

ON THE IDENTITY OF *ARUNDINARIA CLARKEI* GAMBLE EX BRANDIS (POACEAE : BAMBUISOIDEAE) – ITS RECOLLECTION AND TAXONOMIC POSITION

P. KUMARI AND P. SINGH¹

Botanical Survey of India, Central National Herbarium, Howrah 711103
e-mail : pushparbg@rediffmail.com

¹*Botanical Survey of India, CGO Complex, Salt Lake City, Kolkata 700 064*
e-mail : pchanna@gmail.com

The identity of *Arundinaria clarkei* Gamble ex Brandis, a less known bamboo of Eastern India is discussed. It is more appropriately placed under genus *Melocanna*. *Schizostachyum mannii* described by R.B. Majumdar is confirmed as its synonym.

'*Arundinaria clarkei*' as annotated by Gamble was described by Brandis (1906) with meager description. Camus (1913) treated it as a good species under *Arundinaria*, followed by Blatter (1929), Vermah & Bahadur (1980) and Shukla (1996), but without any further addition to our knowledge of this less known bamboo. Majumdar (1989) transferred it to *Neomicrocalamus* Keng as *Arundinaria sensu stricto* is considered a new-world genus. Muktesh Kumar (1998) transferred it to *Racemobambos* Holttum.

Critical study of the type material of *Arundinaria clarkei* deposited in CAL and the fresh collection of vegetative, flowering and fruiting material from Meghalaya revealed that the taxonomic reappraisal of the species is essential.

Distribution

Brandis (1906) described *Arundinaria clarkei*, citing – "*Arundinaria clarkei*, Gamble MSS. Manipur". However, the single specimen of *Arundinaria clarkei* having a flowering branchlet twig with a hand written note "Type specimen, name published in 'Indian Trees' p. 666 (1906)" and signed by Gamble was collected from 'Cherra end' 2000 ft by C.B. Clarke in October 1867. There is no evidence of other specimens either any Type or other collection from Manipur or any other place for this species. However another species collected by C.B. Clarke 48322 from 'Munneypore' in Nov. 1885 [Herb. Acc. 549483 (CAL)] and annotated by Gamble as "*Bambusa clarkei* new sps." is available having a leafy twig and illustrations of floral parts which is mentioned by Gamble as "material insuff. for description". Present study therefore suggests the strong possibility of misinterpretation of the locality for *Arundinaria clarkei* as Manipur by Brandis (1906).

The type locality of the species given as 'Manipur' instead of 'Cherra end' by Brandis (1906) and followed by subsequent workers appears wrongly placed and it needs to be corrected and known as 'Cherra end (Meghalaya)'.

Taxonomic history

Describing this species, Brandis (1906) states "A slight shrub 10 ft. high, L. 4-7 by 1/2 - 3/4 inch n. 28-33 on 1/4 inch Stamens 6, hence placed here". Blatter (1929) placing it under doubtful species gave the description as such given by Brandis (1906).

Tiwari (1992) misinterpreted the description given by Blatter (1906) and added the characters "solid" for culm, which was followed by Seethalakshmi & Kumar (1998). Search in all reputed herbaria of the region like ASSAM, CAL, DD, NEHU could not find any further material of this species except C.B. Clarke 5563 (CAL) which could support the description added by the workers after Brandis (1906).

Taxonomic position

Bor (1940) did not include *Arundinaria clarkei* in his work. Since, *Arundinaria sensu stricto* is a new world genus, Majumdar (1989) transferred it to *Neomicrocalamus* Keng, without any discussion on availability

Table 1 : Comparison of *Arundinaria clarkei* with *Melocanna* and *Racemobambos*.

Characters	<i>Racemobambos</i>	<i>Melocanna</i>	<i>Arundinaria clarkei</i>
Inflorescence	a leafy raceme or small panicle	branched leafy or leafless panicle	spicate panicle on leafy branches
Spikelets	arising in axils of small bract; 2-8 flowered, with terminal rudimentary floret 2-3	clustered in bracts; 1-flowered with or without rachilla extension	clustered in bracts; 1-flowered with terminal hairy rachilla extension
Empty glumes	1 or many	1 or many with immature, abortive buds, convolute, mucronate, glabrous	2 in mature floret, ovate, acute, mucronate, glabrous
Lemma	chartaceous with mucronate or acuminate tip	ovate-lanceolate, convolute, glabrous, sharp mucronate	ovate, acute, glabrous, short-mucronate
Palea	2-keeled	not keeled	very faintly 2-keeled
Lodicules	3	2 - 3	3
Stamens	6, filaments free	6, free or irregularly united	6, exserted, free
Ovary	usually hairy on the upper part	glabrous, continuing into c. 4 mm long hairy style	glabrous, continuing into short style
Stigmas	3, plumose	single or 3, feathery	3, hairy
Fruit	caryopsis	bacca, pyriform, 5-10 cm long, 3-6 cm across, fleshy with long curved beak	bacca, pyriform, 2-3 cm across, 2-4 cm long, with 5-10 mm long, pointed, slightly curved beak

of any fresh evidence. Muktesh Kumar (1998) transferred it to *Racemobambos* Holttum as *Neomicrocalamus* is considered as synonym of the former.

The critical morphological study of vegetative, flowering and fruiting characters, revealed that the species rightly belongs to genus *Melocanna* rather than *Racemobambos* (Table 1). This view is also strengthened by the SEM phylloderm analysis in which the pattern of stomatal arrangement and shape of papillae etc. are similar to that of *Melocanna baccifera*. (Plate 3). A new combination is therefore proposed.

Critical study of the type material of *Arundinaria clarkei* and the fresh collection from Meghalaya (P. Kumari 34612, P. Kumari 34637; P. Kumari & P. Singh 34676 & 34683), further revealed that *Schizostachyum mannii* described by R.B. Majumdar is identical with this species. Hence *S. mannii* R.B. Majumdar is relegated to synonymy of *Melocanna clarkei* (Gamble ex Brandis) P. Kumari & P. Singh.

A detail description along with the illustration and present distribution is given here to facilitate the correct identification of this species.

Melocanna clarkei (Gamble ex Brandis) P. Kumari & P. Singh **comb. nov.** *Arundinaria clarkei* Gamble ex Brandis in Ind. Trees 666. 1906; E.G. Camus, Les Bambusees 49. 1913; Blatt. in Ind. For. 55: 547. 1929; Vermah & Bahadur, Ind. For. Rec. 6(1): 1. 1980. *Neomicrocalamus clarkei* (Gamble ex Brandis) R.B. Majumdar in Fl. Ind. Enum. Monocotyl 279. 1989. *Racemobambos clarkei* (Gamble ex Brandis) M. Kumar in Seethalakshmi & Kumar, Bamboos India 230. 1998. *Schizostachyum mannii* R.B. Majumdar in Karthik. & al., Fl. Ind. Enum. Monocotyl 281. 1989; D.N. Tiwari, Monog. Bamboo 144. 1992; U. Shukla, Grass. N.E. India 223. 1996; Seethalakshmi & Kumar, Bamboos India 250. 1998.

Type : Cherra end, 2000 ft, Oct. 1867, C.B. Clarke 5563 (Holotype, CAL!); 12 km to Umkiang from Jowai, Jaintia hills, 6.9.2005, P. Kumari & P. Singh 34676 (Epitype CAL! designated here).

Moderate sized, erect bamboo with distant culms. Rhizome pachymorph with 50 - 60 cm or longer solid necks. Culms 10 - 12 m tall, 2 - 3 cm in diameter, light green to yellowish green, turning grayish with age; nodes even, merely a line, oblique, with 1 - 1.5 cm broad white ring below and a thin 2 - 3 mm dark purplish ring above; internodes terete, unequal, much varying in length (5 - 31 cm), hollow, thin walled, wall thickness c. 2 mm; bud short, ovate with ciliate appendages; branch compliment with 11 - 12 more or less subequal branches, usually from upper nodes only. Culm-sheaths deciduous, shorter than internodes, triangular, yellowish-brown;

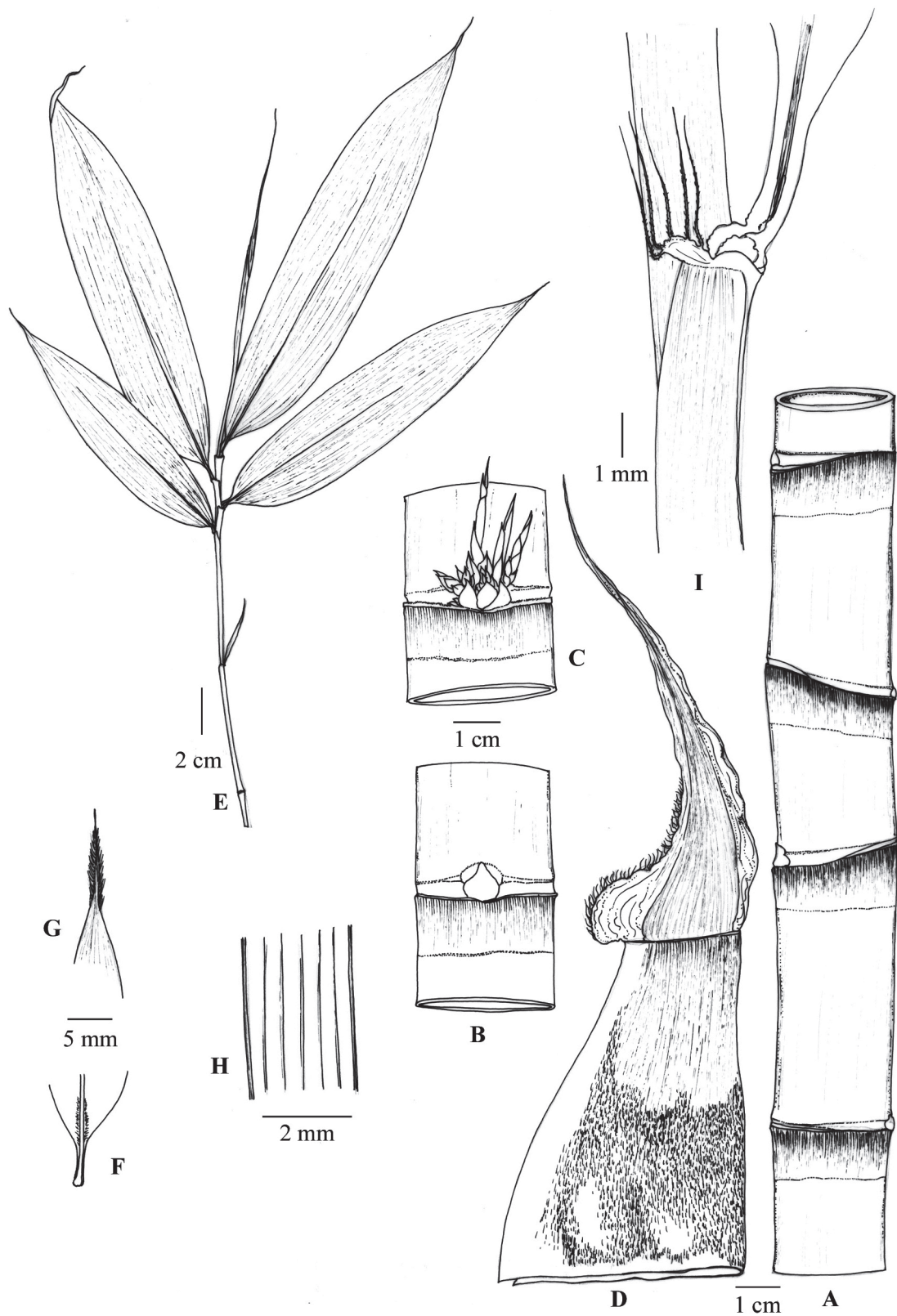


Fig.1. *Melocanna clarkei* (Gamble ex Brandis) P. Kumari & P. Singh :
A. Culm portion; **B.** Nodal bud; **C.** Branches emerging from bud; **D.** Culm sheath; **E.** Leafy twig; **F.** Leafbase;
G. Leaf apex; **H.** Leaf abaxial surface; **L.** Leaf-sheath. [*P. Kumari* 34637 (CAL)].

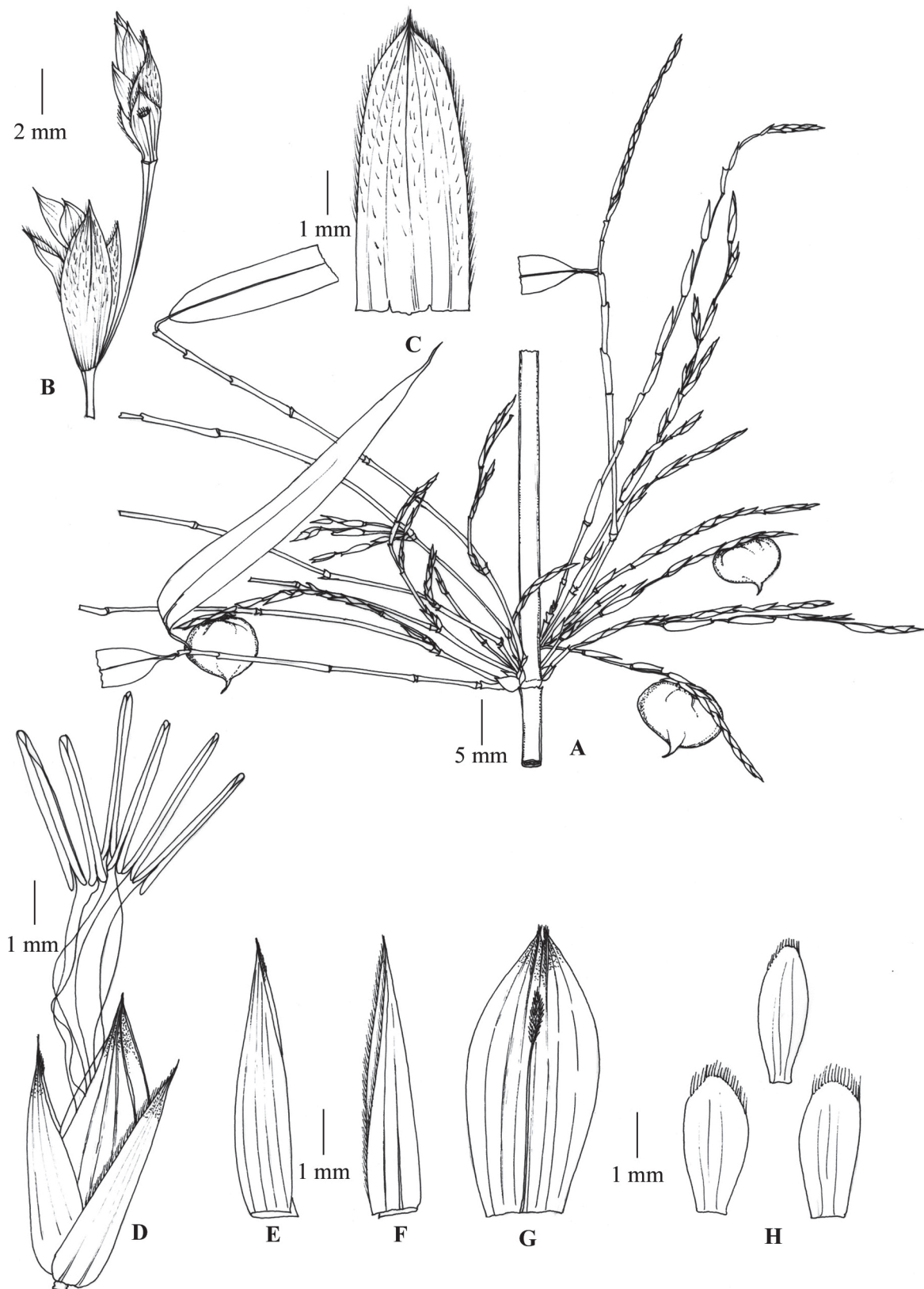


Fig.2. *Melocanna clarkei* (Gamble ex Brandis) P. Kumari & P. Singh :
A. Flowering and Fruiting branches; **B.** Spiklets; **C.** Bract;
D. Mature floret; **E.** Empty glume; **F.** Lemma; **G.** Palea; **H.** Lodicules. [*P. Kumari* 34612 (CAL)].



Plate1. *Melocanna clarkei* (Gamble ex Brandis) P. Kumari & P. Singh : **A.** Young culms; **B.** Mature culms; **C.** Culm-sheath; **D.** Nodal-bud.



Plate 2. *Melocanna clarkei* (Gamble ex Brandis) P. Kumari & P. Singh : **A.** Flowering; **B.** Inflorescence, Inset stamen; **C.** Fruits; **D.** Seedlings.

sheath proper 8 - 10 cm long, 10 - 12 cm broad at base, gradually attaining into 4 - 5 cm broad, truncate top, thin, crustaceous, rolled, faintly striate, densely appressed blackish-brown hairs on outer surface below, glabrous smooth on inner surface, margins smooth; imperfect blade as long as sheath proper, caducous, erect, striate, with inflated, broad, rounded base and acuminate, recurved apex, long ciliate (deciduous) at incurved margins; ligule c. 1 mm high, entire, smooth; auricles obscure. Leaves 5 - 6 per twig; leaf-blades lanceolate, 18 - 25 cm long, 2 - 3 cm broad, unequally, rounded-attenuate at base terminating somewhat acuminate into 1 - 1.5 cm long feathery apex with setaceous tip, glabrous on both surfaces except 1 - 2 scabrid nerves along one margin on adaxial surface and few hairs near base on abaxial surface, smooth at margins; mid vein thin, prominent, glabrous, secondary veins 8 - 10, tertiary veins 5 - 7, faint, not easily distinguished, few faint hair like dots are observed on abaxial surface; pseudopetiole 6-7 mm, swollen, bulging; leaf-sheath faintly striate, somewhat thin keeled, glabrous, ending into rounded, narrow callus, ciliate at margins first afterwards smooth; ligule narrow, truncate, glabrous, except few hairs near petiole attachment; auricles roundedly-elongate, somewhat pointed, bearing 5 - 6, c. 5 mm long cilia. Inflorescence spicate panicle on leafy branches; branches 15 - 30 cm long, 10 - 12 drooping at culm nodes; each branch nodes bearing 2 - 3, 10 - 15 cm long branchlets; rachis striated, hirsute, somewhat flattened at one side, bearing clusters of spikelets in bracts. Spikelets bracteate, having lower 2 - 4 prophylls and glumes with immature floret buds and terminal mature flower with hairy rachilla extension; bracts c. 1.2 cm long, ovate-lanceolate, mucronate, pubescent on outer surface, long ciliate along margins; rachilla 1 - 2 mm long, flattened at one side, glabrous except very few minute cilia at apex; empty glumes 2 in mature floret, 5 - 6 mm long, ovate, acute, mucronate, 5 - 7 nerved, glabrous, ciliate along margins; lemma c. 6 mm long, ovate, acute, short mucronate, 9-nerved, glabrous, minutely ciliate at apex on margins; palea equal or slightly longer than lemma, ovate, acute, faintly 2-keeled, 1-nerved between keels, 2-nerved on either side, glabrous entirely except few minute hairs at apex, with terminal rachilla extension hairy at apex; stamens 6, c. 4 mm long, exserted, blunt at purplish apex; ovary c. 0.5 mm, glabrous, continuing into short style, which soon divides into 3, hairy stigmas; lodicules 3, c. 3 mm, oblong, ovate, white fimbriate at top, hyaline, transparent, becoming somewhat fleshy afterwards; fruits fleshy, pyriform, 2 - 3 cm across, 2 - 4 cm long, with 5 - 10 mm long, pointed, slightly curved beak. (**Fig. 1 & 2; Plate 1 & 2**).

SEM features

Stomata – common, low dome, overarched from both ends by two elongate papillae giving ‘X’ shaped appearance; prickles frequent along mid vein; microhairs – infrequent; macrohairs – very rare, along mid vein, base swollen. (**Plate 3**).

Fl. : May - April.

New shoot: August - September.

Distribution : India : Meghalaya (Khasi hills – Laityrra, Cherrapunjee-Sellah; Jaintia hills - Jowai, below Sundai, Umtulu river site, Lashka dam site, near Umkiang), Manipur, Mizoram, Nagaland. (Technical report, 2001 by SFRI, Itanagar).

Habitat : Found between 900-1600 m in sub-tropical to warm temperate zone. Grows in hilly evergreen forests forming large, spreading patches.

Specimens examined : India : Meghalaya: Cherra end, 2000 ft, Oct. 1867, *C.B. Clarke* 5563 (holo, CAL); Jaintia hills, Jowai, 915 m, Aug. 1889, *G. Mann* 4846 (DD); Jaintia hills, 1220 m, April 1889, *G. Mann* s.n. (DD); Jaintia hills, below Sundai, March 1890, *G. Mann* s.n. (CAL); Umtulu river in Jaintia hills, about 15 miles from Jowai, April 1889, *G. Mann* s.n. (CAL); Khasi hills, Laityrra, 760 m, 22.4.1985, *H.B. Naithani* Sr. II 1287 (DD); Jaintia hills, 12 km to Umkiang from Jowai, 9.4.2004, *P. Kumari* 34612 (CAL); Khasi hills, Laityrra, 28.4.2004, *P. Kumari* 34637 (CAL); Jaintia hills, 12 km to Umkiang from Jowai, 6.9.2005, *P. Kumari & P. Singh* 34676 (CAL); Jaintia hills, Lashka dam site, 7.9.2005, *P. Kumari & P. Singh* 34683 (CAL).

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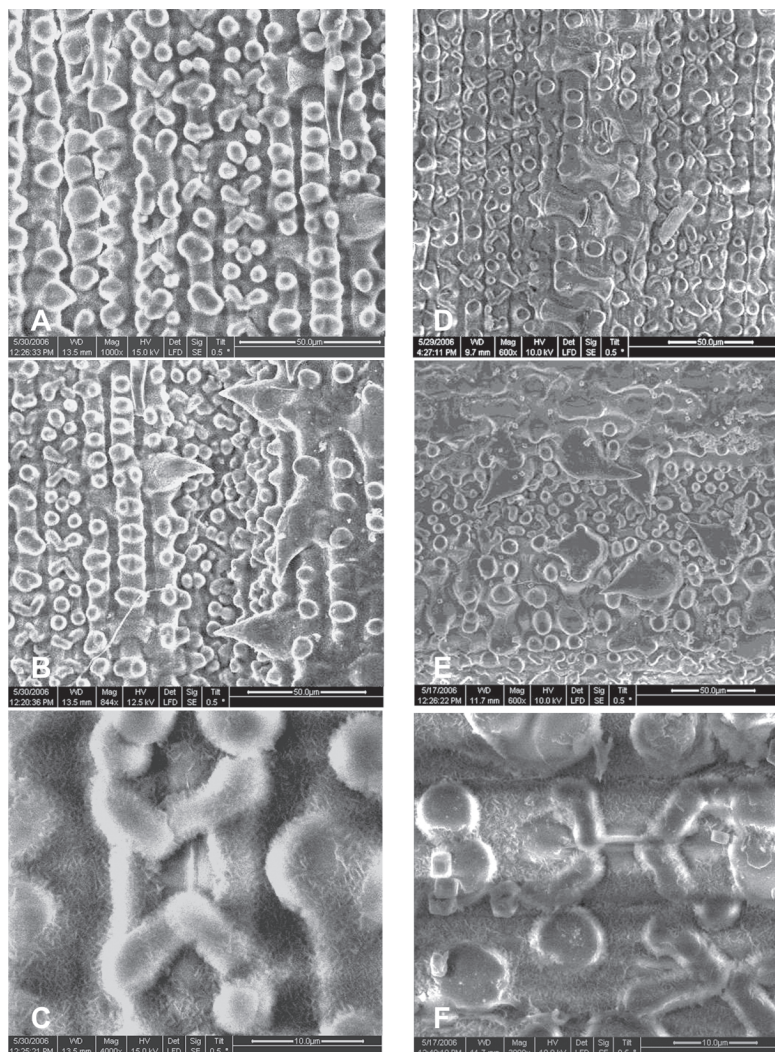


Plate 3. Comparison of *Melocanna baccifera* & *M. clarkei*
SEM leaf-abaxial surface structures: **A - C.** *M. baccifera* (Roxb.) Kurz
[*P. Kumari* 25161 (CAL)]. **D - F.** *M. clarkei* (Gamble ex Brandis) P. Kumari &
P. Singh [*P. Kumari* 34612 (CAL)].

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