

The Taxonomy and Cultivation of *Chimonobambusa* Makino

by Wen Taihui

Zhejiang Forestry Institute
Hangzhou, China

During the preparation of this issue, we received the unhappy news that Dr. Wen had passed away after struggling with pancreatic cancer. We elected to follow through with the publication of this monograph even though there may be defects that only Dr. Wen could have corrected. We gratefully acknowledge the help of Dr. Lynn Clark who reviewed the manuscript and to Mr. Wen Zuomin, Dr. Wen's son, and Mr. He Xiaoling for providing us with the final illustrations.

Kenneth Brennecke
V. Grant Wyborney
Editors



Chimonobambusa tumidinoda (Hsueh & Yi) Wen



Wen, Taihui. Professor at the Zhejiang Forestry Institute. Professor Wen was born in 1924 in Pingyang County, Zhejiang Province. He graduated from the Department of Forestry at Zhejiang University. He worked at the Forestry Division of the Agriculture and Forestry Department of Zhejiang Province as Chief of the investigation and statistics section, forest protection section, forest management section, and bamboo forest section. Later, he worked at the Zhejiang Forestry Institute as Vice-President, and at the same time he was a member of the council of the Zhejiang Forestry Association, President of the Zhejiang Province Bamboo Association, and a member of the American Bamboo Society. His long-term research involved bamboo classification, morphology, anatomy, culture, management, and history. He visited India, Thailand, and the United States for bamboo research and meetings. Prof. Wen described three new genera and more than 60 new species. He published papers on the use of characters of the vascular system and fruits in bamboo classification, and he proposed several new methods for forestry management, including use of measurements of bamboo culm weight, stand volume, leaf area index, and other forest stand measurements. He also presented some new theories about growth of bamboo forests and bamboo stands, an economic index, and the origin of bamboos. With regard to the history of bamboo, he determined the probable distribution of bamboo in China 4,000 years ago, and also wrote about the history of bamboo management in China. Professor Wen passed away January 20th, 1993.

Foreword

Although I never met Professor Wen Taihui, I gained an appreciation of his taxonomic philosophy and work on bamboos through our correspondence, and I am pleased to be able to write this foreword to his long-anticipated monograph of *Chimonobambusa*. Professor Wen spent many years conducting research on Chinese bamboos; his many publications on bamboos reflect the care with which he studied the specimens and plants available to him, as well as the depth of his knowledge. Dr. Wen was also familiar with Western literature on bamboos, and made efforts to communicate with taxonomists outside of China who were interested in bamboo. Taxonomically, Dr. Wen tended to recognize groups (especially genera) based on shared similarities rather than splitting fine differences, in keeping with his broad perspective on bamboos. Professor Wen was diligent in his replies to my letters and questions, and continued to respond up until just a few months before his death. With Dr. Wen's passing, China lost one of its foremost authorities on bamboo.

The present work can be considered a monograph, which in taxonomic terms is an authoritative treatment of a group of plants (or other organisms) that includes descriptive materials well as data on the taxonomic history, distribution, and evolutionary relationships of the group. This treatment of *Chimonobambusa* represents Dr. Wen's accumulated knowledge of this genus, and incorporates his views on the boundaries of the genus, although he did not discuss relationships of the species within *Chimonobambusa*. Included in this monograph are discussions of basic morphology, a taxonomic history of the genus, and cultural information, as well as the basic taxonomy, descriptions and distribution of the 33 species he recognized as belonging to *Chimonobambusa*. A key to the species of *Chimonobambusa* is also included, which should prove useful for both botanists and enthusiasts alike.

Dr. Wen's emphasis on shared similarities led him to recognize a broadly defined *Chimonobambusa*, including the genera *Oreocalamus* and *Qiongzhusuea*. While there is general agreement that *Oreocalamus* is synonymous with *Chimonobambusa* and should not be recognized as a separate genus (Soderstrom and Ellis, 1987; Zhang, 1992; Zhu, Ma and Fu, 1994; J. Campbell, pers. comm.), the inclusion of *Qiongzhusuea* in *Chimonobambusa* has been more controversial (Hsueh and Zhang, 1988; Zhang, 1992; Hsueh and Li, 1993). Even if *Chimonobambusa* and *Qiongzhusuea* are maintained as separate genera, all agree that the two entities are closely related and share many vegetative and reproductive features (Zhang, 1992; Hsueh and Li, 1993; Zhu, Ma and Fu, 1994; Wen, this work; J. Campbell, pers. comm.). These differences in classification are not meant to confuse the non-taxonomist, but they do reflect sincere differences in opinion about the degree of relatedness (or divergence) between *Chimonobambusa* and *Qiongzhusuea*, and the rank at which these two taxa should be placed in the taxonomic hierarchy. Evidence can be found to support both positions.

Hsueh and Li (1993), Zhang (1992) and Hsueh and Zhang (1990) admitted that *Chimonobambusa* and *Qiongzhusuea* share a very similar morphology of inflorescences, spikelets and florets, but pointed out that the two shoot at different times of the year, have somewhat different altitudinal distributions, exhibit different chromosome morphologies, and cite chemical data in which the isozymes of the two are distinct. Wen (1991; this work) emphasized the similarities in reproductive structures between these two, as well as similarities in branching and rhizomes, to justify maintaining one genus with subdivisions based on the vegetative differences highlighted by Hsueh and co-workers. At another level, it is difficult to find agreement on the numbers of species included within *Chimonobambusa* (and *Qiongzhusuea* if recognized), and the same species are not always listed for these genera among the different treatments.

Thus the present work represents a significant contribution to our knowledge of

Chimonobambusa, but like any taxonomic treatment, it is the best approximation currently available. I hope that the accumulation of more data will help future bamboo taxonomists to refine this classification of *Chimonobambusa* and to build on the very strong foundation laid by Professor Wen.

In closing, I would like to thank Ken Brennecke for his efforts in guiding this manuscript through to publication. In particular, Ken's meticulous attention to the artwork and maps improved their quality tremendously, and ultimately, high-quality illustrations make any monograph more usable. Regrettably, Dr. Wen died while still in the process of revising and correcting the manuscript, but Ken handled this complex situation nicely. It is my hope that this work will stimulate more interest in and study of *Chimonobambusa* and its relatives, and I am sure that also would have been Professor Wen's wish.

Lynn G. Clark
Department of Botany
Iowa State University
October, 1995*

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*Although the text of this material was compiled and solidified in 1993, publication was delayed until 1996 due to technical difficulties. Editors.

Preface

Chimonobambusa Makino is an interesting and mystic group of bamboo. Some species of *Chimonobambusa* have quadrangular culms, or very tumid nodes, and its shoots appear during the colder season. The genus is distributed at altitudes of 500 to 2600 m in China, Burma, Laos, Japan and India. These plants are able to endure cold, and may be introduced to high altitude and humid areas. Its shoots are noted as a delicious food; it was an item offered as a tribute for kings in China 2000 years ago. The Qiongzhu stem is very interesting; Pan Ku in his book "The History of the Han Dynasty" recorded a story about the Qiongzhu stick. An ambassador, Zhang Qian, came from Central Asia, and told his king: "There he saw the Qiongzhu stick and Sichuan's coins, it took a roundabout way from India to Central Asia." So, we can understand that the Qiongzhu stick was transported to Central Asia and India from China during the Han Dynasty (126 B.C.). Some species of *Chimonobambusa* are of high value as ornamental plants, and some are rare handicraft material which can under good forest management produce high volumes of culms and shoots.

For a long time, the general knowledge of *Chimonobambusa* was very poor. This book perhaps can help people who are curious about this bamboo to understand it. "The Taxonomy and Cultivation of *Chimonobambusa* Makino" is an English handbook, that includes three new Sections, 33 species, and 18 forms of *Chimonobambusa*, with 38 line drawings and a colored phytograph showing their morphology and distribution. Also included are history, morphology, distribution, conditions of growth, cultural information, and taxonomy.

Therefore, it is hoped that this treatment will be most useful for the identification of *Chimonobambusa* and its cultivation; moreover, it is a reference book for technical personnel and teachers of botany, forestry, agriculture and horticulture.

Dr. Wen Taihui
February 24, 1990



Chimonobambusa marmorea (Mitford) Makino

Taxonomic History

Chimonobambusa Makino was first recognized as a genus by Makino (1914) and was studied by Nakai (1925) with Latin diagnoses. When Makino first published this genus, he included two species *Chimonobambusa marmorea* (Mitf.) Makino and *C. quadrangularis* (Fritz) Makino. However, neither Makino nor Nakai designated a type species of this genus. Rehder (1949) selected *Chimonobambusa marmorea* (Mitf.) Makino as the type species of *Chimonobambusa*. That decision was correct because to this day *Chimonobambusa quadrangularis* (Fritz) Makino has not been found in flower, but the flowers of *Chimonobambusa marmorea* (Mitf.) Makino had been described from the first. So we can conceive that when Makino described the flower of *Chimonobambusa* he was using material of *Chimonobambusa marmorea*.

Chimonobambusa marmorea is based on *Bambusa marmorea* Mitf. (1894, 1896). Latour Marliac introduced this species from Japan to France, and from France to the Royal Botanic Garden, Kew, England, where the type specimens "Kew Royal Garden 16" and "Kew Royal Garden 17" were collected and preserved in Kew Royal Garden such that the number 16 is a lectotype.

Nakai (1925) transferred 10 species to *Chimonobambusa*. Although he did not understand these species very well, most of the combinations are correct in my opinion. Nakai (1933) published a new genus *Tetragonocalamus*, a single species at that time. This species, *Tetragonocalamus angustus* (Munro) Nakai, was designated as the type species of *Tetragonocalamus* by Nakai. *Tetragonocalamus angustus* (Munro) Nakai is based on *Bambusa angusta* Munro. Later, McClure checked the type specimens of *Bambusa angusta* Munro and stated that it was a synonym of *Bambusa breviflora* Munro. I agree with McClure's opinion.

Therefore, *Tetragonocalamus* Nakai would be a synonym of *Bambusa*. But because Nakai in his first published account in the Journal of Japanese Botany 9(2):90, said "If *Bambusa angulata* differs specifically from *Bambusa quadrangularis*, the scientific name of Shihetsik should be *Tetragonocalamus quadrangularis* (Fenzi) Nakai," so this scientific name is used by some persons. In any case, this is an obscure name, because the main description of *Tetragonocalamus* is following *Bambusa breviflora* Munro. As Nakai described: "*Culmus sympodiellus simulque, monopodialis. Inflorescentis paniculata efloida viridescenti-albida, ramis angulatis, angulo ciliato. Spiculae dense congeste 5-6 flores. Flores hermaphroditi. Gluma exterior 1, interior 1, paleae 3, staminia 6, stigmata 3.*"

My teacher, Keng Y.Z. (1940), published a new genus *Oreocalamus* Keng, and designated *Oreocalamus szechuanensis* (Rendle) Keng as the type of *Oreocalamus*. It is based on *Arundinaria szechuanensis* Rendle (1914); the type was collected in China, western Szechuan Obian, Washan, in June 1908, by E. H. Wilson No. 3408 (type) preserved in the Herbarium of the Arnold Arboretum. At the same time, Keng Y.I. published another species *Oreocalamus utilis* Keng, in the same paper. Keng, P.C. (1948) transferred *Oreocalamus szechuanensis* and *O. utilis* to *Chimonobambusa*.

McClure described *Chimonobambusa microfloscula* in Lingnan University Science Bulletin No. 9, 1940 and transferred *Chimonobambusa naibumensis* (Hayata) McClure et W.C. Lin, from *Arundinaria* (1974). Later, *C. naibumensis* was found to have sympodial

rhizomes and determinate inflorescences, so it cannot belong to *Chimonobambusa*. Accordingly, I transferred it to *Ampelocalamus* (Wen, 1987).

C.J. Hsueh and T.P. Yi published their new genus *Qiongzhuea*, which included three species, *Q. tumidinoda* Hsueh & Yi as the type species. Its type specimen was collected in China, Sichuan Province, Leipo, alt. 2600 m, 15 May 1965, by F.Y. Wang et al. No. 11563 (in Sichuan Forestry Institute). Its flowers, fruits, rhizomes, and culm leaf sheaths show affinity with *Chimonobambusa*, but the nodes of most species of this genus are not tumid. Only culm-nodes of the type are very tumid, and since the shoot appears usually from May to October, some taxonomists of China, America, and England do not support *Qiongzhuea* as a genus.

In the 1980's C.J. Hsueh, T.P. Yi, and W.P. Zhang also described some new species of *Chimonobambusa*: *C. pachystachys*, *C. grandifolia*, *C. brevinoda*, and *C. hejiangensis*; Taihui Wen described *C. setiformis*, *C. maculata*, and *C. pubescens*; C.H. Dai described *C. convoluta*; and W.D. Li and C.S. Wu described *C. linearifolia*, and *C. lactistriata*.

Morphology

A) Inflorescence

As Clark (1989) said: "McClure (1966) presented an excellent, comprehensive discussion of bamboo morphology." McClure's best discussion of bamboo morphology is the structure of the inflorescence. He first found a bud included in the glumes, at the base of spikelets of *Schizostachyum*. We can imagine that after the bud has sprouted, that spikelet becomes like an inflorescence, so this spikelet is not true spikelet. McClure (1966) gave it a name: "pseudospikelet." This is a very important character, such that bamboo inflorescences may be divided into two types:

1. Inflorescences with pseudospikelets, that is, an iterant inflorescence, or indeterminate inflorescence, as in *Bambusa*, *Schizostachyum*, *Dendrocalamus*, *Pseudostachyum*, *Thyrsostachys*, *Cephalostachyum*, *Sinobambusa*, *Semiarundinaria*, *Phyllostachys*, *Indosasa*, *Chimonobambusa*, *Guadua*, *Sphaerobambos*, and others. All of these were classified as the Bambusatae by Keng & Keng f. (1959).

2. Inflorescences without pseudospikelets, that is, a semelautant inflorescence or determinate inflorescence, as in *Arundinaria*, *Sasa*, *Ampelocalamus*, *Thamnocalamus*, *Indocalamus*, *Gelidocalamus*, *Chusquea*, and others. All of these were classified as the Arundinariatae by Keng & Keng f. (1959).

Based on this distinction, C.D. Chu & C.S. Chao (1979) published their genus *Acidosasa*, with its semelautant inflorescence distinguishing it from *Indosasa*; likewise, L.C. Chia (1988) published his genus *Monocladus* with the iterant inflorescence distinguishing it from *Sasa*.

B) Fruit

The morphology of fruits is important in the classification systems of Munro (1868)

and Bentham (1897). Whether the pericarp is adnate to or free from the seed coat is the principal basis of classification. In 1907, Brandis found that endosperm was lacking in matured fruit of *Dinochloa*, *Melocalamus*, *Melocanna* and *Ochlandra*. I found the baccas of *Qiongzhuea* and *Oreocalamus* to be empty, with endosperm lacking. I found *Chimonobambusa marmorea* flowering and fruiting at Hangzhou; its fruit had no hilum or ventral suture, but did have a thick hollow pericarp lacking endosperm which is the same as *Qiongzhuea* (Fig. 1).

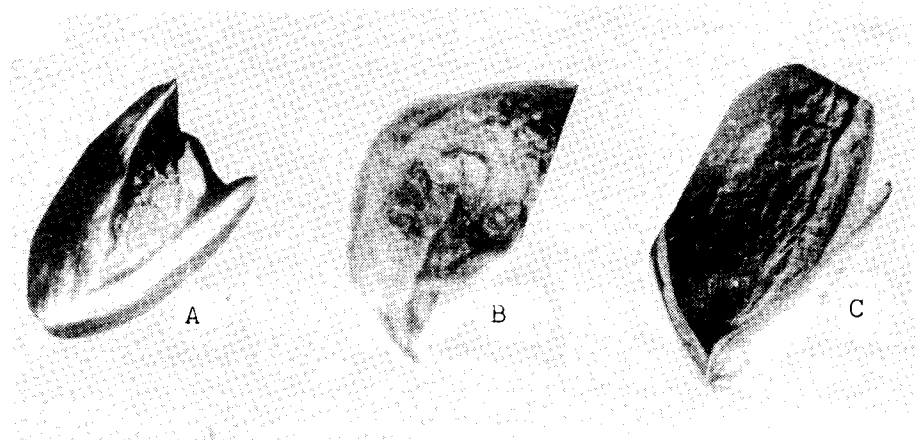


Figure 1. Fruits; A. *Chimonobambusa rigidula* X 3.8; B. *C. hejiangensis* X 4.25; C. *C. utilis* X 4.25.

C) Rhizomes

Bamboo rhizomes are usually divided into four types:

Type I. Sympodial rhizomes with short necks, producing culms with more buds at the base, such that when the buds all sprout, a thick clump is formed, as in *Bambusa*, *Dendrocalamus*, and *Cephalostachyum*.

Type II. Sympodial rhizomes with long necks, the culm with fewer buds at the base, and the neck nodes lacking buds, a new culm forming, at the apex of the neck as it emerges, as in *Yushania*, *Pseudostachyum*, and *Melocanna*.

Type III. Monopodial rhizomes without buds at the base of culms, the rhizomes running in the ground, with a bud and some roots at the nodes of rhizomes, as in *Phyllostachys* and some species of *Chimonobambusa*. This type is not very stable because sometimes the latent bud can sprout at the base of the culm, so that the monopodial rhizome would change to an amphipodial rhizome.

Type IV. Amphipodial rhizomes, the culms with fewer buds at the base, the rhizome running in the ground, with a bud and roots at each node of the rhizome, as in many species of *Chimonobambusa*, *Arundinaria*, *Clavinodum*, *Indocalamus*, *Sasa*, *Sinobambusa*, and *Semiarundinaria*.

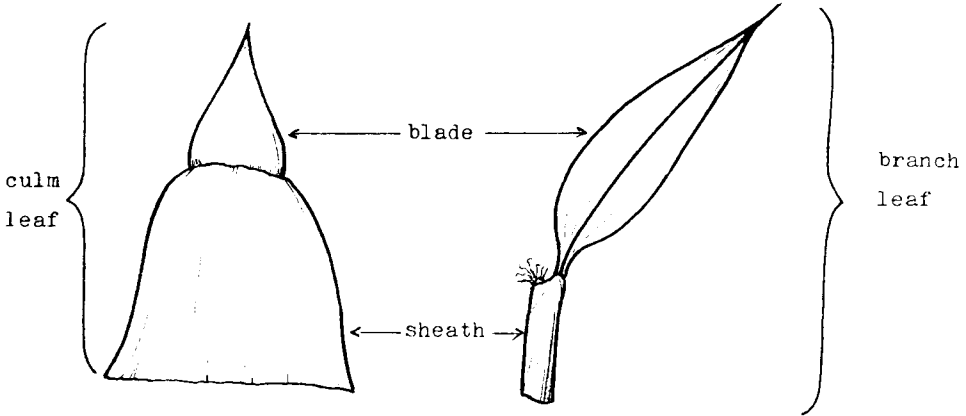


Figure 2. Leaf characteristics.

D) Culm Leaves

Usually, the culm leaf presents important characters for distinguishing among species, and it may be important also to distinguish some genera. In *Chimonobambusa*, the very small and erect culm leaf blade and triangular culm leaf sheath help to distinguish it from other genera. The culm leaf is composed of a sheath, blade, sheath auricle and inner ligule. Their morphology, color, and pubescence are very useful characters to distinguish species (Figure 2).

E) Branches and Buds

Branch and bud morphology are often important features used to distinguish genera, but are not always useful in distinguishing among species. Branches can have five types at least among the genera which produce only a single bud per node:

1. Single branch, as in *Sasa*, *Indocalamus*, and *Monocladus*.
2. Two branches, as in *Phyllostachys*.
3. Three branches, as in *Chimonobambusa*, *Sinobambusa*, *Semiarundinaria*, *Indosasa*, *Acidosasa*, and *Clavinodum*.
4. Several branches with the main branch very conspicuous, as in *Bambusa*, *Dendrocalamus*, *Cephalostachyum*, *Neosinocalamus*, *Ampelocalamus*, and *Gigantochloa*.
5. Several branches with the main branch inconspicuous, as in *Gelidocalamus*, and *Yushania*.

Buds can be important in distinguishing genera. Clark (1989) and Dransfield have excellent discussions regarding bud morphology. But I have not studied this in *Chimonobambusa*.

F) Culms

The culm includes internodes and nodes. The node is delimited by the culm leaf scar and the supranodal ridge and between these is the internodal region.

Some species of *Chimonobambusa* Sect. *Oreocalamus* have a quadrangular or nearly quadrangular internode, with a ring of spines on the node. Some species of *Chimonobambusa* Sect. *Qiongzhuea* have a very tumid node, but Sect. *Chimonobambusa* has more or less aerial roots on the nodes.

Distribution and Habitat

Chimonobambusa Makino is a natural group, and the species of this genus are distributed widely in high altitude areas of China, Laos, Vietnam, Burma, and India. In the Sichuan and Yunnan provinces of China, their altitudinal range is from 1,500 to 2,600 m. This area appears to be the center of distribution (Figure 3).

The type of *Chimonobambusa*, *C. marmorea*, has its natural distribution in Japan. But I suppose that the Japanese *C. marmorea* was introduced from China, because the old peasants of the Chinese Fujing province coastal mountains call this species "Hanzhu," which is the same as the Japanese name. Perhaps some bamboos were introduced into Japan in early times by monks.

Sect. *Chimonobambusa* usually occurs at 100 m to 500 m (lower altitudes), but can be found at altitudes of 1,400 to 1,800 m in the southwest of China and Japan, in the broadleaf forests. The average annual rainfall of this area is 1,400 - 1,600 mm, the average annual temperature is 14-20° C with an extreme low temperature of -10° C, and an average annual air humidity of 70-80%.

Sect. *Oreocalamus* usually occurs at higher altitudes than Sect. *Chimonobambusa*; most species are found between 1,000 - 2,000 m alt., although some species can be distributed at lower altitudes. The area of distribution has an average annual rainfall of 1,000 - 1,400 mm, an average annual temperature of 8-16° C, an extreme low temperature of -14° C, and an average annual air humidity of 70-80%. This is a very wide area, from Taiwan throughout southeast and southwest China to Burma and India.

Sect. *Qiongzhuea* usually has a higher altitudinal range than Sect. *Oreocalamus*; its species range from 1,400 to 2,600 m, occurring in the Sichuan, Guizhou, and Yunnan provinces and Tibet in China. The distributional area has an average annual rainfall of 1,400 - 1,700 mm, an average annual temperature of 8-12° C, an extreme low-temperature of -16° C, and average annual air humidity of 80-90%.

Cultural Information

All species of *Chimonobambusa* are short-day understory plants that do best when the forest canopy reduces the sunlight by 60%; this is a key to cultural success or loss. Also, they are very valuable economic plants. For example, *Chimonobambusa utilis* is a large or medium bamboo, usually with culms 3-4 cm in diameter, rarely to 6 cm, and it has a quadrangular culm, so it is not only a valuable decorative plant in the courtyard, flower garden,

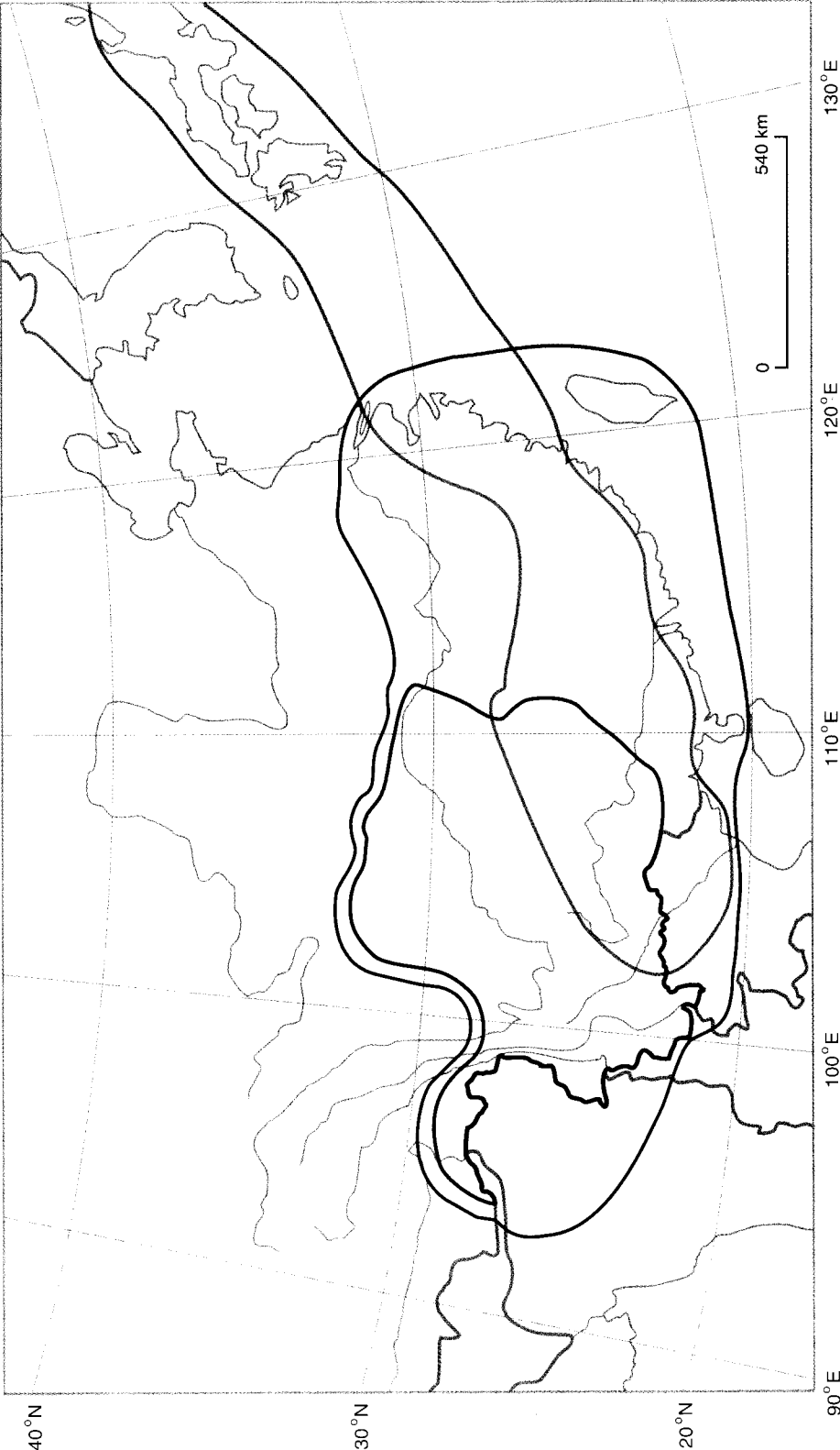


Figure 3. Distribution of *Chimonobambusa*.
(——) Distribution area of Sect. *Oreocalamus*.
(——) Distribution area of Sect. *Qiongzhuea*.

or potted, but it also is a valuable material for handicraft articles. Its shoots are a delicious food, provided fresh for dinner parties or processed into dried bamboo shoots.

The center of this species' distribution is Sichuan province, Jinfoshan, in which is found about 23,000 hectares of *Chimonobambusa utilis* forest, altitude 1400 to 2250 m, an average annual temperature of 8.5°C, an extreme low temperature of -14.1°C, and an average annual rainfall of 1,444-1,800 mm. Its best growth is under the forest at altitudes of 1,700-2,000 m, with a soil pH of 5-7 (Table 1).

Table 1.
Jinfoshan meteorological conditions. (Wu M.)

Condition	Jan	Feb	Mar	Apr	May	Jun		
Av. temp (C)	-2.4	-1	4	8.9	12.1	14.9		
Rainfall (mm)	28.7	33.6	63.2	107	198.9	207.2		
Av. air humidity (%)	89	91	90	88	90	88		
Condition	Jul	Aug	Sep	Oct	Nov	Dec	Overall	Total
Av. temp (C)	17.8	17.4	14.1	8.8	4.3	-0.1	8.2	
Rainfall (mm)	204.7	199.9	144.8	133.2	75.2	37.2		1434
Av. air humidity (%)	90	89	89	91	90	90	90	

Usually, bamboo shoots appear earlier in warmer areas, and later in colder areas, but *Chimonobambusa* shows the reverse behavior. For example, *Chimonobambusa utilis* at an altitude of 2,000 m has its shoots appear from the last ten days of July to the last ten days of August, and shoot production comes up to 2250 kg/hectare; but at an altitude of 1,500 m, the shoots appear from the last ten days of August to the middle of September, and shoot production is only 750 kg/ha. This behavior is out of the ordinary, and is very important for its cultivation.

At Jinfoshan, *Chimonobambusa utilis* flowered and bore fruit in 1936, and the area returned to forest following its natural reseeding after six years, with culms 1.5-2 m high. In 1976, *Chimonobambusa utilis* was flowering again in the same place; its flowering cycle is therefore about 40 years. The two-year-old seedlings were 40 cm high, and could have been used for planting.

The growth of *C. utilis* under the upper forest cover is better than without upper forest cover, with the density of upper forest cover at 0.5-0.6 better than at 0.7-0.75 (Table 2).

Restoration is a method of continual utilization of *Chimonobambusa* forests. This

Table 2.
The density of forest cover and the growth of *Chimonobambusa* (Wu M.).

Density of upper forest	Density of lower <i>C. utilis</i> cover	<i>C. utilis</i>			
		Average Diameter (cm)	Average Height (m)	Trees/ha.	Culm weight (kg/ha)
0.50	0.60	3.24	6.60	7,620	21,195
0.60	0.70	3.00	6.30	10,170	21,960
0.70	0.60	2.12	5.40	7,680	10,095
0.75	0.40	2.39	5.00	6,990	7,905
0.00	0.60	1.46	2.66		6,255

usually requires:

1. Clearing the low shrubs and weeds in the forest.
2. Trimming the lower branches up to 2-3 m high.
3. Cutting the 4 year or older culms, in March or May.
4. Harvesting the shoots in August to September for eating, producing for preservation about 5,000-15,000 strong shoots per hectare.

Taxonomy

***Chimonobambusa* Makino**

***Oreocalamus* Keng Y.Z.**

***Qiongzhuea* Hsueh C.J. & Yi T.P.**

Subarborescent or shrubby, rarely arborescent. Rhizomes amphipodial or monopodial, creeping under the ground, more slender than the culms, usually arising from the lateral buds of rhizomes, rarely from buds at the base of culms. Internodes usually cylindrical but some species with quadrangular internodes at the median or basal parts of the culms. Nodes prominent or very tumid, with a ring of spines or aerial roots at the median and basal parts of the culms, sometimes without aerial roots or spines; branches usually three per node initially, later many branches. Culm leaves shorter than internodes, thin, chartaceous; sheaths triangular or linear-triangular; auricles absent; inner ligule small; rounded or truncate at apex; blade very small, short, awl shaped, erect.

Inflorescence a terminal or axillary leafy panicle; pseudospikelets linear, solitary or racemose, many-flowered; rachilla segments slender; florets rather distant from each other; glumes usually two, rarely one or three, membranaceous, rather similar, lanceolate to ovate-lanceolate, acute, or acuminate at apex, many-nerved, frequently one of them subtending a bud; lemmas thinly chartaceous, smooth, ovate-lanceolate, acuminate, 5-7-nerved, tessellate; palea almost as long as the lemma, truncate or weakly bimucronate at the top, 2-keeled;

lodicules 3, ovate, one narrower and broadly lanceolate, acute; stamens 3, exserted; ovary narrowly ovoid, a short style dividing into 2 exserted plumose stigmas. Fruit externally glabrous, hilum and ventral suture absent; pericarp fleshy, thick, hollow, and lacking endosperm; pericarp of the seed coat, bacca-like.

Section I. *Chimonobambusa*

Type Species: *Chimonobambusa marmorea* (Mitf.) Makino.

Vagina culmi persistens, internodia cylindrica, nodi radicales.

Culm leaves persistent, internodes cylindrical, nodes slightly prominent with a ring of aerial roots at the basal nodes.

Section II. *Oreocalamus* (Keng) Wen & Ohrnberger

Basionym:

Oreocalamus Keng, in Sunyatsenia 4(3-4): 146, 147, 1940.

Synonym:

Subgen. *Oreocalamus* Hsueh & Yi, in *Bamb. Res.* 7(3): 3, 1988.

Type Species: *Chimonobambusa szechuanensis* (Rendle) Keng f.

Vagina culmi decidua; internodia quadrata vel cylindrica; nodi prominuli, spiniferi.

Culm leaves deciduous, internodes quadrangular or slightly quadrangular at the median or basal part of the culms; nodes prominent, with a ring of spines at the median or basal part of the culms.

Section III. *Qiongzhuea* (Hsueh & Yi) Wen & Ohrnberger

Basionym:

Qiongzhuea Hsueh & Yi, in *Act. Bot. Yunnanica* 2(1): 91, 92, 1980.

Type Species: *Chimonobambusa tumidinoda* (Hsueh & Yi) Wen & Ohrnberger.

Folia culmorum decidua, internodia cylindrica; nodi optime tumidi vel prominuli, non radicales et spiniferi.

Culm sheaves deciduous; internodes cylindrical; nodes very tumid or prominent, without aerial roots or spines.

Key to Sections and Species

Key to the Sections of *Chimonobambusa*

- 1a. Culm leaves persistent; internodes cylindrical, with a ring of aerial roots on the basal

nodes, but no spines; shoots appearing from August to December———

———Sect. I *Chimonobambusa*

1b. Culm leaves deciduous; internodes cylindrical or quadrangular, a ring of spines on the basal nodes present or absent, but no aerial roots; shoots appearing from April to December.

2a. Culm leaves caducous or late; basal internodes quadrangular or cylindrical, with a ring of spines at basal nodes, but no aerial roots; shoots appearing from August to December———

———Sect. II. *Oreocalamus*

2b. Culm leaves caducous; internodes cylindrical, lacking spines and aerial roots at nodes; nodes sometimes very tumid; shoots appearing from April to July ———

———Sect. III *Qiongzhusia*

Key to species of *Chimonobambusa*

Sect. I. *Chimonobambusa*

1a. Culm leaves abaxially with white, rounded macula.

2a. Culm leaves abaxially glabrous, with dense brown hairs at base, margins ciliate; oral setae 3-4 mm long at the apex of foliage leaf sheaths. ———

———1. *C. marmorea*

2b. Culm leaves abaxially with dense dark brown hair, margins glabrous; oral setae 12 mm long at the apex of foliage leaf sheaths.

3a. Foliage leaves 2-3, inner ligule inconspicuous, 1-2 mm long.———2. *C. setiformis*

3b. Foliage leaves 4-6, inner ligule 6 mm long.———

———3. *C. damingshanensis*

1b. Culm leaves not maculate.

4a. Culm solid or subsolid, pubescent and maculate; culm leaves abaxially glabrous, dense brown hairs at base.———

———4. *C. pubescens*

4b. Culm hollow, glabrous or pubescent, without macula; culm leaves abaxially hirsute.———

———5. *C. luzhiensis*

Sect. II. *Oreocalamus*

1a. Culm leaves abaxially with white, rounded macula.

2a. Culm leaves abaxially glabrous.

3a. Young culms white hispidulous; foliage leaf blades lanceolate, 20-25 mm wide.———

———6. *C. utilis*

3b. Young culms glabrous; foliage leaf blades linear-lanceolate, 7-12 mm wide.———

———7. *C. angustifolia*

2b. Culm leaves abaxially hispid.

4a. Young culms hispid.

5a. Foliage leaf blades lanceolate, 12-21 mm wide; nodes prominent.———

———8. *C. pachystachys*

5b. Foliage leaf blades linear-lanceolate, 5-10 mm wide; nodes very prominent.—

———9. *C. linearifolia*

- 4b. Young culms glabrous. ————— 10. *C. purpurea*
- 1b. Culm leaves abaxially without white macula.
- 6a. Culm leaves abaxially with colored striae.
- 7a. Young culms with small purple macula; culm leaves abaxially with white striae. —
————— 11. *C. lactistriata*
- 7b. Young culms without macula; culm leaves abaxially with gray striae. —————
————— 12. *C. ningnanica*
- 6b. Culm leaves without colored striae.
- 8a. Culm leaves abaxially glabrous.
- 9a. Culms quadrangular at basal internodes; culm leaves purple-tessellate. —
————— 13. *C. quadrangularis*
- 9b. Culms usually cylindrical; culm leaves not purple-tessellate.
- 10a. Young culms and branches glabrous, sheath-scar downy at first. —————
————— 14. *C. szechuanensis*
- 10b. Young culms and branches hispid, sheath-scar glabrous. —————
————— 15. *C. paucispinosa*
- 8b. Culm leaves abaxially hispid.
- 11a. Culm leaves usually longer than internodes.
- 12a. Internodes 13-14 cm long, hispid; sheath scar downy. —————
————— 16. *C. hirtinoda*
- 12b. Internodes 7-8 cm long, white downy; sheath scar glabrous. —————
————— 17. *C. brevinoda*
- 11b. Culm leaves usually shorter than internodes.
- 13a. 2-4 foliage leaves at the apex of branchlets at first, the leaf-sheaths caducous, so usually with single leaf at the apex of branchlets. — 18. *C. hejiangensis*
- 13b. Usually with 2-4 leaves at the apex of branchlets, the foliage leaves persistent.
- 14a. Foliage leaf blades 30-35 cm long. ————— 19. *C. grandiflora*
- 14b. Foliage leaf blades 10-23 cm long.
- 15a. Internodes and foliage leaf sheaths abaxially yellow downy. —————
————— 20. *C. convoluta*
- 15b. Internodes hirsute, foliage leaf sheaths glabrous.
- 16a. Foliage leaf blades abaxially white hirsute; culm leaves glabrous or pilose. ————— 21. *C. microfloscula*
- 16b. Foliage leaf blades abaxially glabrous; culm leaves abaxially hirsute.
- 17a. Culm leaf sheaths with 1-2 fimbriae at both sides of apex; 2-3 leaves at the apex of branchlets. ————— 22. *C. verruculosa*
- 17b. Culm leaf sheaths without fimbriae at apex; 3-5 leaves at the apex of branchlets. ————— 23. *C. armata*

Sect. III. *Qiongzhusa*

- 1a. Culm nodes very tumid, breaking easily at nodes when young.
 - 2a. With 3-4 leaves at the apex of branchlets.
 - 3a. Culm leaf sheaths abaxially hirsute.
 - 4a. Internodes glabrous.———24. *C. tumidinoda*
 - 4b. Internodes hirsute.———25. *C. metuoensis*
 - 3b. Culm leaf sheaths abaxially glabrous.———26. *C. macrophylla*
 - 2b. Usually a single leaf at the apex of branchlets.———27. *C. unifolia*
- 1b. Culm nodes not prominent or somewhat prominent.
 - 5a. Foliage leaf sheaths with erect setae at the apex.
 - 6a. Internodes and intranodal region glabrous; culm leaves abaxially glabrous.
 - 7a. Sheath-scar glabrous; young shoots dark green; branchlets with 2-3 leaves.———28. *C. communis*
 - 7b. Sheath-scar hispid; young shoots light green; branchlets with 2-5 leaves.———29. *C. montigena*
 - 6b. Internodes pubescent; culm leaves abaxially, with brown hairs and striae.———30. *C. puberulla*
 - 5b. Foliage leaf sheaths without oral setae.
 - 8a. Internodes glabrous.
 - 9a. 1-3 leaves at the apex of branchlets; foliage leaf blades abaxially glabrous; shoots appearing from September to October.———31. *C. rigidula*
 - 9b. Usually with single leaf at the apex of branchlets; foliage leaf blades abaxially pubescent; shoots appearing from April to May.———32. *C. opienensis*
 - 8b. Internodes hirsute.———33. *C. maculata*

Section I. *Chimonobambusa*

1. *Chimonobambusa marmorea* (Mitford) Makino, *Bot. Mag. Tokyo* 28: 154, 1914; Nakai, *J. Arnold Arb.* 6(3): 151, 1925.

Type: Collected from Royal Botanic Garden, Kew, and preserved there. It was introduced from Japan into France by A. Latour Marliac, in 1889, and from there introduced to England shortly afterward. The type specimens would be Kew Royal Garden No. 16, No. 17. The No. 16 should be designated the lectotype.

Basionym:

Bambusa marmorea Mitford, *Garden* 46: 547, 1894; *Bamboo Garden* 93, 1896.

Phyllostachys marmorea (Mitf.) Ascherson et Graebner, *Syn. Mitteleur Fl.* 2(1):778, 1902.

Synonyms:

Bambos kantsik Sieb., *Syn. Pl. Econ.* 5, 1830, nom. nud.

Bambusa nana var. *gracilima* Kurz, *Cat. Hort. Bot. Bogor* 20, 1866, nom. nud.

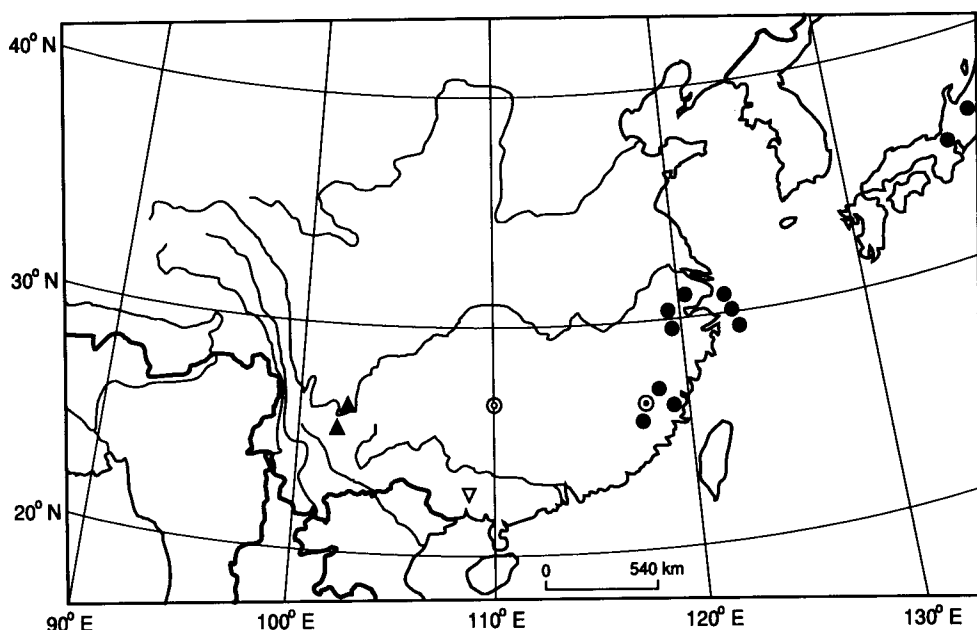


Figure 4. Distribution of Sect. *Chimonobambusa*; (●) *Chimonobambusa marmorea*; (⊙) *Chimonobambusa setiformis*; (▽) *Chimonobambusa damingshanensis*; (⊗) *Chimonobambusa pubescens*; (▲) *Chimonobambusa luzhiensis*.

Arundinaria nana Makino, *Bot. Mag. Tokyo* 11: 160, 1897.

A. matsumarai Kacke, *Bull. Herb. Boissier* 7: 716, 1899.

Semiarundinaria tenuifolia Koidz, *Act. Phytotax. & Geobot.* 11: 314, 1942.

f. *marmorea*

Culms usually 2-3 m tall, 10-15 mm in diameter; internodes glabrous, purplish-black to lilac; nodes rather prominent. Culm leaves 8-12 cm long, membranaceous, soft, persistent; sheaths triangular, purplish-brown, abaxially marked with white round macula, with yellowish-brown hairs on the side of base; auricles and oral setae absent; inner ligule inconspicuous; blades very small, aristate, erect. Branches usually 3 per node, approximately erect; foliage leaves 3-4 towards the apex of branchlets; sheaths glabrous, many-nerved, oral setae crooked, smooth; inner ligules 1 mm long; blades narrowly lanceolate, thinly chartaceous, obtuse at the base, caudate-acuminate at apex, 6-15 cm long, 8-12 mm wide, tessellate. Pseudospikelets linear, 2-4 cm long, purplish-green, with 4-7 florets; rachilla segments 3-4 mm long, glabrous; glumes usually two, sometimes one or none, rarely three, membranaceous, light brown, rather homomorphous, lanceolate to ovate-lanceolate, acute or acuminate, 6-8 mm long, 5-nerved, frequently one of them subtending a bud; lemmas thinly chartaceous, green and partly purplish, smooth, ovate-lanceolate, acuminate, 6-7 mm long, 5-7 nerved, tessellate; palea almost as long as the lemma, truncate or weakly emarginate at the top, 2-keeled, glabrous on the keels, 2-nerved between and on either side of keels respectively; lodicules 3, ovate, but the dorsal one narrower and broadly lanceolate, acute, 2 mm long, the margins near the top ciliate; stamens 3, exserted, anthers 3-5 mm long; ovary narrowly ovoid, surmounted by a short style dividing into 2 plumose stigmas. Fruits oblong,

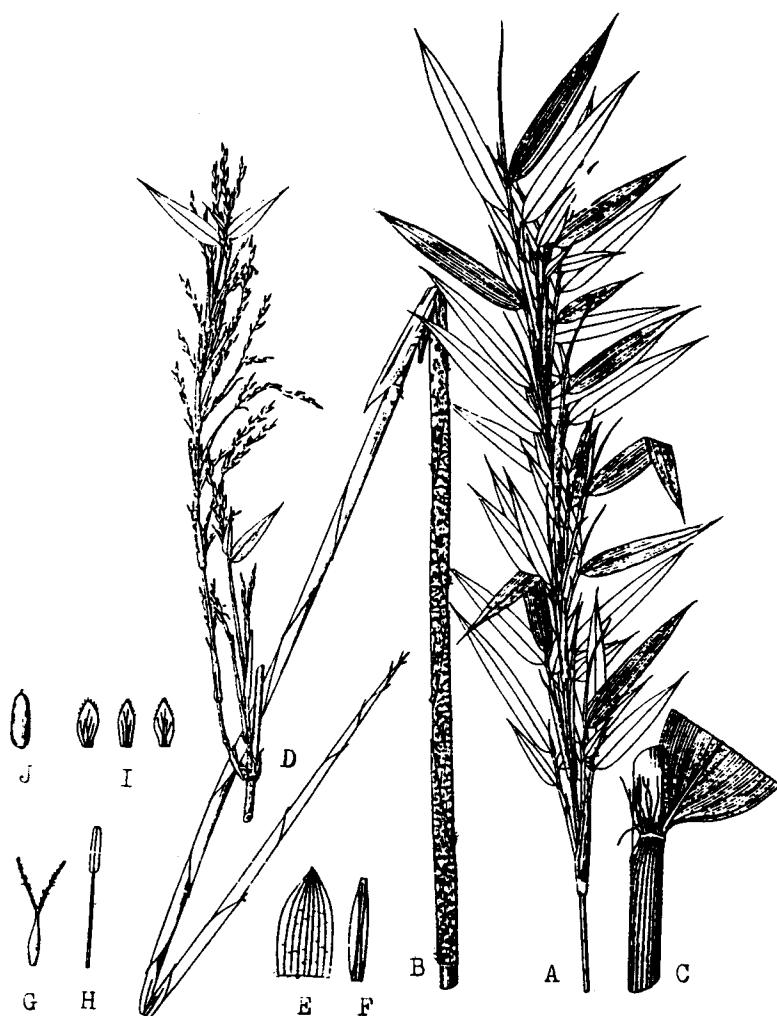


Figure 5. *Chimonobambusa marmorea*; A. Branch with leaves; B. Shoot, showing its culm-leaves; C. Upper part of leaf-sheath; D. Flowering branch; E. Lemma; F. Palea; G. Pistil; H. Stamens; I. Lodicules; J. Fruit (Drawing from S. Suzuki, *Index to Japanese Bambusaceae*, 1978, F. 133).

6-9 mm long, 4-5 mm in diameter, glabrous (Figures 4 & 5).

Distribution: Native to southeastern China, perhaps introduced to Japan at an early time.

Recorded Chinese names: Hanzhu, Guanyinzh.

Recorded Japanese names: Kanchiku.

English name: Marbled bamboo.

German name: Marmorierter Bambus.

Specimens examined: China, Zhejiang Province, Putuo Island, 1982, Lu S.G. (fl.) 82201 (ZJFI); same site, 1981, Hua S.C. al. 81903 (ZJFI); same site, 1984, Zhang W.P. 840337 (SWFC, SCFS); same site, 1986 Hsueh C.J. 8601 (SWFP); Hangzhou, Shiwudon Oct. 1987 Wen T.H. (fl.) 87101 (ZJFI); same site, Wen T.H. Oct. 1988, (fl, fr), 88101 (ZJFI); Fujing Province, Xiapu, hill, July. 1976, Wen T.H. 76132 (ZJFI); Shaxian, Lin Y. 43 (PE); Fuzhou, 1976, Yao C.Y. et al. 76060 (NJU).

Phenology: In 1982, flowering specimens of *C. marmorea* were collected in China, Zhejiang province, Putuo Island and in 1987-1988 at Hangzhou west hill. In 1988, at Kew Royal Bot. Garden, England, this species also flowered continuing in one flowering phase for 2-6 years. Shoots appear in autumn to the beginning of winter. Tall rank sprouts without branches appear first, shooting out branches from several nodes near the top of culms in the summer of the next year. Branching expands gradually downwards with the years, and the lower branches shoot out longer.

f. variegata (Makino) Ohwi, *Flora Jap.* 89, 1966; Muroi & H. Okamura, *Take Sasa*, 125, fig. 28, 1977; S. Suzuki, *Index Jap. Bambus.*, 334, 373, 1978; H. Okamura, *Hort. Bamboo Sp. Jap.*, 30, fig. 28, 1986.

Basionym:

Arundinaria marmorea var. *variegata* Makino ex E.C. Camus, *Bamb. Monogr.*, 47, 1913; S. Honda, *Descr. Prod. For. Jap.*, 38, 1900, nom. nud.

Synonyms:

Chimonobambusa marmorea cv. *variegata* Makino, *Bot. Mag. Tokyo* 28: 154, 329, 1914, nom. nud.; Makino & Nemoto, *Fl. Jap. 2nd ed.*, 1333, 1931; Tsvelev, *Grass Soviet Union*, 1: 124, 1976.

Chimonobambusa marmorea cv. *variegata*, Ohwi, *Fl. Jap. Rev. ed.* 135, 1965.

Arundinaria marmorea cv. *variegata*, Lawson, *Bamb.*, 157, 1968.

Culms yellow, with a few light green stripes, and a few white stripes on the leaves. When exposed to the sun, exhibit red stripes on the surface of yellow culms.

Distribution: Japan.

Recorded Japanese name: Bemikan-chiku, Shu-chiku, Chigo-kanchiku.

f. *gimmei* Muroi & Kasohara, *Rep. Fuji. Bamb. Gard. No. 17: 8, 1972.*

Synonym:

Chimonobambusa marmorea cv. *gimmei*, Ohrnberger, *Bamb. World, Chimonobambusa*, 1990.

Culms green, with yellow stripes, leaves without stripes.

Distribution: Japan.

Recorded Japanese name: Gimmei-kanchiku.

Uses: All of this species and its forms are very tough; the culms can make good horsewhips, although the shoots are very small, but it is good food for dinner party. These

are very well appreciated, when planted in a pot or at side of the rock.

2. *Chimonobambusa setiformis* Wen, *J. Bamb. Res.* 3(2): 29-30, fig. 5, 1984.

Type: Collected by Hua S.C. & Chang P.S. from China, Fujian Province, Wuyi mountain, Dazhulin, Jan. 1981, Fl. 81616 (ZJFI).

Culms 3-5 m tall, 1.5-2.0 cm in diameter; internodes 10-15 cm long, cylindrical, slightly grooved or flattened on one side, solid or nearly so, green-gray or green-purplish, scabrous, with thick white pubescence below the nodes; sheath-scar rather prominent with purplish-tawny hairs on the surface when young, glabrous when old; nodes prominent, with some aerial roots at nodes of lower culms. Culm leaf sheath persistent, triangular, chartaceous, abaxially green-purplish when young, soon tawny-purplish, with white rounded macula, and bulbous-based hairs on the surface, margins glabrous, apex acute, auricles and oral setae absent; ligule convex, 0.5 mm high; blades 1-2 mm long, aristate, erect. Branches usually 3. Foliate leaves 2-3 towards the top of branchlets; sheaths 2.5 cm long, glabrous, striate, with yellow hairs at apex, auricles absent or not conspicuous, oral setae well developed, white, erect, slender, 12 mm long; margins scabrous or hirtellous; blades 6-13 cm long, 8-12 mm wide, thin, linear-lanceolate, acuminate or nearly obtuse at base, acuminate and prolonged at apex, both surfaces glabrous, lateral veins 4-5, the margins serrated; inner ligule small, not conspicuous, 1 mm long. Inflorescence unknown (Figures 4 & 6).

Distribution: Only found in China, Fujian Province, Wuli mountain. Usually in the understory of broad leaf forest.

Recorded Chinese name: Wuli-fangzhou.

This species is very similar to *C. marmorea*, but the culm leaf sheaths with thick bulbous-based hispid hairs, but glabrous at the base and margins, and foliage leaf sheaths with oral setae well developed, usually to 12 mm long in *C. setiformis* which distinguish it from *C. marmorea*.

3. *Chimonobambusa damingshanensis* Hsueh & W.P. Zhang, *Bamb. Res.* 7(3): 5-7, fig. 1, 1988.

Type: Collected from China, Guangxi Province, Wuming Xain, Damingshan, Hsueh 8605 (SWFC).

Culms 1.5-2 m tall, 6-8 mm in diameter, internodes 10-13 cm long, glabrous, sometimes white pubescent when young, green or purplish-green, yellow tomentose below the nodes; walls thick; nodes tumid; sheath-scar conferted, tawny, tomentulose; nodal region 3-4 mm wide, with some aerial roots at the base. Culm leaf sheaths persistent, usually slightly longer than the internodes, abaxially with conferted tawny hair and white macula, margins ciliolate; ligule short, ciliolate; blades 3-4 mm long, deciduous. Branches 1-3, white pubescent below the nodes. Foliage leaves 4-6 at the apex of the branchlets; sheaths purplish, glabrous, oral setae 11 mm long; inner ligule 6 mm long; blades lanceolate, 15-18 cm long, 11-13 mm wide, tessellate. Inflorescence racemose terminal, with a few pseudospikelets. Lemmas 10 mm long, 3-4 mm wide, ovate-lanceolate, apex aristate; palea shorter than lemmas, 6-7 mm long, 2-keeled, bifid (Figures 4 & 7).



Figure 6. *Chimonobambusa setiformis*; A. Culm, showing its culm-leaf; B. Culm, showing the node; C. Culm-leaf; D. Branch with leaves; E. Leaf.

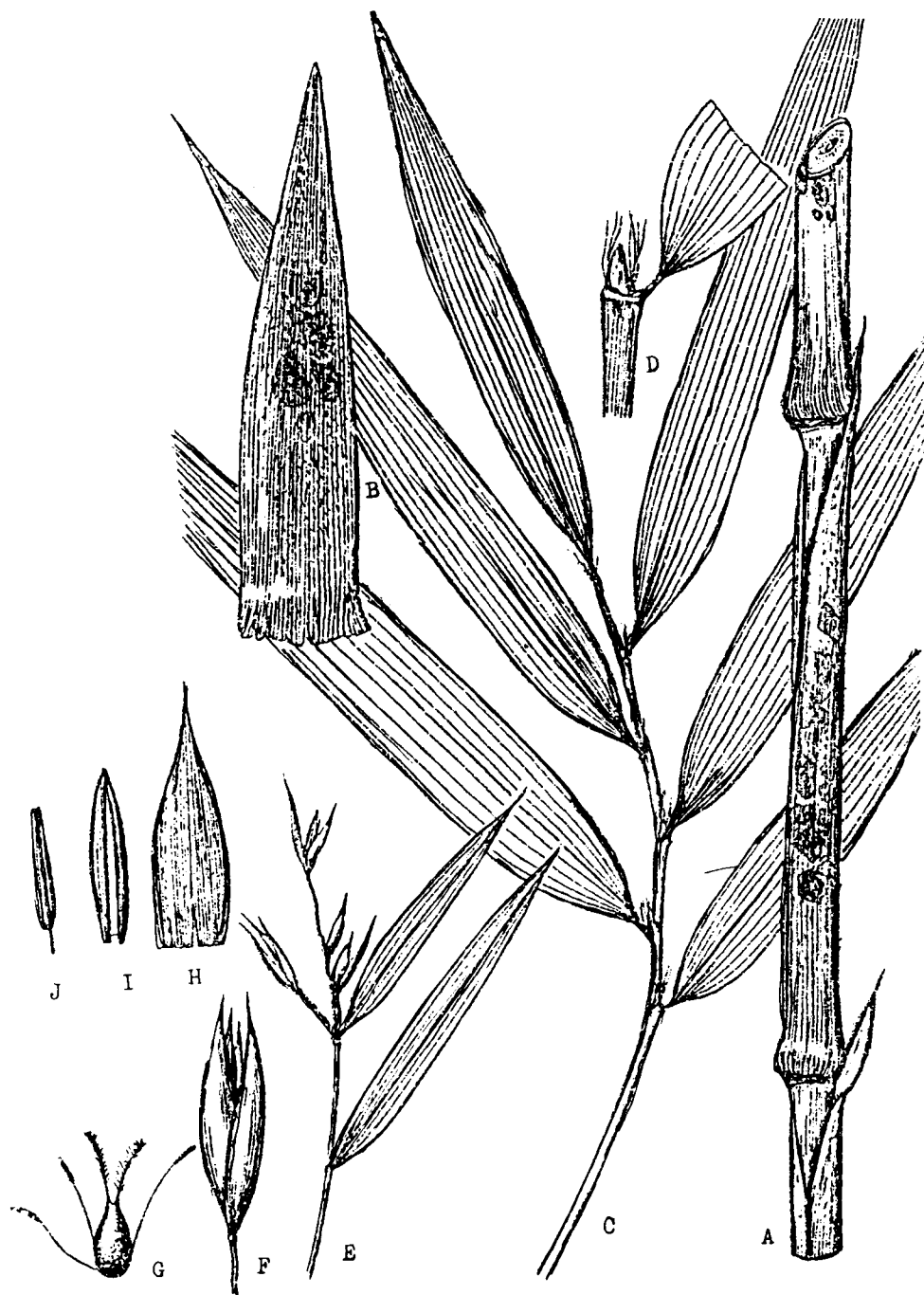


Figure 7. *Chimonobambusa damingshanensis* A. Young culm; B. Culm-leaf; C. Branch with leaves; D. Upper part of leaf sheath; E. Flowering branch; F. Spikelet; G. Pistil and stamens; H. Lemma; I. Palea; J. Stamen.

Distribution: Only known from China, Guangxi Province, Wuning Xian, Damingshan.

This species approaches *C. setiformis*, but differs in its tumid nodes, foliage leaves 4-6 at the apex of the branchlets, and longer inner ligules.

4. *Chimonobambusa pubescens* Wen, *J. Bamb. Res.* 5(2): 20-22, fig. 4, 1988.

Type: Collected by Chen Sijiang in May 1984, from China, Henan Province, Jingxian, Sanqinxiang, Nanshan Cx 84514 (ZJFI).

Synonym:

Chimonobambusa solida B.M. Yang & C.Y. Zeng, *Nat. Sci. J. Hunan Nor. Univ.* 11(3): 234-235, 1988.

Culms usually 2 m tall, 8 mm diameter, solid or nearly solid; internodes 8-14 cm long, cylindrical and flat or grooved at base on one side, green, with white pubescence when young, glabrous when old, sometimes with purple-tawny macula; nodes prominent, some aerial roots at nodes in lower part of culms; sheath-scar with tawny hairs, nodal region 2 mm long. Culm leaf sheaths triangular, persistent, chartaceous, shorter than internodes, green-yellow or green-purple when young, abaxially tessellate, and glabrous, but with thick tawny hairs at base, margins ciliate; auricles absent; ligule convex and toothed at apex, 2 mm high; blades small, aristate, erect, glabrous. Branches usually 3. Foliage leaves 3-4 towards the top of branchlets; sheaths 25-28 mm long, glabrous, margin ciliate; auricle absent, oral setae few, 4-8 mm long, white, erect; inner ligule not prominent, scabrous; blades linear-lanceolate, 9-12 cm long, 7-9 mm wide, cuneiform at the base, acuminate at the apex, 5-nerved, transverse, veinlets conspicuous, tessellate. Inflorescence unknown (Figures 4 & 8).

Distribution: Only found in China, Hunan Province, Jingxian, under the broad leaf forest.

Recorded Chinese name: Shiyue-Hanzhu.

Phenology: Shoots appearing October to November.

5. *Chimonobambusa luzhiensis* (Hsueh & Yi) Wen & Ohrnberger.

Basionym:

Qiongzhueta luzhiensis Hsueh & Yi, *Act. Bot. Yunnanica* 5(1): 45, 46, fig. 4, 1983.

Synonym:

Oreocalamus luzhiensis (Hsueh & Yi) Keng f., *J. Nanjing Univ.* 22(3): 416, 1986.

Type: China, Guizhou Province, Luzhi Xian, alt. 1700-1900 m, 12 August 1981, Yi T.P. 81106 (SCFS).

Culms 3-5 m tall, 1-2 cm in diameter; internodes cylindrical or a little quadrangular, 10-20 cm long, green, glabrous, not farinose; sheath-scar prominent, with tawny hairs at surface; nodes not tumid, glabrous. Culm leaf sheaths persistent, shorter than the internodes, coriaceous, triangular, abaxially with thin tawny hairs, conferted, tawny, ciliate at the

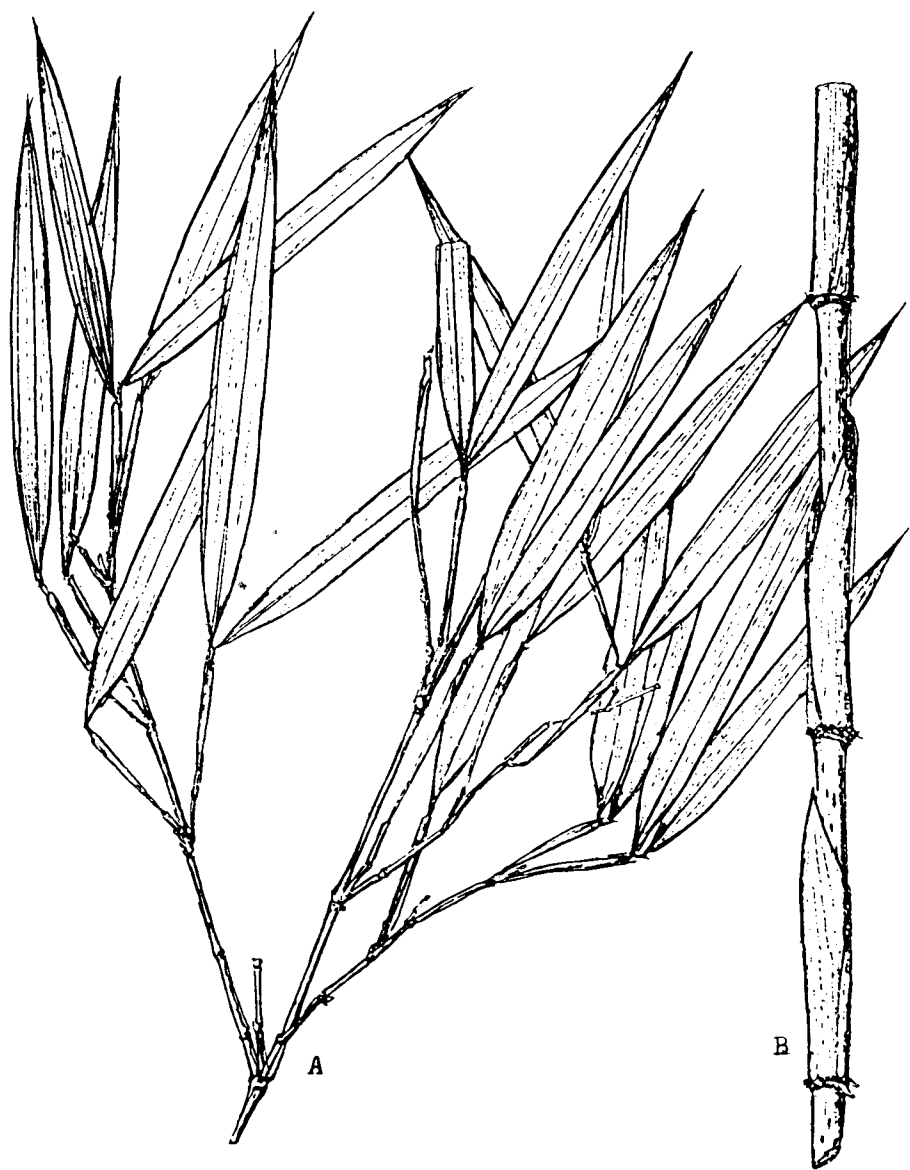


Figure 8. *Chimonobambusa pubescens*; A. Branch with foliate leaves; B. Young culms, showing its culm leaves and culm.

margins; auricles absent, oral setae 3-5, erect, 2-5 mm long; inner ligules truncate, 1 mm tall, pubescent; blades, erect, 2-9 mm long, 1-2 mm wide, glabrous. Branches usually 3. Foliage leaves 2-4 towards the top of branchlets; sheaths 3.5-8 cm long, margins ciliate; auricles absent, oral setae 3-5, erect, 3-5 mm long; inner ligules truncate, glabrous, 1 mm high; blades lanceolate, glabrous, 15-30 cm long, 6-24 mm wide, lateral veins 5-7 pairs, transverse veinlets conspicuous, margins serrated. Inflorescence unknown (Figures 4 & 9).

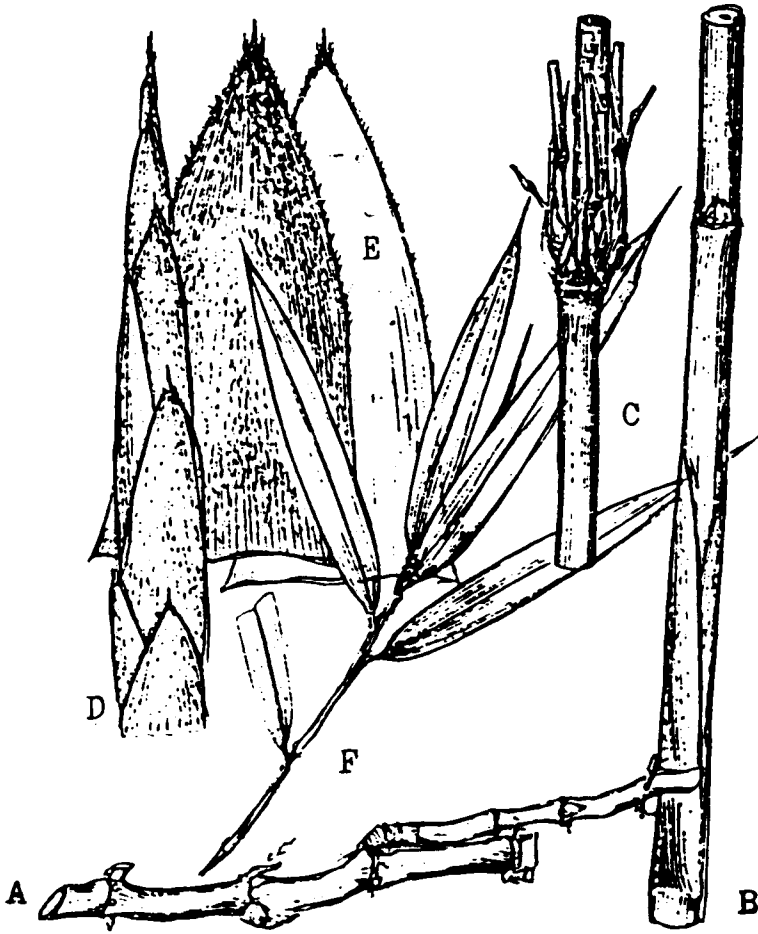


Figure 9. *Chimonobambusa luzhiensis*. A. Rhizome; B. Culm, showing its culm leaf; C. Culm, showing its branching; D. Shoot; E. Culm leaf; F. Branch with foliate leaves.

Distribution: Only known in China, Guizhou Province, Luzhi.

Section II. *Oreocalamus*

6. *Chimonobambusa utilis* (Keng) Keng f., *Techn. Bull. Nation For. Res. Bur.* 8: 15, 1948; Keng Y.L. *Fl. Ill. Pl. Prim. Sin. Gramineae* 94, fig. 64, 1959.

Basionym:

Oreocalamus utilis Keng, *Sunyatsenia* 4: 148, f. 31, 1940.

Type: Collected by Young X. J. from China, Sichuan Province, Nanchuan Jinfoshan, 14 April 1938, 3075 (NJFU).

Culms 5-10 m tall, 3-6 cm in diameter, internodes 8-10 cm long, with white hairs,

scabrous, quadrangular in the central and lower parts of culms, and cylindric in the upper; walls 6-8 mm thick; nodes a little prominent, with a ring of short spines; sheath-scar bearing brown hairs. Culm leaf sheaths triangular, sub-coriaceous, deciduous, shorter than the internodes, tawny-purplish, with white round macula abaxially when young, glabrous, margins bearing light-yellow cilia, sometimes downy at the base; ligule 0.6-1.2 mm long, round at top; blades 4-7 mm long, aristate, erect. Branches usually 3, foliage leaves 2-3 towards the top of branchlets; sheaths glabrous, 3-6 cm long, with a few oral setae at apex; ligule 1-2 mm long, truncate or round at apex, pubescent; blades lanceolate, thin, papery, 10-16 cm long, 12-23 mm wide, glabrous, lateral veins 6-7 pairs, transverse veinlets visible, one side serrated. Inflorescence a raceme, with 1-3 or more pseudospikelets and some bracts. Pseudospikelets 25-45 mm long, with 1-3 glumes and 4-6 florets; glumes 6-9 mm long, 7-9 nerved; lemmas 10-12 mm long, 9-10 nerved, glabrous; paleas shorter than lemmas, mucronate or depressed at apex, 2-4 nerved between the keels, and 1-2 nerved on either side of keels; lodicules 3, glabrous or ciliolate; stamens 3, anthers 5-6 mm long; ovary 1 mm long, glabrous. Fruits baccate, 1-1.5 cm long, 6-8 mm diameter; pericarp 1.5-2.5 mm thick, fleshy, hollowed (Figures 10 & 11).

Distribution: Distributed over a wide area in Sichuan, Guizhou and Yunnan provinces in China at altitudes of 1400 to 2600 m.

Recorded Chinese name: Jinfoshan-fanzhu.

Specimens examined: China, Sichuan Province, Jinfoshan, April 1938, Young X.J.

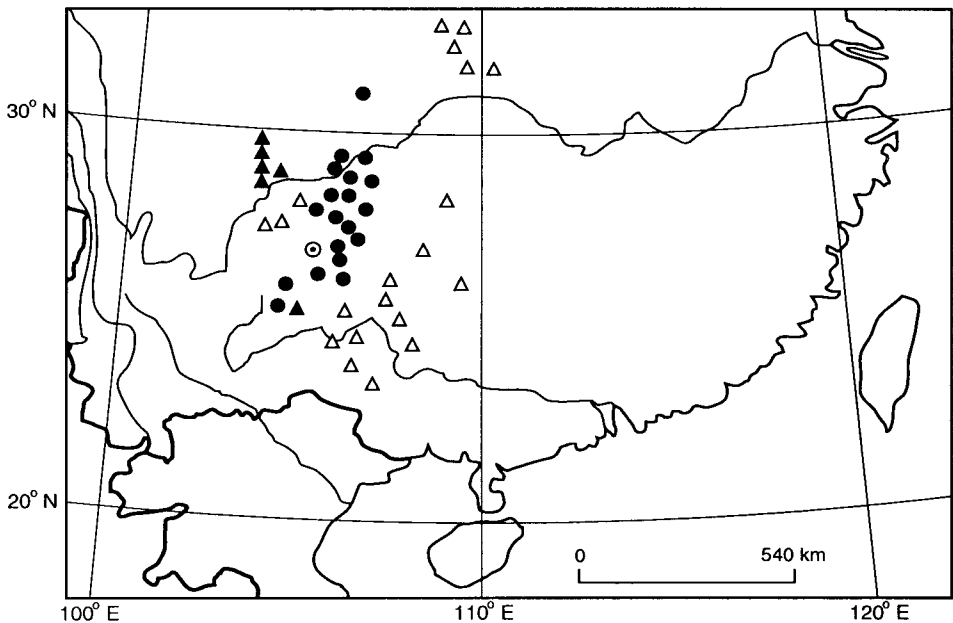


Figure 10. Distribution of (●) *Chimonobambusa utilis*, (Δ) *Chimonobambusa angustifolia*, (▲) *Chimonobambusa pachystachys*, and (⊙) *Chimonobambusa linearifolia* (Sect. *Oreocalamus*).



Figure 11. *Chimonobambusa utilis*; A. Culm; B. Flowering branch; C. Spikelet; D. Lodicules; E. Stamens; F. Pistil; G. Fruit and its section; H. Fruit (Drawing from Keng, Y.L., *Fl. Ill. Pl. Prim. Sin. Gramineae*, fig. 64, 1959).

3075, 3086, No. 3131 (PE); Nanchuan, Li G.F. 61449 (KUN, NJU), No. 61450 (NJU); Xion C.H. et al. 93827 (KUN); No. 39795 (PE); Wang F.J. 10098 (PE); Young C.C. 00245 (PE); Yi T.P. 69001 (SCFC); Li C. 2055 (SWFC); Zhang W.P. 840301 (SWFC); Ling S. No. [sic] (SWFC). Guizhou Province, Suiyang, Li W.D. 77-S-1 (SWFC); Li W.D. 77020 (PE); Daozhen, Li W.D. No. 77-S-2 (SWFC, GZFI); Li W.D. 77021 (PE); Zhenyi, Li W.D. 77003 (GZFI); G.N. No. 0008 (PE); Xishui, Yi T.P. 81101 (SCFS); Xifon, G.F. 760073 (GZFC).

Phenology: About 14,460 ha of *Chimonobambusa utilis* forest are distributed in China, Sichuan Province, Jinpo mountain, where 15,500 t of shoots of *C. utilis* are produced every year. From 1938 to 1940 flowering specimens were collected by Dr. X.J. Young; in 1981 this species was flowering again, with one flowering phase that continued for 3-5 years, indicating a flowering cycle of about 40 years. Its shoots appear in October. This is an important species of *Chimonobambusa*, which has large culms and a high production of shoots and limber culms. It can be grown at high altitude and in areas of high humidity.

Uses: This plant has many uses. Its large and square culms make it not only a good ornamental plant, but also a good material for handicraft articles. The young shoots are also very delicious.

7. *Chimonobambusa angustifolia* C.D. Chu & C.S. Chao, *J. Nanj. Fec. For. Coll.* 3: 35, fig. 5, 1981.

Type: China, Guangxi Province, Jiuwandashan, alt. 1100 m, Chu C.D. et al. 7094 (NFU).

Culms 2 m tall, 1 cm in diameter; internodes slightly quadrangular toward the base of the culms, 8-15 cm long, green-purplish when young, bearing tawny pubescence at lower part of nodes, soon glabrous; nodes very prominent, sometimes geniculate, with a ring of about 8-10 spines on the nodes at lower part of culms. Culm leaves deciduous, chartaceous, shorter than the internodes, triangular, abaxially glabrous, without white macula, tessellate; oral setae 6-10 mm long, ligules conspicuous, 5 mm high; blades erect, small, 1-2 mm long. Branches 3, nodes very prominent; leaves 1-2 (-3) at the apex of branchlets. Foliage leaf sheaths with the margins ciliate, with a few oral setae at the apex; blades linear-lanceolate, 8-17 cm long, 7-12 mm wide, glabrous, lateral; veins 3-4 pairs. Inflorescence unknown (Figure 10).

Distribution: China, Guangxi, Shanxi, Hubei, Sichuan and Guizhou provinces, alt. 700-1400 m.

Chinese Name: Dong-zhu.

Specimens examined: China, Guangxi Province, Rongshin, Jiuwandashan, alt. 1100 m, Chu C.D. et al. 7904 (NFU); Lingyum, Yaomashan alt. 1200 m, Chu et al. 7917 (NFU); Daimiaoshan, Chen D.C. 203 (IBG); Shanxi Prov. Nanzheng, Yi T.P. 76313 (SCFS); Wang Z.B. 20803 (WUG); Hangzhong, Li P.Y. 1057 (WUG); Zhenba, Tang G.W. 17 (SWFC, SCFS); Hubei Prov. Xingshan, Yi T.P. 76352, 76355 (SAFS); Sichuan Prov. Fengdou, Yi T.P. 75402 (SCFS); Shizhu, Yi T.P. 75413 (SCFS); Guizhou Prov. Donyun, Chu 81008 (NJFU, GZAC); Dushan, Fung S.L. 79022 (PE, GZFI); Lipo, Song C.H. 318, 587 (NIFU); Anlong, Wang Z.P. 98323 (NJU); Chishui, s.n. (GZAC); Yanhe, Zhang C.C. 78-14 (SWFC); Liping, Li Y.K. 75232 (SWFC); Wangmo, Yi T.P. 8119 (SCFS, SWFC); Wang Z.P. G8314 (NJU); Wu C.S. 83024 (GZFI); Leishan, Tang C.Z. 50053 (PE).

8. *Chimonobambusa pachystachys* Hsueh & Yi, *J. Yunnan For. Coll.* 1: 33, fig. 1, 1982.

Type: China, Sichuan Province, Gulan Xian, 17 Jun. 1976, Yi T.P. 76282 (SCFS), (SWPC).

Culms 3-6 m tall, 1-3 cm in diameter, quadrangular at lower part; internodes 15-22 cm long, tawny downy when young, bearing some bulbous-based hairs, nodes prominent, with a ring of short spines; sheath-scar bearing tawny pubescence. Culm leaf sheaths chartaceous, delayed deciduous, shorter than internodes, abaxially with thin tawny hairs and white rounded macula; auricles absent; ligules truncate, about 1 mm wide; blades 3-4 mm long, persistent. Branches 3, leaves 1-3 at the top of branchlets. Foliage leaf sheaths gla-

brous, bearing a few oral setae on both shoulders; inner ligule truncate; blades chartaceous, rounded or cuneiform at base, acuminate at apex, 10-18 cm long, 11-21 mm broad, lateral veins 4-6 pairs, tessellate. Floriferous branchlets tufted, with 4-5 bracts and 2-3 pseudospikelets with 3 glumes and 4-6 florets; lemmas chartaceous, apiculate at apex, glabrous or pubescent; paleas shorter than lemmas, 2-keeled, glabrous; lodicules 3, membranaceous, ciliate; stamens 3, ovary glabrous, style very short, near base with two stigmas, plumose. Fruit baccate, oblong (Figures 10 & 12).

Distribution: China, Sichuan and Yunnan provinces, alt. 900-2000 m.

Specimens examined: China, Sichuan Province, Gulan, Yi T.P. alt. 1230-1851 m 76282 (SWFC, SCFS); Shuyong, Yi. T.P. alt. 950-2000 m, 73013 (SWFC, SCFS); Zhengning, N.F. 76020 (NJFU); Omian, N.F. 76036 (NFU) Young, G.H. 6354 (PE); Guangan, Yi T.P. No.

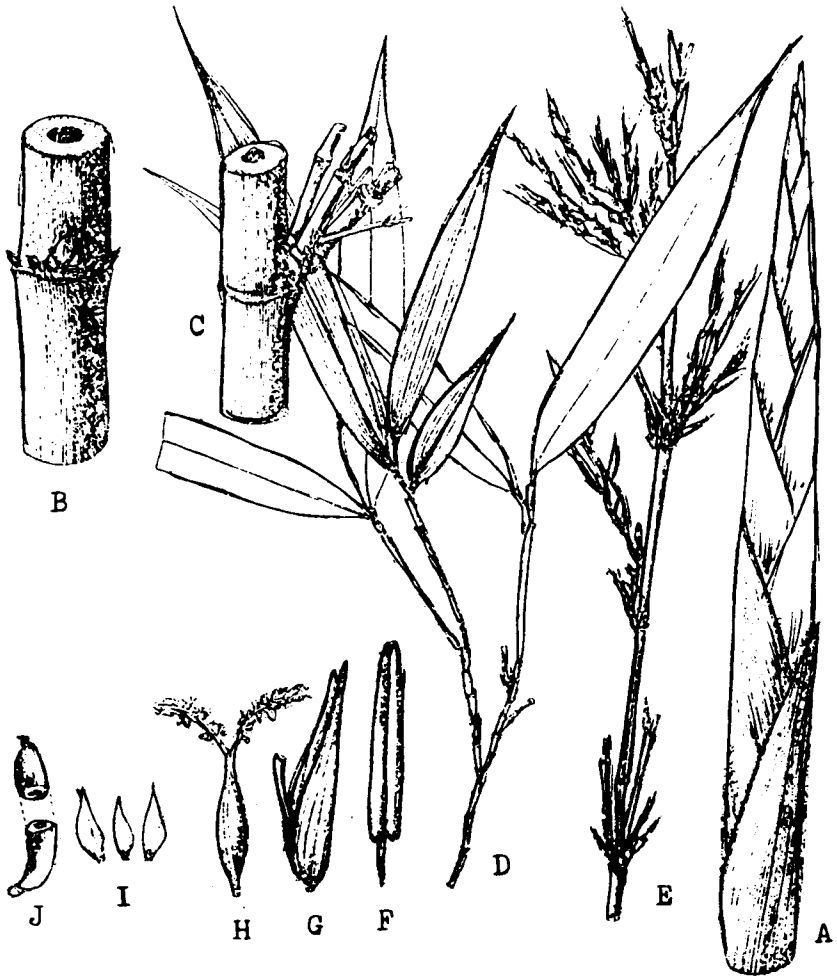


Figure 12. *Chimonobambusa pachystachys*; A. Shoot; B. Culm, showing its spines on the node; C. Culm, showing its branching; D. Branch with foliage leaves; E. Flowering branch; F. Stamens; G. Floret; H. Pistil; I. Lodicules; J. Fruit, showing its section.

2031 (SCFS). Yunnan Province, Yiliang, Yen, alt. 1449 m, 803 (PE); Fuyuan, s.n. (SWFC).

9. *Chimonobambusa linearifolia* W.D. Li & Q.X. Wu, *J. Bamb. Res.* 4(1): 47-48, fig. 3, 1985.

Type: Collected by Z. P. Wang et al. from China, Guizhou Province, Wangmo Xian, alt. 1400 m in shrubs, 1983, G8314 (NJU).

Synonym:

Chimonobambusa recurva Yi, *Bull. Bot. Res.* 8(4): 63-65, fig.1, 1988.

Culms 3-5 m tall, 1.5 cm in diameter; internodes cylindric at upper part of culms, but quadrangular at the middle and base of culms, green, with conferted white pubescence and sparse hairs when young, glabrous and tuberculate when old, with brown hairs below the nodes; nodes very prominent, sheath-scar with light tawny hairs, with a ring 9-12 short spines at nodes. Culm leaves chartaceous, triangular, tawny, exhibiting light yellow macula abaxially, bearing sparse light yellow pubescence basally, margins ciliolate, transverse veinlets purple; auricles absent; ligule convex, ciliolate; blades very small, subulate. Branches 3, solid, nodes very prominent. Foliage leaves 2-4 at the top of branchlets; sheaths glabrous; auricles absent, oral setae erect, white; inner ligules convex, small; blades linear-lanceolate, 6-14 cm long, 5-10 mm wide, both surfaces glabrous, truncate at base, lateral veins 3-4, transverse veinlets conspicuous. Inflorescence unknown (Figures 10 & 13).

Distribution: In China, Guizhou and Sichuan Provinces, high altitude area.

Specimens examined: China, Guizhou Province, Wangmo Xian, alt. 1400 m, 8314 (NJU); Sichuan Province, Gulin Xian, alt. 1040 m, 1986, Yi T.P., 86539 (SCFS).

10. *Chimonobambusa purpurea* Hsueh & Yi, *J. Yunnan For. Coll.* 1: 36, fig. 2, 1982; Chen S.L. & Chia, *Chinese Bamb.*, 57, 1988.

Type: Collected by Yi T.P. in China, Sichuan Province, Guain Xian, 23 April 1968, No. 68003 (SCFC).

Synonym:

Chimonobambusa neopurpurea Yi, *J. Bamb. Res.* 8(3): 24, 1989.

Culms 4-8 m tall, 2-5 cm in diameter, walls thin, 2-3 mm thick, internodes slightly quadrangular at middle of and below culms, glabrous, 10-16 cm long, nodes plane or prominent, with a ring of short spines on the nodes at middle and basal part of culms; sheath-scar bearing tawny hairs. Culm leaf sheaths triangular, chartaceous, purple-tawny with white rounded macula and tawny hairs when young, with thick tawny hairs at base, margins with yellow cilia, tessellate; ligule rounded, ciliate at the apex; auricles absent; blades small, 1-3 mm long, persistent. Branches 3, nodes prominent; foliage leaves 2-4 at the top of branchlets, sheaths glabrous, with white oral setae at both shoulders; inner ligule very small; blades lanceolate, apex acuminate, and cuneate at base, 10-19 cm long, 1-2 cm wide, lateral veins 4-6 pairs, transverse veinlets visible. Raceme with 4-5 bracts, and 1-3 pseudospikelets; pseudospikelets 2-3 cm long, with 2-3 glumes and 3-12 florets; lemmas chartaceous, 7-8

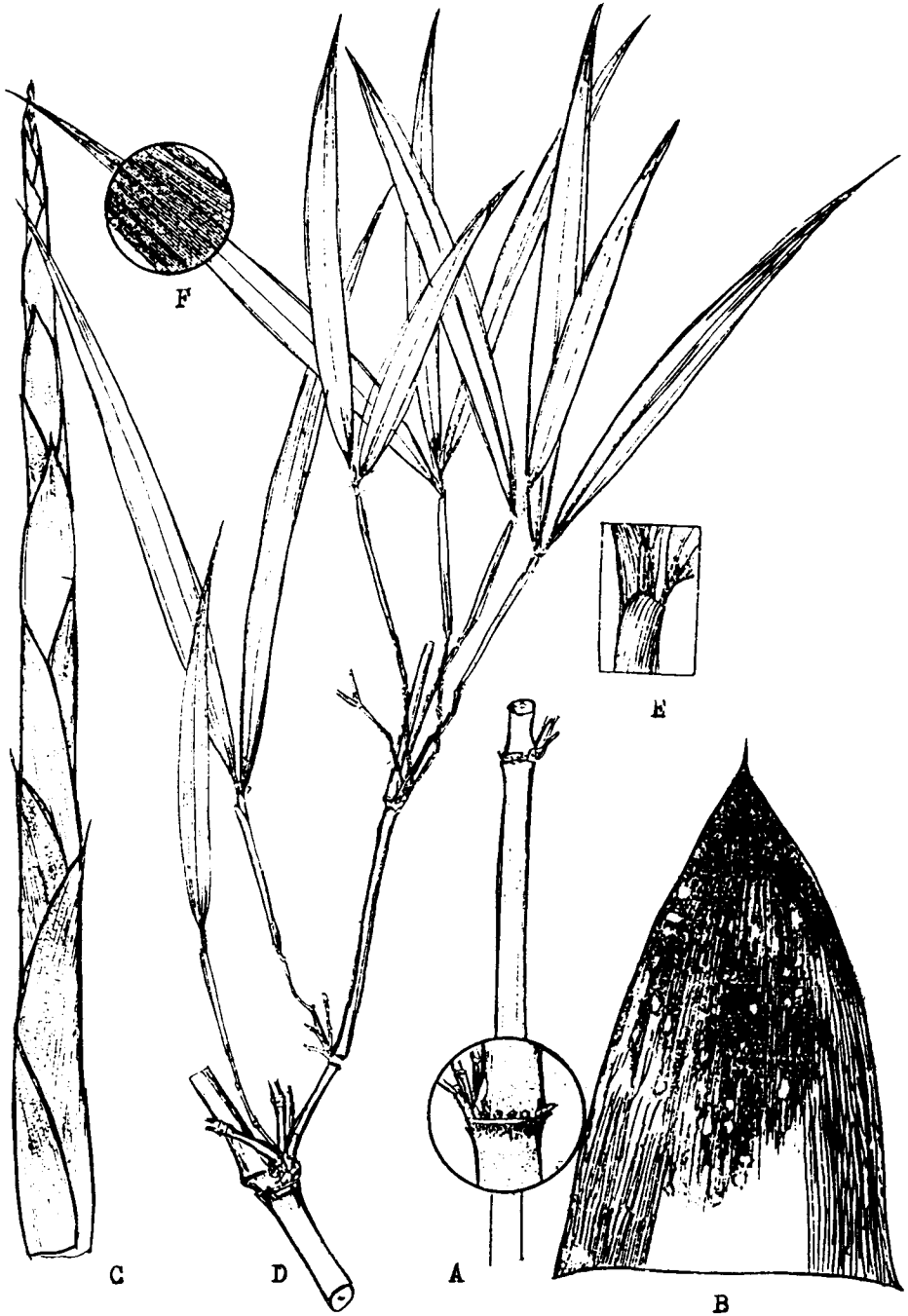


Figure 13. *Chimonobambusa linearifolia*; A. Culm, showing its spines on the node; B. Culm leaf; C. Shoot; D. Branch with leaves; E. Upper part of leaf-sheath; F. Enlargement of leaf.

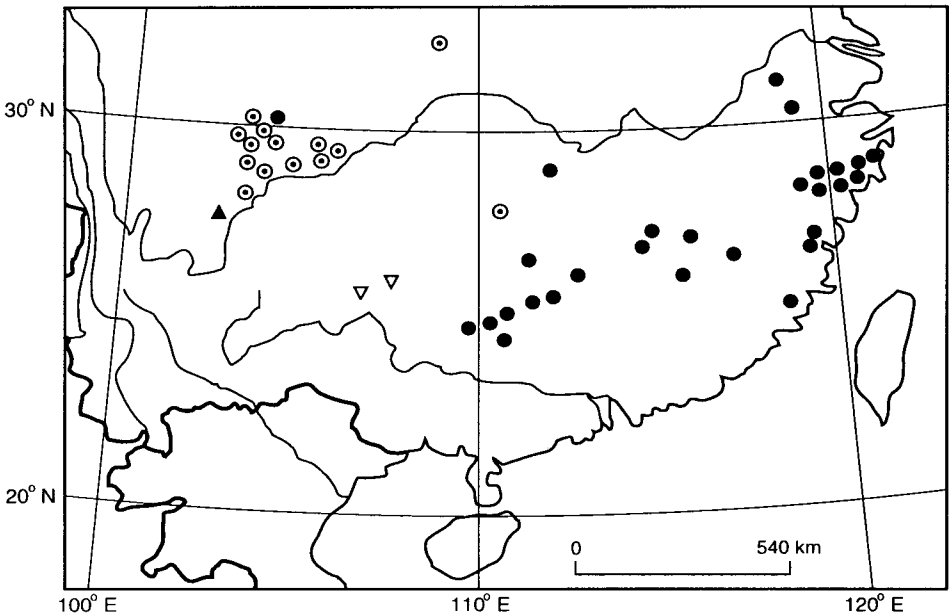


Figure 14. Distribution of (⊙) *Chimonobambusa purpurea*, (▽) *Chimonobambusa lactistriata*, (▲) *Chimonobambusa ningnanica*, and (●) *Chimonobambusa quadrangularis*.

nerved paleas as long as lemmas, 2-keeled, depressed at apex; lodicules 3, membranaceous, ciliate on the apex; stamens 3; ovary ovate, style very short, stigmas 2, plumose. Fruit bacca-like, 4-7 mm long, 2-4 mm in diameter (Figures 14 & 15).

Distribution: China, Sichuan and Guingxi Provinces, altitude 900-1800 m, under the broadleaf forest.

Chinese name: Ciheizhu.

Specimens examined: China, Sichuan Province, Omian, Wen T.H. October 1979, 79101 (ZJFI); same site, Hsueh C.L. 1002 (SWFC); EF 85071 (SWFC); Zhang W.P. No. 840377 (SWFC); NFU 76026 (NFU); Guan Xian, Fan W.P. 2001 (JSBI), Yi T.P. 75387, 75388, 82030, 83115 (SWFC); Wen T.H. No. 86106 (ZJFI); Zhang W.P. 84088 (SWFC); Yaan, Hsueh C.L. 1024, 976-1, 1017 (SWFC); Chongqing, SG 738 (PE); Anxian, Yi T.P. 74802 (SCFS); Yongchuan, Yi T.P. 75394 (SCFS); Daijiao, 460354 (SZ); Mabian, Yi T.P. No. 84043 (SCFS); Pingshan, Yu D.C. 3031 (PE); Leipo, Gua Z.T. 9194 (PE); Jiangnan, Chen A.G. No. 13 (PE); Tianquan, Li C. 976 (SWFC); Guingxi province Yang-shuo, Chen C.Y. 53880 (IBG).

Uses: This species has a square culm and a pretty form. It is a good decorative plant and a good material for handicrafts, and the young shoots are edible.

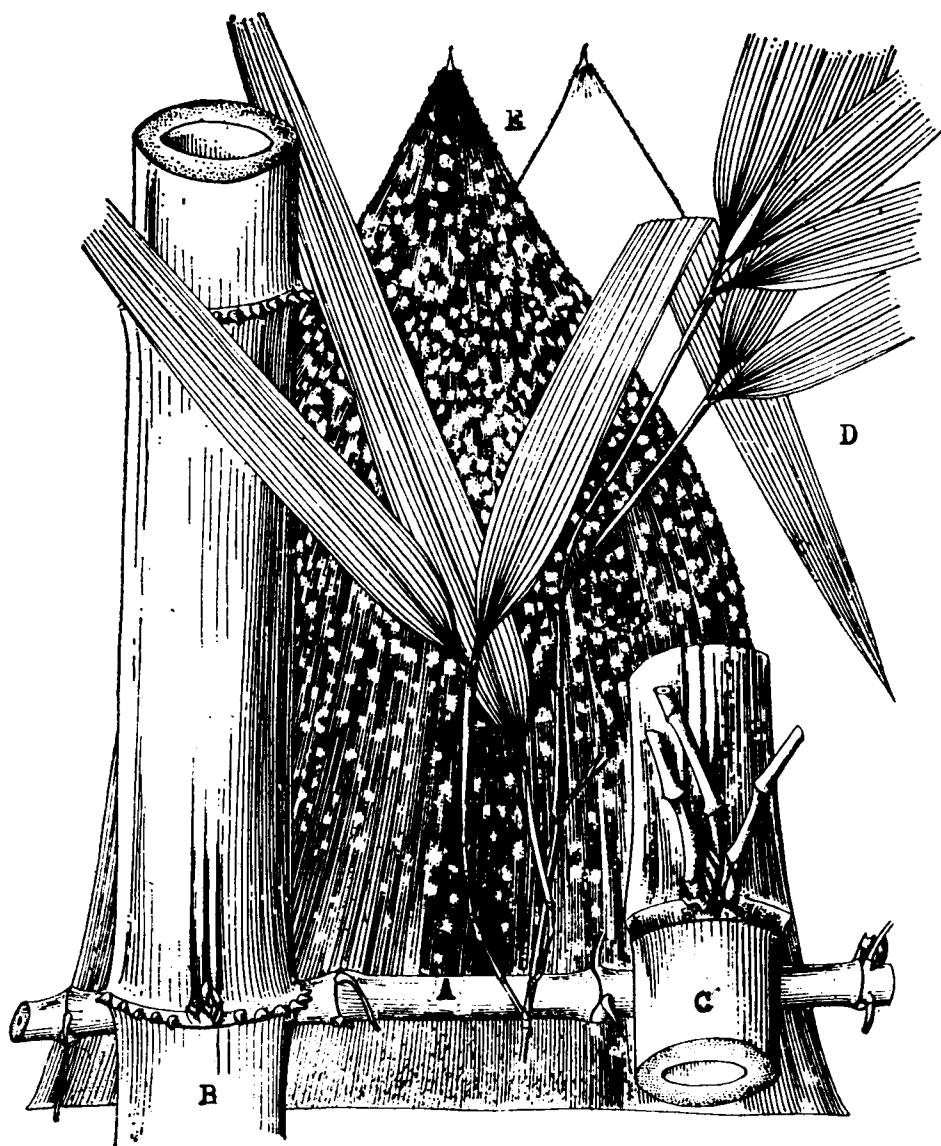


Figure 15. *Chimonobambusa purpurea*; A. Rhizome; B. Culm, showing its bud; C. Culm, showing its branching; D. Branch with foliage leaves; E. Culm leaf (Drawing from Yi T.P., *J. Bamb. Res.* 8(3): 23, fig. 2)

11. *Chimonobambusa lactistriata* W.D. Li & Q.Y. Wu, *J. Bamb. Res.* 4(1): 46-47, fig. 2, 1985.

Type: China. Guizhou Province: Ceheng, alt. 500 m, under trees, 1983, Z. P. Wang et al. G8313 (NJU).

Synonym:

Chimonobambusa rivularis Yi, *J. Bamb. Res.* 8(3): 17-21, 1989.

Culms usually 4-5 m tall, 2-4 cm in diameter; internodes quadrangular at middle and basal part of culms, with a groove at one side, green bearing purple striae and minute purplish spots when young, soon deciduous, appressed bulbous-based hairs on the surface; nodes very prominent, with a ring of about 4-19 short spines at internodes; sheath-scar bearing purple hairs at first. Culm leaf sheaths usually longer than internodes, chartaceous, triangular, dark purple at first, later tawny, and with light-green or white striae, the culm leaf sheaths at lower part of culms with brown bulbous-based hairs, but glabrous elsewhere, margins ciliate, glabrous at base, tessellation purple; auricles absent; ligules very small, convex; sheath-blades very small. Branches usually 3, solid. Foliage leaves 4-9 at top of branchlets; sheaths glabrous, margins ciliate; without auricles, with a few oral setae on the shoulders, erect, deciduous; inner ligule convex, margins ciliate; leaf-blades lanceolate, 8-17 cm long and 8-20 mm broad, bearing pubescence at the lower, cuneate at base, apex acuminate and caudate, lateral veins 5-6, tessellate. Inflorescence unknown (Figures 14 & 16).

Distribution: Only known to be distributed in China, Guizhou Province.

Specimens examined: Guizhou Province, Ceheng Xiang, 1983, C.P. Wang et al. 8317 (NJU, GZFI); Lipo Xian BCG No. 81-1 (GZAC).

Phenology: Shoots appear in October.

12. *Chimonobambusa ningnanica* Hsueh & Gao, *J. Bamb. Res.* 6(2): 13-15, 1987.

Type: Collected by SWFC Bamboo Expedition in China, Sichuan Province, Ningnan, alt. 2555 m, 26 March 1985, No. J85045 (SWFC); same locality J85043 (SWFC).

Culms usually 3-6 (-12) m tall, 2-3 (-7) cm in diameter; internodes cylindric, but quadrangular in basal part or middle part of culms, bearing a groove on one side or flattened, slightly farinose with tawny hairs on the outside at first, soon glabrous, but some tubercula left over; nodes prominent, internodes 2-4 mm wide, with a ring of short spines, sheath-scar conferted tawny tomentose. Culm leaves delayed deciduous, chartaceous or thickly chartaceous, narrow triangular, shorter than internodes, purple-green at young and yellow-brown when old, usually with ashy striate and brown hair; auricles and oral setae absent, subulate, 1-5 mm long. Branches usually 3, or more, foliage leaves 2-4 at top of branchlets; inner ligule truncate, 0.8 mm high; blades lanceolate 20-26 cm long and 18-25 mm broad, acuminate and prolonged at the apex, glabrous, 4-6 nerved. Inflorescence unknown (Figures 14 & 17).

Distribution: China, Yunnan and Sichuan provinces alt., 1800-2650 m.

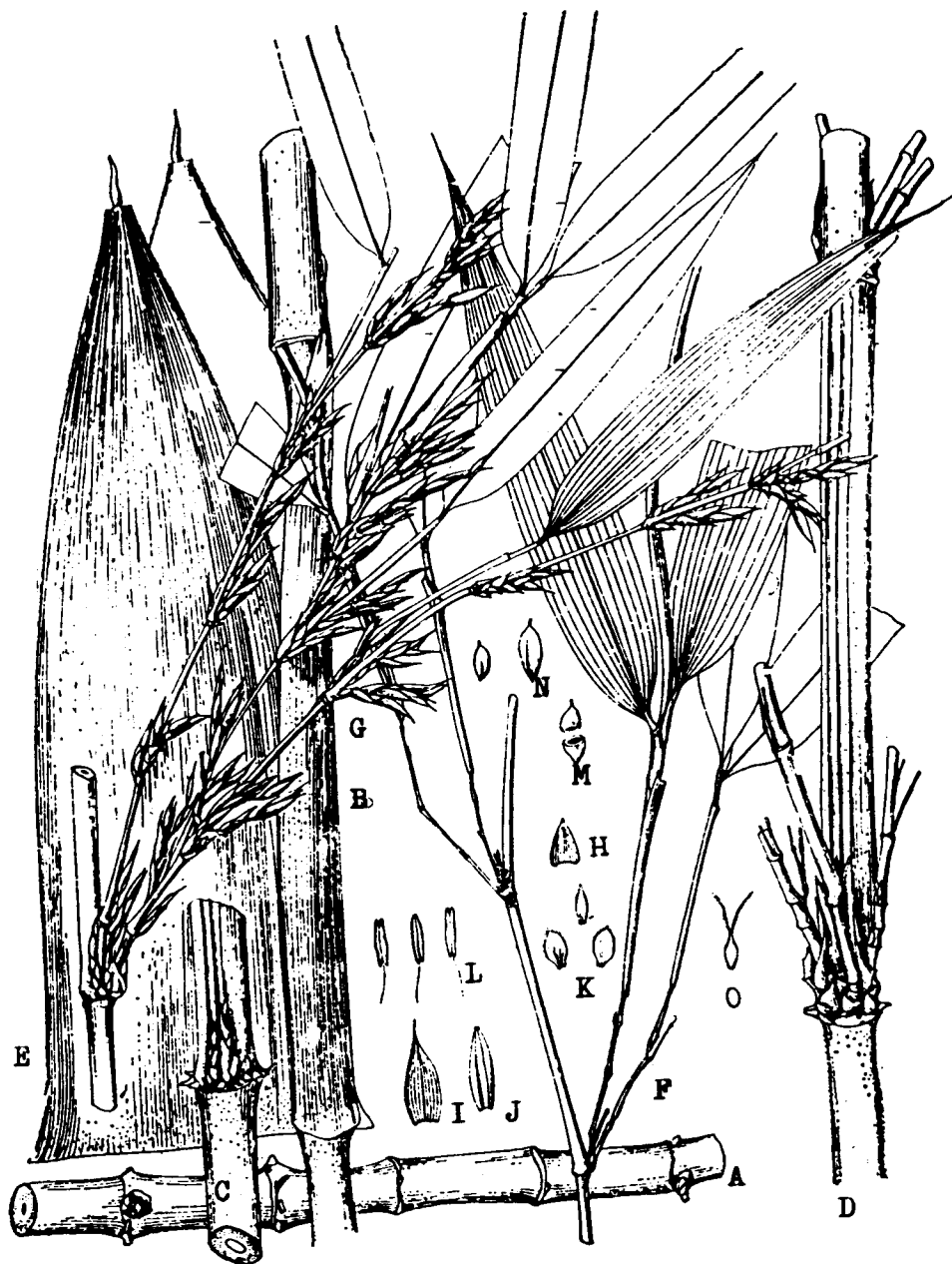


Figure 16. *Chimonobambusa lactistriata*; A. Rhizome; B. Young culm, showing its culm leaf sheath; C. Culm, showing its buds; D. Culm, showing its branching; E. Culm leaf; F. Branch with foliage leaves; G. Flowering branch; H. Glumes; I. Lemma; J. Palea; K. Lodicules; L. Stamens; M. Fruit section; N. Fruit. O. Pistil (Drawing from Yi T.P., *J. Bamb. Res.* 8(3): 19, fig. 1).

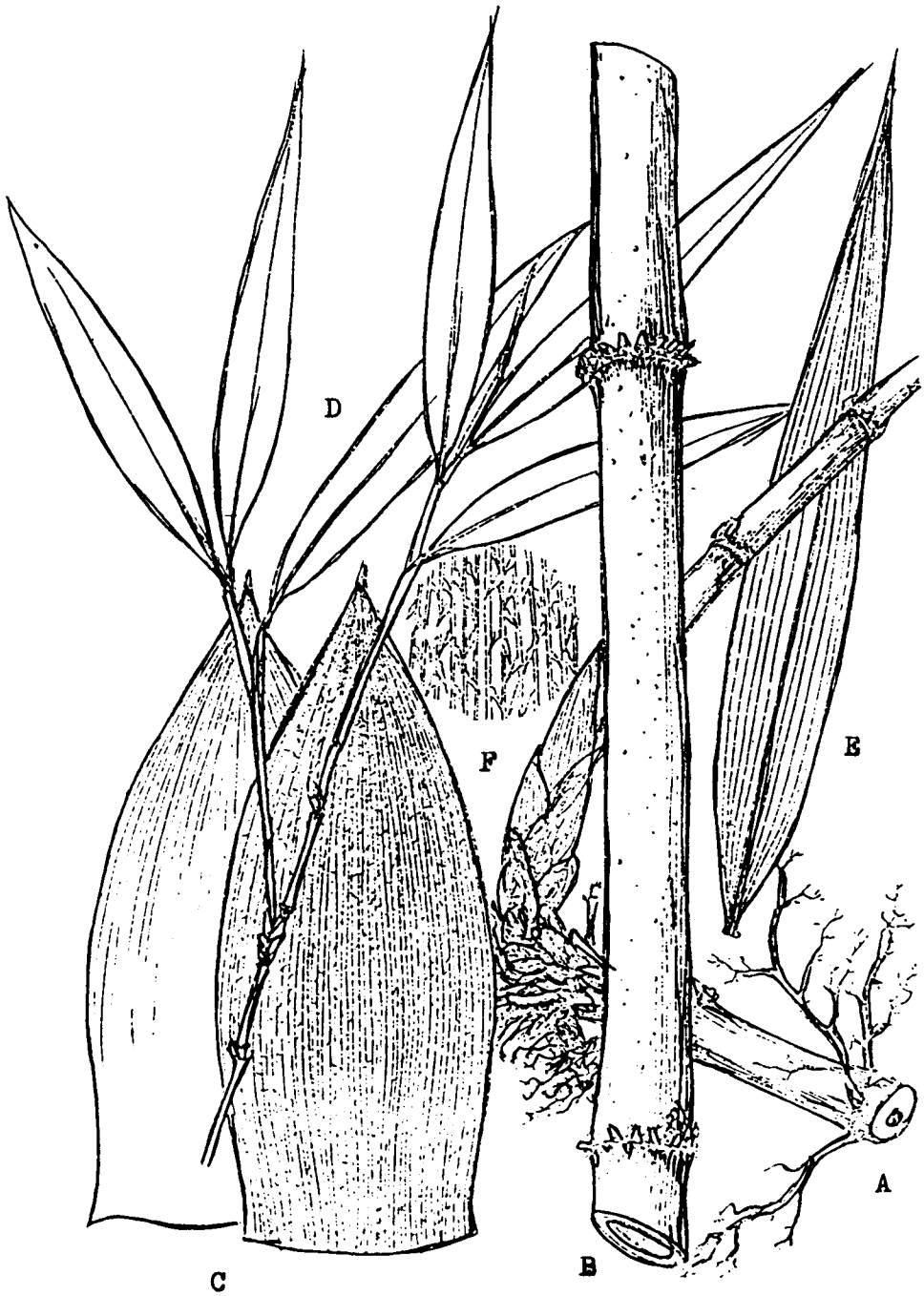


Figure 17. *Chimonobambusa ningnanica*; A. Rhizome and young culm; B. Culm, showing its spines on the node; C. Culm leaves; D. Branch with foliage leaves; E. Blade; F. Hispid on the outside of culm leaf.

Specimens examined: China, Sichuan Province, Ningnan 2550 m in altitude, J85045 (SWFC); same locality J85043 (SWFC); Luxi, April 1982, Wen T.H. 82424 (ZJFI); Boushan Yi T.P. 83134 (SCFS); Fenqing, Yi T.P. 84004 (SCFC); Yuxi, alt. 2200 m, February 1984, Hsueh C.J., no No. (SWFC); Luchun, Hsueh C.J. 822(SWFC); same site alt. 1650 March 1986, Wang C.L. 82004 (SWFC); Gejin, alt. 1800 m, Oct. 1985, Zhang W.P. 840304, 84038 (SWFC); Changning alt. 1700 m, Feb. 1985; same site, Hua C.M. 85002 (SWFC); Maguang Hsueh C.J. 19 (SWFC); same site, Zhang W.P. 840340 (SWFC); Xinping Hsueh C.J. 1279 (fl), 85308 (SWFC); Mangshi, Hsueh C.J. 1155, 1134 (SWFC); Qiubei, Liu Z.C., no No. (SWFC); Yuangang, Wang K.L. 82008 (SWFC); same site, Li F.S. 82009 (SWFC); Menghai Du f. 86058 (fl).

Phenology: Shoots appear from August to September.

13. *Chimonobambusa quadrangularis* (Fenzi) Makino, *Bot. Mag. Tokyo* 28: 153, 1914.

Type: Collected by E.H. Parker, from China, Zhejiang Province, Wenzhou in 1883. Type specimens perhaps at FI.

Basionym:

Bambusa quadrangularis Fenzi, *Bull. Soc. Tosc. Ort.* 5: 401; W. Watson, *Bull. Misc. Info. Kew* 299, 1889; Mitford, *Garden* 46: 147, 1894; Mitford, *Bamb. Gard.*, 89, 1896; Fairchild, *US Dept. Agric. Bur. Pl. Industr. Bull.* 43: 33, 1903.

Synonyms:

Bambos sikaktake Sieb, *Syn. Pl. Ecom. Jap.* 6: 1827, *nom. nud.*
Arundinaria quadrangularis (Fenzi) Makino, *Bot. Mag. Tokyo* 9: 71, 1895; D. McClintock, *Plantsman* 1(1): 44, 1979.
Phyllostachys quadrangularis (Fenzi) Rendle, *J. Linn. Soc.* 36: 443, 1904; Porterfield, *J. China Br. Roy. Asiat. Soc.* 62: 54, 1931.
Bambusa angulata (not Munro), cf. McClure, *Taxon* 6(7): 210, 1957.
Tetragonocalamus angulata (Munro) Nakai, *J. Jap. Bot.* 9(2): 86, 1933; S. Suzuki, *Index Jap. Bamb.*, 98, 1978.
Tetragonocalamus quadrangularis (Fenzi) Nakai, *J. Jap. Bot.* 9(2): 90, 1933; Lin W.C., *Bull. Taiwan For. Res. Inst.* 69: 108, 1961; Muroi, *Guide Book Fuji Bamb. Gard.* 7: 53, 1963.

f. *quadrangularis*

Culms 5-7 m tall, 3-4 cm in diameter, quadrangular in the middle and lower parts, cylindric in the upper; internodes 8-20 cm long, dark green, abaxially tuberculate, rough; walls 3-8 mm thick; nodes prominent, with a ring of short spines at nodes. Culm leaf sheaths deciduous, triangular, subcoriaceous, light brown, mottled with purple at surface, margins brown ciliate, auricles absent; ligule inconspicuous; blades very small, aristate, erect. Branches usually 3, rarely 7 at each node; foliate leaves 3-5 towards the top of branchlets, sheaths glabrous, 4-7 cm long, densely ciliate on sides; inner ligule tongue-shaped, 1 mm or less in height, hardly visible from the outside; oral setae well developed, erect or erect-palmate, white or light purplish brown, auricles small, pearly, inconspicuous, blades narrow lanceolate or broadly linear, apex acute, base cuneate, thin papery, 10-20 cm long, 1-2 cm broad; densely pubescent with minute hairs beneath at first, lateral veins 4-7, tessellate. Inflorescence un-

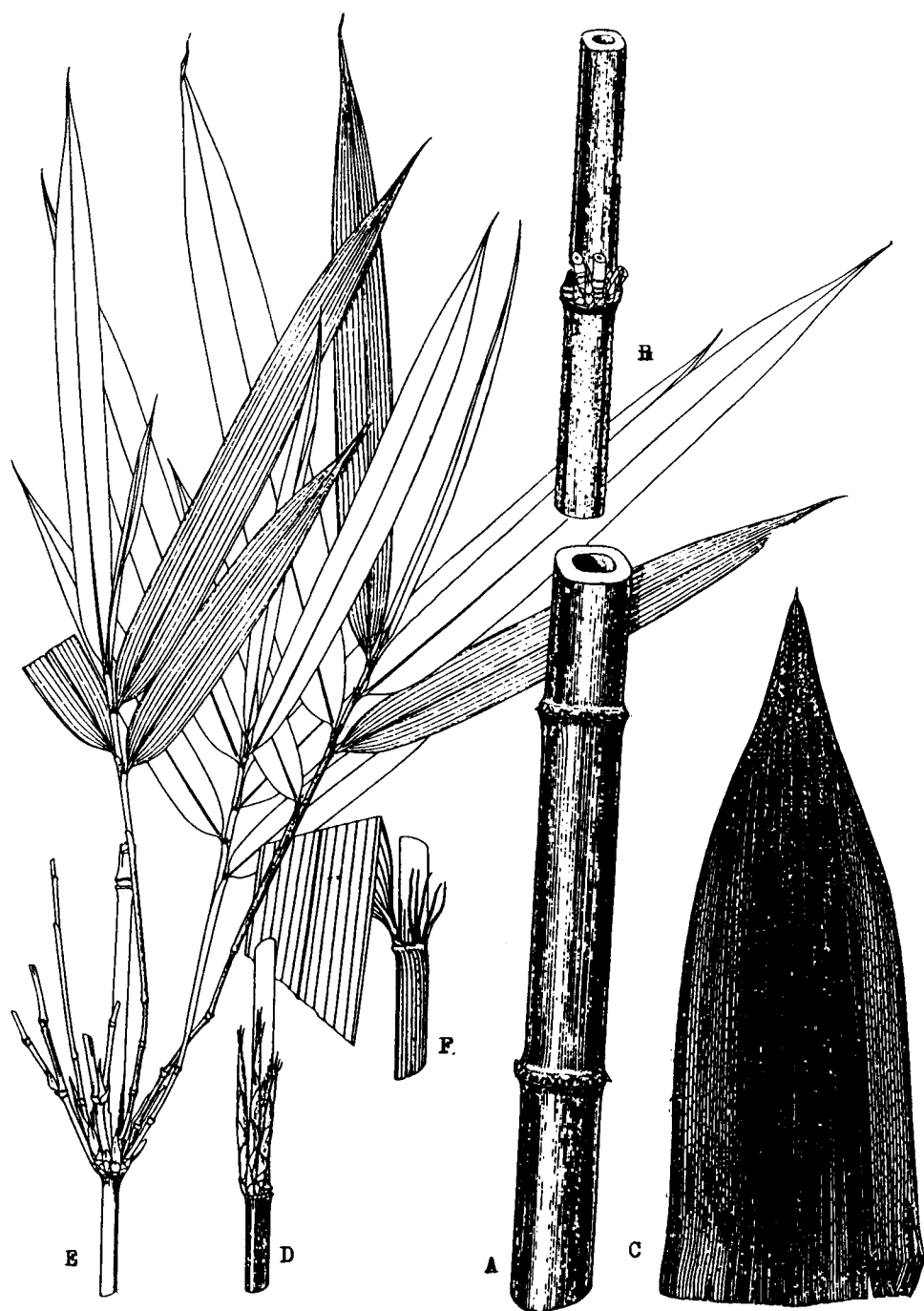


Figure 18. *Chimonobambusa quadrangularis*; A. Culm, showing its spines; B. Culm, showing its branching; C. Culm leaf; D. Culm, showing its buds; E. Branch with leaves; F. Upper part of foliate leaf-sheath (Drawing from S. Suzuki, *Index to Japanese Bambusaceae*).

known (Figures 14 & 18).

Distribution: Native of Southeast China, introduced to Japan, Ryuku, France, England, Germany, Portugal, America, and USSR.

Specimens examined: China, Zhejiang Province, Wenzhou 1883, E.J. Parker, no No.; same site Ling K. No. 2627; Qingyuan 1983, Chen S.C. 83039 (ZJFI); Suichang, June 1979, Jiang G.C. 13-1 (ZJFI); Jinyun, Keng Y. L. 439 (NJU); Leqing, Zhong G.G. 3743 (JSBI); same site 1984, Zhang W.P. 840338 (SWFC); Taishum, 1984, Zhang W.P. 840339 (SWFC); Jiangxi Province, Yifeng 1980, Zhang C.G. 800059 (SWFC); Anfu, Yue C.S. 3105 (JSBI, KUN); same site Go X.M. 1177 (NJTFC); Lichuan Nue, 3015 (KUN); Sinan, Sinan collector group 342 (PE); Fujing Province, Sanming, 1981, Huan K.F. et al. FJ 81522 (NJTFC); Laizhou, Jang S.X. 76126 (ZJFI); Nanjing, 1976, Yao C.Y. 76068 (NJU); Henan Province, Donan, Yang B.M. 06346, 06353 (SWFC, HUTC); same site, Liu Y. 874 (JSBT); Ningyuan, Yang B.M. 06329 (HNTC); Taojiang, Liu L.H. 06917 (HNTC); Sichuan Province, Guanxian, Hsueh C.J. 1278, 1279 (SWFC). Guangxi Province, Lingchuan, 1976, Zou W.Y. 769012 (NJFC, SWFC); same site, 1976, Xion W.Y. 76418 (NJFC); Quilin, 1973, Dai C.W. 73-3 (PE, GXFI); same site, China and Germany collector group 1231 (IBG); Yixian, 1960, Huan D.I. No. 60864 (IBG).

Recorded Chinese name: Fanzhu;

Japanese name: Shiho-chiku; Shiraku-dake;

English name: Square bamboo;

French name: Bambu carre;

German name: Vierkantiger bambus.

Phenology: No record of flowering. Shoots appear from August to December. In Taiwan, Alisan, distributed to alt. 1450 m. Since it is able to endure cold, and is a short-day plant, this species can grow well near walls, rock-walls, and under trees, and has a high value as an ornamental plant.

f. *albo-striata* (Muroi & H. Okamura) Wen, comb. nov.

Basionym:

Tetragonocalamus quadrangularis f. *albo-striatus* Muroi & Okamura, *Rep. Fuji Bamb. Gard.* 17: 10, 1972; Muroi, *Var. Bamb. Stripe Jap.*, 1: 11, 1974.

Synonym:

Chimonobambusa quadrangularis cv. *albo-striata*, Ohnberger, *Bamb. World*, *Chimonobambusa* 1990.

Leaves green, with a few white stripes.

Distribution: Japan.

Recorded Japanese name: Furi-hôchiku, Furi-shikakudake.

f. *aureo-striata* (Muroi & H. Okamura) Wen, *J. Bamb. Res.* 10(1): 17, 1991.

Basionym:

Tetragonocalamus quadrangularis f. *aureo-striata* Muroi & H. Okamura, *Rep. Fuji Bamb. Gard.* 17: 10, 1972; Muroi, *Var. Bamb. Stripe Jap.* 1: 11, 1974.

Synonym:

Chimonobambusa quadrangularis cv. *aureostriata*, Ohrnberger, *Bamb. World*, *Chimonobambusa*, 1990.

Leaves green, with a few yellow stripes.

Distribution: Japan.

Recorded Japanese name: Kashima-hôchiku, Kishima-shikakudake.

f. *cyrano-bergeraca* Wen, *J. Bamb. Res.* 10(1): 18, 1991.

Basionym:

Chimonobambusa quadrangularis cv. *Cyrano de Bergerac*, Rifat, *J. Bamb. Res.* 6(2): 26, 1987.

Synonym:

Chimonobambusa quadrangularis cv. *Cyrano de Bergerac*, D. Ohrnberger, *Bamb. World*, *Chimonobambusa*, 1990.

Culms green, with yellow stripes, some leaves variegated.

Distribution: Cultivated in Japan, introduced from Japan to France, Switzerland by C. Rifat in 1987.

f. *nagaminea* (Muroi & H. Hamada) Wen, *J. Bamb. Res.* 10(1): 18, 1991.

Basionym:

Tetragonocalamus quadrangularis f. *nagamineus* Muroi & H. Hamada cf. H. Okamura, *Hort. Bamb. Sp. Jap.*, p. 31, 1986.

Synonyms:

Chimonobambusa quadrangularis cv. Joseph de Jussieu, Rifat, *J. Bamb. Res.* 6(2): 25, 1987.

Tetragonocalamus quadrangularis cv. *Nagamineus* Muroi & Hamada, cf. H. Okamura, *Hort. Bamb. Sp. Jap.*, p. 31, 1986.

Chimonobambusa quadrangularis cv. *Nagamine*, Ohrnberger, *Bamb. World*, *Chimonobambusa*, 1990.

Culms light yellow, with green stripes at the sulcus and other part of culms, leaves with a few white stripes.

Distribution: Cultivated in southern Honshu of Japan, and introduced from Japan to

France, and Switzerland by C. Rifat in 1987.

Japanese name: Kimmei-hôchiku.

f. *purpuriculma* Wen, J. Bamb. Res. 8(1): 24, 1989.

Culms purple when young.

Distribution: Naturally distributed in China, Fujing Province, Shunchang Xian.

f. *sotaroana* (Muroi) Wen, J. Bamb. Res. 10(1): 17, 1991.

Basionym:

Tetragonocalamus quadrangularis var. *sotaroanus* Muroi, *Hyogo Biology No. 2*: 7, 1948.

Synonyms:

Tetragonocalamus quadrangularis f. *sotaroanus* (Muroi) Muroi, *J. Himeji Gakuin Woneus Jr. Coll. No. 1*, 1974;

Tetragonocalamus quadrangularis cv. *sotaroanus* Hatusima, *Woody Pl. Jap.* 1976;

Chimonobambusa quadrangularis cv. *Sotaroana*, D. Ohrnberger, *Bamb. World*, *Chimonobambusa* 1990.

Culms green when young, after two years exhibit some light-green stripes.

Distribution: in Japan.

Recorded Japanese name: Gomafu-hôchiku, Gomafu-shikaku-dake.

f. *suow* (Kasahara & H. Okamura) Wen, J. Bamb. Res. 10(1):18, 1991.

Basionym:

Tetragonocalamus quadrangularis f. *suow* Kasahara & H. Okamura, cf. H. Okamura et al., *Hort. Bamb. Sp. Jap.*, 31-32, 1986.

Synonyms:

Tetragonocalamus quadrangularis cv. *tatejima* Kasahara & H. Okamura.

Chimonobambusa quadrangularis cv. *Napoleo-Bonaparte*, Rifat, *J. Bamb. Res.* 6(2): 25, 1987.

Chimonobambusa quadrangularis cv. *suow*, D. Ohrnberger, *Bamb. World*, *Chimonobambusa*, 1990.

Culms yellow, with many light green stripes, leaves variegated.

Distribution: Cultivated in southern Japan. Introduced from Japan to France and Switzerland by C. Rifat.

Recorded Japanese name: Tatejima-hôchiku, Suow-shikakudake.

Uses: This is a famous decorative plant group for its square culm and beautiful foli-

age. Usually it is planted beside walls, windows, rocks and roadways. Some forms such as *f. nagaminea*, *f. suow*, and *f. cyrano-bergeraca* are very beautiful. It is a good choice for a decorative plant.

14. *Chimonobambusa szechuanensis* (Rendle) Keng f., *Tech. Bull. Not. Res. Bur. China* 8: 15, 1948.

Type: China, Sichuan Province, Obian, Washan, June 1908, E.H. Wilson No. 3408 (Herb. Arn. Arb.).

Basionym:

Arundinaria szechuanensis Rendle, Sargent. Pl. Wilson II 64, 1914.

Synonym:

Oreocalamus szechuanensis (Rendle) Keng, *Sunyatsenia* 4(3-4): 147, 1939; Keng f. & Hu C.H., *J. Nanjing Univ.* 22(3): 415, 426, 1986.

f. szechuanensis

Culms 3-4 m tall, 1-2 cm in diameter; internodes cylindric, smooth, glabrous, 18-22 cm long, with a groove at one side, nodes little prominent, with a ring of short spines; sheath-scar bearing a ring brown hairs. Culm leaves thick chartaceous, delay deciduous, shorter than internodes, glabrous, margins ciliate; ligules 0.5-1 mm high, truncate or slightly round; blades small, 3-5 mm long. Branches usually 3, foliate leaves 1-3, towards the top of branchlets; sheaths glabrous, margins ciliate; no auricles, oral setae white, 3-5 mm long; blades oblong-lanceolate, acuminate caudately at apex, cuneiform at base, 18-20 cm long, 12-15 mm broad, lateral veins 4-6 pairs, transverse veinlets visible. Raceme with 3 bracts at base, 2-3 pseudospikelets; pseudospikelets with 3 glumes and 3-4 florets; lemmas ovate-lanceolate, acuminate at apex, 7-9 nerved; paleas oblong, as long as lemmas, round or depressed at apex, 2-keeled; lodicules 3, membranaceous, ciliate; stamens 3; style short, nearly the base with two stigmas, plumose. Fruit bacca-like, ovoid-oblong, 15 mm long and 6 mm broad, pericarp thick (Figures 19 & 20).

Distribution: China, Sichuan and Guizhou Provinces, altitude 1000-2400 m under broadleaf forest.

Specimens examined: China, Sichuan Province, Omian, Xion C.H. et al. 32710, 32258 (SZ, JSBI); Zheng Wanjun, 6680 (PE); same site, Wen T.H. 5 October 1979, 79104 (ZJFI); same site, Young G.H. 57381 (JSBI); NJFU 76031 (NFU), Yi T.P. 74078, 83006 (SCFS); Yaan, Hsueh C.L. 1017 (SWFC); Li C. 832 (SWFC); Mabian, Li C.C. 7801 (NJU); Li C.C. 4 (SCFS); Yi T.P. No. 84041 (SCFS); Obian, Yi T.P. 74230 (SCFS); Zhang W.P. 840376 (SWFC); Olon, Wen T.H. 84610 (ZJFI); Guanxian, Hsueh C.L. s.n. (SWFC); Nanchuan, Fan W.P. 5832 (PE); SCAC 90141 (PE); Tianquan, SCAC 699 (PE); Guizhou Province, Shuyang, Go T. s.n. (SWFC).

Chinese name: Sichuan-Fangzhu.

Phenology: Flowering in Sichuan Province, Obian in 1908, and in 1984 flowering again, the flowering cycle about 70-80 years.

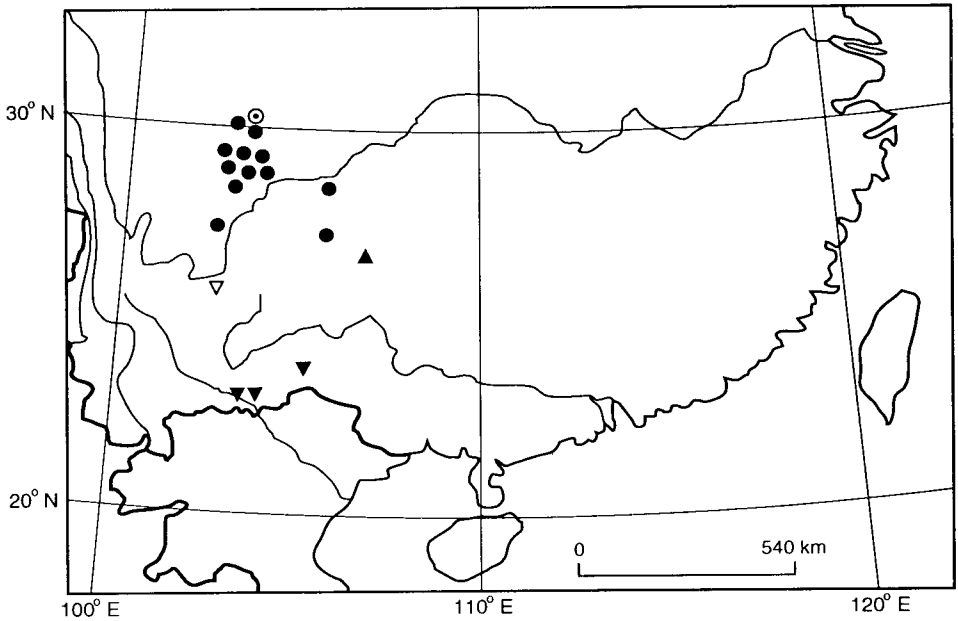


Figure 19. Distribution of (●) *Chimonobambusa szechuanensis*, (⊙) *Chimonobambusa szechuanensis* f. *flexuosa*, (▽) *Chimonobambusa paucispinosa*, (▲) *Chimonobambusa hirtinoda*, and (▼) *Chimonobambusa brevinoda*.

f. *flexuosa* (Hsueh & C. Li) Wen & Ohrnberger, D. Ohrnberger, *Bamb. World*, *Chimonobambusa*, 44, 1990.

Basionym:

Chimonobambusa szechuanensis var. *flexuosa* Hsueh & C. Li, *J. Yunnan For. Coll.* 1: 31, 1982.

Culm internodes flexuose at the lower culms, sheath-scar bearing tawny hairs (Figure 21).

Distribution: Only known to be distributed in China, Sichuan province, Yaan Xian, alt. 1280-1320 m.

Uses: The flexuose internodes make this is a valuable ornamental plant.

15. *Chimonobambusa paucispinosa* Yi, in *J. Bamb. Res.* 9(3): 24-26, fig. 1, 1990.

Type: Collected by Yi T.P., from China, Yunnan Province, Suijiang Xian, alt. 1450 m, 23 August 1988, No. 88156 (SCFS).

Culms 3-5 m tall, 1-2 cm in diameter; internodes 10-14 cm long, cylindric or slightly quadrangular at lower part of culm; grey-yellow hispid when young, soon glabrous; wall

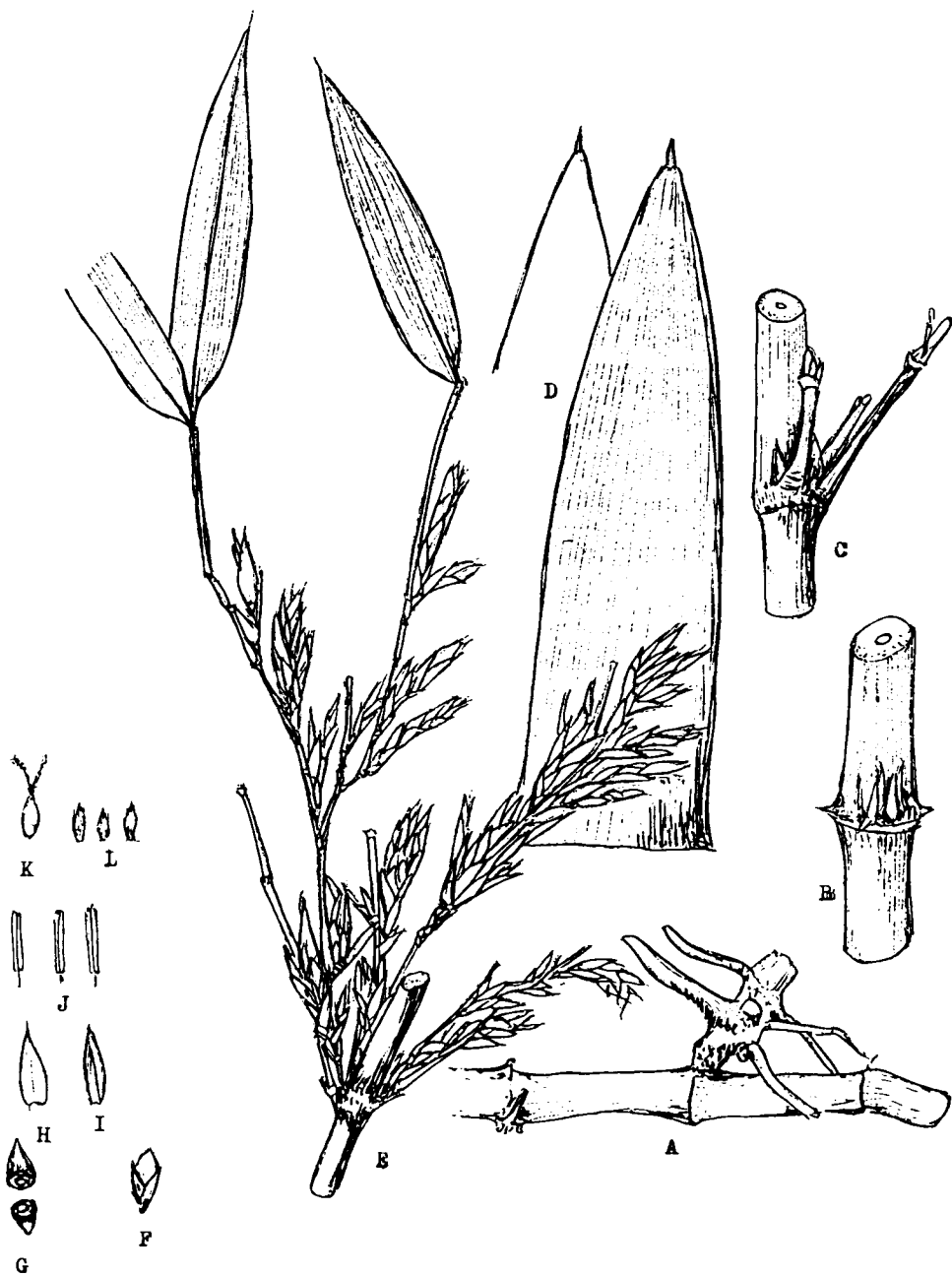


Figure 20. *Chimonobambusa szechuanensis*.; A. Rhizome; B. Culm, showing its buds; C. Culm, showing its branching; D. Culm leaf; E. Flowering branch; F. Fruit; G. Section of fruit; H. Lemma; I. Palea; J. Stamens; K. Pistil; L. Lodicules.

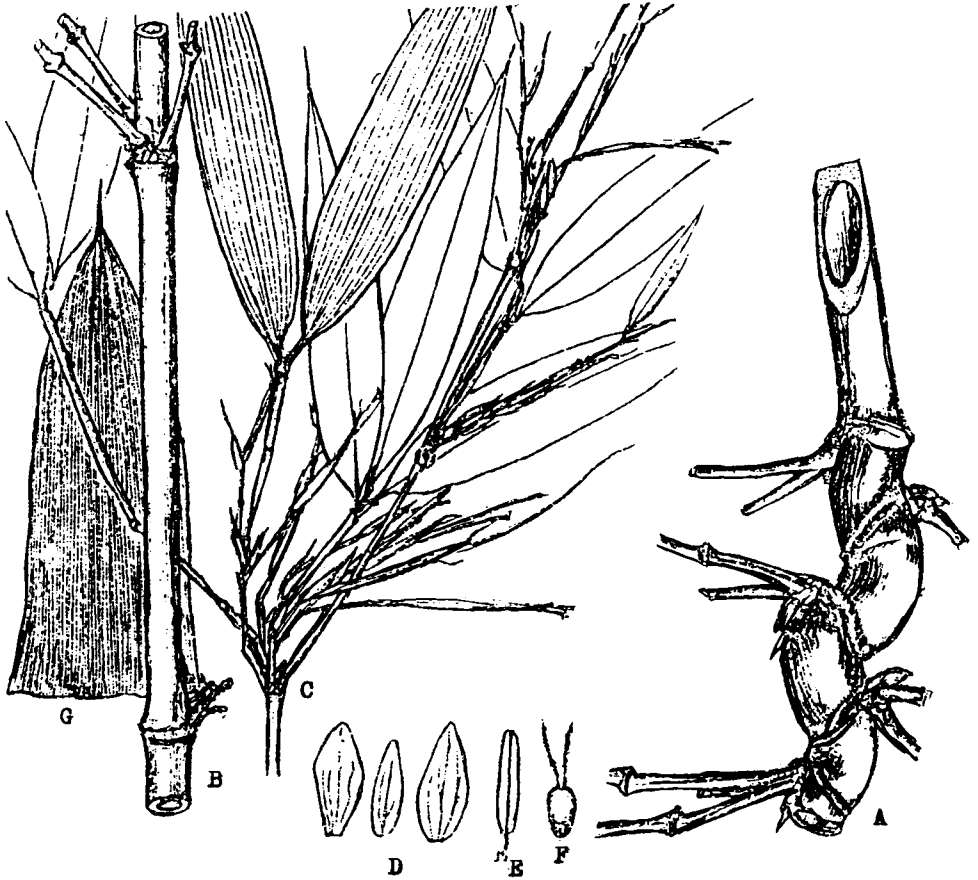


Figure 21. *Chimonobambusa szechuanensis* f. *flexuosa*; A. Deformed culm; B. Culm, showing its branching; C. Branch with foliate leaves; D. Lodicules; E. Stamens; F. Pistil; G. Culm leaf.

3.5-6 mm thick; sheath-scar glabrous, nodes prominent; nodal region 1-2 mm long, with a ring of short spines at the nodes. Culm leaf sheaths deciduous, triangular, without macula, glabrous or pilose at the base, margins ciliate; auricles and oral setae absent; ligule truncate, 0.5 mm high; sheath-blades triangular, erect, 3-6 mm long, and 1-2 mm broad. Branches 3, with grey-yellow hispid at first; foliate leaves 1-4 towards top of branchlets; sheaths glabrous, 22-32 mm long, margins glabrous, auricles absent, a few oral setae erect, 1-3 mm long, sometimes absent; inner ligule rounded 0.3 mm high; blades lanceolate, 9-13 cm long, 10-15 mm broad, lateral veins 3-4 in either side, tessellate, margins serrate. Inflorescence unknown (Figures 19 & 22).

Distribution: Only found in China, Yunnan Province, Suijiang Xian, alt. 1450 m, under broadleaf forest.

Uses: Culms can be used to make paper.

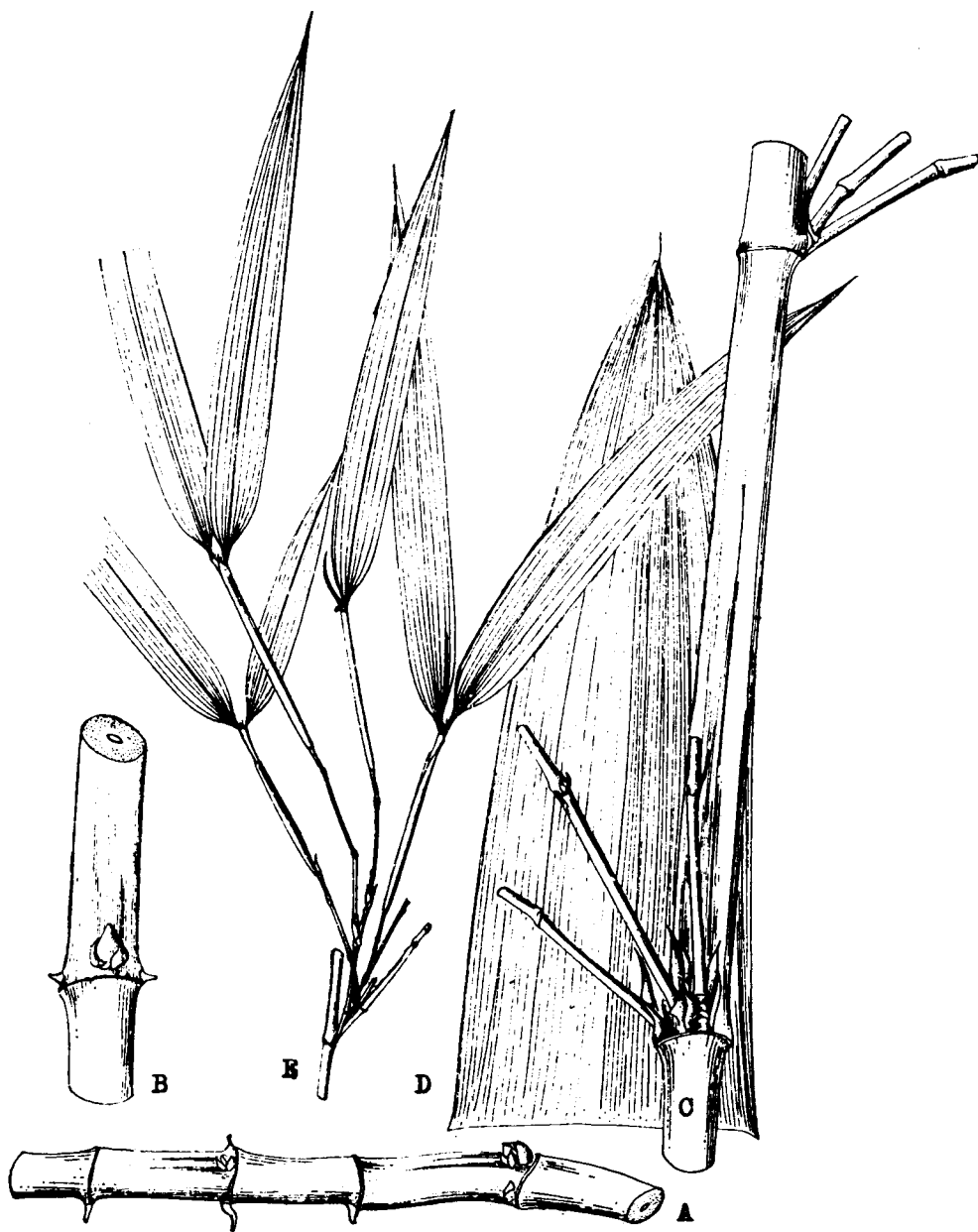


Figure 22. *Chimonobambusa paucispinosa*; A. Rhizome; B. Culm, showing its spines; C. Culm, showing its branching; D. Culm leaf; E. Branch with foliate leaves (Drawing from Yi T.P., New Taxa of Bamboo from North-Eastern Yunnan, *J. Bamb. Res.* 9(3): 25, f. 1).

16. *Chimonobambusa hirtinoda* Chao & K.M. Lan, *Bamb. Res. 1(1): 2-3, fig. 2, 1982; Hsueh et al., Bamb. Res. 36: 9, 1988; D. Ohrnberger, Bamb. World, Chimonobambusa, 1990.*

Type: China, Ghizhou Province, Duyan, Doupengshan, alt. 1100 m, Chu C.D. et al. No. 81009 (NJFU).

Culms usually 5 m tall, 25 mm in diameter, quadrangular at lower part, with thick hairs when young, scabrous, internodes 12-16 cm long, nodes prominent with a ring of short spines on the nodes, and with conferted dark brown hairs on the lower nodes. Culm leaf sheaths chartaceous, longer than internodes, bearing sparse tawny hairs, none white maculate, margins with conferted cilia, tessellate; blades very small, subulate, 1-2 mm long. Branches 3, with conspicuous hair at the base of nodes; foliate leaves 2-3 at the apex of branchlets; sheaths glabrous, with a few oral setae at both shoulders; blades thin, lanceolate or linear-lanceolate, 9-16 cm long, and 10-18 mm broad, glabrous, lateral vein 4-5 pairs. Inflorescence unknown. (Figures 19 & 23.)

Distribution: Only known to be distributed in China, Guizhou province, alt. 1100 m.

17. *Chimonobambusa brevinoda* Hsueh & W.P. Zhang, *J. Bamb. Res. 7(1): 14-16, fig. 1, 1988; Hsueh et al., Bamb. Res. 36: 5, 1988.*

Type: China, Yunnan province, Malipo, alt. 1650 m, 1985, Zhang W.P. No. 840332 (SWFC).

Culms 2-3 m tall, 1 cm in diameter, internodes cylindric or quadrangular at middle or lower part of culms, nearly solid, 7-8 cm long, green, with white lineate tomentum on the outside when young, glabrous when old; nodes prominent, with a ring of 5-6 short spines at the nodal region, with thick tawny hairs under the nodes; culm leaf sheaths nearly persistent, chartaceous, with tawny macula and purplish-tawny hairs, bearing conferted tawny tomentum at base, with yellow cilia at margins; ligule obscure, ciliate; blades small, subulate, about 1 mm long. Branches usually 3, solid, nodes very prominent; foliate leaves 3-5 at the apex of branchlets; sheaths 35 mm long, glabrous; auricles absent, oral setae white, 13 mm long; ligule small; blades lanceolate, chartaceous, 13-16 cm long, and 1 cm broad, acuminate at apex, cuneiform at base, lateral veins 3-4 pairs, transverse veinlets conspicuous. Inflorescence unknown (Figures 19 & 24).

Distribution: China, Yunnan Province, Malipo.

Specimens examined: Yunnan, Malipo, alt. 1650, Zhang W.P. No. 840332 (SWFC); For. D.D. No. 83016 (SWFC); Maguan, Yi T.P. No. 77335 (SCFS); Bamb. G. No. 1 (SWFC); Xichou, For. D.D., s.n. (SWFC).

Phenology: Shoots appear in October.

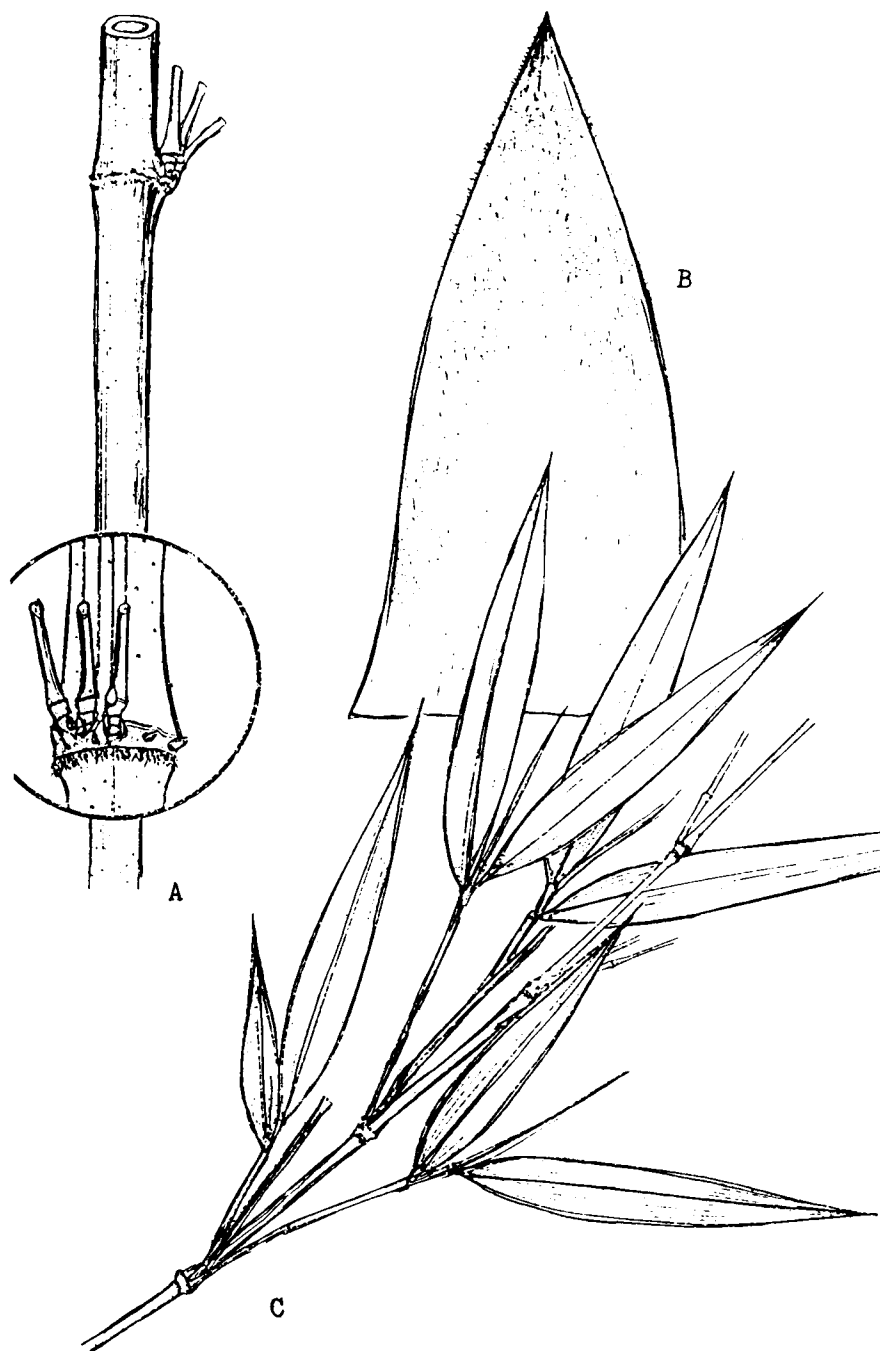


Figure 23. *Chimonobambusa hirtinoda*; A. Culm, showing its branching; B. Culm leaf; C. Branch with foliate leaves (Drawing from Chao C.S., New Species of Bambusoideae from Guizhou Province, *Bamb. Res. 1*: 2-3, f. 2).

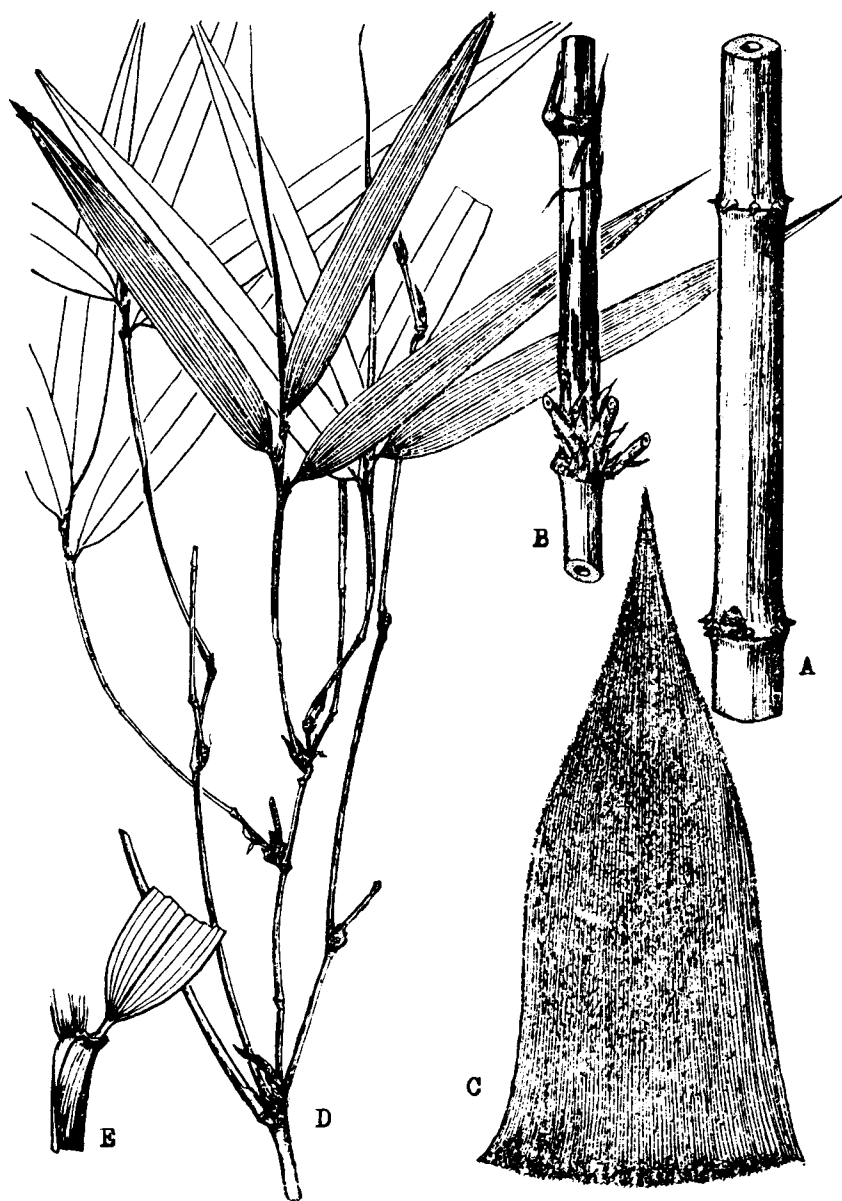


Figure 24. *Chimonobambusa brevinoda*; A. Culm, showing its spines; B. Young culm, showing its branching; C. Culm leaf; D. Branch with foliate leaves; E. Upper part of sheath (Drawing from Hsueh et al., New Taxa of *Chimonobambusa* Makino from China, *J. Bamb. Res.* 7(1): 3, fig. 1).

18. *Chimonobambusa hejiangensis* C.D. Chu & C.S. Chao, *J. Nanj. Pec. For. Coll.* 3: 36, 43, fig. 6, 1981; Hsueh & Yi, *J. Yunnan Coll. For.* 1: 36, 1982; D. Ohrnberger, *Bamb. World*, *Chimonobambusa*, 17, 18, 1990.

Type: Collected by Chu C.D. et al., in China, Sichuan Province, Hejian, alt. 1000 m, No. 76004 (NFU).

Culms 5-7 m tall, 2-3 cm in diameter; internodes usually 20 cm long, cylindric, green, with white pubescence and sparse hairs when young; nodes purplish, nearly glabrous, minutely verrucose and concave tuberculate, with a ring of spines on the nodes. Culm leaf sheaths nearly coriaceous, shorter than internodes, bearing sparse hair, but conferted on the base, both of margins ciliate, 2 mm long, white macula absent, veins inconspicuous; blades triangular subulate, 7-14 mm long, erect. Foliage leaves 3-5, toward the top of branchlets at first, but soon sheaths deciduous, only with single leaf at the top of branchlets; oral setae absent; blades chartaceous, linear-lanceolate, 11-20 cm long, 15-20 mm wide, glabrous, lateral veins 4-6 pairs. Inflorescence terminal, with a big bract at the base, pseudospikelets usually 1-3; pseudospikelets 10-12 cm long, short petiolate, 9-10 florets; lemmas chartaceous, ovate-triangular, 7-9 nerved; paleas as long as lemmas, 2-keeled, concave at apex, veins inconspicuous; lodicules 3; stamens 3, ovary oblong, style very short, stigmas 2, plumose (Figures 25 & 26).

Specimens examined: China, Sichuan Province, Hejiang, alt. 1000 m, Chu C.D. et al. 76004 (NFU); 76007 (NFU); Yi T.P. 81004 (SCFS); Xu Y.H. 1 (SCFS); Wu C.S. No. 83001 (GZFI); Chishui, Zhang Y.S. no No. (ZJFI); Zhang J.S. 009, No. 012, 013 (fr, fl) (SWFC); Zhang J.S. et al. 729008 (GZAC); Wu C.S. s.n. (GZFI); Xifend, Lan K.M. 820025 (GZAC); Gac 760060 (GZAC).

Chinese name: Hejiang-Fanzhu.

19. *Chimonobambusa grandifolia* Hsueh & W.P. Zhang, *J. Bamb. Res* 7(1): 17-19, fig. 2, 1988; D. Ohrnberger, *Bamb. World*, *Chimonobambusa*, 1990.

Type: Collected by Li Y.M. et al. in China, Yunnan Province, Pingbian, Daweishan Mountain, 1978 No. O32 (WSFC).

Culms 4 m tall, 10-15 mm in diameter, wall thick; internodes cylindric, 20-35 cm long, with brown hairs, scabrous; nodes very prominent, with a ring of short spines at the intranodes; sheath-scar conferted tawny hairs. Culm leaves delayed deciduous, chartaceous, shorter than the internodes, with tawny hairs, and thick at base, striae conspicuous, transverse veinlets inconspicuous, with tawny ciliae at margins; ligule 1 mm high; blades small, 5-7 mm long, triangular, deciduous. Branches 3; nodes very prominent, foliage leaves 6-8 at the apex of branchlets; sheaths glabrous, 5-8 cm long, with white ciliae at margins, oral setae very evolute, 15 mm long; inner ligule 2 mm high; blades oblong-lanceolate, 30-35 cm long, apex caudate, base cuneiform, 7-8 nerved, transverse veinlets conspicuous. Inflorescence unknown (Figures 25 & 27).

Distribution: Only known distribution is in China, Yunnan Province, Pingbian.

Phenology: Shoots appear from August to September.

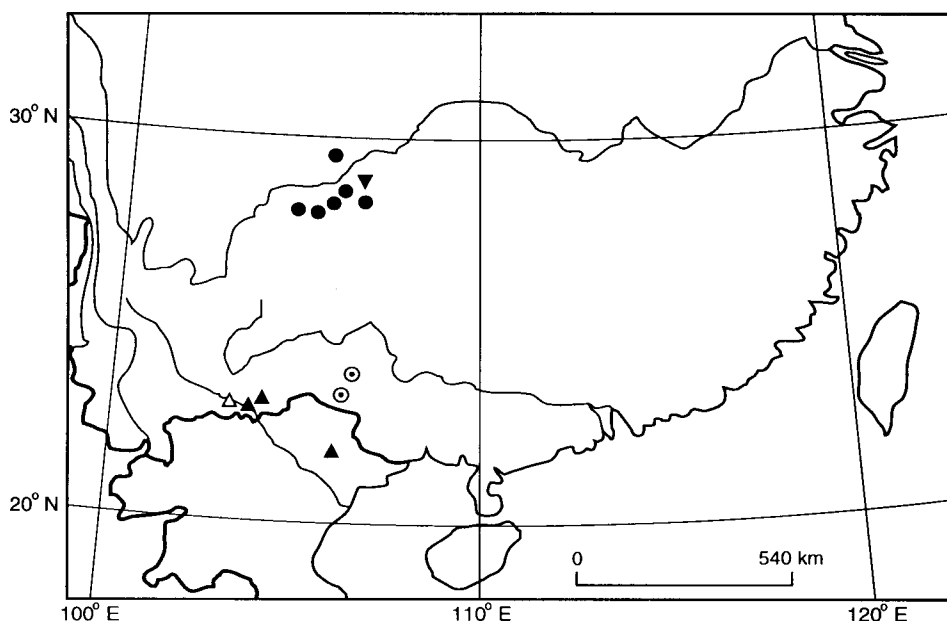


Figure 25. Distribution of (●) *Chimonobambusa hejiangensis*, (Δ) *Chimonobambusa grandifolia*, (⊙) *Chimonobambusa convoluta*, (▲) *Chimonobambusa microfloscula*, and (▼) *Chimonobambusa verruculosa*.

20. *Chimonobambusa convoluta*, Dai & Tao, *Act. Phytotax. Sin.* 20(2): 212-213, fig. 2, 1982.

Type: Collected by Dai Q.H. et al. China, Guanxi Province, Laoshan, 13 Nov. 1980, 8048 (GXFI).

Culms 2-3 m tall, 1-2 cm in diameter, internodes cylindric, 12-16 cm long, green and with lineate tawny pubescence; nodes prominent, bearing a ring of short spines on the nodal region at lower part of culms; sheath-scar bearing conferted tawny hairs, culm leaves deciduous, triangular, shorter than the internodes, with purplish macula and thin tawny hairs, and conferted hairs on the base, margins ciliate; auricles absent, with a few oral setae on both shoulders, sometimes absent; ligule 1 mm high, apex serrated; blades subulate, 1-2 cm long, glabrous. Branches 3; nodes prominent, foliate leaves 3-4 at the top of branchlets; sheaths with tawny pubescence, margins ciliate; auricles absent, oral setae 8-10 mm long, erect; inner ligule 1 mm high; blades linear-lanceolate, 16-20 cm long and 10-12 mm broad, upper surface glabrous, lower surface bearing white pubescence, lateral veins 4-5 pairs, transverse veinlets conspicuous. Inflorescence 1-3 pseudospikelets; pseudospikelets 2-5 cm long, compressed, bearing conferted tawny hairs; with glumes 3-7, and 5-10 florets; lemmas 8.5 mm long, 6 mm broad, ovate, with conferted tawny hairs, apex mucronate; paleas longer than lemmas, 2-keeled, keel ciliate, bearing thick tawny hairs on the surface. Inflorescence unknown (Figure 25).

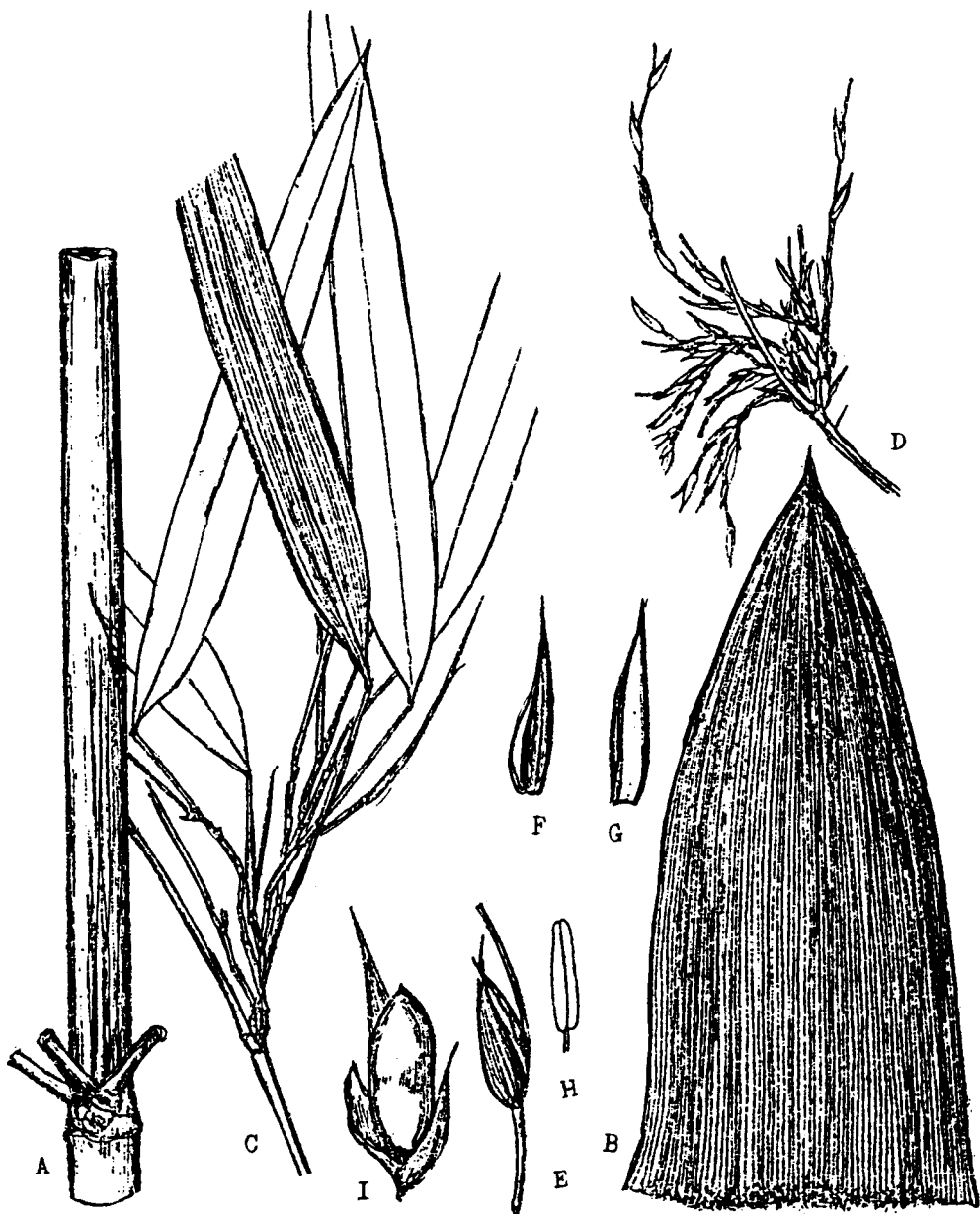


Figure 26. *Chimonobambusa hejiangensis*; A. Culm, showing its branching; B. Culm leaf; C. Branch with foliage leaves; D. Flowering branch; E. Pseudospikelet; F. Lemma; G. Palea; H. Stamens; I. Fruit.

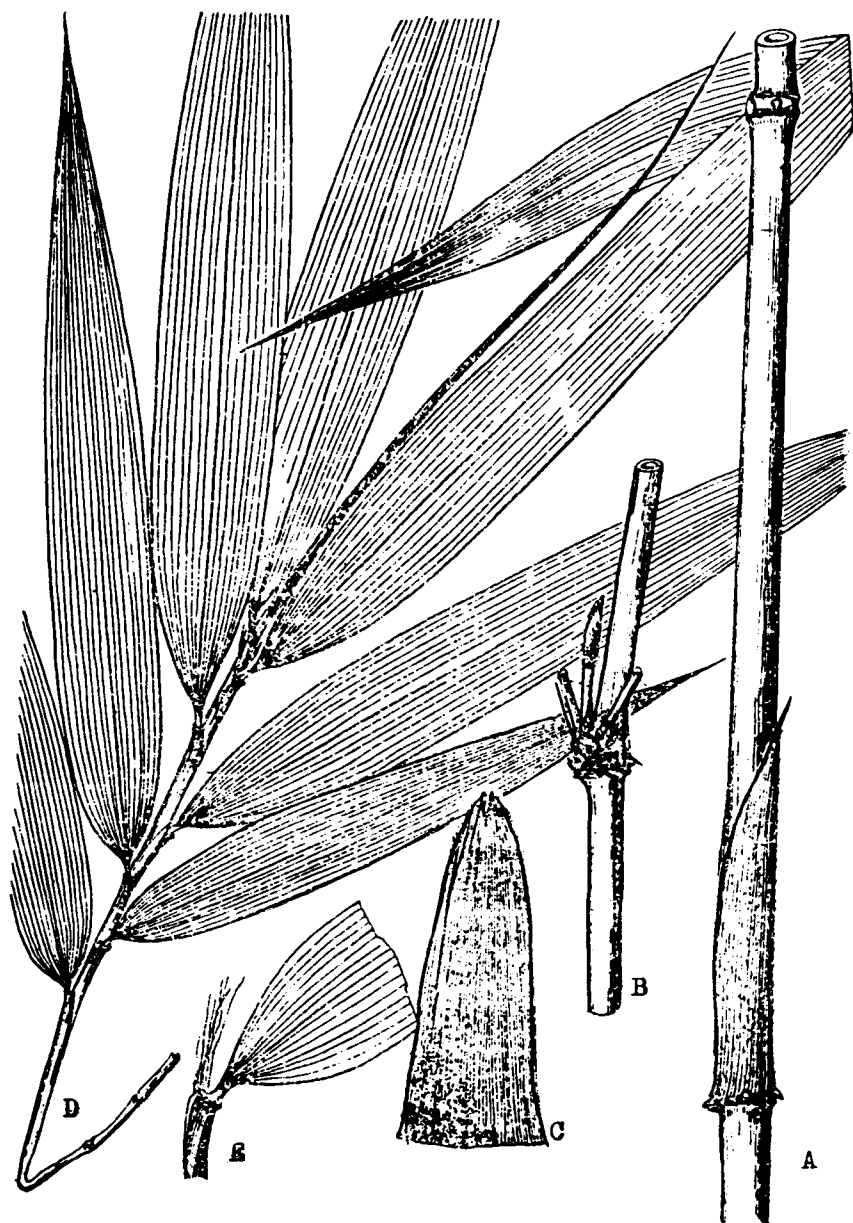


Figure 27. *Chimonobambusa grandifolia*; A. Culm showing its spines on the node; B. Culm, showing its branching; C. Culm leaf; D. Branchlet with foliage leaves; E. Upper part of sheath.

Distribution: Only known to be distributed in China, Guangxi Province.

Recorded Chinese name: Ci-Zhu.

Specimens examined: China, Guangxi Province, Tianlin, Laoshan alt. 800-1400 m,

Dai Q.H. et al. No. 8048 (GXFI); same site, Yi T.P. 78130, 78134 (SCFS); same site, Chou W.W. 82435 (ZJFI); Li Z.T. 600751 (PE); Lubian, Li Z.T. 6C2547(IBG).

21. *Chimonobambusa microfloscula* McClure, *Lign. Univ. Sci. Bull.* 9: 17-18, 1940; Hsueh & Zhang W.P., *J. Bamb Res.* 7(1): 21, 1988.

Type: Collected by F.A. McClure from Vietnam, Tonkin, 12 km northwest of Shapa and 2 km beyond T'a Phing Forestry Station, Jan. 21, 1932, Lu 19878 (SYS).

Culms 4-6 m tall, 15-20 mm in diameter, wall thick; internodes cylindric, with brown bulbous-based hairs when young, glabrous or scabrous when old, 14-20 cm long; sheath-scar glabrous; nodes very ridged with a ring of short spines on the nodes at lower part of culm. Culm leaves thick, chartaceous, triangular, deciduous, shorter than the internodes, with striae and brown or white bulbous-based hairs, transverse veinlets absent, bearing tawny ciliate margins; auricles absent; ligule 1 mm high, ciliate on the apex; blades small, awl-shaped, deciduous, erect. Branches usually 3, node very prominent; foliage leaves 3-5 at the top of branchlets; leaf-sheaths glabrous or glabrescent, margin ciliate, with oral setae on both shoulders, 12 mm long; inner ligule small; blades linear-lanceolate, 10-20 cm long, 10-15 mm wide, acuminate or cuneate at base, acuminate prolonged to apiculate at apex, with white pubescence on the lower surface, lateral veins 4-5, transverse veinlets visible. Panicle terminal, with 5 spikelets; glume 4-5 mm long, obtuse, 1-carinate, both sides 2-nerved, membranaceous, other glumes, 5-6 mm long, not carinate, both sides 3-nervose, glabrous; lemmas 7-9 mm long, membranaceous, oblong-lanceolate, veins purplish; paleas as long as lemmas, 2-keeled, round at top, glabrous; lodicules, stamens and pistil unknown (Figure 25).

Distribution: China and North Vietnam, altitude 1400-1800 m.

Specimens examined: China, Yunnan Province, Jieping, Yi T.P. 83179 (SCFS); Jieping, Zhang W.P. 840324 (SWFC); Hsueh C.Y. 85284 (SWFC); Vietnam Tonkin, 12 km northwest of Shapa, wild in forest January, 1932, McClure 19878.

22. *Chimonobambusa verruculosa* (Yi) Wen, D. Ohrnberger, *Bamb. World, Chimonobambusa*, 47, 1990.

Type: Collected by Yi T.P. from China, Sichuan Province, Gulin Xian, altitude 1040 m, 27 October 1986, 86539 (SCFS).

Basionym:

Qiongzhuea verruculosa Yi, in *Bull Bot. Res.* 8(4): 65-67, fig. 2, 1988.

Culms erect 1.5-3 m tall, 1-1.5 cm in diameter; internodes 10-18 cm long, nearly solid, green, glabrous or with grey hairs below the nodes when young; nodes prominent, with a ring about 2-4 of short spines or aerial roots at nodes. Culm leaf sheaths triangular, chartaceous, delayed deciduous, usually shorter than the internodes, with bulbous-based hairs, margins ciliolate, no transverse veinlets; auricles absent, a few oral setae erect; ligule 0.5 mm high, apex truncate, purplish, with tawny pubescence, margins glabrous; blades 1-5 mm long, usually erect. Foliage leaves 1-3 towards the top of branchlets, sheaths 22-43 cm long, glabrous; no auricles, with a few oral setae 2 mm long, purplish; inner ligule apex

rounded, 0.5 mm long, puberulous; blades 10-18 cm long and 12-16 mm wide, apex acuminate, rounded or cuneate at base, glabrous at bottom surface, margins serrate, lateral veins 3-4 pairs, tessellate. Inflorescence unknown (Figure 25).

Distribution: Only known to be distributed in China, Sichuan Province, Gulin Xian.

Specimens examined: Sichuan Province, Gulin, altitude 1100 m, 86403; same site 27 October, 1986, Yi T.P. 86531 (SCFS).

23. *Chimonobambusa armata* (Gamble) Hsueh & Yi, *J. Bamb. Res.* 2(1): 38, 1983.

Type: J.W. Oliver, February, 1894, collected from hills of upper Burma, altitude 1840 m (Herb. India For. Res. Ins.)

Basionym:

Arundinaria armata Gamble, in *Ann. Roy. Bot. Gard. Calcutta* 7: 130, f. 119, 1896; J.D. Hooker, *Fl. Brit. India* 7: 385, 1896; Camus, *Les Bambusées*, 37, 1913; Rhind, *Grasses Burma*, 11, 1945.

Synonyms:

Oreocalamus armatus (Gamble) Wen, *J. Bamb. Res.* 5(2): 22, 1987.

Chimonobambusa yunnanensis Hsueh et al., *J. Bamb. Res.* 7(1): 19, f. 3, 1988; Hsueh et al., *Bamb. Res.* 38: 11, 1988.

f. *armata*

Culms 5-9 (-12) m tall, 3-5 (-8) cm in diameter; internodes quadrangular in medium and lower part of culm, green, glabrous, sometimes scabrous, very thin-walled, 12-20 cm long; nodes little prominent, bearing a ring of spines, sheath-scar with tawny hairs. Culm leaves thin, papery, striate, triangular, as long as or longer than the internodes, delay deciduous, with a few scattered stiff hairs on the outside, ciliate on the margins; no auricles, ligule 2-3 mm high, cilia at apex; blades small, 5-13 mm long, triangular, pubescent. Branches usually 3, at each node; foliage leaves 3-5 towards the top of branchlets, sheaths striate, ending in small calluses and bearing a few straight stiff bristles; inner ligule very short, ciliate; blades bright green, oblong lanceolate, long-acuminate, 15-23 cm long, 2-3 cm wide, subulate, twisted, scabrous; smooth above, slightly rough beneath, scabrous on the margins, shining, pubescent above, secondary veins 6 pairs, intermediate 5-7, transverse veinlets numerous, raised, irregularly spaced. Pseudospikelets 5-8 cm long, with 7-10 florets and 3-4 glumes linear-triangular thin chartaceous, including buds; lemmas chartaceous, ovate-triangular, 8-9 mm long, 7-9 nerved; palea nearly as long as lemmas, rounded or bifid at apex, 2-keeled; lodicules 3, membranaceous, margins ciliate; stamens 3; ovary oblong, style very short, stigmas 2, plumose (Figures 28 & 29).

Distribution: India, Burma, and southwest China.

Specimens examined: China, Xizang, Motue Xian, Li B. S. et al. 03665 (fl); same site 02092, 02692 (NFU), alt. 1500-2100 m; Yunnan Province, Gongshan, Fung G.M. 24748 (KWN); Wang C.W. 67006 (PE); 9030 (PE); Yi T.P. same site 77303, No. 77318 (SCFS); Fugong, C.Z. 7271 (PE); Lushui, Zhang S.G. 014 (SWFC); same site B.S. 012 (SWFC);

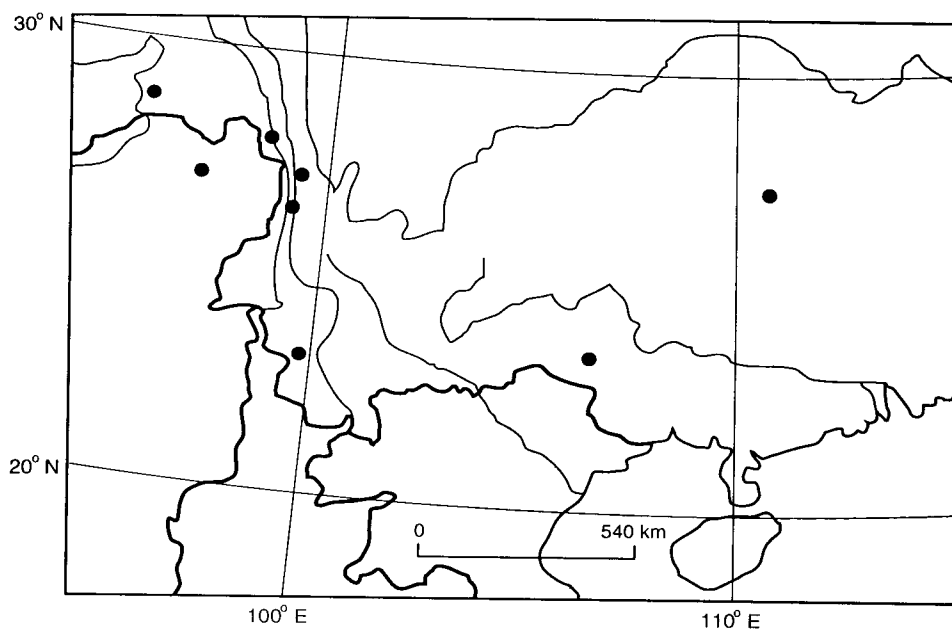


Figure 28. Distribution of (●) *Chimonobambusa armata*.

Luxi, Wen T.R. April 1982, 82424 (ZJFI); same site Teng Chong, April 1982 82420 (ZJFI); Yangjing, Hsueh 1280 (SWFC); Yangjing, alt. 1430 m, Chen C.G. No. 011 (SWFC); Yengshan, 1981, E.F. J85060; Weixin, Hsueh C.L. no No. (SWFC); Guingxi Province Leshan, Tenle, Chou, W.W. April 1982, 82429 (ZJFI); Hunan, Lengshan, alt. 900 m, May 1984, Chen S.C. 84544 (ZJFI).

Recorded Burmese name: Mat-tut.

Chinese name: Mao-Fanzhu.

Phenology: Shoots appear from August to December. The culm is the largest in this genus.

Uses: Young shoots are delicious. Square culms are a good material for handicraft processes.

f. *tuberculata* (Hsueh & Gao) Wen & Ohrnberger, in *Bamb. World*, *Chimonobambusa*, 15, 1990.

Basionym:

Chimonobambusa tuberculata Hsueh & Gao, in *J. Bamb. Res.* 6(2): 11-13, f. 2, 1987, Hsueh et al. *Bamb. Res.* 36: 11, 1988.

Synonym:

Chimonobambusa strigosa Hsueh & W.P. Zhang, nomen nudum, A Taxonomic Study of *Chimonobambusa* Makino in China, unpublished M.S. Thesis, Southwestern Forestry College, Kunming, p. 55, 1987.

Culm sheaths with some little dark brown macula on the outside; shoots appear in

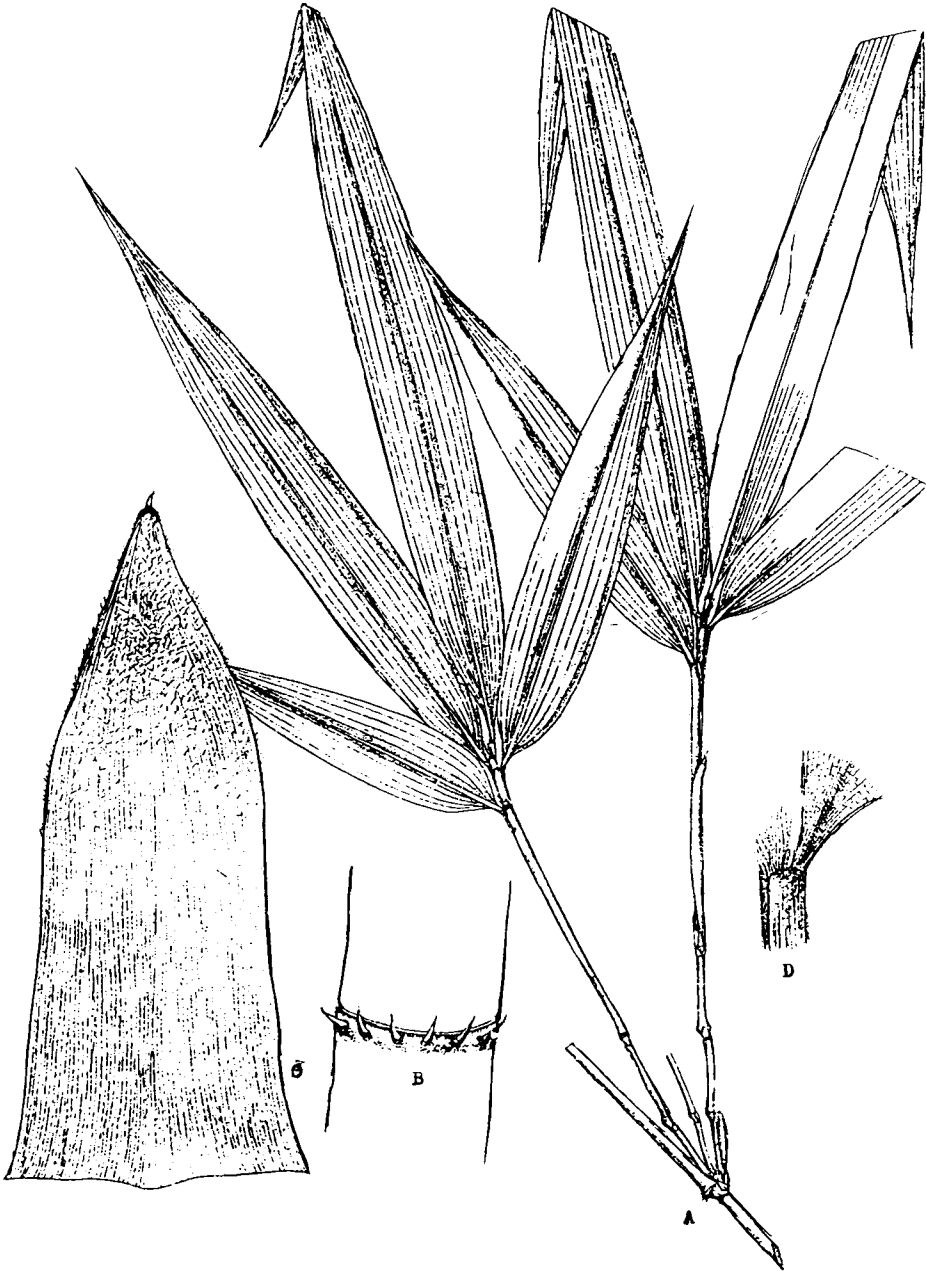


Figure 29. *Chimonobambua armata* (Gamble) Hsueh & Yi; A. Branch with leaves; B. Culm, showing its spines; C. Culm leaf; D. Upper part of sheath (Drawing from Gamble, the *Bambuseae of British India*, f. 119, 1986).

August to September.

Distribution: Only found in China, Yunnan Province, Yongshan Xian, altitude 1350 m, 12 April 1985, WSFC No. J85660 (Type, in SWFC).

Section III. *Qiongzhusa* (Hsueh & Gao) Wen & Ohrnberger

24. *Chimonobambusa tumidinoda* (Hsueh & Yi) Wen, comb. nov.

Type: Collected by Wang F.Y. from China, Sichuan Province, Leipo, alt. 2600 m, 15 May 1965, 11563, (fr. fl.) (SF); vegetal Type collected by Yi T.P. from China, Sichuan Province, Yunlian Xian, alt. 1460-2000 m, under the broadleaf forest, in 1973, 73001 (SCFS).

Basionym:

Qiongzhusa tumidinoda Hsueh & Yi, in *Act. Bot. Yunnanica* 2(1): 93-96, f. 1, 2, February 1980.

Synonyms:

Chimonobambusa tumidinoda, nom. nud. et non. auct. in *Pl. Veget. Sin.* ed. by Z.Y. Wu, pp. 411-420, April 1980.

Chimonobambusa tumidissinoda Hsueh & Yi, ex Ohrnb. *Bamb. World*, *Chimonobambusa*, p. 45, 1990.

Culms 3-6 m tall, 1-3 cm in diameter; internodes 15-25 cm long, nearly solid, cylindrical, with a groove on one side, green, glabrous; nodes very tumid, with a keel on the top; sheath-scar with tawny hairs when young, glabrous when old. Culm leaves triangular-oblong, chartaceous, deciduous, shorter than the internodes, purple-green, with tawny hairs at outside and brown cilia at margins, apex with some 2-3 mm long brown oral setae; no auricles; ligules 1-1.3 mm high, rounded, ciliolate; blades 5-17 mm long, awl-shaped, erect, deciduous. Branches usually 3, sometimes 4-7, foliage leaves 2-4 towards the top of branchlets; sheaths 2-2.5 cm long, glabrous, margins ciliate, a few oral setae erect on the apex; auricles absent, inner ligules lower, glabrous, truncate or rounded; blades narrow lanceolate, 5-14 cm long, 6-12 mm broad, both sides serrate or glabrous, lateral veins 2-4, tessellate. Pseudospikelets 3-4.5 cm long, 2.5-4 mm broad, with 3-8 florets; glumes 2, glabrous; lemmas ovate-lanceolate, 10-14 mm long, glabrous, usually 9-nerved, transverse veinlets prominent; palea shorter than lemmas, 8-12 mm long, 2-keeled, with some obscurely striate veinlets, bifid at apex; lodicules 3, 1.5-2.5 mm long, margins ciliated; stamens 3, anthers 4-8 mm long, purplish; ovary obovate, 2.5 mm long, glabrous, style 1 mm long, stigmas 2, plumose; fruit a bacca, dark green, glabrous, 10-12 mm long, 6 mm in diameter, no hilum and ventral suture, with a fleshy and thick pericarp, hollowed, lacking endosperm (Figures 30 & 31).

Distribution: In China, Sichuan and Yunnan provinces, alt. 1400-2600 m, under the broadleaf forest.

Specimens examined: Sichuan Province: from Omian to Mabian, 1942, Chen B.G. s.n. (NS); Leipo, alt. 2600 m, 15 May 1965, Wang F.Y. et al. 11563, fl. fr. (SF); same site, alt. 200 m, 9 June 1963, Chuan C.C. 0292 (SU, SB); same site, alt. 2100-2200 m, 1959, Guan

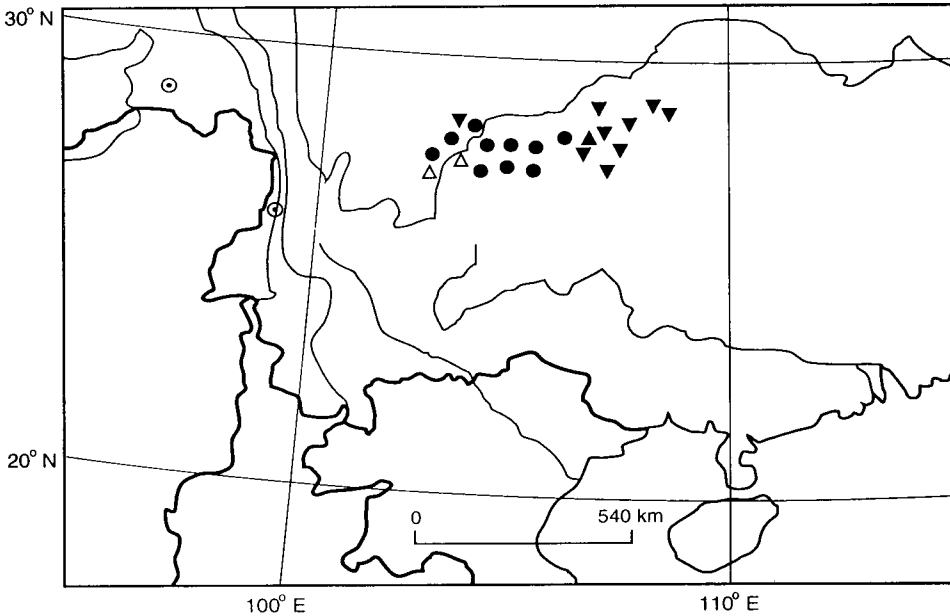


Figure 30. Distribution of (●) *Chimonobambusa tumidinoda*, (⊙) *Chimonobambusa metuoensis*, (Δ) *Chimonobambusa macrophylla*, (▲) *Chimonobambusa unifolia*, and (▼) *Chimonobambusa communis*.

Z.T. No. 9926 (HU); Zhengning Xian, alt. 1340 m, SFI 139 (SF); Shuyong, alt. 1800-2000 m, 24 April 1973, Yi T.P. 73001 (SCFS); Yunlian, alt. 1460-2000 m, May to June, Yi T.P. 76090, 76137 (fl. fr.) (SFS). Yunnan Province: Daguang, altitude 2100 m, May 1973, Quanmin Bot. Ins. 03-B1 (YB); Suijiang 1973, no No. (YB); Weixin, altitude 1650 m, 5 June 1976, Yi T.P. 76153 (SCFS).

Phenology: Usually with a very great area under the broadleaf forest, at altitudes from 1400 to 2600 m; includes 12,000-255,000 [sic] plants per hectare. In the distribution area, yearly rainfall is 1400 mm and air humidity is 80-90%. This is a short-day plant. Shoots appear and the flowering period is in April; fruit matures in May.

Uses: This species has a high value as an ornamental plant and as a rare material for handicrafts; its culms can be used to make Zhiongzhu sticks. About 200 years ago, the Zhiongzhu stick was transported to India and Central Asia. Its young shoots are noted as a delicious food.

25. *Chimonobambusa metuoensis* Hsueh & Yi, *J. Bamb. Res.* 2(1): 34, 35, f.4, 1983.

Type: Collected by Yi T.P. from China, Xizang, Medong Xian, altitude 1900-2000 m, 15 August 1977, No. 77180 (SCFS).

Culms 5-7 m tall, 1-2.5 cm in diameter; internodes 20 cm long, cylindric, with a groove on one side, green, diffuse hair, soon deciduous, scabrous, walls 3-4 mm thick; nodes very tumid, articulate; nodal region 4-6 mm wide, conferted tawny downy, with a ring about 12-25 spines, 2-3 mm long; sheath-scar prominent, conferted tawny hairy at first. Culm leaves delayed deciduous, thin coriaceous, triangular, shorter than the internodes, purplish, bearing white-grey hairs on the surface, striae conspicuous, transverse veinlets inconspicuous.

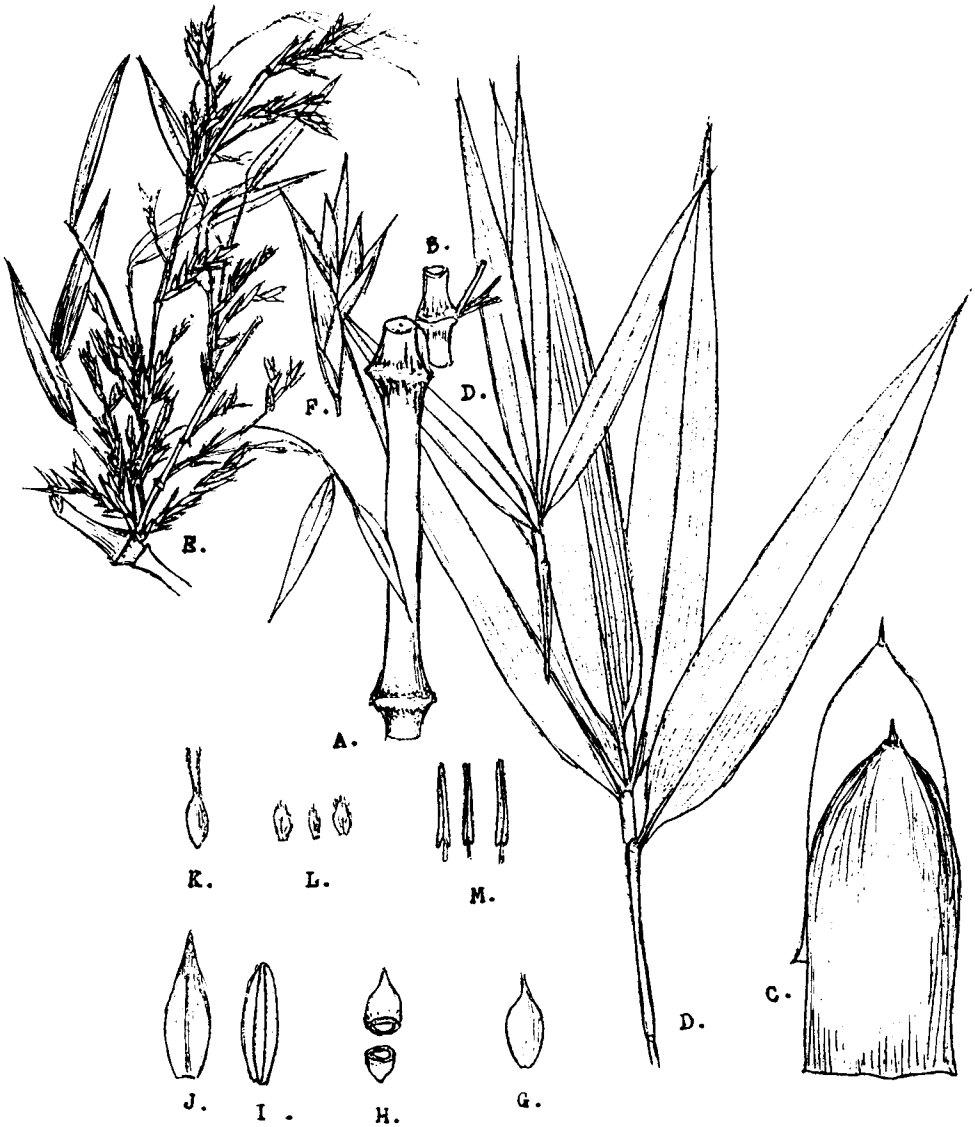


Figure 31. *Chimonobambusa tumidinoda*; A. Culm, showing its node; B. Culm; C. Culm leaf; D. Branch with foliage leaves; E. Flowering branch; F. Pseudospikelets; G. Fruit; H. Section of fruit; I. Palea; J. Lemmas; K. Pistil; L. Lodicules; M. Stamens (Drawing from Yi T.P.).

ous or at upper part conspicuous, with grey to dark brown ciliation at margins; auricles absent; ligule truncate, 1 mm high, apex with grey-brown ciliation; blade small subulate, erect, 2-3 mm long, glabrous, articulate at base. Foliage leaves 2-3 at apex of the branchlets; sheaths 4-8 cm long, glabrous, striate, dark purple at first; no auricles; inner ligule truncate or rounded, purple, glabrous about 1 mm long, blade lanceolate, chartaceous 12-33 cm long and 15-40 mm broad, apex acuminate and base cuneiform, both surfaces are glabrous, 5-8 nerved, transverse veinlets conspicuous, margins serrated. Inflorescence unknown (Figures 30 & 32).

Distribution: Only known to be distributed in China, Xizang, Medong, and Chayu Xian, alt. 1900-2200 m, under broadleaf forest.

Specimens examined: Medong Xian, Dalgong, alt. 1900-2200 m, 15 August 1977, Yi T.P. No. 77180 (SCFS); Chayu, Sanchayu, Rongyi, 21 August 1979, Yi T.P. No. 79182 (SCFS).

Phenology: Shoots appear from July to August.

Uses: This species is a good decorative plant.

26. *Chimonobambusa macrophylla* (Hsueh & Yi) Wen & Ohrnberger, D. Ohrnberger, *Bamb. World, Chimonobambusa*, 21, 1990.

Type: Collected by Yi T.P. from China, Sichuan Province. Leibo, alt. 1400 m, 11 April 1984, No. 84044 (SCFS).

Basionym:

Qiongzhusa macrophylla Hsueh & Yi, in *Act. Phytotax. Sin.* 23 (5): 398-999, f.1, 1985.

f. *macrophylla*

Culms 2-5 m tall, 1-2 cm in diameter, internodes cylindric, 13-26 cm long, glabrous, wall 2.5-3.5 mm thick; nodes very prominent, articulate, sheath-scar prominent, glabrous. Culm leaves deciduous, chartaceous, triangular-oblong, shorter than the internodes, outside glabrous, striae conspicuous; auricles and oral setae absent; ligule truncate 0.5-1 mm high, apex ciliate; blades subulate, 3-9 mm long, glabrous. Branches usually 3, foliage leaves 1-4 at the apex of branchlets; sheaths 4.5-7 cm long, glabrous, margins glabrous or with slightly ciliate when young; auricles and oral setae absent; inner ligule truncate or round, glabrous, 0.5-1 mm high; blades oblong to lanceolate, 11-22 cm long and 16-39 mm broad, cuneiform at base, glabrous, 5-8 nerved, transverse veinlets conspicuous, petiole 1.5-4 mm long, glabrous. Inflorescence unknown (Figures 30 & 33).

Distribution: Only known to be distributed in China, Sichuan Province, Leibo, and Mabian Xian, alt. 1500-2200 m, under the broadleaf forest.

Specimens examined: Sichuan Province, Leibo Xian, 1500 m, Yi T.P. 84044 (SCFS); Mabian Xian, alt. 200-2200 m, 8 April 1984, Yi T.P. 84040 (SCFS).

Uses: The plants of this species are smaller than those of *C. tumidinoda*, but its nodes are very prominent. This species makes a good potted and decorative plant.

f. *intermedia* (Hsueh & D.Z. Li) Wen & Ohrnberger, D. Ohrnberger, *Bamb. World, Chimonobambusa*, 21, 1990.

Type: Collected by SWFC Bamb. Exp. from Sichuan Province, Leibo, alt. 1250 m, April 1985, No. J85024 (SWFC).

Basionym:

Qiongzhusa intermedia Hsueh & D.Z. Li, in *Act. Bot. Yunnanica* 10(1): 53, 1988.

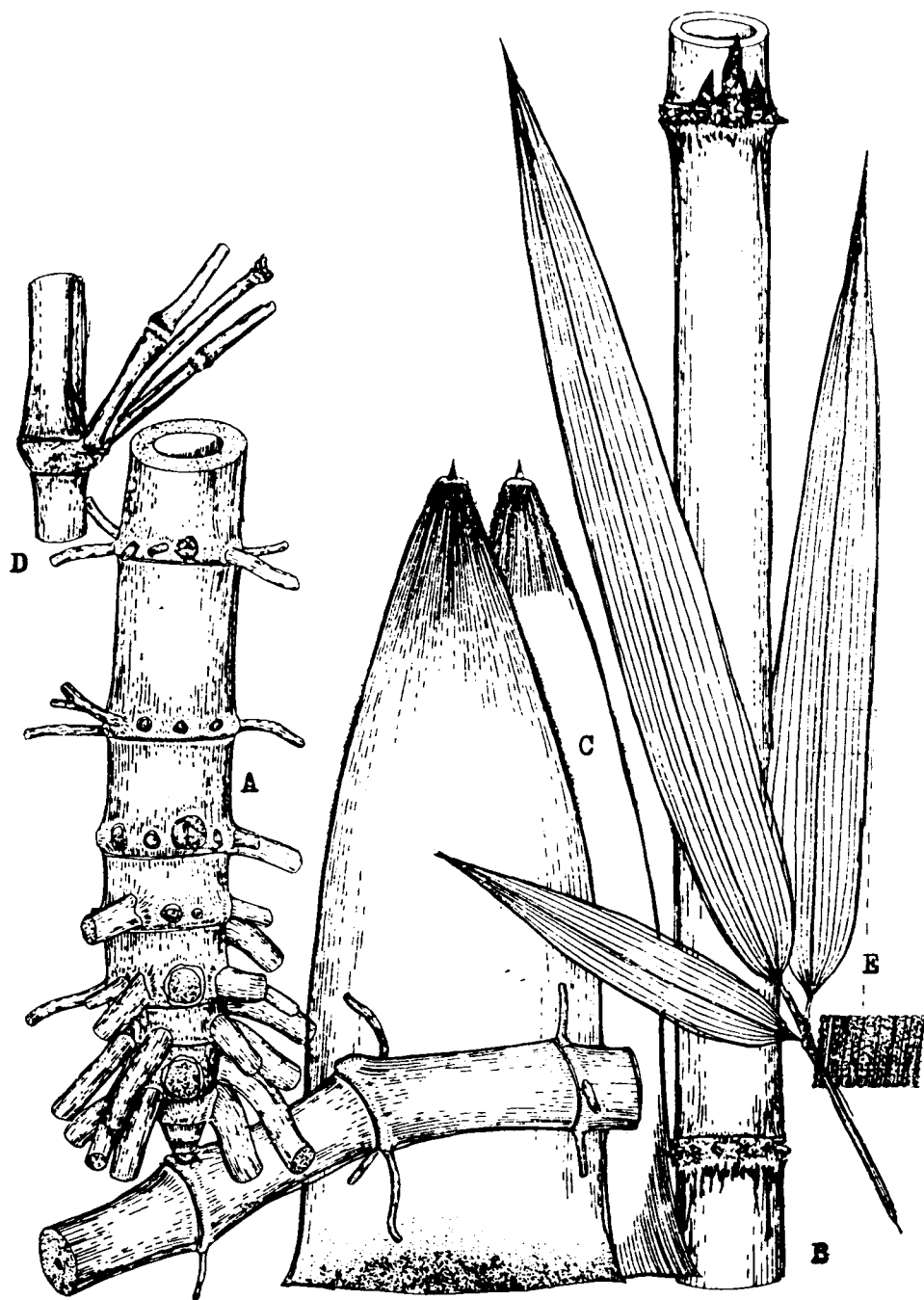


Figure 32. *Chimonobambusa metuoensis*; A. Rhizome and under part of culm; B. Culm; C. Culm leaf; D. Culm, showing its branching; E. Branch with foliage leaves, and the enlargement of leaf (Drawing from Yi T.P.).

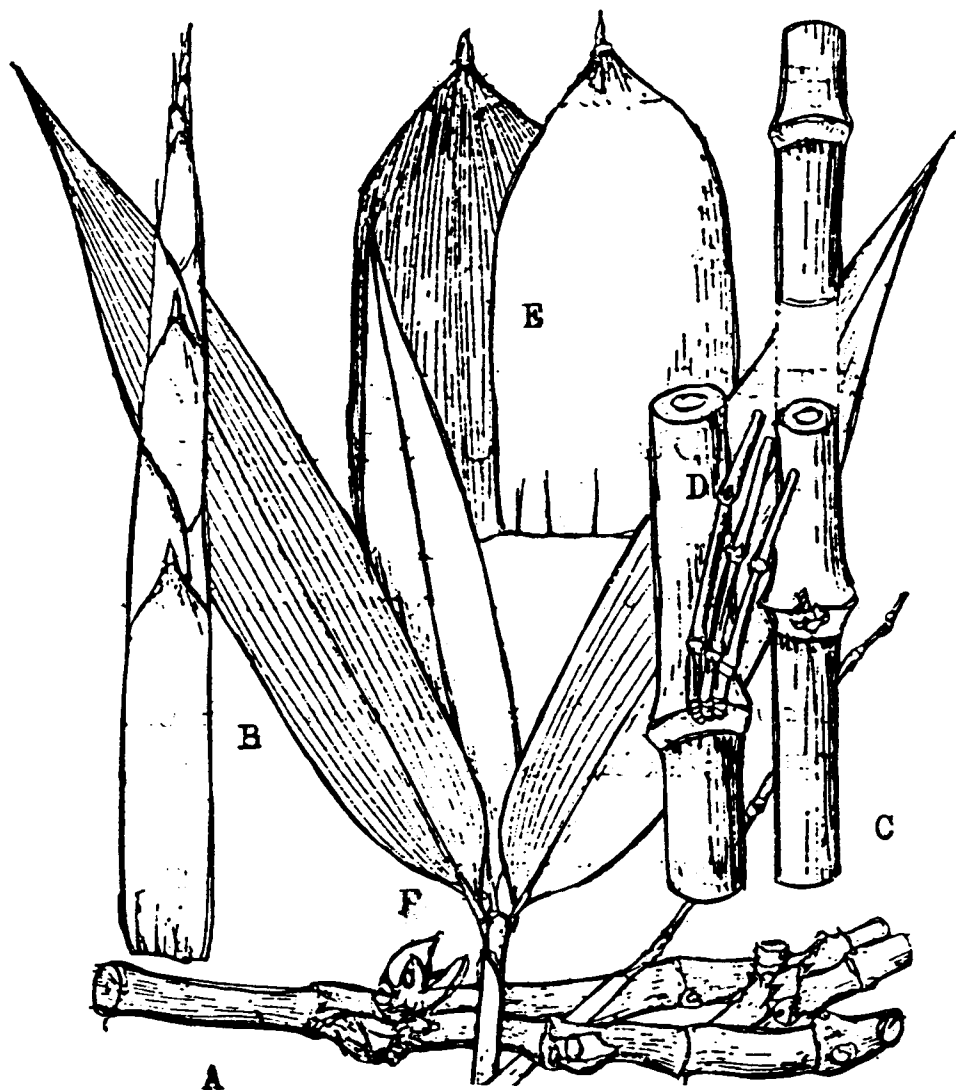


Figure 33. *Chimonobambusa macrophylla*; A. Rhizome; B. Shoot; C. Culm, showing its nodes; D. Culm, showing its branching; E. Culm leaf sheath; F. Branch with foliage leaves.

Culms slightly farinose when young, culm-sheaths bearing sparse tawny hairs, soon glabrous (Figure 34).

Distribution: Only known to be distributed in China, Sichuan Province, Leibo Xian.

f. *leiboensis* (Hsueh & D.Z. Li) Wen & Ohrnberger, D. Ohrnberger, *Bamb. World*, *Chimonobambusa*, 21, 1990.

Type: Collected by SWFC Bamb. Exp., Sichuan Province, Leibo, alt. 1430 m, April

1985, No. J85030 (SWFC).

Basionym:

Qiongzhusa macrophylla f. *leiboensis* Hsueh & D.Z. Li, *Act. Bot. Yunnanica* 10(1): 51-52, 1988.

Culms slightly farinose, internodes to 31-36 cm long, the longest of any in this genus, leaf-blade 4-5 cm broad, the widest of any in this genus (Figure 35).

27. *Chimonobambusa unifolia* (Yi) Wen, D. Ohrnberger, *Bamb. World, Chimonobambusa*, 46, 1990.

Type: Collected by Guo Hong from China, Sichuan Province, Changning, alt. 600 m, 29 November 1988, No. 8801 (SCFS).

Basionym:

Qiongzhusa unifolia Yi, in *J. Bamb. Res.* 9(1): 27-30, fig. 1, 1990.

Culms 1-1.6 m tall, 3.5 mm in diameter, erect; internodes cylindric, with a groove or flattened at one side, 12-24 cm long; wall 1.5-2 mm thick; nodes very prominent, articulate, nodal region 1.5-3 mm long, with ashy or light tawny farina; sheath-scar slightly prominent, dark brown, bearing conferted tawny short hairs. Culm leaves purple-green at first, triangular deciduous, chartaceous, light yellow, outside glabrous, with a ring of hairs only at the base, margins ciliate; auricles and oral setae absent; ligule rounded, 0.5 mm high, apex ciliate; blades triangular to linear-lanceolate, purple-green, erect, 2-12 mm long, striate conspicuous, twisted, glabrous. Branches usually 3, only single foliage leaf at the apex of branchlets; auricles and oral setae absent; blades linear-lanceolate, 9-20 cm long and 11-25 mm broad, apex acuminate, base cuneiform, both surfaces glabrous, 4-6 nerved, transverse veinlets conspicuous, both margins serrated; petiolate 1-2 mm long, rarely white pubescent. Inflorescence unknown (Figures 30 & 36).

Distribution: Only known in China, Sichuan Province, Changning Xian, alt. 600 m, under the broadleaf forest.

Phenology: Shoots appear from November to December.

28. *Chimonobambusa communis* (Hsueh & Yi) Wen & Ohrnberger, D. Ohrnberger, *Bamb. World, Chimonobambusa*, 16, 1990.

Type: Collected by Yi T.P. from China, Sichuan Province, Fengdou, alt. 1610 m, No. 75403 (SCFC).

Basionym:

Qiongzhusa communis Hsueh & Yi, in *Act. Bot. Yunnanica* 2(1): 96-98, fig. 3, 1980.

Synonym:

Oreocalamus communis (Hsueh & Yi) Keng f., in *J. Nanj. Univ.* 22(3): 416, 1986.

Culms 4-7 m tall, 1-3 cm in diameter; internodes cylindric, but slightly quadrangular

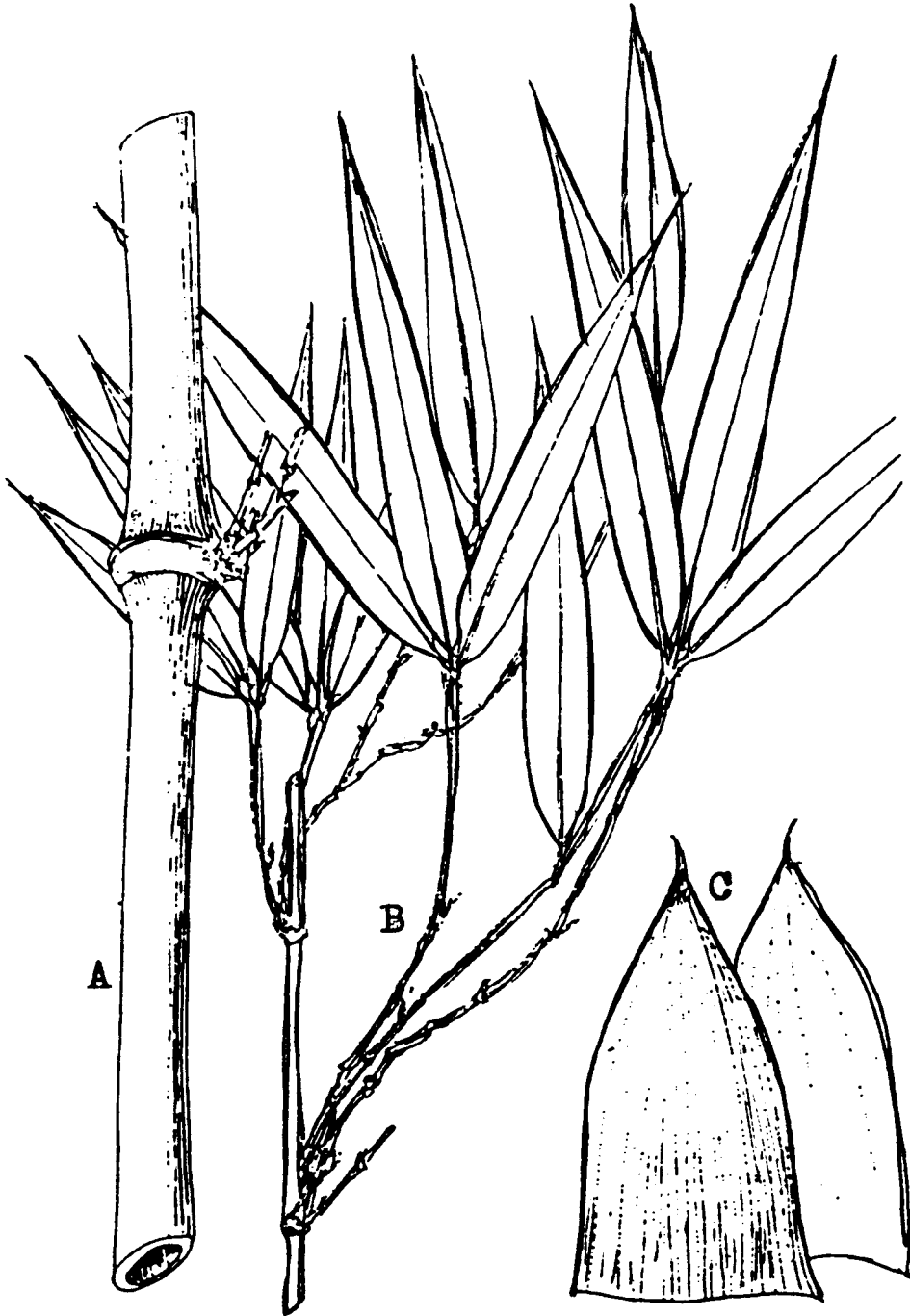


Figure 34. *Chimonobambusa macrophylla* f. *intermedia*; A. Culm; B. Branch with foliage leaves; C. Culm leaf.



Figure 35. *Chimonobambusa macrophylla* f. *leiboensis*; A. Culm, showing its branch; B. Rhizome and shoot; C. Rhizome; D. Branch with foliage leaves; E. Culm leaf.

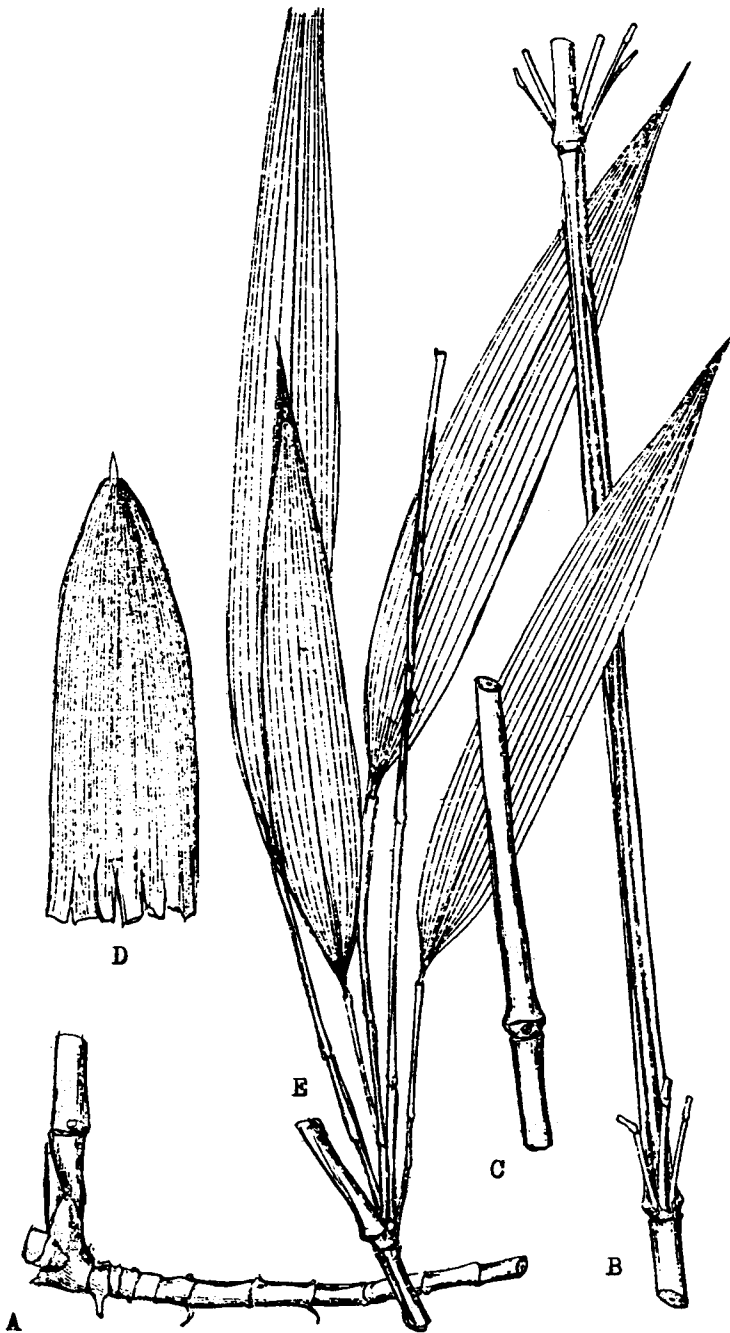


Figure 36. *Chimonobambusa unifolia*; A. Rhizome; B. Culm, showing its branching; C. Culm, showing its node; D. Culm leaf; E. Branch with foliage leaves.

at lower part of culms, 15-25 cm long, glabrous, flattened or grooved on one side; wall 3-5 mm thick; nodes slightly prominent; sheath-scar glabrous. Culm leaves deciduous, chartaceous, dark green at first, soon light-tawny, glabrous, shiny; auricles absent; ligule round, glabrous; blade subulate 5-11 mm long, glabrous, erect. Branches usually 3, nearly solid; nodes prominent, foliage leaves 2-3 at top of branchlets, sheaths coriaceous, glabrous, 2-4 cm long; auricles and oral setae absent; ligule 1 mm high, truncate, glabrous; blades lanceolate, 8-12 cm long, 13-20 mm broad, cuneiform at base, lower surface pubescent, 4-5 nerved, transverse veinlets conspicuous. Flowering branchlets with a spathe 12-25 mm long, pseudospikelets with a pedicel 3-10 mm long, glabrous, 5-7 florets, slightly compressed, 5-10 mm long, glabrous; glumes 3, 7-13 mm long, 7-10 nerved, glabrous; lemmas 8-13 mm, glabrous, 7-9 nerved, palea shorter than lemmas, 7-11 mm long, 2-keeled, keels ciliate, apex round or furcate; lodicules 3; stamens 3, anthers 5-6.5 mm long; ovary 1.5 mm long, glabrous, style 0.8 mm long, stigmas 2, white plumose (Figure 30).

Distribution: With a great area distributed in China, Sichuan Province, and Hubei, Guizhou Province, alt. 1900-1980 m. At Sichuan Province, Fengdon has 5,100 hectares.

Specimens examined: Sichuan Province, Fengtuo, alt. 1610 m, Yi T.P. 75403 (SCFS); same site, alt. 1750 m, Yi T.P. 1750(?); Shizhu, alt. 1420-1600 m, 20 August 1975, Yi T.P. No. 75412 (SCFS); alt. 1590, SCB 222 (SB); Nanchuan, Jinfoshan, alt. 1600 m, May 1965, Cai. W. et al. s.n. (SCFS); Pengshui, alt. 1420-1600 m, 20 August 1977, Zean C.P. (fl); Hubei Prov. Lichuan, 26 May 1959, Ye Z.Z. 495 (HB); Ensi, alt. 1800 m, 21 July 1958, Li H.J. No. 4418 (HB); same site May 1959, Wang E.M. 421 (HB); Xuanen, alt. 1600 m, 15 July 1958, Li H.J. 4250 (HB); Guizhou Province; Meitan, alt. 860 m, 9 June 1977, Li W.D. et al. 77-011 (fr. fl.) (YF).

Chinese name: Pingzhou.

Phenology: Shoots appear and fruit matures in May, flowering period is in March.

Uses: The young shoots of *C. communis* are said to be good eating. The timber is tough and can be made into bamboo mats and some furniture, farm tools, and the young culms can be made into rope and shoes.

29. *Chimonobambusa montigena* (Yi) Wen, comb. nov.

Type: Collected by Yi T.P., from China, Yunnan Province, Zhaotong Xian, alt. 2300-2500 m, on 8 September 1988, 88168 (SCFS).

Basionym:

Qionghuea montigena Yi, in *J. Bamb. Res.* 9(3): 26-30, fig. 2, 1990.

Culms 1.5-3 m tall, 7-14 mm in diameter; internodes 13-19 cm long, cylindric, slightly farinose, glabrous; wall 3-4 mm thick; nodes very prominent. Culm leaves deciduous, shorter than the internodes, triangular, subcoriaceous, outside glabrous but with brown hairs at the base, margins ciliate; auricles small, with a few oral setae; ligule round 1 mm high; blades lanceolate 8-15 cm long, 10-26 mm wide, lateral veins 4-5 in either side, transverse veinlets visible. Pseudospikelets linear 2-3.2 cm long, 3-5 mm broad, 5-7 florets; rachilla segments 2-4 mm long, glabrous; glumes 1, lanceolate, 1-2 cm long, 2-3 mm broad, 9-11 nerved; lemmas 9-13 mm long, 9-11 nerved, tessellate; paleas shorter than lemmas, 6-9 mm long, 2-

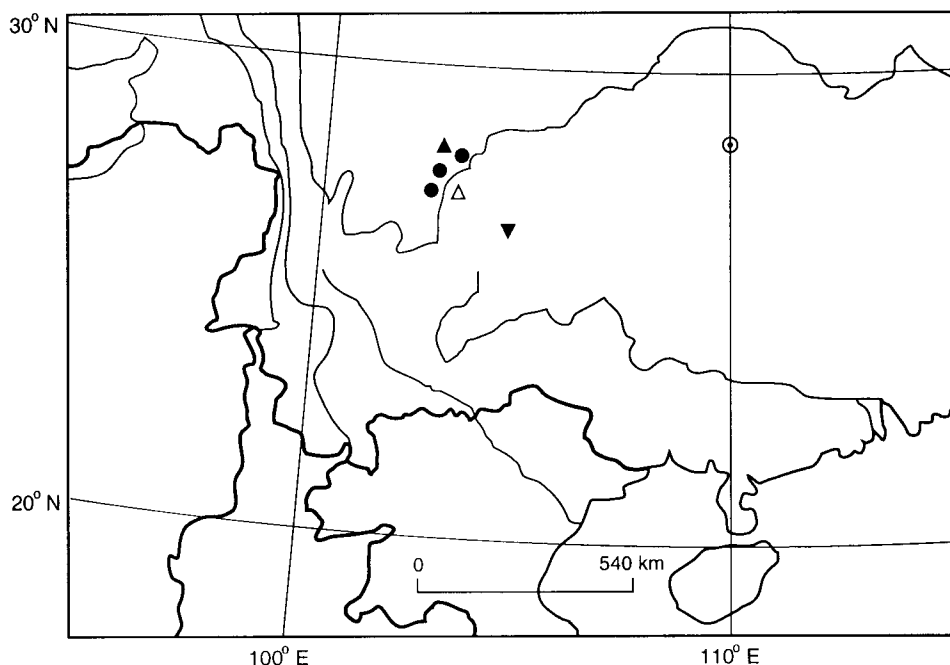


Figure 37. Distribution of (Δ) *Chimonobambusa montigena*, (∇) *Chimonobambusa puberulla*, ($\bullet$) *Chimonobambusa rigidula*, ($\blacktriangle$) *Chimonobambusa opinensis*, and ($\odot$) *Chimonobambusa maculata*.

keeled, 2-nerved between and 2-3 nerved on either side of keels; lodicules 3, 2-2.5 mm long, margins purple; glabrous or ciliate; stamens 3, anthers 5-6 mm long; ovary 1-2 mm long, glabrous, style 0.6-1 mm long; stigmas 2-3, plumose. Fruit a bacca, pericarp thick, without hilum and ventral suture, 7-13 mm long, 5-7 mm broad (Figures 37 & 38).

Distribution: Only found in China. Yunnan Province, Zhaotong Xian, alt. 2320-2500 m.

Phenology: Young shoots appear in April to May, fruit matures in September.

30. *Chimonobambusa puberulla* (Hsueh & Yi) Wen & Ohrnberger, comb. nov.

Type: Collected by Yi T.P. from China, Quizhou Province, Luzhi Xian, alt. 190 m, on 12 August 1981. 81106 (SCFS).

Basionym:

Qiongzhuea puberulla Hsueh & Yi, in *Act. Bot. Yunnanica* 5(1): 42-46, fig. 3, 1983.

Synonyms:

Oreocalamus puberulla (Hsueh & Yi) Keng f., in *J. Nanj. Univ.* 22(3): 416, 1986.

Chimonobambusa puberula (Hsueh & Yi) Wen & Ohrnberger, in *Bamb. World*, *Chimonobambusa*, 32, 1990.

Culms 4-5 m tall, 15-25 mm in diameter; internodes cylindric or slightly quadrangular, 15-20 cm long, green or purple-green when young, not farinose, pubescent, scabrous,

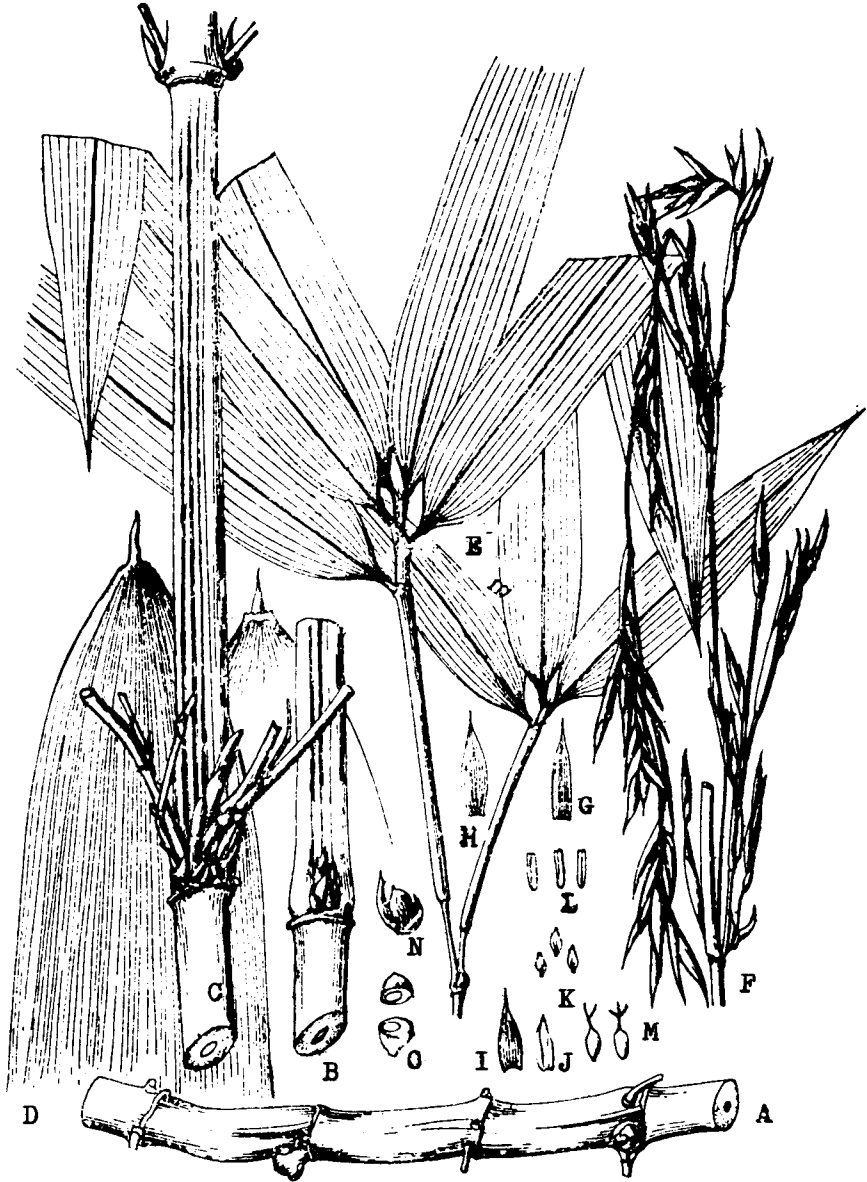


Figure 38. *Chimonobambusa montigena*; A. Rhizome; B. Culm, showing its buds; C. Culm, showing its branching; D. Culm leaf; E. Branch with foliage leaves; F. Flowering branch; G-H. Glumes; I. Lemma; J. Palea; K. Lodicules; L. Stamens; M. Pistil; N. Fruit; O. Section of fruit (Drawing from Yi T.P.).

walls 2-5 mm thick, nodes prominent, glabrous, sheath-scar prominent, with brown hairs; nodal region 1-3 mm long, glabrous. Culm leaves deciduous, linear-triangular, coriaceous, bearing brown hairs and striae on the outside, margins with conferted tawny cilia; auricles absent, with a few oral setae 1-4 mm long, erect; ligule truncate or rounded, glabrous, 1 mm high; blade subulate-triangular, 2-13 mm long, purple, bearing pubescences at base, striae conspicuous, erect. Branches usually 3, rarely 7, nodes prominent, pubescent under the nodes; foliage leaves 2-4 at the apex of branchlets; sheaths 3-4 cm long, bearing conferted cilia at margins; auricles absent, with a few oral setae, 3-5 mm long, erect; inner ligule truncate or rounded, 1 mm high; blade lanceolate, chartaceous, glabrous, 10-19 cm long and 10-16 mm broad, acuminate at apex, cuneiform at base, lateral veins 4-6 pairs, transverse veinlets conspicuous, margins serrated. Inflorescence unknown (Figure 37).

Distribution: Only known distributed in China, Quizhou Province, Luzhi Xian, alt. 1600 m.

Specimens examined: Luzhi Duojian, alt. 1600 m, 12 November 1981, Yi T.P. 81106 (SCFS); Ibid, 12 August 1981, 81130 (SCFS).

Phenology: Shoots appear in October.

Uses: The young shoots are edible. Culms can be used as timber to make some furniture, farm tools, and paper.

31. *Chimonobambusa rigidula* (Hsueh & Yi) Wen & Ohrnberger, D. Ohrnberger, *Bamb. World*, *Chimonobambusa*, 42, 1990.

Type: Collected by Li You-Quang from China, Sichuan Province, Muchuan, alt. 1300 m, 19 June 1981. No. 01, fr. fl. (SCFS).

Basionym:

Qiongzhuca rigidula Hsueh & Yi, in *Act. Phytotax. Sin.* 21(1): 96-99, fig. 2, 1983.

Synonym:

Oreocalamus rigidulus (Hsueh & Yi), Keng f., in *J. Nanj. Univ.* 22(3): 416, 1986.

Culms 2-6 m tall, 1.5-3 cm in diameter; internodes 10-24 cm long, cylindric or a little quadrangular, glabrous, nodes slightly prominent; sheath-scar glabrous. Culm leaves chartaceous to coriaceous, deciduous, glabrous or pilose on the outside, with tawny cilia at margins; auricles and oral setae absent; ligule glabrous and truncate at apex; blades subulate, glabrous, deciduous. Foliage leaves 1-3 towards the top of branchlets; sheaths glabrous; auricles and oral setae absent; ligule truncate; blades lanceolate 7-13 cm long, 8-17 mm wide, lateral veins 3-4, transverse veinlets conspicuous. Raceme with 4-9 pseudospikelets; pseudospikelets 17-25 mm long, with 3-6 florets, and 4-5 glumes; glumes glabrous, 1-6 mm long, 7-11 veins; lemmas 8-14 mm long, 9-13 veins, glabrous paleas shorter than lemmas, 7-12 mm long, glabrous, 2-keels, round at apex; lodicules 3, lanceolate or ovate-lanceolate, 1.5-3 mm long, purplish, ciliolate at top; stamens 3, anther purplish, 5-7 mm long; ovary oblong, glabrous, 1 mm long, stigmas 2, plumose. Fruits 8-11 mm long, 5-7 mm broad, glabrous (Figures 37 & 39).

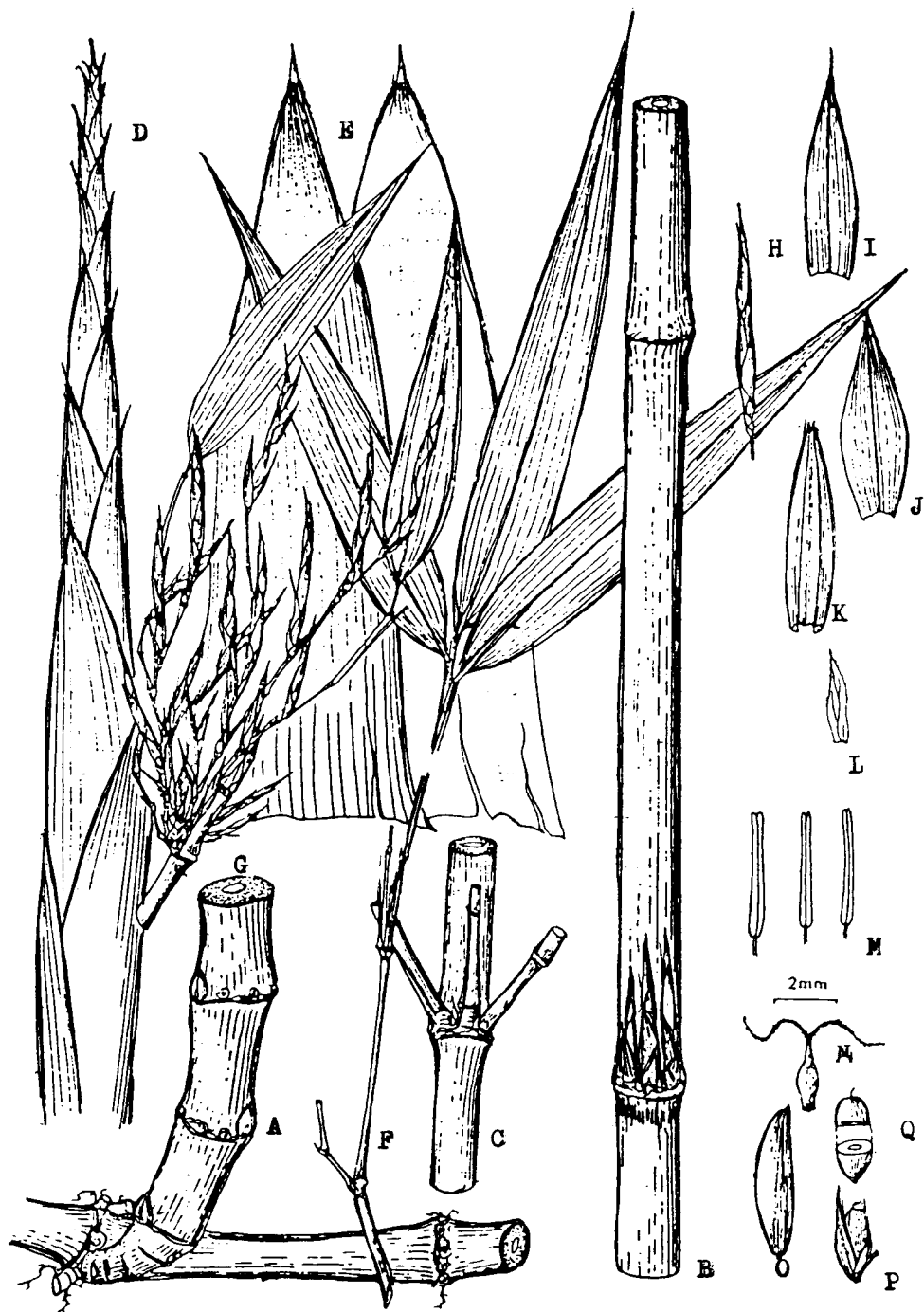


Figure 39. *Chimonobambusa rigidula*; A. Rhizome and culm; B. Culm, showing its buds; C. Culm, showing its branching; D. Shoot; E. Culm leaf; F. Branch with foliage leaves; G. Flowering branch; H. Pseudospikelet; I. Glumes; J. Lemma; K. Palea; L. Lodicules; M. Stamens; N. Pistil; O, P. Fruit; Q. Section of fruit (Drawing from Yi T.P.).

Distribution: China, south part of Sichuan Province, alt. 1300-1700 m.

Specimens examined: Muchuan, alt. 1300 m, 1981, Li Y. Q. 61; same site, 12 May 1981, Lui Y.Q. no No.; Pinshan, alt. 1500-1700 m, 11 September 1980, Yi T.P. 80144; Mabian, 16 December 1980, Li Z.Q. No. 8001, same site, 21 May 1981, Li Z.Q. no No.

Chinese name: Shizhuzi.

32. *Chimonobambusa opienensis* (Hsueh & Yi) Wen & Ohrnberger, D. Ohrnberger, *Bamb. World, Chimonobambusa*, 30, 1990.

Type: Collected by Yi T.P., from China, Sichuan Province, Obian, alt. 1900 m, on 30 August 1974, No. 74217 (SCFS).

Basionym:

Qiongzhusa opienensis Hsueh & Yi, in *Act. Bot. Yunnanica* 2(1): 98-99, f. 4, 1980.

Synonym:

Oreocalamus opienensis (Hsueh & Yi) Keng f., in *J. Nanj. University* 22(3): 416, 1986.

Culms 5-7 m tall, 2-5.5 cm in diameter; internodes cylindric, sometimes slightly quadrangular at lower culms, green when young, soon yellow-green, glabrous, flattened on one side; walls 5-8 mm thick; nodes slightly prominent, no spines, sheath-scar glabrous. Culm leaf sheaths deciduous to coriaceous, triangular to oblong, purple-tawny, with sparse dark brown hairs, margins tawny ciliate; auricles absent; ligule purple-tawny glabrous, 1 mm high; blades subulate 4-6 mm long, scabrous, base articulate. Branches 2-3, sometimes 5, nodes prominent, usually with single foliage leaf at the apex of branchlets, rarely 2 leaves; leaf-sheaths 25-40 mm long, glabrous, both shoulders with 2-4 oral setae, 3-7 mm long, purplish or purple-green; auricles absent; inner ligule truncate, 0.2-0.5 mm high; blades lanceolate, chartaceous, 8-17 cm long and 13-16 mm broad, acuminate at apex, cuneiform at base, lower surface pubescent, 4-5 nerved, transverse veinlets conspicuous, one side serrate. Inflorescence unknown (Figure 37).

Distribution: Only known to be distributed in China, Sichuan Province, Obian Xian, under the broadleaf forest.

Specimens examined: Obian Xian, alt. 1600 m, 30 August 1974, Yi T.P. 74216 (SCFS); same site, alt. 1900 m, Yi T.P. 74217 (SCFS); same site, May 1977, Zheng X.B. s.n. (SCFS); same site, June 1977, SF 01 (SCFS).

Chinese name: Sanyuezhu.

Phenology: Shoots appear from April to May.

33. *Chimonobambusa maculata* (Wen) Wen, *J. Bamb. Res.* 7(1): 31, 1988.

Type: Collected by Chen S.C. from China, Hunan Province, Lonshan Xian, Cengjiajie Cx 84540 (ZJFI).



Figure 40. *Chimonobambusa maculata*; A. Rhizome and culm; B. Branch with foliage leaves; C. Young culm, showing its culm leaves.

Basionym:

Qiongzhuea maculata Wen, in *J. Bamb. Res.* 5(2): 22, f. 5, 1986.

Culms usually 1.5 m tall, 8 mm in diameter; internodes cylindric, and flat or grooved on one side, 10-16 cm long, green and white hair when young, glabrous when old; nodes rather prominent. Culm leaves triangular, persistent, thicker chartaceous, shorter than the internodes, with purple-tawny maculata at upper part of outside, and with light brown hairs at the lower part of outside, margins with yellow cilia at first, apex acute; no auricles; ligule small, 1 mm high, convex, pilose at apex; blades very small, aristate, erect, 1-3 mm long, striate. Branches usually 3, rather equal in diameter, outside with yellow hair; foliage leaves 1-2 towards the top of branchlets; usually a single foliage leaf; sheaths 25 mm long, glabrous; no auricles; inner ligule lower scabrous; blades narrowly lanceolate, 8-14 cm long, 9-13 mm broad, obtuse at base, caudately acuminate at apex, lateral veins 4, transverse veinlets not prominent. Inflorescence unknown (Figures 37 & 40).

Distribution: Only found in China, Henan Province, Lonshan Xian, under the broad-leaf forest.

Phenology: Shoots appear from October to November.

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