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SHORT COMMUNICATION

CALAMUS PSEUDOERECTUS (ARECACEAE), A NEW SPECIES FROM THE EASTERN HIMALAYA, INDIA

Sujit Mondal, Shyamal K. Basu & Monoranjan Chowdhury

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***CALAMUS PSEUDOERECTUS* (ARECACEAE), A NEW SPECIES FROM THE EASTERN HIMALAYA, INDIA**

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Abstract: *Calamus pseudoerectus* (Arecaceae or Palmae), a new species of rattan from the hilly slopes of Mukti and Mahananda rivers at Darjeeling District of West Bengal in the eastern Indian Himalaya, is described and illustrated. This species closely resembles two Indo-Myanmar species, *C. erectus* Roxb. and *C. arborescence* Griff. It, however, is distinguished by its short and extremely slender stem, spine ornamentation, pendulous, long-branched inflorescence, and minute fruits with fimbriate scales. A comparative study among *C. pseudoerectus* sp. nov., *C. erectus* Roxb., and *C. arborescence* Griff. is provided. Conservation status of this species is proposed as Endangered (EN) as per IUCN.

Keywords: *Calamus arborescence*, *Calamus erectus*, new taxa, Palmae, Rattans.

Calamus L. is the largest genus of the family Arecaceae (Palmae) with about 520 species worldwide, mostly distributed in the Asia-Pacific region and Africa (Dransfield et al. 2008; Baker 2015; Baker & Dransfield 2016). The spiny climbing and non-climbing rattans, the source of the commercial rattan cane, are distributed from tropical Africa, India to Fiji, southern China through Malay Archipelago to northern Australia (Baker & Dransfield 2014). *Calamus* is most species-rich in the southeastern region of Asia, with 183 species occurring across the Malay Peninsula, Philippines, Borneo, Sumatra,

and Java (Baker & Couvreur 2012; Govaerts et al. 2013) and 52 species recognized from New Guinea (Baker et al. 2002; Baker & Dransfield 2006). Baker & Dransfield (2014) added 14 more species of *Calamus* from New Guinea. The lower hills of the eastern Himalaya and the Terai parts are quite rich in *Calamus* species, with 28 species reported from China (Pei et al. 1991), seven from Bangladesh (Alam 1990), eight from Bhutan (Noltie 1994), and nine from Nepal (Paudel & Chowdhary 2005). In India, Beccari (1894) reported 72 species of *Calamus* from undivided British India for the first time; presently, around 36 species and three varieties of *Calamus* are recorded from various parts of the Himalaya, Western Ghats, and the Andaman & Nicobar Islands (Basu & Basu 1987; Renuka 1987; Basu 1992). A total of 18 species of the genus *Calamus* L., *Plectocomia* Mart. ex. Bl., and *Daemonorops* Bl. were reported from various altitudes of West Bengal (Mondal & Chowdhury 2018). During exploration of palms and canes in the various lower hills and riverine forests along small streams ('khola') and rivers of the Darjeeling Himalaya, a few interesting specimens of *Calamus* were collected from Muktikhola (26°49'26"N & 88°13'22"E, 822m) and Choklong riverine

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forests (26°51'42"N & 88°21'45"E, 609m) of Mahananda Wildlife Sanctuary on the hillslopes of the Mukti and Mahananda rivers, respectively. After extensive morphologic comparisons in key herbaria (Herbarium, BSI, Central National Herbarium (CAL), Herbarium, BSI, Eastern Regional Centre, Shillong (ASSAM), Herbarium, BSI, Sikkim Himalya Regional Center, Gangtok (BSHC), and Herbarium, University of North Bengal (NBU), matching with some digital herbarium of Herbarium, Royal Botanical Garden, Kew (K), Herbarium, National Taiwan University (TAI) Herbarium, Royal Botanical Garden, Edinburgh (E), and extensive literature search (Renuka 1987; Alam 1990; Pei et al. 1991; Basu 1992; Noltie 1994; Paudel & Chowdhary 2005; Baker & Couvreur 2012; Govaerts et al. 2013; Baker & Dransfield 2014), it was found that it is a new species for science. The new taxon is carefully described and illustrated and a comparison of diagnostic morphologic characters with two allied Indian species, *C. erectus* Roxb. (Hort. Bengal. 72. 1814) and *C. arborescence* Griff. (Calcutta J. Nat. Hist. 5.33.1845), are presented (Table 1). Of the 36 species in India, two species, *C. erectus* and *C. arborescence*, are completely different from the others in respect of lack of knee, cirrus, and flagella. Similar character-bearing species from southeastern Asia are *C. acaulis* A.J. Hend., N.K. Ban & N.Q. Dung from Vietnam and *C. oxycarpus* Becc., *C. macrorhynchus* Burret, *C. erectus* Roxb., and *C. dianbaiensis* C.F. Wei from China. The new species is close to this group and lacks knee, cirrus, and flagella.

TAXONOMIC TREATMENTS

Calamus pseudoerectus sp. nov.

S. Mondal, S.K. Basu & M. Chowdhury,
Betgara, Otlā bet [Nepali] (Image 1; Fig. 1).

Similar to *Calamus erectus* Roxb. and *C. arborescence* Griff. in respect of having similar types of ocrea and devoid of knee, flagella, and cirri, but distinct by big, branched inflorescence, minute and scattered spines, and very small fruits with fimbriate fan-shaped scales. It further differs by having scattered spines on leaf sheath and rachis, while in *C. erectus* and *C. arborescence*, spines are clustered and whorled. It is further characterized by pendulous big inflorescence, sheath with white and brownish-black powdery dust, conspicuous ocrea, oblong fruits, 5mm × 1mm, brown.

Holotype: 10044 (CAL), 08.ii.2018, India, West Bengal, Darjeeling District, Muktiholes hillslopes, 26°49'26"N & 88°13'22"E, 822m, coll. S. Mondal & M. Chowdhury.

Isotype: Calcutta University Herbarium (CUH), NBU

(10044).

Cluster-forming rattan, erect up to 11m long. Stem solid, with sheaths 18–20 cm diameter, without sheaths 12–13.5 cm diameter; internodes 5–9.8 cm long, 12.1–13.2 cm diameter. Leaf ecirrate, 1.56–3.37 m long; flagella absent; sheath blackish-brown, caducous scales, sparsely variable sized blackish-brown armed with minute and few long flat spines along zone of adnation between inflorescence and sheath; knee absent; petiole 1–1.2 m long, young petiole with white powdery dust, mature petiole base with dense brown dust, covered with irregular small spines, base flat, leaf sheath closed with spongy, thick sheath fibers on both edges; leaflets 38–43 on each side of rachis; rachis 1.3–1.8 m long; glabrous, rarely spines on both edges, leaflets linear-ensiform, 41–75 cm × 2.1–4.1 cm, leaflets alternate in equidistance at base and terminal part, but opposite at middle; green beneath, narrowly elliptic to linear, mid leaflets 71–76.5 cm × 4.8–5.6 cm; apical leaflets 39.6–41.8 cm × 1.6–2.1 cm, apical leaflet scarcely united at base; fine spines 3–6 mm long, on major veins of both abaxial and adaxial surfaces; inflorescences long, looping, 2.10–2.40 m long, non-flagelliform, branched to 1 order, one pistillate and one staminate flower lies in each node; pistillate flowers deeply embedded on rachis node, sterile staminate flowers lies at base of pistillate flowers; prophyll strictly tubular, 14–32 cm × 4.8–3.1 cm tightly sheathing, opening asymmetrically at apex, with brown indumentums similar to that of the sheath, very sparsely armed with minute recurved spines, sometimes with fine bristles around bract opening; peduncular bracts one or two, peduncular up to 1.12m long, 1.3cm diameter, with irregular spine on margin and adaxial surface, rachis bract 5.6–14.4 cm × 3.3–5.2 cm, similar to prophylls; primary branches (rachillae) 25.6–134.2 cm apart, rachillae 2–3 at each nodes; rachillae alternate, straight, 10.3–27.6 mm × 1.6–2.5 mm; rachilla bracts 1.3–1.6 cm × 2.3–2.8 cm, similar to prophylls; floral bracteoles tubular, 0.7–1.4 cm × 1.8–2.5 cm, asymmetrically opened; pistillate flowers oval, 0.6–0.4 cm × 0.4–0.5 cm, sessile, lacking indumentums; calyx 0.4cm diameter, connate at base, three-lobed; lobes 0.6cm × 0.4cm; corollatubular at base, 0.4–1.1 cm × 1.6cm long, tip three-lobed; lobes triangular, 0.6mm long; ovary globose; stigma three, prominent; sterile staminate flower narrow, 0.7cm × 0.3cm, solitary, sessile, attached at base of pistillate flowers, calyx 0.4cm diameter, connate at base, three-lobed; lobes 0.6cm × 0.4cm; tubular at base, corolla 0.4–1.1 cm × 1.6cm, tip three-lobed; lobes triangle, 0.6cm long; sterile stamens six; separate fertile male plants not seen. Fruits very

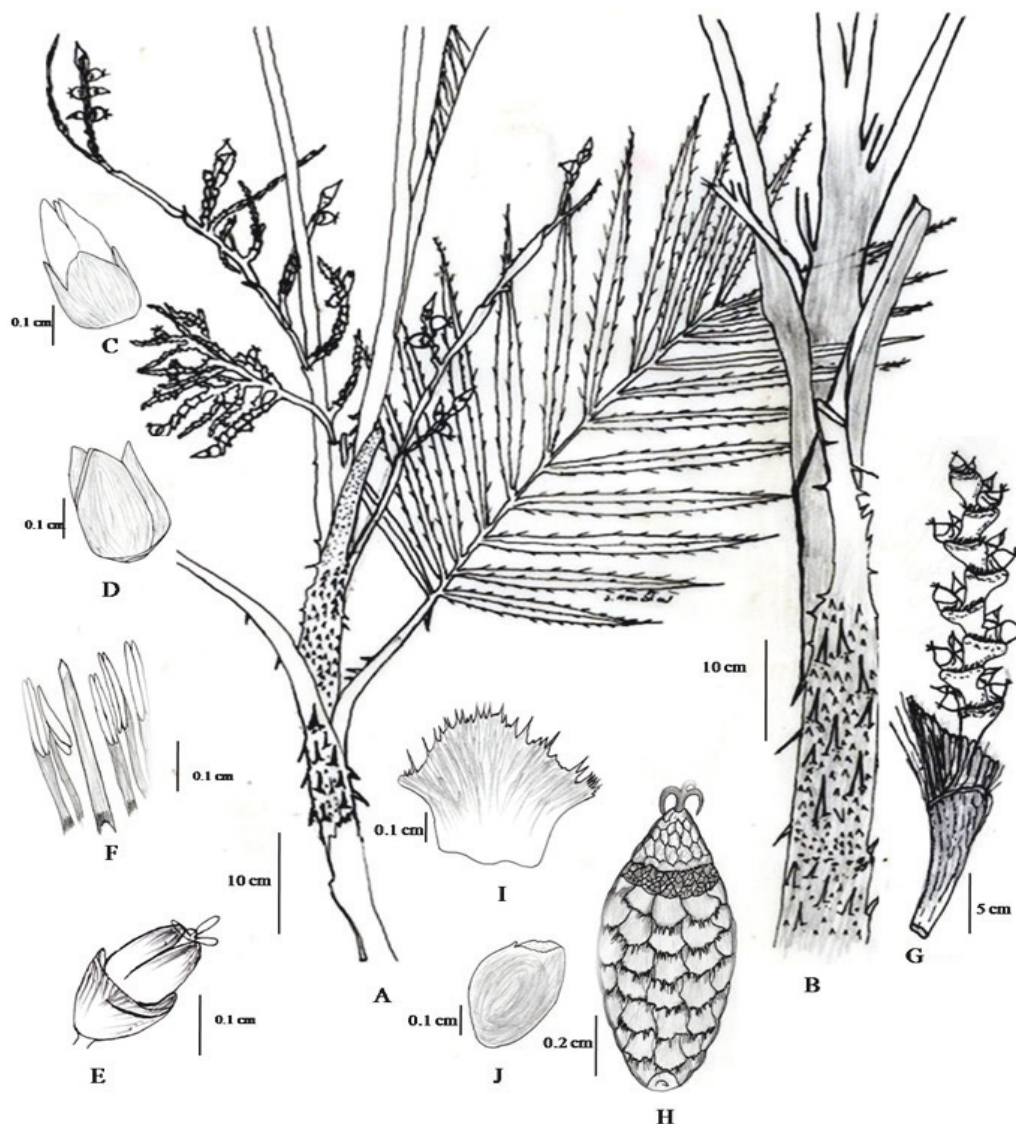


Figure 1. *Calamus pseudoerectus* sp. nov.: A, B - habit with leaf sheaths, leaves, and inflorescence | C - sterile staminate flower | D - calyx | E - pistillate flowers | F - sterile stamens | G - rachilla with female and sterile male flower | H - mature fruit | I - scales | J - seed. © Sujit Mondal.

small, ellipsoid, 0.7–0.8 mm × 0.3–0.4 mm, rusty brown, with three distinct stigmatic projection, 0.1–0.2 mm long, covered with longitudinal rows of scales, reddish brown, 0.4–0.8 mm × 0.3–0.5 mm, scales not regular, fan-shaped, margins fimbriate, arranged in nine rows; one-seeded. Seeds oblong, 0.5 cm × 0.1 cm, brown.

Phenology: Flowering: December–February; Fruiting: February–May.

Distribution: India (West Bengal, Darjeeling District).

Habitat: Hill slopes of riverine forests at lower hills, associated with bushes of *Lantana camara* L., *Mikania micrantha* Kunth, *Pandanus nepalensis* H. St. John, *Curcuma aromatica* Salisb., *Alstonia neriifolia* D. Don, and *Wallichia caryotoides* Roxb.

Uses: Leaves are used as thatch; local peoples use

fruits for diabetes.

Etymology: The specific epithet is given as the new species is quite closer to the Indian rattan *C. erectus*.

Additional specimen examined (paratypes): 10212 (NBU), one specimen collected on 12.iv.2018, West Bengal, Darjeeling District, Shivkhola hillslopes, 26°51'42"N & 88°21'45"E, 609m, coll. S. Mondal & M. Chowdhury.

Notes: This species was discovered from the lower hills of Darjeeling District of India around 16 km away from Siliguri City. *Calamus pseudoerectus* is presently known from four populations in the lower hill forests of Darjeeling District of West Bengal in the eastern Himalaya. Three populations were found at Murtikhola and one population at Shivkhola area of Mahananda WS.

Table 1. Morphologic comparison among *Calamus erectus* Roxb., *C. arborescens* Griff., and *C. pseudoerectus* sp. nov.

Characters	<i>Calamus erectus</i> Roxb.	<i>Calamus arborescens</i> Griff.	<i>Calamus pseudoerectus</i> sp. nov.
Sheath Spines Pattern Size (cm) Colour	With yellow powdery dust Dense, in oblique rows Comb-like, whorl, dense 4–7 Yellow	Powdery dust absent Dense, in oblique rows Comb-like, whorl 1–4 Black	Whitish at young and blackish-brown powdery dust, sparsely variable sized armed or spines 2–3 Blackish-brown
Rachis Size (m) Spine type Pattern	3–3.5 Dense long spines Spine 1–2 or whorled, comb-like	2–2.5 Dense long spines Whorled, comb-like	1.3–1.8 Glabrous or rarely spines Rarely on both edge
Petiole Size (m) Spines	0.5–1.5 Whorled, comb-like	0.5–1.5 Whorled, comb-like	0.5–1.2 Single, rarely on edge
Leaves Leaflets Number (pair) Size (cm) Arrangement Terminal leaflets	25–40 60–80 × 3.5–5 Leaflets alternate in equidistance, green beneath Joined at half of their length	25–39 80–100 × 5–6 Leaflets opposite in equidistance, white beneath Joined at half of their length	38–43 41–75 × 2.1–4.1 Leaflets alternate in equidistance at base and terminal part, but opposite at middle; green beneath Joined at one-fourth of their length
Prophyll Size (cm) Type Colour Spines Texture	Tubular, short 7–10 Uniform, upper parts soft, lacerate Green Thickly Papery, tattering apices	Tubular, very long 20–30 Uniform, lacerate above Green Thickly Papery, tattering apices	Tubular, long 14–32 Opening wider, upper parts fibrous, Whitish-greenish-brown Absent Leathery, strong
Inflorescence Size (m) Peduncle Rachillae	Short, round 1–2 Round, strongly armed with black comb- like spines Rachillae 1 at each node, female flower rarely with sterile male flower	Pendulous, compressed 1.6–2 Compressed, strongly armed with black comb-like spines Rachillae 1 at each node, female flower rarely with sterile male flower	Pendulous, compressed 2.10–2.40 Compressed, pedicle unarmed, smooth Rachillae 2–3 at each node, each female and sterile male flower together in each node throughout
Pistillate flowers Stigma	Deciduous	Deciduous	Persistent
Fruit Shape Size (cm) Colour Stigmatic projection Scales Shape Size (mm) Margin Vertical rows	Big Ovoid-ellipsoid 3–5 × 2–2.5 Brown Absent Boat-shaped 6–7 × 9–11 Brown, entire 12	Big Obovoid-ellipsoid 2–2.2 × 0.5–0.7 Brown Absent Boat-shaped 6–7 × 9–11 Reddish, entire 12	Very small Ellipsoid 0.7–0.8 × 0.3–0.4 Rusty brown Present Fan-shaped 0.4–0.8 × 0.3–0.5 Reddish-brown, fimbriate 9
Seed Size (cm) Colour	Big, 2.7 × 1.3 Yellow	Big, 1.2 × 0.6 Yellow	Small, 0.5 × 0.1 Brown

Each population is with an average of 10–15 individuals. Altogether, 40–60 individuals were observed. We examined several pistillate inflorescences and every time found minute fruits with seeds and fimbriate scales. The present study did not record staminate specimens.

Given the size of the area is about 60km² (area of occupancy <500km² and area of occurrence <5000km²), number of locations four (≤5), and threats to the habitat, we recommend *Calamus pseudoerectus* under the status of Endangered (EN; IUCN Standards & Petitions Subcommittee 2014). The type locality is the part of the Himalayan hotspot (Myers et al. 2000) and faces

tremendous adverse anthropologic pressure including tea gardens, road and house construction, huge forest resource collections by local people, and ecotourism. As *C. pseudoerectus* grows in the open forest of Mahananda WS where human infiltration is huge due to the presence of nearby tea gardens and ecotourism sites, the existing habitat needs to be protected by the forest department for the sake of in situ conservation of this new species.

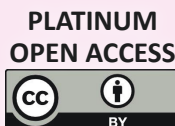


Image 1. *Calamus pseudoerectus* sp. nov. at Darjeeling District of West Bengal, India: A, B - habit | C - stem | D - inflorescence | E - sheath | F - petiole | G, H - sheath with fiber | I - rachilla | J - pistillate flower | K - sterile staminate flower | L - sterile stamens | M - mature fruit | N - fimbriate scales | O - seed. © Sujit Mondal.

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