hairy without, glabrous or slightly hairy within; ligule very narrow. *Leaves* linear-lanceolate, 10-20 cm. long, 1-2 cm. broad, rounded at the base into a short petiole, ending in a subulate, twisted point; leaf-sheaths glabrous, striate, ending in a rounded, erect auricle with a few long bristles; ligule very short.

Inflorescence a large branching, very pale panicle, with spicate branches bearing heads with many sterile and few fertile spikelets, pale, cylindrical; sterile 7-11 mm. long, the fertile 25-30 mm., often curved. *Glumes* two, ovate, acute. Lowest lemma hermaphrodite or male often gemmiparous, followed by 3-8 hermaphrodite and then 3-5 more or less incomplete florets; rhachilla short, club-shaped, ciliate at the top. *Lemmas* ovate-acute, mucronate, many-nerved, glabrous, pubescent within; palea much shorter, acute, 2-keeled, shortly ciliate on the keels, 3-5 intramarginal nerves. *Lodicules* 3, oblong or narrowly obovate, long-fimbriate. *Ovary* narrowly oblong, attenuate upwards into a thickened hairy style; stigmas three, plumose.

Common in both VALLEYS and ascends in the hills to 4,000 ft.

6. *Bambusa khasiana* Munro, in Trans. Linn. Soc. XXVI (1868) 97.

Culms 10-13 m. tall, growing singly from a creeping rhizome; internodes 12-30 cm. long, covered during youth with glistening golden hairs and variegated with transverse blotches, dark olive-green, 12-36 cm. long; walls thin. *Culm-sheaths* 12-15 cm. long by 10-12 cm. broad, striate, covered with dense, tawny, appressed hairs, straight, truncate at the top; imperfect blade as long as or longer than the sheath, narrow (2.5 cm.) at the base, centre portion thickened, cuspidately acuminate, the sides widened out into large, inflated, membranous wings, broadly rounded on the sheath;

ligule very short. *Leaves* membranous, pale, 10-16 cm. long by 20-25 mm. broad, lanceolate, rounded at the base into a short petiole; leaf-sheaths glabrous, striate, minutely auricled with a few long deciduous hairs; ligule-elongate, truncate.

Inflorescence an ample panicle made up of branches bearing distant sub-verticillate groups of spikelets, of which many are sterile. *Fertile spikelets* 17-22 mm. long, at first cylindrical, afterwards compressed, glabrous, 5-6 flowered, the lower hermaphrodite the upper 1-2 imperfect, sterile, rachilla striate, smooth, fimbriate at the top. *Glumes* short, ovate, mucronate, brown on the margins, glabrous, median nerve strong. *Lemmas* similar to the glumes; 11-13-nerved, glabrous; palea equalling the lemma or longer, 2-keeled, ciliate on the keels. *Lodicules* ovate-orbicular, many-nerved, shortly fimbriate. *Stamens* with obtuse anthers. *Ovary* linear-oblong; style short; *stigmas* 3, long, plumose.

KHASI HILLS and MANIPUR.

7. *Bambusa nana* Roxb., Hort. Beng. (1814) 25.

A very thick, evergreen, caespitose shrub. *Culms* 2-3 m. tall by 3.0 cm. in diameter, glabrous, smooth, green when young, then yellow, hard, much-branched from the base; branches fasciculate, nodes thickened; internodes 20-40 cm. long. *Culm-sheaths* green at first, then yellow, stiff, glabrous, 10-15 cm. long, 5-7.5 cm. broad, rounded at the top; limb linear, acuminate, decurrent at the base into two indistinct, ciliate auricles, hairy on both surfaces; ligule narrow. *Leaves* mostly small, 2.5-7.5 cm. long, 5-7 mm. broad, rounded at the base into a short petiole, narrowed above into a subulate, twisted point; ligule short.

Inflorescence a rather short, diffuse, leafy panicle, with few spikelets, solitary or clustered. *Spikelets* 1.25-3.75 cm. long, glabrous, straw-coloured, bearing 5 or more florets separated by rachilla joints 2.5 mm. long, the terminal floret imperfect. *Glumes* absent or rarely only one. *Lemmas* 16-20 mm. long, ovate-acute, many-nerved, glabrous; palea shorter, many-nerved, 2-keeled, minutely ciliate at the top. *Stamens* long-exserted, pendulous; anthers obtuse or shortly

apiculate, yellow. *Ovary* obovate, pubescent at the top; *style* very short; *stigmas* long, plumose. *Caryopsis* elliptic in shape, furrowed, shortly hairy at the top, crowned with the base of the style.

Frequently cultivated as a hedge in tea gardens.

8. *Bambusa halcooa* Roxb., Hort. Beng. (1814) 25.
Local names :—*Baluka*. Assam; *Sil Barua*, *Teli Barua*, Sylhet.

A tall, stout, densely caespitose bamboo. *Culms* up to 16-24 m., 7.5-15 cm. in diameter, the lower nodes giving off leafless hard branches; internodes 20-45 cm. long; nodes swollen with a whitish ring above, hairy below. *Culm-sheaths* of two kinds; the lower short and broad, densely appressed hairy on the upper surface, ciliate on the edges and the rounded top; imperfect blade short, triangular, decurrent into short, fringed auricles; the upper 25-35 cm. long, 20-25 cm. broad, almost glabrous, truncate; reduced blade 15-20 cm. long, 7.5-10 cm. broad, acuminate, closely hairy below, decurrent at the base on the sheath in a narrow ciliate band. *Leaves* lanceolate, sub-cordate or attenuate at the base, petioled, (petiole hirsute), sometimes long-ciliate at the base. 16-32 cm. long, 12-24 mm. broad, scabrous, shortly hairy below; leaf-sheath striate, appressed white hairy, truncate above with a narrow callus, with a few stiff bristles.

Inflorescence a large, compound panicle, bearing spicate branches with bracteate heads of spikelets; rhachis pubescent. *Spikelets* ovoid-lanceolate, flattened, 9-14 mm. long, 6-8-flowered, the upper and the lower floret sterile, the others hermaphrodite; rhachilla hidden. *Glumes* 0-2, ovate-acute, many-nerved. *Lemmas* membranous, ovate, many-nerved, mucronate, fimbriate on the margins, straw-coloured, at length brown, palea as long as the lemma, ovate-acute, 2-keeled, long ciliate on the keels, with four intracarpinal, anastomosing nerves. *Lodicules* 3, ovate or obovate, 3-5-nerved, fimbriate. *Stamens* apiculate with a few silky hairs. *Ovary* broadly ovoid, acuminate, hairy; stigmas 3, plumose.

Very common in both VALLEYS of the province where it has a great repute as a durable and strong bamboo.

9. *Bambusa vulgaris* Schradler, in Wendland Collect. Pl. II (1810) 26.

A moderate-sized bamboo with rather distant culms. *Culms* 6-15 m. tall, smooth, 5-10 cm. in diameter, green or striped with yellow lines, polished, shining; nodes hardly swollen, often with a ring of brown hairs; internodes 25-45 cm.; walls thin. *Culm-sheaths* 15-25 cm. long by 17-23 cm. broad, concave at the top, rounded, hairy, often streaked with yellow, ciliate on the margins, glistening smooth within; limb 5-15 cm. long by 10 cm. broad, sub-triangular, acute, hairy on both faces; base decurrent forming two rounded, falciform auricles, which are fringed with wavy stiff bristles. *Leaves* membranous, linear-lanceolate, acuminate or subulate, rounded at the base, shortly petiolate, 15-25 cm. long by 15-40 mm. broad, glabrous or sparsely hairy below, scaberulous on both surfaces; sheaths striate, laxly hairy; auricles round with a few deciduous stiff hairs; ligule short, ciliate.

Inflorescence a large, leafy, compound panicle, bearing spicate branches with heads of spikelets in bracteate clusters of 3-10, the clusters larger at the nodes. *Spikelets* erect, pedicelled, oblong-lanceolate, acute, compressed. *Glumes* 1-2, 6-9 mm. long, ovate-acute, many-nerved, ciliate towards the apex. *Lemmas* 8-15 mm. long, acuminate-cuspidate, attenuate at the base, papyraceous, fimbriate towards the top, 11-19-nerved; paleas 7-14 mm., bluntly acute, 2-keeled, long-ciliate on the keels, faintly 3-nerved. *Lodicules* three, hyaline, unequal in size, two ovate-oblong, the third longer acute, 3-nerved, long-ciliate. *Stamens* exerted, purple; anthers narrow, blunt or apiculate, hairy at the apex. *Ovary* narrowly oblong, hairy; *stigmas* three, short, plumose.

Frequently cultivated and readily recognized by the peculiar yellow stripes on the culms.

10. *Bambusa arundinacea* Willd. Sp. Pl. II (1799) 245. Local names: *Kotoha*, *Kata*, *Koto*, Assam; *Ketua*, *Ketuasi*, Bengali.

A very densely tufted bamboo. *Culms* 16-35 m. tall, bright green, shining, 15-18 cm. in diameter; internodes 45

cm. long, thick, very branchy, branched from the base, often flattened on one side or angular; basal branches horizontal, armed at the nodes with 2-3 recurved spines, bearing few leaves; nodes prominent, the lower rooting. *Culm-sheaths* coriaceous, orange-yellow when young, with dense golden hairs, often striped with green or red, rounded at the top; limb triangular up to 10 cm. long, concave, glabrous outside, clothed on the inner surface with a dense mat of dark-coloured felt; margins decurrent on the sheath, wavy, plaited, long and thickly ciliate, auricle very narrow. *Leaves* 7-18 cm. long, 2-10 mm. broad, glabrous above, hairy beneath, linear-lanceolate or linear, attenuate or subcordate at the base, shortly petioled, acuminate, margins smooth or scaberulous; sheaths very hirsute, then glabrescent.

Inflorescence a very large panicle; branches spicate with a few loose clusters of spikelets, each cluster with about 5 spikelets. *Spikelets* lanceolate, acute, 1.75-2.5 cm. long, sessile, 4-6-flowered, rhachis dull, smooth. *Glumes* 2 or absent, ovate-lanceolate, acutely mucronate. *Lemmas* smooth at the base, acuminate or mucronate, sometimes shortly fimbriate at the top, often entirely glabrous; paleas narrower than the lemmas, somewhat longer, 2-keeled, keels ciliate, rhachilla hardly visible. *Lodicules* 3, two sub-obtuse, the third lanceolate. *Stamens* 6, with yellow anthers, sometimes with an apiculate bristle. *Ovary* elliptic-oblong; style short, glabrous; stigmas 2 or 3, long, plumose. *Caryopsis* oblong, 5-8 mm. long, grooved on one side.

SYLHET and the GARO HILLS.

11. *Bambusa mastersii* Munro, in Trans. Linn. Soc. XXVI (1868) 113. Local name:—*Beti bans*, Assam.

A very small reed-like species, climbing. *Leaves* oblong-lanceolate, 25-30 cm. long, 36 mm. broad, glabrous on both surfaces except towards the base of the median nerve, glaucescent below, attenuate at the base into a short petiole which is sometimes hairy, terminating in a rostrate-acuminate hairy tip; margins rough; median nerve yellow, shining, secondary nerves 10-12 pairs, intermediate 5, tessellate by reason of a reticulation of oblique lines of pellucid glands; leaf-sheaths

striate, ciliate on the margins, covered on the sides with a coat of stiff appressed hairs, fimbriate at the throat, terminating in a narrow callus and short auricles bearing several, stiff, long, folded bristles; ligule very short.

Inflorescence unknown.

Collected by Masters in Dibrugarh.

9. GIGANTOCHLOA Kurz.

Spikelets ovate and rounded or oblong and compressed, with imperfect florets at the summit and at the base; hermaphrodite florets few; glumes 2 or 3; lemmas as in *Bambusa*; paleas in the hermaphrodite florets 2-keeled, ciliate on the keels; lodicules 3-2, rarely more or one or absent. *Stamens* 6, monadelphous; anthers mucronate, penicillate at the apex. *Ovary* often rostrate, more or less hairy above. *Caryopsis* oblong or linear with a membranous pericarp.

Arborescent or climbing bamboos. *Culms* usually robust and bare at the base; sheaths auriculate. Inflorescence a compound panicle.

Gigantochloa macrostachya Kurz. Forst. Flor. Burm. II (1877) 557.

A large evergreen bamboo. *Culms* 10-16 m. tall, 6-10 cm. in diameter, glaucous in youth below the nodes, afterwards dark green in colour; nodes scarcely swollen, hairy; internodes 45-75 cm. long, the lower very short. *Culm-sheaths* short, 12-20 cm. long, broader than long, contracted at the summit but still broad at the throat, hardly ciliate on the margins; imperfect blade almost as long as the sheath, somewhat acuminate, sub-cordate, furnished on both sides with two large, sinuate auricles, which are densely long-ciliate. *Leaves* thin, lanceolate, 16-40 cm. long, 12-50 mm. broad, attenuate or rounded at the base into a short petiole, ending above in a scabrid setaceous point, somewhat scabrid on the marginal nerves, otherwise smooth and glabrous, scabrid on the margins, hairy below; sheaths at first hairy, glabrescent, often keeled, terminating at the throat in a rounded callus with two small lateral auricles, which are ciliate; ligule short.

Inflorescence a very large, leafy panicle, composed of heads of spikelets more or less distichously and alternately spaced on the branches; bracts at the base of the branchlets large, sub-foliaceous. *Spikelets* up to 5 cm. long, acuminate, subulate, narrow, covered in part by the long cilia of the glumes and lemmas, hermaphrodite florets 2-3, terminal barren. *Glumes* 2-3, ovate-mucronate, long-ciliate. *Lemna* of the hermaphrodite florets ovate-mucronate, many-nerved; palea very narrow, 2-keeled, ciliate on the keels, bifid at the top, 2-3 nerved between the keels. *Lodicules* absent. *Filaments* exerted, connate at the base into a short tube; *Stamens* purple, connective produced into a hairy acumen. *Ovary* narrowly ellipsoid, surmounted by a long slender style, ending in a single stigma. *Caryopsis* narrow, linear, mucronate.

LOWER ASSAM.

10. OXYTENANTHERA Munro.

Spikelets narrow, elongate, cylindrical or conical, often curved; bearing 1-3 florets, the uppermost usually fertile; rachilla very short; glumes 1-3; lemmas ovate, elongate, mucronate; palea of the lowest floret 2-keeled, that of the upper floret convolute or scarcely keeled; lodicules absent. *Stamens* 6, monadelphous, exerted, tube at first thick, short, afterwards elongate, membranous, anthers narrow, acute, apiculate; ovary ovoid; style slender; stigmas 3.

Arborescent or climbing bamboos. *Rhizome* thick, creeping or stoloniferous. *Inflorescence* a large panicle with spicate heads of few or many spikelets.

Key to the species of *Oxytenanthera*.

- | | | |
|----------------------------------|----|-----------------------------|
| Cilia of glumes black or purple. | .. | 1. <i>O. nigrociliata</i> . |
| Cilia of glumes white. | .. | 2. <i>O. albo-ciliata</i> . |

1. *Oxytenanthera nigrociliata* Munro, in Trans. Linn. Soc. XXVI (1868) 128.

An arborescent bamboo, evergreen, living in colonies. *Culms* 10-15 m. tall, caespitose, erect, robust, striate; floriferous branches fascicled at the nodes, up to 1 m. in length; internodes 40-70 cm. long, 5-10 cm. in diameter. *Culm-*

sheaths 15-40 cm. long, rounded-truncate at the top, densely hairy on the back with hairs caducous in the middle line, leaving two hairy regions on either side, margins ciliate; imperfect blade triangular or lanceolate, shorter than the sheath; auricles bright green, rounded, naked, hairy within; ligule narrow, faintly toothed. *Leaves* lanceolate, attenuate at the base into a short petiole, ending in a subulate twisted point, 18-35 cm. long, 3-5.5 cm. broad, somewhat scabrous above, paler below, a little hirsute at first, afterwards glabrous, tessellately nerved; leaf-sheaths stiff, hairy, glabrescent, smooth, ciliate at the edges, terminated by two small thick auricles.

Inflorescence a very large leafy decomposed panicle of spicate verticils; verticils about 2-3 cm. apart, consisting of 3-6 spikelets, some fertile, some sterile. *Fertile spikelets* narrow, cylindrical, lanceolate, 1.25-3 cm. long, ciliate with black hairs, 5-7-flowered, the lower 2-3 imperfect, the middle one hermaphrodite, the upper imperfect. *Glumes* 1-3, ovate-acute, mucronate, many-nerved, ciliate on the margins with brown, black or purple hairs; lemmas of the fertile florets lanceolate, acuminate, long-mucronate, ciliate on the margins at the top with brown or violet hairs, many-nerved; paleas as long as or shorter than the lemma, narrow, obtuse, acute or mucronate, 2-keeled, ciliate on the keels, 2-3 intracarinal nerves; lodicules absent. *Stamens* 6, long-exserted, monadelphous; tube finally 1 cm. long or longer, anthers 6-8 mm. narrow, purple, ending in long hirsute points. *Ovary* narrow, ovoid, acuminate, pubescent; style long; stigmas short; plumose. *Caryopsis* cylindrical, linear-oblong, truncate, furrowed, 14 mm. long, hairy on the top.

GARO HILLS.

2. *Oxytenanthera albo-ciliata* Munro, in Trans. Linn. Soc. XXVI (1868) 129. Local names:—*Kalia* or *Kalisundi*. Sylhet.

An arborescent bamboo, often gregarious, evergreen or deciduous. *Culms* densely tufted, 7-10 m. tall, hispid at the summit; nodes oblique, internodes 15-35 cm. long, by 1.5-2.5 cm. in diameter; walls 6-8 mm. thick. *Culm-sheaths*

thick, hard, 10-20 cm. long by 15 cm. broad, at first covered with tawny appressed hairs, afterwards smooth, folded and coriaceous at the base, somewhat truncate; limb oblong-lanceolate, about as long as the sheath, acuminate, broad and rounded at the base and decurrent; ligule long, truncate. *Leaves* linear-lanceolate, rounded at the base, shortly petioled, long-setaceous, 15-20 cm. long, 2-2.5 cm. broad, glabrous above, scabrid on one or both margins; leaf sheaths smooth, striate; ligule long, sparsely ciliate.

Inflorescence a spreading, compound panicle. *Spikelets* in sub-verticillate groups, placed laterally and alternately on the floriferous branches, having yellow, ciliate scales at the base. *Spikelets* 18-20 mm. long, pale, narrowly cylindrical, often curved, composed of two glumes, one male floret, with a (sometimes) hermaphrodite, no imperfect florets at the top. *Glumes* ovate-acute, white-ciliate. *Lemma* elliptic or ovate, acute or feebly emarginate, convolute, many-nerved, white-ciliate; palea shorter, often much shorter, ovate-obtuse, 2-keeled, ciliate on the keels, that of the upper floret not keeled, convolute, ciliate at the top. *Stamens* long exserted; anthers yellowish-green, long hirsute-apiculate. *Ovary* narrowly ovoid, long acuminate, pubescent; stigmas two. *Carypsis* elongate, oblong, cylindrical, acuminate, beaked.

SYLHET.

11. ARUNDINARIA Michaux.

Spikelets divaricate-racemose. *Glumes* indistinctly tessellate, lower subaristate; stamens 3; style 1; stigmas 3, sub-plumose.

The genus *Arundinaria* has been split up into several genera by Japanese botanists. The true *Arundinaria* grows in North America as pointed out by Nakai in Journ. Arn. Arbor. VI (1925) 189. He considers that, when the flowers of the species below become known, *A. hirsuta* and *A. rolloana* will be found to be species of *Arundinaria*, but that it is impossible to conjecture the correct genus of the remaining two species.

Key to the species of *Arundinaria*.

Flowers not known.

Culm-sheaths short, imperfect blade recurved.

Leaves with conspicuous veinlets.

- | | | | | |
|-------------------------------------|----|----|----|-----------------------|
| Culms caespitose. | .. | .. | 1. | <i>A. hirsuta</i> . |
| Culms distant. | .. | .. | 2. | <i>A. rolloana</i> . |
| Leaves without transverse veinlets. | .. | .. | 3. | <i>A. suberecta</i> . |

Culm sheaths very long, imperfect blade

erect, very long. 4. *A. mannii*.

Flowers known.

Leaves with conspicuous veinlets, tall. .. 5. *A. maling*.

1. *Arundinaria hirsuta* Munro, in Trans. Linn. Soc. XXVI (1868) 30.

A small shrubby bamboo with single stems from the rhizome. *Culms* greyish-green, 1.2-2.4 m. tall, 5-7.5 mm. in diameter, nodes glabrous, raised; internodes up to 32.5 cm. long, often strigosely hirsute above, walls rather thin. *Culm-sheaths* papery, about 15 cm. long and 2.5 cm. broad at the base, striate, covered with long, brown hairs, rounded at the top and ending in large, recurved, long-ciliate auricles; imperfect blade subulate, acuminate, recurved; ligule narrow, pubescent. *Leaves* oblong-lanceolate, 7.5-12.5 cm. long, 12.5-17.5 mm. wide, rounded at the base into a short petiole, terminating above in a subulate, twisted, scabrous point, smooth above, pale and strigosely white hairy beneath, edges cartilaginous and scabrous, serrate; leaf-sheaths striate, covered with long, stiff bristles, ending in a hairy callus, and rounded reflexed auricle, bearing long, stiff, almost spinescent, hairy bristles; ligule elongate, often dark-coloured.

Inflorescence unknown.

Forms large stretches beyond Japvo, NAGA HILLS, at 9,700 ft.

2. *Arundinaria rolloana* Gamble, Bamb. Brit. Ind. (1896) 24.

A shrubby bamboo with stoloniferous distant culms, the rhizomes at first covered with shining, acute, glabrous scales, afterwards jointed, the joints about 1.25 cm. long. *Culms* 2.4 m. tall, 2 cm. in diameter, slightly rough, green at first,

afterwards yellow, somewhat flattened on one side; nodes swollen, lower rooting; internodes 20-30 cm. long, walls rather thin. *Culm-sheaths* 10-15 cm. long, 2.5-5 cm. broad, at first covered with scattered appressed bristles, afterwards glabrous, shining, ciliate on the edges, narrowed convexly in the upper third into a rather broad, truncate mouth, which is furnished with long, recurved, rounded, falcate auricles with long bristles; imperfect blade 3.75-5 cm. long, narrow, subulate, recurved; ligule narrow. *Leaves* 15-20 cm. long, by 2.5-3.75 cm. broad, oblong-lanceolate, rounded at the base into a short, very broad petiole, terminating above in a rather short, acute point, smooth above, sparsely hairy beneath; margins cartilaginous, spinulose-scabrous; leaf-sheaths striate, sparsely strigose, hairy, ending in a narrow line and a rounded, long-ciliate auricle; ligule long, membranous, deeply cleft.

Inflorescence unknown.

NAGA HILLS, 5-7,000 ft.

3. *Arundinaria suberecta* Munro, in Trans. Linn. Soc. XXVI (1868) 32.

A graceful, erect, wiry shrub, growing in thick clumps. *Culms* 3-5 m. tall, 7.5 mm. in diameter, olive-green, smooth; nodes slightly swollen; internodes 15-25 cm. long, cavity very small; branches in whorls from the nodes. *Culm-sheaths* 5-15 cm. long, 1.25 cm. broad at the base, thin, papery, striate, glabrous, gradually attenuate upwards to a naked or fimbriate mouth; imperfect blade subulate, leafy, 1.25-3.75 cm. long, recurved; ligule long, fimbriate at the tip. *Leaves* narrow, linear, 5-10 cm. long, 5.7-5 mm. broad, narrowed at the base into an extremely short petiole, setaceous at the tip; margins scabrous, serrate, revolute, smooth above except the scabrous marginal nerves, pale beneath; leaf-sheaths striate, loose, glabrous or slightly hairy when young, ending in a callus and somewhat produced, with a few deciduous bristles; ligule rather long, pubescent.

Inflorescence unknown.

KHASI HILLS, 4,500 ft.

4. *Arundinaria mannii* Gamble, Bamb. Brit. Ind. (1896) 26.

A slender, graceful, tufted, climbing, wiry bamboo. *Culms* solid, 1.25 cm. thick 10 m. tall, branchy; nodes thickened, bearing many geniculate branches; internodes 1 m. long, smooth. *Culm-sheaths* 30-45 cm. long, convolute, apparently persistent, very thin and slender, 5-7.5 mm. broad at the top, rough with sparse, stiff, brown, appressed bristles; imperfect blade inserted on the sheath, continuous, very long, 22.5-25 cm., linear, ending in a long setaceous point, closely appressed hairy within at the base; ligule narrow, dentate. *Leaves* 15-22.5 cm. long, 17.5-25 mm. broad, thin, papery, lanceolate, rounded or attenuate at the base into a short wrinkled petiole; the tip at first thickened and scabrous hirsute, then surmounted by a long, setaceous apex; surfaces smooth above except the scabrous points on the marginal nerves, somewhat glaucous and sparsely rough hairy beneath, scabrid on one margin; leaf-sheaths glabrous, striate, ending on one side in a round shining callus without an auricle, on the other side in a short pointed auricle with a few long stiff bristles; ligule small, hairy, ciliate.

Inflorescence unknown.

JAINTIA HILLS, 3,000 ft.

5. *Arundinaria maling* Gamble, in Kew Bull. (1912) 139.

An erect shrubby bamboo, 3-9 m. tall, emerging in distant culms from a thick rhizome. *Culms* slender, erect, fistulose; internodes 30-40 cm. long, scabrid above, 2-3 cm. in diameter. *Culm-sheaths* chartaceous-coriaceous, striate, sparsely yellowish-hispid without, margins ciliate, up to 30 cm. long, 10 cm. broad, attenuate at the top, broadly auricled, auricle furnished with long, patent, rigid cilia; imperfect blade subulate, 6-7 cm. long, erect or reflexed, scabrid within; ligule 1 cm. long, fimbriate. *Leaves* chartaceous, linear-lanceolate, attenuate at the base into a short petiole, terminating above in a setaceous-acuminate point, glabrous on both surfaces, margins minutely scabrid, 5-10 cm. long, .8-2 cm.

broad; sheaths striate, glabrous except for a few cilia at the mouth and on the back; ligule pubescent, truncate, short.

Inflorescence a decompound panicle, 10 cm. long, supported at the base by spathaceous bracts; rhachis glabrous, angled; branchlets and pedicels filiform, sinuate, 1-2 cm. long. *Spikelets* 10-20, 3.5 cm. long, 7-9-flowered, distichous, alternate, uppermost empty; rachilla-joints clavate, curved, flattened on the inner surface, pubescent and ciliate, 5-6 mm. long. *Glumes* 2, ovate, scabridly setaceous-acuminate; lemma ovate, 7-9-nerved with transverse nerves, 1-1.3 cm. long, scabridly setaceous-acuminate; palea bifid at the apex, 2-keeled, ciliate on the keels, 7-8 mm. long. *Anthers* 5-6 mm. long, bifid at the apex. *Ovary* ovoid; style short; stigmas 3, long-plumose. *Caryopsis* unknown.

Piri, BALIPARA FRONTIER TRACT, 10,000 ft.

12. SEMIARUNDINARIA Makino.

Spikelets racemosely branched or paniculate; glumes coriaceous, inconspicuously tessellate; stamens 3; style 1; stigmas 3, plumose.

Shrubby bamboos; culm-sheaths appendiculate, deciduous or adherent to a dorsal point only; oral setae smooth, rigid.

Semiarundinaria pantlingii Nakai, in Journ. Arn. Arbor. VI (1925) 151, Syn. *Arundinaria pantlingii* Gamble, Bamb. Brit. Ind. (1896) 129.

An erect shrub. *Culms* tall, smooth, 1.4 cm. in diameter, slightly hairy below the nodes; nodes hairy at the base of the fallen sheath; internodes 17.5-20 cm. long. *Culm-sheaths* rather thick and tough, 25 cm. long, smooth, striate, long-ciliate on the edges, tapering upwards to a convex top; imperfect blade erect, subulate, 7.5-10 cm. long, glabrous on both surfaces, decurrent on the sheath into rounded, hairy auricles furnished with a few long curved bristles; ligule faintly ciliate, dentate, pubescent on the back. *Leaves* oblong-lanceolate, long-acuminate, 12.5-17.5 cm. long, 1.5-2 cm. broad, narrowed at the base into a petiole, ending above in a long, scabrous, twisted point, smooth above, rough beneath,

scabrid on one margin; leaf-sheaths striate, glabrous, long-ciliate on the margins, ending in a very hairy ring furnished on either side with a few long twisted bristles; ligule long, pubescent on the back.

Inflorescence of short panicles terminating the culms and the branches, supported by glabrous sheathing bracts like small culm-sheaths, the spikelets hairy on long wavy, capillary glabrous pedicels. *Spikelets* 5 cm. long or more, curved, very narrow, with 2 empty glumes, 6-10-flowered, the uppermost 2 to 4 lemmas usually barren. *Glumes* 2, lower 5 mm., the upper 10 mm. long, 3-5-nerved, ovate-acuminate, mucronate, slightly ciliate; lemmas rather longer than the upper glume, long-mucronate, 7-nerved, scabrous on the midrib; palea as long or longer than the lemma, 2-keeled, ciliate on the keels, bifid at the apex. *Lodicules* 3, obovate or ovate-acute, faintly nerved and ciliate. *Stamens* 3, filaments short; anthers linear, acute. *Ovary* glabrous; style short; stigmas 3, long-plumose. *Caryopsis* oblong, dark-brown, grooved, surmounted by the persistent base of the style.

Piri, BALIPARA FRONTIER TRACT, 10,000 ft.

13. CHIMONOBAMBUSA Makino.

Spikelets racemose; glumes not tessellate but longitudinally nerved; nerves raised; stamens 3; styles 2; stigmas plumose.

Shrubby bamboos. *Culm-sheaths* almost inappendingulate; oral setae smooth.

Key to the species of *Chimonobambusa*.

Inflorescence on leafy branches.	..	..	1.	<i>C. polystachya</i> .
Culm-nodes without spines.	..	..	1.	<i>C. polystachya</i> .
Culm-nodes with spines.	..	..	2.	<i>C. griffithiana</i> .
Inflorescence terminal; glumes mucronate.	..	..	3.	<i>C. callosa</i> .
Inflorescence axillary, glumes obtuse.	..	..	3.	<i>C. callosa</i> .
Inflorescence on separate leafless culms.	..	..	4.	<i>C. khasiana</i> .
Leaves without transverse veinlets.	..	..	4.	<i>C. khasiana</i> .
Leaves with transverse veinlets.	..	..	5.	<i>C. intermedia</i> .
Leaf-sheaths ciliate, florets 3-5 fertile.	..	..	5.	<i>C. intermedia</i> .
Leaf-sheaths not ciliate, floret 1, usually fertile.	..	..	6.	<i>C. hookeriana</i> .

1. Chimonobambusa polystachya Nakai, in Journ. Arn. Arbor. VI. (1925) 151. Syn. *Arundinaria polystachya* Kurz ex Gamble, Bamb. Brit. Ind. (1896) 7.

A small shrubby bamboo with rather soft culms. *Culm-sheaths* not known. *Leaves* soft, green, 15-20 cm. long, 15-25 mm. broad, long-acuminate, rounded or attenuate at the base into a short petiole, rough above, sparsely hairy below or smooth below, scabrid on one margin; leaf-sheaths greenish yellow, striate, glabrous, ending in a broad bifid callus, produced upwards to meet the ligule; ligule long, striate, blunt, fimbriate.

Inflorescence a terminal or axillary, racemose, leafy panicle, bearing narrow, papery bracts 2.5 cm. long; rachis channelled on one side. *Spikelets* pedicellate, 1.25-1.8 cm. long, 4-6-flowered, with the uppermost flower imperfect; rachilla claviform, visible, covered with white hairs. *Glumes* 2, ovate-acuminate, 5-7.5 mm. long, 5-7-nerved, keeled and ciliate towards the tip; lemmas ovate, long-acuminate, 10-12.5 mm. long, 7-9-nerved, ciliate on the edges; paleas longer than the lemma, 2-keeled, ciliate on the keels, mucronate, bifid at the apex, 1 nerve intercarinal and 1 nerve extracarinal. *Lodicules* 3, usually 2 ovate, obtuse, fimbriate, with 3 conspicuous areolate veins, the other veins smaller; the third ovate, acute, 3-nerved. *Stamens* exerted often flexuose; anthers long, apiculate. *Ovary* ovoid, glabrous; style short, with two long plumose stigmas.

Common in the KHASI HILLS.

2. Chimonobambusa griffithiana Nakai, in Journ. Arn. Arbor. VI. (1925) 151. Syn. *Arundinaria griffithiana* Munro, in Trans. Linn. Soc. XXVI (1868) 30.

An erect bamboo covering large areas. *Culms* erect single, 3-10 m. tall, 2.5-3.75 cm. in diameter, olive-green; nodes prominent, armed with a circle of short spines; internodes 17.5-22.5 cm. long, striate, furrowed, furnished with a ring of tawny hairs at the base of the node. *Culm-sheaths* striate, longer than the internodes, 15-22.5 cm. long, 10-12.5 cm. broad at the base, where they bear a belt of thick, tawny, soft hairs, gradually and somewhat convexly attenuate upward to

a truncate top 7 mm. broad; the apex furnished with rounded auricles, back covered thinly with scattered, stiff hairs from bulbous bases, edges ciliate; imperfect blade 5.25 mm. long, triangular, acute, hairy; ligule short, hairy, ciliate; leaves linear-lanceolate, acuminate, thin 10-12.5 cm. long, 10-12.5 mm. wide, narrowed at the base into a short petiole, terminating above in a long, setaceous, somewhat scabrous point, smooth above, pale below, margins smooth; leaf sheaths striate, glabrous, ciliate on the edges, ending in a narrow ring with a few curved bristles; ligule hairy without.

Inflorescence a terminal panicle, surrounded with sheathing bracts, hairy at the base and ciliate on the edges. *Spikelets* 2.5-3.75 cm. long, narrow with 2 empty glumes, 4-6-flowered in verticillate clusters on thin wavy scabrid hairy pedicels; rhachis hairy, flattened on one side; rhachilla long, 5.7-5 mm., flattened, hairy, ciliate at the clavate top. *Glumes* 2, ovate-lanceolate, mucronate, 5-7-nerved, scabrous hairy on the back; lemmas 12.5 mm. long, lanceolate, long mucronate, scabrous, hairy above, 7-nerved; paleas nearly as long, himucronate, 2-keeled, ciliate on the keels. *Lodicules* 3, obovate, faintly nerved, long ciliate, one shorter and narrower. *Stamens* apparently not exerted; anthers emarginate, crowned with a few fine long hairs. *Ovary* linear-oblong; glabrous, style short; stigmas 2, long, plumose.

A very common bamboo in the NAGA, KHASI and AKA HILLS. It often forms the only underwood in evergreen hill forest.

3. *Chimonobambusa callosa* Nakai, in Journ. Arn. Arbor. VI. (1925) 151. Syn. *Arundinaria callosa* Munro, in Trans. Linn. Soc. XXV (1868) 30.

A shrubby thorny bamboo. *Culms* 4-7 m. tall, 1.25-2.5 cm. in diameter, greyish-green, smooth, striate when young; nodes raised in a ring which is subtended by the base of the fallen sheath fringed with soft brown hairs, and which is studded with thick, short, conical spines, the said spines breaking through the sheath when the latter is detached; internode 15-25 cm. long, nearly solid at the base, the wall higher up being rather thin. *Culm-sheaths* as long as or longer than the internodes, loose, thin, striate, smooth, transversely veined,

ciliate on the edges, gradually attenuate upwards from a hairy base to a 5 mm. truncate apex; imperfect blade 12·5-25 mm. long, subulate, hairy without and within, decurrent on the sheath in long-fringed, short auricles; ligule 2·5 mm. long, fimbriate. *Leaves* 20-22·5 cm. long, 17·5-32·5 mm. wide, oblong-lanceolate, thin; unequally attenuate at the base, shortly petioled, terminating in a scabrous acuminate point, finely glandular-scabrous above, especially on the marginal veins, pale and pubescent beneath, scabrid-serrate on the margins; leaf-sheath densely tawny pubescent, glabrescent, ending in a short ciliate callus, with a few, stiff, curved bristles.

Inflorescence a branched panicle ending in a leafy branchlet; the nodes of the panicle subtended by sheathing papery bracts. *Spikelets* 5-7·5 cm. long, subtended by glabrous, narrow, straw-coloured bracts 6-12-flowered; rhachillae very prominent, 5 mm. long, curved, flattened, glabrous. *Glumes* 2, short, glabrous, ovate-acute, 1-3-nerved; lemmas ovate, acute, mucronate, ciliate at the apex, 3-7-nerved; paleas acute, 2-keeled, thickly pubescent, keels ciliate. *Lodicules* 3, ovate, faintly nerved, fimbriate, one smaller. *Anthers* short blunt. *Ovary* ovate, glabrous; style short; stigmas 2, shortly plumose.

AKA and KHASI HILLS, 5-6,000 ft. Also found on the Saramethi ridge at 7,000 ft.

4. *Chimonobambusa khasiana* Nakai, in Journ. Arn. Arbor. VI. (1925) 151. Syn. *Arundinaria khasiana* Munro, in Trans. Linn. Soc. XXVI (1868) 30.

A thick bushy shrub. *Culm* 2·5-4 m. tall, 1·25 cm. in diameter, smooth, dark green, almost black; nodes prominent; internodes 15-20 cm. long; branchlets very many from the nodes, geniculate, dark-coloured. *Culm-sheaths* papery, straw-coloured, 15-22·5 cm. long by 3·75-5 cm. broad at the base, striate, smooth, upper part with transverse veinlets, tapering from the middle to a narrow tip; imperfect blade narrower than the apex of the sheath, subulate, recurved, 2·5 cm. long; ligule 5-7·5 mm. long, subulate, dentate or lacerate. *Leaves* linear-lanceolate, 7·5-10 cm. long by 7·5 mm. broad, attenuate at the base into a short petiole, terminating above in a twisted setaceous point, smooth on both sides or sometimes slightly

pubescent beneath, scabrid on both margins; leaf-sheaths thin, striate; ligule rather long.

Inflorescence on separate leafless culms, consisting of falcate, branching, geniculate panicles, fascicled at the nodes, and subtended by membranous, short ovate bracts. *Spikelets* 1-1.25 cm. long, 2-3-flowered; rhachilla produced. *Glumes* 2, short, the lower 3-, the upper 5-7- nerved, shortly mucronate, ciliate at the tip and on the margins; lemmas similar, longer and stiffer, sometimes minutely scabrous-pubescent; paleas longer than the lemmas, 2-keeled, glabrous except the ciliate tip, acute or bifid, 1-nerved on either side of the keels. *Lodicules* 3, ovate-obtuse, or one acute, fimbriate, 3-7-nerved, nerves brown. *Anthers* blunt at the apex. *Ovary* glabrous, elliptic; *style* short; *stigmas* plumose.

Quite common in the KHASI HILLS, 5-6,000 ft.

5. *Chimonobambusa intermedia* Nakai, in Journ. Arn. Abor. VI. (1925) 151. Syn. *Arundinaria intermedia* Munro, in Trans. Linn. Soc. XXVI (1868) 28.

A slender caespitose bamboo. *Culms* smooth, greyish-green, 3-4 m. tall; nodes swollen with a prominent ring and a whitish line below them; internodes 12.5-25 cm. long; branches many from the nodes. *Culm-sheaths* glabrous, papery, strongly striate, 20-25 cm. long, by 2.5-5 cm. broad, ciliate below the blade; imperfect blade narrow, subulate, up to 5 cm. long, recurved; ligule up to 5 mm. long, blunt. *Leaves* bright green, very variable, 7.5-20 cm. long, attenuate at the base into a short swollen petiole, terminating in a setaceous point, scabrous above and on both margins, pale and smooth or hairy near the mid-rib beneath; leaf-sheaths striate, glabrous or with scattered, long, stiff hairs above; callus minute; auricle falcate with curving, deciduous bristles; ligule elongate, obtuse or triangular.

Inflorescence on leafless stems consisting of racemose panicles verticillate from the nodes, subtended by membranous bracts; rhachis smooth, dark, with small triangular bracts below and sometimes a tuft of hair above at the axils. *Spikelets* 1.25-2.5 cm. long, yellow or purplish, 3-5-flowered, rhachilla produced and crowned by an imperfect floret or

naked; rhachilla clavate, compressed, long ciliate above. *Glumes* 2, pale, ovate, membranous, the lower 3-5-, the upper 7-9- nerved, blunt or acute, ciliate at the tip; lemma similar but shortly mucronate, 7-9-nerved, often minutely scabrous on the dorsal surface; palea longer than the lemma, bi-mucronate, 2-keeled, ciliate on the keels. *Lodicules* 3, ovate, fimbriate. *Stamens* slightly exerted; anthers blunt or slightly apiculate. *Ovary* linear-oblong, glabrous; style short; stigmas 2, plumose; caryopsis short, oblong, swollen in the middle, tipped with the persistent base of the style.

Piri, BALIPARA FRONTIER TRACT, 10,000 ft.

6. *Chimonobambusa hookeriana* Nakai. in Journ. Arn. Abor. VI. (1925) 151. Syn. *Arundinaria hookeriana* Munro, in Trans Linn. Soc. XXVI (1868) 29.

A caespitose bamboo. *Culms* 5-6 m. tall, glaucous-green in colour, covered with a white scurf when young, often striated green and yellow: nodes with dark bluish rings below, prominently ringed with the persistent base of the sheath; internodes 20 cm. long, fistular; walls thin. *Culm-sheaths* papery striate, 30-60 cm. long, 7.5-15 cm. broad at the base, attenuate to a truncate summit; imperfect blade linear, 7.5-15 cm. long, 2.5-3.5 mm. broad; ligule short. *Leaves* linear-to oblong-lanceolate, glaucous-green when young, 15-30 cm. long, attenuate at the base into a short petiole, ending above in a scabrous setaceous point, somewhat rough above, pale and glabrous beneath, margins scabrous; leaf-sheaths striate, glabrous but minutely ciliate at the margins, ending in a broad callus and thin membrane without bristles; ligule long, conspicuous.

Inflorescence of loose, falcate, racemose panicles fascicled at the nodes of a leafless culm. *Spikelets* about 8 mm. long, pedicellate, 1-flowered with a terminal imperfect floret. *Glumes* 2, oblong, thin, membranous, the lower 2.5, the upper 5 mm. long; the lower 3-nerved hairy at the tip, the upper 5-nerved, mucronate; lemma large, hard, broadly ovate, involute, angled, prominently 3-nerved; palea thick, 2-keeled, glabrous, hirsute on the prolonged tip. *Lodicules* 3, thickened at the base and coloured, obovate, acute or rounded, fimbriate, 3.5-

nerved. *Stamens* exerted, anthers subacute. *Ovary* ellipsoid, glabrous; style short; stigmas 2, short, plumose. *Grain* ellipsoid, dark, smooth, tipped with the pointed base of the style.

Piri, BALIPARA FRONTIER TRACT, 6-8,000 ft.

14. SINOBAMBUSA Makino.

Spikelets racemose, sub-phyllipodous; glumes tessellate, acute; stamens 3; styles 2; stigmas plumose.

Shrubby bamboos. *Culm-sheaths* deciduous, appendiculate; internodes extremely long; oral setae smooth, rigid.

Sinobambusa elegans Nakai. in Journ. Arn. Arbor. VI (1925) 152. Syn. *Arundinaria elegans* Kurz, in Jour. As. Soc. Beng, XLII (1873) 248.

An evergreen, slender, tufted, shrubby bamboo. *Culms* green or blackish, 4-7 m. tall, flattened on one side in alternate internodes; nodes somewhat raised; internodes 17-23 cm. long. *Culm-sheaths* one-third the length of the internodes, papery, striate, minutely hispid above, narrowed in the upper third to a truncate mouth bearing minute auricles; imperfect blade narrow, subulate, recurved; ligule rather broad, finely ciliate. *Leaves* linear-lanceolate, long-acuminate, 10-12·5 cm. long, 7·5-12·5 mm. wide, shortly petioled, smooth above, glaucescent beneath, cartilaginous and scabrid on the margins, tessellately nerved; sheaths striate, smooth, ending in a minutely ciliate callus; ligule very short.

Inflorescence a terminal interrupted leafy panicle or raceme, bearing pedicellate spikelets; rhachis thin, wiry, curving, pubescent. *Spikelets* 2·5 cm. or more long, flattened, 7-8-flowered; rhachilla visible, wiry, clavate. *Glumes* 2, 5 mm. long, 3-5-nerved, ovate-acuminate, keeled, ciliate on the keel; lemmas similar, 7-nerved, with transverse veins; palea shorter, 2-keeled, white-ciliate on the keels, obovate, bifid at the apex, 2-nerved between the keels, 1-nerved on either side. *Lodicules* 3, 3-5-nerved, ovate, acute, long-ciliate. *Stamens* hardly exerted; anthers purple, rounded or mucronate at the tip. *Ovary* smooth, oblong, surmounted by the short style; stigmas 2, white plumose.

A common bamboo on the slopes of Pulebadze, Kohima, NAGA HILLS, where it is much sought after as the shoots are made into a pickle.

15. THAMNOCALAMUS Falconer.

Spikelets 1-8-flowered, with upper florets more or less incomplete, arranged in simple leafy racemes, the leaves forming sheaths or bracts. *Glumes* indistinctly nerved, about a third shorter than the spikelets; lemma acute or long-acuminate, equalling or exceeding the palea in length; lodicules 3, rarely 6. *Style* short; stigmas 3.

Caespitose bamboos. *Culms* fistular, cylindrical, arching; culm-sheaths rapidly caducous. *Inflorescence* with sheathing bracts at the base.

Key to the species of *Thamnocalamus*.

Erect shrubs.

Transverse veinlets conspicuous; bracts large.

Bracts narrow, enclosing 2-3 spikelets. .. 1. *T. spathiflorus*.

Bracts broad, enclosing 3-5 spikelets. .. 2. *T. aristatus*.

Transverse veinlets inconspicuous; bracts short. 3. *T. fulconeri*.

Scandent shrub, 4. *T. prainii*.

1. *Thamnocalamus spathiflorus* Munro, in Trans. Linn. Soc. XXVI (1868) 34. Syn. *Arundinaria spathiflora* Trin. in Mem. Acad. Petersb. Ser. 6. III (1835) 617.

A gregarious, caespitose, shrubby bamboo. *Culms* up to 6 m. tall, smooth, fistular; internodes 15-36 cm. long; branches 30-45 cm. long, woody, glabrous; branchlets semi-verticillate, fasciculate, shining; nodes hardly prominent, marked by a white ring. *Culm-sheaths* straw-coloured, coriaceous, thin, loose, smooth inside, striate without, with ciliate margins; margins parallel to near the top where they are slightly narrowed convexly into a truncate, rounded mouth; imperfect blade 5-10 cm. long, erect, subulate, decurrent on the sheath, caducous; ligule short, fimbriate. *Leaves* clustered in groups of 2-4 at the ends of short, jointed branches which bear loose, narrow, yellow sheaths, 7.5-12.5 cm. long, linear-lanceolate, attenuate at the base into a short petiole, terminating above in an acute hairy point, smooth on

both surfaces, scabrous on the margins; leaf-sheaths loose, 5.7-5 cm. long, straw-coloured, striate, ciliate on one margin, truncate at the top into a narrow, ciliate callus and bearing short auricles with a few long purple bristles; ligule long ciliate.

Inflorescence usually on separate leafless culms, sometimes leafy; rhachis very slender, much jointed, bearing at the joints papery straw-coloured, narrow sheaths 3.75-7.5 cm. long, truncate or with an imperfect blade, which enclose 2-3 pedicellate (or one sessile) spikelets. *Spikelets* loose, compressed, 2.5-6.25 cm. long, with 2 glumes and 4-8 hermaphrodite florets; rhachilla long-clavate, white-hairy at the tip. Glumes 2, linear-lanceolate; one obtuse, short, the other long, mucronate, striate, glabrous; lemmas ovate, long-acuminate, mucronate, 1.5-2.5 cm. long, scabrous, striate; palea much shorter, 2-keeled, ciliate on the keels, sometimes bifid, 1-2-nerved. *Lodicules* 3, ovate-falcate or ovate-acute, 3-5-nerved, fimbriate. *Stamens* long-exserted; anthers blunt. *Ovary* glabrous, ovoid, elongate; style short; stigmas 3, long plumose. *Caryopsis* linear-oblong, glabrous, furrowed.

Probably occurs on Piri, BALIPARA FRONTIER TRACT, 10,000 ft., as it is common in BHUTAN.

2. *Thamnocalamus aristatus* E. G. Camus. *Bambusées* (1913) 54. Syn. *Arundinaria aristata* Gamble. *Bamb. Brit. Ind.* (1896) 18, t. 17.

A tufted bamboo with robust culms. *Culms* at first mealy white, then glaucous green, afterwards a brilliant yellow, 2.5-4 m. high, 12-15 mm. in diameter; nodes hardly inflated; internodes 20-30 cm. long. *Culm-sheaths* 15-20 cm. long, 7.7-5 cm. broad at the base, gradually attenuate towards the truncate summit; ligule short, pubescent; imperfect blade linear, scarcely subulate, decurrent, 24-48 mm. long. *Leaves* grouped in twos and threes at the top of the branchlets, oblong-lanceolate, attenuate at the base into a long, glandular, 4.5 mm. long petiole, terminating above in a setaceous point, glabrous or sparsely hairy below, scabrid on one margin; median nerve narrow shining; lateral nerves 3-5 pairs, tessellate; leaf-sheaths lax, striate, 5-7.5 cm.

long, terminating in a callus clothed with long hairs; ligule long, acute or truncate.

Inflorescence composed of long racemes grouped in panicles at the top of the culms, the articulations of the branchlets with large spathe-like bracts, which enclose 3-5 shortly pedicelled spikelets. *Bracts* 36-50 mm. long, 12-15 mm. broad, carrying a foliaceous, more or less developed, limb. *Spikelets* 25-50 mm. long, 4-8-flowered, terminal floret barren; rhachilla visible, articulate, whitish, hairy below the nodes. *Glumes* similar, membranous, oblong-lanceolate, scaberulous at the top, keeled, mucronate, 3-5-7-nerved. *Lemma* ovate, long acuminate, dark coloured, scabrous-hirsute, with 9 prominent nerves; palea somewhat shorter, 2-keeled, 2-cuspidate at the top, with ciliate keels, scabrous, nerved within and without the keels. *Lodicules* lanceolate-acute, ciliate, 3-nerved. *Stamens* purple, obtuse at the apex. *Ovary* ovate, short-styled with 3 hairy stigmas. *Grain* linear-oblong, dark brown in colour, furrowed on one side.

On Piri, BALIPARA FRONTIER TRACT, 10,000 ft.

3. *Thamnocalamus falconeri* Hook, f. *apud* Munro, in Trans. Linn. Soc. XXVI (1868) 34. Syn. *Arundinaria falconeri* Benth. et Hook. f., Gen. Pl. III, 1208.

A laxly caespitose bamboo. *Culms* fistular, smooth when young, covered with a white scurf when old, frequently striped yellow and green; nodes raised; internodes 10-15 cm. long; branchlets almost filiform, rigid, fascicled at the nodes. *Culm-sheaths* striate, hairy when young, straw-coloured, papyraceous. 20-30 cm. long, 50-75 mm. broad, ciliate on the margins, attenuate and truncate at the top; imperfect blade subulate, recurved, 7.5-12 cm. long, 5-7 mm. broad; ligule narrow, hairy. *Leaves* 7.5-10 cm. long, 7-14 mm. broad, narrow, thin, pale, attenuate at the base into a somewhat long petiole furrowed above, ending above in an acuminate or subsetaceous point, scabrid on the margins; sheaths glabrous, truncate above, not fimbriate; ligule elongate, hairy.

Inflorescence a panicle with racemosely arranged branchlets, with one or more racemes of spikelets 2.5 cm. long,

supported at the base by spathiform and chaffy bracts. *Spikelets* 5-7 in each raceme, glabrous, 7-9 mm. long, shortly pedicelled, 1-flowered or rarely 2-flowered; rhachilla produced and carries a sterile floret. *Glumes* 2, membranous, oblong, acute or mucronate, 3-5-nerved; lemma ovate-lanceolate, 5-7-nerved, shortly mucronate, ciliate at the tip; palea as long or longer, 2-keeled, furrowed on the back, bifid at the top. *Lodicules* almost equal, fimbriate. *Stamens* exserted, obtuse or shortly apiculate, purple. *Ovary* ovate, glabrous; style short; stigmas 3. *Grain* linear, oblong, furrowed.

Piri, BALIPARA FRONTIER TRACT, 10,000 ft.

4. *Thamnocalamus prainii* E. G. Gamus, *Bambusées* (1913) 54. Syn. *Arundinaria prainii* Gamble, *Bamb. Brit. Ind.* (1896) 21.

A small, wiry, climbing shrub. *Culms* thin, slender, smooth, yellowish, curving, up to 10 m. long, 5-7.5 mm. in diameter; nodes swollen in a well-marked ring; internodes short, usually 20-22.5 cm. long, wall thick, often quite solid; branches fasciculate at the nodes. *Culm-sheaths* thin, somewhat scabrous above, 2-15 cm. long; 10-20 mm. broad, attenuate convexly in the upper half to a narrow edge; imperfect blade short, 2.5-5 mm. long, subulate; ligule short, rounded. *Leaves* thin, oblong-lanceolate, 5-10 cm. long, 7.5-17.5 mm. wide, round at the base into a short petiole, terminating above in a long, curved, setaceous point, scabrid on one margin; leaf-sheath striate, smooth; ligule long, rounded, blunt.

Inflorescence in terminal or axillary panicles, bearing distant spikelets in the axils of sheath-like straw-coloured bracts; rhachis very slender, wiry, smooth, geniculate. *Spikelets* 2.5-3.5 cm. long, on slender pedicels, 3-6-flowered, uppermost flower imperfect, distichously arranged on the alternate sides of a wiry flexuose rhachis. *Glumes* usually 2 (or 3), the lower keeled, ciliate on the margins, lanceolate, the upper ovate-acute, 3-5-nerved, ciliate at the tip; lemmas triangular, falcate, acute, glabrous, 9-11-nerved; paleas falcate, as long as the lemmas, 2-keeled, minutely ciliate on the keels, acute or bifid at the apex. *Lodicules* 3, two broadly

ovate, 3-nerved, ciliate, the third lanceolate-acute, 1-3-nerved. *Stamens* 6; anthers purple, bluntly apiculate. *Ovary* oblong, hairy above; style thick, bulbous at the base; stigmas 3, plumose.

On Pulebadze, Kohima, NAGA HILLS, 6,000 ft.; also in the JAINTIA HILLS about 3,500 ft.

16. PHYLLOSTACHYS Sieb. et Zucc.

Spikelets sessile, 1-4-flowered; rhachilla articulate between the florets; glumes 1-2, many-nerved, often unequal, glabrous, often ending in an imperfect limb; lemmas ovate-lanceolate, acuminate, many-nerved; paleas 2-keeled, often bi-mucronate, many-nerved; lodicules often 3, unequal, lanceolate-acute, nerved. *Stamens* 3, long exerted; anthers linear. *Ovary* stipitate, ovoid or globose, glabrous; style long; stigmas 3, long, plumose.

Shrubby or arborescent bamboos, caespitose. *Culms* smooth, rough or pubescent, flattened on one side in alternate nodes; nodes prominent; internodes rather short; branches 2-3-nate at the nodes; culm-sheaths papyraceous, striate, tessellate, rounded, ending in a subulate imperfect limb. *Leaves* small or medium-sized, petioled, articulate on the sheath; sheaths loose, smooth.

Inflorescence a terminal panicle, rather lax, covered with spatheform, imbricate bracts, which often end in an imperfect limb.

Key to the species of *Phyllostachys*.

Leaves thin, leaf-sheaths long, bristly at the mouth.	.. .. .	1. <i>P. assamica</i> .
Leaves thick, leaf-sheaths with hardly any bristles at the mouth.	.. .. .	2. <i>P. mannii</i> .

1. *Phyllostachys assamica* Gamble ex Brandis, Ind. Trees (1906) 667.

A caespitose bamboo. *Culms* 10-12 m. tall, brilliant green in colour, up to 20 cm. in diameter, sometimes more, with a waxy ring below the nodes which disappears with age; nodes glabrous and internodes short. *Culm-sheaths* 15-25 cm. long, thin, contracted at the summit into a short, truncate

or rounded collar, covered with black hairs, which are at first appressed, afterwards erect and caducous; imperfect limb subulate, papyraceous, at first erect then turned backwards and downwards; striations dark green in the centre, pink on the margins; auricles small if present, often absent. *Leaves* broadly linear, glaucous, shortly petioled, somewhat long acuminate-setaceous at the tip, 8-12 cm. long, 12-16 mm. broad, toothed on the margins, covered on the lower surface with stiff white hairs; sheaths keeled, ciliate on the margins, shortly auricled, throat with a few hairs.

Inflorescence a panicle made up of spikes of lanceolate spikelets; bracts ciliate at the throat, with a foliaceous limb, large, ovate-lanceolate, 35 mm. long, by 20 mm. broad. *Spikelets* brownish or greenish, 20-25 mm. long, with 3-5 perfect florets, the upper floret imperfect. *Lower glume* very large, rather like a sheath, often terminated by a very small limb; upper glume short, oblique, obliquely acute, few-nerved, 2-keeled, those of the upper spikelets longer and with more unequal sides, often absent in the uppermost spikelet; lemmas ovate-acute, many-nerved; nerves strong; paleas as long as the lemmas, narrow, bi-mucronate at the top, 2-keeled, ciliate on the keels. *Lodicules* ovate-lanceolate or oblanceolate, sometimes emarginate or bifid, fimbriate, 3-7-nerved unequal. *Stamens* exerted, pendulous; connective apiculate. *Ovary* ovoid, furrowed at the base.

MISHMI HILLS, collected by Griffith near Preamsong's village.

2. *Phyllostachys mannii* Gamble, Bamb. Brit. Ind. (1896) 28.

A caespitose shrub. *Culms* 5-6 m. tall, 2.5-3 cm. in diameter; internodes 20 cm. long, yellow, flattened on one side. *Culm-sheaths* papery, straw-coloured, 20-22.5 cm. long, 2.5-5 cm. broad, rounded at the top and truncate, extended at the base of the blade into two short, fimbriate, caducous, curved auricles; imperfect blade 5.7-5 cm. long, recurved, narrow, subulate, decurrent on the sheath; ligule broad, long-pectinate. *Leaves* thick, 10-12.5 cm. long, 1.25-2 cm. wide, rounded at the base into a petiole 7.5 mm. long, shortly acuminate at the tip, smooth and glabrous on both surfaces

except for a few-white hairs near the midrib below, spinulose-serrate on one edge; transverse nerves extremely numerous; leaf sheaths loose, glabrous, smooth, straw coloured, ending in a narrow ciliate callus with a few deciduous bristles.

Inflorescence unknown.

This bamboo is commonly cultivated in Shillong. KHASI HILLS, 5,000 ft.
